

GRADE 4 COOKING & FOOD

First edition

8 units

32 lessons · one school year

A video for every lesson

FIRST EDITION

COURSE GUIDE

This course follows eight strands of cooking and food through one school year: kitchen and food safety, the food groups and the balanced meal, taste and smell, heat and cold, food chemistry, cravings and a balanced way of eating, fire and spice, and meal planning for the family table. Each unit is built around real people and real moments: Daniel Fahrenheit sealing mercury in a glass tube, British sailors squeezing lemon and lime juice into their rations, the Corps of Discovery carrying “portable soup” across the Rocky Mountains, Percy Spencer finding a melted candy bar in his pocket, John Landis Mason patenting his screw-top jar, prospectors guarding their sourdough through the Gold Rush, and Amelia Simmons writing the first cookbook by an American.

Every lesson follows the same path. First comes **the story**. Then **how they figured it out**: the question they faced, what they tried, what they saw and what they learned. Then **the kitchen science**, explained for a fourth grader. Last, **let’s cook**: the student makes a real recipe for the family, with an adult beside, and records it in a cook’s notebook, tasting, rating and improving it the next time. Food is treated as God’s good gift, received with thanks and shared with others. We talk about food in terms of skill, safety, nourishment, thankfulness and hospitality, never in terms of body size or appearance.

The year ends with a family feast: the student plans a balanced menu, shops with a parent, cooks several dishes learned during the year with an adult beside, sets the table, welcomes the family and gives thanks.

Most videos come from trusted public and teaching sources: the USDA and FoodSafety.gov, university extension services, America’s Test Kitchen and America’s Test Kitchen Kids, SciShow Kids, Learn Bright, Townsends and careful cooking teachers chosen lesson by lesson. Every video was previewed for content, accuracy and modest dress. Most are short; a few run longer and are best watched together. Some channels end with an invitation to subscribe or a

short message about their other videos; you can stop the video when the teaching ends. Pause whenever the lesson's note asks the student to predict what will happen next.

Start with Lesson 1.1 →

WHO IT IS FOR

Written for students in grade 4 (about ages 9–10) who read on their own, can measure with cups and spoons, and are ready to learn a safe knife grip and to cook at the stove with an adult right beside them. A parent or responsible adult reads along, stands beside the student for every knife, stove and oven step, and does all the grilling. Nothing needs to be bought beyond an ordinary kitchen and ordinary groceries; an instant-read food thermometer is the one inexpensive tool we strongly recommend.

HOW TO USE THIS COURSE

1. **The weekly rhythm.** The year has 32 lessons, one a week, in two sessions. Session 1 (about 45–60 minutes) is the warm-up, the video, the teaching and the picture study. Session 2 (about 45–60 minutes) is the kitchen project: cook the recipe, run the little experiment inside it, clean up, and write in the cook's notebook. In the last week of each unit, add a third session for the unit review and the unit challenge.
2. **An adult supervises all cooking.** A parent or responsible adult is present for every kitchen project in this course. Before cooking, check every recipe and every taste test against your own family's food allergies; each recipe card names the major allergens it contains and offers swaps where they are easy.
3. **The grade 4 safety ladder.** Fourth graders use a small serrated knife or paring knife only with an adult right beside them, on a cutting board that cannot slide (a damp towel underneath), using the “claw” and “bridge” grips taught in Lesson 1.3. They use the stove and oven with an adult beside them, pot handles turned in, oven mitts on, and never reach over steam. The microwave is used with an adult nearby. There is no frying in more than a thin film of oil. At the grill, the student preps and watches from 3 feet back while an adult lights the grill and does all the grilling.

4. **Story, then science, then cooking.** The core ideas are written to be read aloud together or read by the student. The paragraphs marked *The story* and *How they figured it out* tell what happened; *The kitchen science* explains what is happening to the food; *Let's cook* names the recipe and the one skill to do well and safely. After each paragraph, ask the student to tell it back in his or her own words.
5. **Picture study.** Each lesson has one painting or historic photograph of a kitchen, a harvest, a market or a table. Look at it quietly for two minutes. Then put it away and have the student tell everything he or she remembers. Bring it back and work through the “look for” items and questions, which point to the food, the heat, the tools and the people in the picture.
6. **The cook's notebook.** Use one notebook for the whole year. For every recipe, write the date, copy the recipe in your own words, record what you measured and saw, make a quick sketch of the finished dish, collect a family rating, and write one thing you would change next time. Then, when you can, cook it again and make that change. Cook it, record it, improve it.
7. **How we talk about food and bodies.** This course never discusses weight or how bodies look. We call foods “everyday foods” and “sometimes foods,” never “good” or “bad.” Treats and feasts are good gifts in their place. Grades rest on effort, care, safety, cleanliness and improvement.
8. **Groceries.** The recipes use ordinary grocery-store ingredients and feed a family of four to six. Most weeks the kitchen project can be the family's lunch, snack or supper, so the course adds little to the grocery bill beyond what the family already buys. Read the recipe card a few days ahead and add its ingredients to the shopping list.
9. **Optional books and tools.** Some units list free charts, guides, cookbooks and simple tools. They are extras. Every recipe can be made without them.
10. **Unit review and unit challenge.** Each unit ends with a short review (50 points) and a unit challenge: something real cooked, served and recorded, such as a family picnic packed to stay cold, a week of balanced dinners, a salt-and-sweetness taste test, or a homemade biscuit lab. Keep the challenge pages and photographs in a folder for the year.
11. **The family feast.** In the last week the student plans, shops for and cooks a balanced meal for the family with an adult beside, using dishes from several units, sets the table, and leads or joins in giving thanks.

SCOPE AND SEQUENCE

UNIT 1 • WEEKS 1–4

Kitchen & Food Safety

Daniel Fahrenheit and the food thermometer; the 40–140 °F danger zone and a picnic that stays cold; cross-contamination, the claw grip and separate cutting boards; and the nine major food allergens.

- 1.1 Daniel Fahrenheit and the Thermometer
- 1.2 The Danger Zone
- 1.3 Cross-Contamination and the Claw Grip
- 1.4 Food Allergies and the Nine Major Allergens

UNIT 3 • WEEKS 9–12

Taste, Smell & Your Taste Buds

The tongue-map myth and a cotton-swab taste test; bitterness, supertasters and the milder Brussels sprout; salt, flavor and Job’s question; and mouthfeel in thick and thin smoothies.

- 3.1 The Tongue-Map Myth
- 3.2 Supertasters and Bitterness
- 3.3 Salt and Flavor
- 3.4 Mouthfeel: Thick and Thin

UNIT 2 • WEEKS 5–8

Food Groups & the Balanced Meal

Food guides from the 1943 Basic Seven to MyPlate; vitamin C and the sailors’ lemons and limes; protein from plants and animals, from Ezekiel’s bread to rice and beans; and what Lewis and Clark carried across the continent.

- 2.1 From the Basic Seven to MyPlate
- 2.2 Vitamins: The Sailors’ Lemons and Limes
- 2.3 Protein from Plants and Animals
- 2.4 Lewis and Clark’s Provisions

UNIT 4 • WEEKS 13–16

Heat & Cold

Percy Spencer’s melted candy bar and the microwave; conduction in a cast-iron skillet of cornbread; John Landis Mason’s jar and safe home canning; and drying food, from raisins to astronaut food.

- 4.1 Percy Spencer and the Melted Candy Bar
- 4.2 Conduction: Iron Skillets and Wooden Spoons
- 4.3 The Mason Jar and Safe Canning
- 4.4 Drying Food: From Raisins to Astronauts

UNIT 5 • WEEKS 17–20

Food Chemistry

Starch and a smooth gravy; oil, vinegar and an emulsion for pasta salad; baking soda, baking powder and Eben Horsford's biscuits; and yeast, sourdough and the Gold Rush.

- 5.1 Starch and a Smooth Gravy
- 5.2 Oil and Vinegar: An Emulsion
- 5.3 Baking Soda, Baking Powder and Eben Horsford
- 5.4 Sourdough and the Gold Rush

UNIT 7 • WEEKS 25–28

Fire, the Grill & Spice

Columbus, chili peppers and a mild chili-spiced bean skillet; the Passover lamb roasted with fire and grill safety; herbs, spices and chimichurri; and sweet, salty, sour and rich flavors on grilled peaches.

- 7.1 Columbus, the Spice Route and the Chili Pepper
- 7.2 The Passover Lamb and Grill Safety
- 7.3 Herbs and Spices: Chimichurri
- 7.4 Flavor Friends: Sweet, Salty, Sour and Rich

UNIT 6 • WEEKS 21–24

Cravings, Reward & a Balanced Diet

Why sweet foods taste so good and how the brain learns to want them; the marshmallow test and waiting well; the Nutrition Facts label and homemade granola bars; and planning a week of filling snacks.

- 6.1 Why We Crave Sweet Foods
- 6.2 Walter Mischel's Marshmallow Test
- 6.3 The Nutrition Facts Label
- 6.4 Snack Planning: Full and Satisfied

UNIT 8 • WEEKS 29–32

Meal Planning & the Family Table

Amelia Simmons's *American Cookery* and johnnycakes; Ruth's parched corn and stovetop popcorn; doubling and halving a recipe for a big pot of chili; and the family feast.

- 8.1 Amelia Simmons and the First American Cookbook
- 8.2 Ruth and Boaz: Bread and Parched Corn
- 8.3 Doubling and Halving a Recipe
- 8.4 The Family Feast

WEEKLY PACING CALENDAR

WEEK	PLAN
1	- Session 1: Lesson 1.1 Daniel Fahrenheit and the Thermometer: warm-up, video, teaching and picture study - Session 2: Lesson 1.1 kitchen project (cook the recipe) and cook's notebook <i>Two sessions a week is the usual rhythm: one to learn, one to cook. Younger children can split a long session in two. Cook the week's recipe again at home whenever you can.</i>

WEEK	PLAN
2	• Session 1: Lesson 1.2 The Danger Zone: warm-up, video, teaching and picture study • Session 2: Lesson 1.2 kitchen project (cook the recipe) and cook's notebook
3	• Session 1: Lesson 1.3 Cross-Contamination and the Claw Grip: warm-up, video, teaching and picture study • Session 2: Lesson 1.3 kitchen project (cook the recipe) and cook's notebook
4	• Session 1: Lesson 1.4 Food Allergies and the Nine Major Allergens: warm-up, video, teaching and picture study • Session 2: Lesson 1.4 kitchen project (cook the recipe) and cook's notebook • Session 3: Unit 1 review and unit challenge
5	• Session 1: Lesson 2.1 From the Basic Seven to MyPlate: warm-up, video, teaching and picture study • Session 2: Lesson 2.1 kitchen project (cook the recipe) and cook's notebook
6	• Session 1: Lesson 2.2 Vitamins: The Sailors' Lemons and Limes: warm-up, video, teaching and picture study • Session 2: Lesson 2.2 kitchen project (cook the recipe) and cook's notebook
7	• Session 1: Lesson 2.3 Protein from Plants and Animals: warm-up, video, teaching and picture study • Session 2: Lesson 2.3 kitchen project (cook the recipe) and cook's notebook
8	• Session 1: Lesson 2.4 Lewis and Clark's Provisions: warm-up, video, teaching and picture study • Session 2: Lesson 2.4 kitchen project (cook the recipe) and cook's notebook • Session 3: Unit 2 review and unit challenge
9	• Session 1: Lesson 3.1 The Tongue-Map Myth: warm-up, video, teaching and picture study • Session 2: Lesson 3.1 kitchen project (cook the recipe) and cook's notebook
10	• Session 1: Lesson 3.2 Supertasters and Bitterness: warm-up, video, teaching and picture study • Session 2: Lesson 3.2 kitchen project (cook the recipe) and cook's notebook
11	• Session 1: Lesson 3.3 Salt and Flavor: warm-up, video, teaching and picture study

WEEK	PLAN
	Session 2: Lesson 3.3 kitchen project (cook the recipe) and cook's notebook
12	- Session 1: Lesson 3.4 Mouthfeel: Thick and Thin: warm-up, video, teaching and picture study - Session 2: Lesson 3.4 kitchen project (cook the recipe) and cook's notebook - Session 3: Unit 3 review and unit challenge
13	- Session 1: Lesson 4.1 Percy Spencer and the Melted Candy Bar: warm-up, video, teaching and picture study - Session 2: Lesson 4.1 kitchen project (cook the recipe) and cook's notebook
14	- Session 1: Lesson 4.2 Conduction: Iron Skillets and Wooden Spoons: warm-up, video, teaching and picture study - Session 2: Lesson 4.2 kitchen project (cook the recipe) and cook's notebook
15	- Session 1: Lesson 4.3 The Mason Jar and Safe Canning: warm-up, video, teaching and picture study - Session 2: Lesson 4.3 kitchen project (cook the recipe) and cook's notebook
16	- Session 1: Lesson 4.4 Drying Food: From Raisins to Astronauts: warm-up, video, teaching and picture study - Session 2: Lesson 4.4 kitchen project (cook the recipe) and cook's notebook - Session 3: Unit 4 review and unit challenge
17	- Session 1: Lesson 5.1 Starch and a Smooth Gravy: warm-up, video, teaching and picture study - Session 2: Lesson 5.1 kitchen project (cook the recipe) and cook's notebook
18	- Session 1: Lesson 5.2 Oil and Vinegar: An Emulsion: warm-up, video, teaching and picture study - Session 2: Lesson 5.2 kitchen project (cook the recipe) and cook's notebook
19	- Session 1: Lesson 5.3 Baking Soda, Baking Powder and Eben Horsford: warm-up, video, teaching and picture study - Session 2: Lesson 5.3 kitchen project (cook the recipe) and cook's notebook
20	- Session 1: Lesson 5.4 Sourdough and the Gold Rush: warm-up, video, teaching and picture study - Session 2: Lesson 5.4 kitchen project (cook the recipe) and cook's notebook

WEEK	PLAN
	Session 3: Unit 5 review and unit challenge
21	- Session 1: Lesson 6.1 Why We Crave Sweet Foods: warm-up, video, teaching and picture study - Session 2: Lesson 6.1 kitchen project (cook the recipe) and cook's notebook
22	- Session 1: Lesson 6.2 Walter Mischel's Marshmallow Test: warm-up, video, teaching and picture study - Session 2: Lesson 6.2 kitchen project (cook the recipe) and cook's notebook
23	- Session 1: Lesson 6.3 The Nutrition Facts Label: warm-up, video, teaching and picture study - Session 2: Lesson 6.3 kitchen project (cook the recipe) and cook's notebook
24	- Session 1: Lesson 6.4 Snack Planning: Full and Satisfied: warm-up, video, teaching and picture study - Session 2: Lesson 6.4 kitchen project (cook the recipe) and cook's notebook - Session 3: Unit 6 review and unit challenge
25	- Session 1: Lesson 7.1 Columbus, the Spice Route and the Chili Pepper: warm-up, video, teaching and picture study - Session 2: Lesson 7.1 kitchen project (cook the recipe) and cook's notebook
26	- Session 1: Lesson 7.2 The Passover Lamb and Grill Safety: warm-up, video, teaching and picture study - Session 2: Lesson 7.2 kitchen project (cook the recipe) and cook's notebook
27	- Session 1: Lesson 7.3 Herbs and Spices: Chimichurri: warm-up, video, teaching and picture study - Session 2: Lesson 7.3 kitchen project (cook the recipe) and cook's notebook
28	- Session 1: Lesson 7.4 Flavor Friends: Sweet, Salty, Sour and Rich: warm-up, video, teaching and picture study - Session 2: Lesson 7.4 kitchen project (cook the recipe) and cook's notebook - Session 3: Unit 7 review and unit challenge

WEEK	PLAN
29	• Session 1: Lesson 8.1 Amelia Simmons and the First American Cookbook: warm-up, video, teaching and picture study • Session 2: Lesson 8.1 kitchen project (cook the recipe) and cook's notebook
30	• Session 1: Lesson 8.2 Ruth and Boaz: Bread and Parched Corn: warm-up, video, teaching and picture study • Session 2: Lesson 8.2 kitchen project (cook the recipe) and cook's notebook
31	• Session 1: Lesson 8.3 Doubling and Halving a Recipe: warm-up, video, teaching and picture study • Session 2: Lesson 8.3 kitchen project (cook the recipe) and cook's notebook
32	• Session 1: Lesson 8.4 The Family Feast: warm-up, video, teaching and picture study • Session 2: Lesson 8.4 kitchen project (cook the recipe) and cook's notebook • Session 3: Unit 8 review and unit challenge <i>Last week. Hold a family feast: the student plans the menu, shops with a parent, cooks a balanced meal with a dish from several units, sets the table, says grace with the family and shows the cook's notebook.</i>

MATERIALS

Cook's notebook (any notebook)

One for the whole year: recipes in your own words, observations, taste charts, sketches, family ratings and “what I would change next time.”

An instant-read food thermometer

The one tool we strongly recommend. Used from Lesson 1.1 on to check the refrigerator, cooked chicken, eggs and leftovers.

A refrigerator thermometer

Optional and inexpensive. Leave it in the fridge to check that it stays at or below 40 °F (4 °C).

Measuring cups (dry and liquid) and measuring spoons

Used in every recipe.

A small serrated knife or paring knife, a vegetable peeler and two cutting boards

Used only with an adult right beside the student. Put a damp towel under the board so it cannot slide. Keep one board for raw meat and one for ready-to-eat foods (Lesson 1.3).

A large skillet (cast iron if you have one), a medium and a large pot with lids, a baking sheet, a muffin tin and oven mitts

Ordinary kitchen equipment for the stovetop and oven recipes.

Mixing bowls, a whisk, a wooden spoon, a spatula, a colander and clean jars with lids

For mixing, draining, shaking dressings and storing.

A blender

For the smoothies in Lesson 3.4 and the salsa in Lesson 4.3; used with an adult beside you, lid on, and never with a hand or spoon inside while it is plugged in.

A small cooler and ice packs

For the picnic plan in Lesson 1.2 and the unit challenge.

Clean dish towels, dish soap and paper towels

Cleanup is part of every recipe.

A timer and a camera or phone

For timing cooking and experiments and photographing finished dishes and unit challenges.

GRADING

Grades come mostly from the kitchen projects and the cook's notebook, because cooking is learned by doing, recording and trying again. A dish that flops but is honestly recorded and then made again with one improvement earns full credit.

PART	%
Kitchen projects (effort, safety, cleanliness and the improve round)	40
Cook's notebook (recipes in your own words, observations, taste charts, sketches)	20
Unit reviews	15
Unit challenges	25

Scale: A 90–100, B 80–89, C 70–79, D 60–69. Below 60: cook the recipe or redo the review again with help.

- Grade the cook, not the dish. Did the student wash up first, follow the safety steps, measure carefully, observe and record honestly, clean up, and try an improvement?
- A notebook page earns full marks when it has a date, the recipe in the student's own words, at least one observation or measurement, a sketch or photo, a family rating and one sentence about what to change.
- A dish that flops but is honestly recorded and tried again earns full credit. Flat biscuits and runny gravy teach as much as perfect ones.
- Unit reviews may be done orally for a student who writes slowly; the parent writes down the answers.
- Never grade or comment on anyone's body, size or how much they ate. Grades rest on effort, care, safety, cleanliness and improvement.

A NOTE TO PARENTS

You do not need to be a chef to teach this course. Read the story aloud together, watch the video, and then be the student's kitchen partner: stand beside the stove and the cutting board, hand over the thermometer, and ask "What do you think will happen?" and "Why do you think it happened?" Those two questions are most of what a good cooking teacher does. Let the student do as much of the work as the safety ladder allows, including the cleanup.

Fourth grade is the year many children first hold a real knife and stand at the stove. Go slowly. Teach the claw grip until it is a habit, turn every pot handle in, and keep the rule that you are right beside the student for every sharp or hot step. Expect some flops: biscuits will come out flat and gravy will be lumpy. Cooks learn by tasting, noticing and trying again. *Fabricando fit faber*: by making, one becomes a maker.

Food in this course is a good gift to be received with thanks and shared. We keep the conversation on skill, nourishment, thankfulness and hospitality, never on weight or appearance, and we name foods neutrally as "everyday foods" and "sometimes foods." Food allergies and any special medical needs belong to your family and your doctor: please read each recipe card's allergen note and make the swaps your family needs.

UNIT 1

KITCHEN & FOOD SAFETY

Every good cook is first a safe cook. In this unit you will meet Daniel Fahrenheit, the instrument maker whose thermometer gave us the numbers on every oven dial and food thermometer in America, and you will learn to use a food thermometer yourself. You will learn the **danger zone**, the temperatures between 40 °F and 140 °F where germs multiply fastest, and you will plan a picnic that stays cold.

Then you will learn how germs ride from raw meat to a salad on hands, knives and cutting boards, and how to stop them. You will learn the **claw grip** and the **bridge grip** for a real knife, used with an adult right beside you. Last, you will learn the nine major food allergens and cook a snack that friends with allergies can share. A parent or responsible adult supervises all cooking in this course, and every family checks every recipe against its own food allergies.

PREREQUISITES

- Can wash hands well with soap and water for 20 seconds
- Can read numbers up to 500 and read a simple dial or digital display
- Can measure with cups and spoons with help
- Agrees to the kitchen rule: an adult is beside you for every sharp or hot job

MASTERY CHECKLIST

- ☐ I can tell how Daniel Fahrenheit made a reliable thermometer and what 32 °F and 212 °F mean.
- ☐ I can use a food thermometer in the thickest part of a food and name the safe temperatures for chicken (165 °F), ground meat (160 °F) and leftovers (165 °F).
- ☐ I can explain the 40–140 °F danger zone and the 2-hour rule (1 hour above 90 °F).
- ☐ I can explain cross-contamination and keep raw meat away from ready-to-eat food with separate boards, clean hands and clean tools.
- ☐ I can use the claw grip and the bridge grip with a small knife, with an adult right beside me.
- ☐ I can name the nine major food allergens and read the allergen line on a food label.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **Fight BAC! (Partnership for Food Safety Education)**: Free. Printable handouts and activities on Clean, Separate, Cook and Chill and safe cooking temperatures, from a partnership that works with the USDA, FDA and CDC. Good for Lessons 1.1–1.3 and the unit challenge.
- **FDA: Food Allergies: What You Need to Know**: Free. The nine major food allergens and how to read a label, from the U.S. Food and Drug Administration. Read it with a parent for Lesson 1.4.
- **An instant-read food thermometer and a refrigerator thermometer**: Inexpensive and used all year. If you buy one tool for this course, make it the food thermometer.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

1.1 Daniel Fahrenheit and the Thermometer	2 sessions of 45–60 minutes
1.2 The Danger Zone	2 sessions of 45–60 minutes
1.3 Cross-Contamination and the Claw Grip	2 sessions of 45–60 minutes
1.4 Food Allergies and the Nine Major Allergens	2 sessions of 45–60 minutes

UNIT 1 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

Who was Daniel Fahrenheit, and what did he do to make thermometers better?

2. 5 pts

At what temperature does water freeze on the Fahrenheit scale? At what temperature does it boil (at sea level)?

3. (5 pts)

Give the safe internal temperature for chicken or turkey, for ground beef, and for reheated leftovers.

4. (5 pts)

What is the danger zone, and what is the 2-hour rule?

5. (5 pts)

Predict: one cup of chicken salad sits in a cooler with ice packs and another sits on a sunny picnic table for 2 hours. Which one is safe to eat, and why?

6. (5 pts)

What is cross-contamination? Give two ways to prevent it.

7. (5 pts)

Describe the claw grip and the bridge grip. Who must be beside you when you use a knife?

8. (5 pts)

Name the nine major food allergens. Which was added most recently?

9. (5 pts)

Predict: a cook makes a peanut-free sandwich for a friend with a peanut allergy but uses the same knife she just used for peanut butter. What might happen, and what should she do instead?

10. (5 pts)

Why should the thermometer go into the thickest part of the food?

ANSWER KEY

1. He was an instrument maker born in Danzig in 1686 who worked in the Netherlands. He made mercury thermometers (1714) that agreed with each other, using fixed points such as freezing water, and he described his scale in 1724.
2. It freezes at 32 °F and boils at 212 °F.
3. Chicken or turkey 165 °F; ground beef 160 °F; leftovers 165 °F.
4. The danger zone is 40–140 °F, where bacteria multiply fastest. Perishable food must go back in the refrigerator within 2 hours, or within 1 hour if it is above 90 °F.
5. The cooler cup is safe because it stayed below 40 °F, where bacteria grow very slowly. The cup on the table warmed into the danger zone, where bacteria multiplied fast, so it should be thrown away.
6. Germs moving from one food or surface to another, such as from raw chicken to salad. Any two: separate boards for raw meat and ready-to-eat food; cut vegetables first; wash hands with soap after touching raw meat; wash boards and knives in hot, soapy water; do not rinse raw poultry; use a clean plate for cooked meat.
7. Claw: fingertips curled under so the blade rests against the knuckles. Bridge: thumb and fingers make a bridge over a round food and you cut through the gap. An adult must be right beside me.
8. Milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, soybeans and sesame. Sesame was added most recently (labeling required from January 1, 2023).
9. A tiny bit of peanut could get on the sandwich (cross-contact) and cause an allergic reaction. She should use a clean knife and board and wash her hands first.
10. Heat moves from the outside in, so the thickest part is the last to get hot. If the thickest part is at a safe temperature, the rest is too.

UNIT CHALLENGE: A SAFE FAMILY PICNIC

Plan, prepare and serve a family picnic lunch (outdoors, or on a blanket indoors) that is safe from start to finish. Make at least one dish with a cooked meat or a mayonnaise-based salad, and one snack that is free of the nine major allergens.

Write a picnic safety plan: the time the food leaves the refrigerator, the latest time it must go back, how you will keep raw and ready-to-eat foods separate while cooking, and an allergy check for each person. Record the cooler temperature with your thermometer when you pack it and again just before eating. Finish with a short report and a family rating.

LOOK FOR	WHAT IT MEANS
Planning	A written menu and safety plan with times, an allergy check for each person and a packing list.
Safety in the kitchen	Hands washed, separate boards used, meat cooked to its safe temperature and checked with the thermometer, adult beside for knife and stove work.
Keeping food cold	Cooler packed with ice packs; temperatures measured and recorded at or below 40 °F; food back in the cold within the time limit.
Cleanup and service	Kitchen and cooler cleaned; meal served with thanks.
Reflection	Family ratings recorded and one honest improvement planned for next time.

1.1 DANIEL FAHRENHEIT AND THE THERMOMETER

OBJECTIVES

- Tell how Daniel Gabriel Fahrenheit made thermometers that agreed with each other and set up the temperature scale we use in American kitchens.
- Read a food thermometer, check it in ice water, and measure the temperature of the refrigerator, a cup of hot water and a cooked food.
- Bake chicken tenders with an adult beside you and check that the thickest one reaches 165 °F (74 °C).

Warm-up. Look at the oven dial, the refrigerator and any thermometer in your house. Write down every temperature number you can find. Which number do you think is the hottest thing in your kitchen? Which is the coldest? Then guess: how hot is the inside of a cooked chicken?

WATCH

Fahrenheit and Celsius for Kids | Temperature Explained

Homeschool Pop · 6:44

<https://www.youtube.com/watch?v=nhpKDDkzpp0>

WHEN TO WATCH

After the story, before the kitchen science. Listen for the freezing point and the boiling point of water on both scales, and write them down.

BACKUP VIDEO

A Flash of Food Safety Calibrating a Thermometer: Ice Water Method

USDA · 2:54

<https://www.youtube.com/watch?v=KCjb85pZb6c>

Before Session 2. Watch how the cook checks a food thermometer in a glass of ice water, then do it yourself.

KEY TERMS

temperature

How hot or cold something is, measured in degrees.

thermometer

A tool that measures temperature. A food thermometer has a metal probe that goes into the food.

Fahrenheit (°F)

The temperature scale used in American kitchens. Water freezes at 32 °F and boils at 212 °F.

Celsius (°C)

The temperature scale used by scientists and most countries. Water freezes at 0 °C and boils at 100 °C.

internal temperature

The temperature in the middle of a food, in its thickest part. This is what tells you if meat is safely cooked.

CORE IDEAS

The story. Daniel Gabriel Fahrenheit was born in 1686 in Danzig, a busy trading city on the Baltic Sea (today Gdańsk, in Poland). As a young man he moved to the Netherlands and became a maker of scientific instruments: barometers and thermometers. In his day thermometers were a mess. Every maker marked his own numbers, so two thermometers set side by side often disagreed. Fahrenheit wanted thermometers that told the same story every time.

How they figured it out. Fahrenheit tried filling his glass tubes with different liquids. In 1714 he made one with mercury, a shiny liquid metal that swells evenly as it warms and does not freeze in a cold winter. Then he needed fixed points, temperatures anyone could make again. He chose the coldest mixture he could make in his workshop (ice, water and a salt), which he called 0; the temperature at which plain water freezes, which became 32; and the warmth of a healthy person, about 96 on his first scale. In 1724 he described his thermometers to the Royal Society, a group of scientists in London. Later scientists used the boiling point of water, 212 °F, as a fixed point too. Because his thermometers agreed with each other, his scale spread, and it is still the scale on American ovens and food thermometers today.

The kitchen science. Germs that make people sick are too small to see, and you cannot tell by looking whether chicken is cooked enough to destroy them. A food thermometer can tell you. Heat travels from the outside of a food to the inside, so the **thickest part** is the last to get hot. That is where the thermometer goes, not touching bone or the pan. The USDA's safe minimum internal temperatures are: all poultry (chicken and turkey) 165 °F (74 °C); ground beef and pork and egg dishes 160 °F (71 °C); whole cuts of beef and pork and fish 145 °F (63 °C), with a 3-minute rest for the meat; leftovers reheated to 165 °F. You can check a thermometer by stirring it in a

glass full of ice and a little water for 30 seconds: it should read 32 °F (0 °C), just as Fahrenheit's scale says.

Let's cook. You will make crispy oven-baked chicken tenders. The skill to do well is **using the thermometer**: slide the probe sideways into the thickest tender until the tip is in the middle, wait for the number to stop changing, and read it. An adult stands beside you whenever the oven door is open, and you wear oven mitts.

PICTURE STUDY



Kitchen Scene with Christ in the House of Martha and Mary, Diego Velázquez, 1618 · Oil on canvas ·
National Gallery, London

Image: [Wikimedia Commons](#), public domain

Diego Velázquez painted this kitchen in Seville, Spain, when he was about 19 years old. A young cook is busy with the meal: fish to cook, eggs, garlic and a pepper to pound in the brass mortar. Behind her, through an opening, you can see the story from Luke 10, when Martha was busy with much serving and Mary sat at Jesus' feet listening. In 1618 there were no thermometers in kitchens. Cooks judged doneness by looking, smelling and touching.

Look closely

- Find the raw fish on the plate. How would this cook know when the fish was cooked through, without a thermometer?
- Find the two eggs and the garlic. Which foods on this table could be eaten without cooking, and which must be cooked?
- Look at the cook's face and the older woman pointing. What do you think the older woman is telling her?
- Find the small scene in the opening on the right. Who is sitting, and who is standing?

Talk about it

1. What does a cook today have that this cook did not have to know when food is safe to eat?
2. Which foods on the table would need to be kept cool while she works? Why?
3. Martha was busy serving and Mary sat listening to Jesus. How can a cook do both: serve well and still stop to listen?

Safety first. A parent or responsible adult supervises all cooking in this course; check every recipe against your family's food allergies before you start. Wash your hands with soap for 20 seconds after touching raw chicken, and never rinse raw chicken in the sink (it splashes germs). An adult stands beside you whenever the oven is open, and you wear oven mitts.

KITCHEN PROJECT

Thermometer Practice and Oven-Baked Chicken Tenders

First you will test your food thermometer the way Fahrenheit tested his: in ice water, in hot water and in the refrigerator. Then you will bake a pan of crispy chicken tenders and use the thermometer to decide when they are done, instead of guessing.

You will need

- An instant-read food thermometer
- A tall glass, ice cubes and cold water; a mug of hot tap water
- A large rimmed baking sheet and a wire rack (optional) or parchment paper
- Three shallow bowls or pie plates for the breading station
- A fork or tongs for raw chicken and a separate clean plate for cooked chicken
- Measuring cups and spoons, oven mitts and a timer

CRISPY OVEN-BAKED CHICKEN TENDERS

Serves 4–5 (about 16 tenders) · Prep 20 min · Bake 15–20 min

Ingredients

- 1½ pounds (680 g) chicken tenderloins (or boneless breasts cut into strips by an adult)
- ½ cup (60 g) all-purpose flour
- ½ teaspoon salt and ¼ teaspoon black pepper
- 2 large eggs
- 2 tablespoons milk
- 1½ cups (75 g) panko bread crumbs
- ½ cup (45 g) grated Parmesan cheese
- 1 teaspoon paprika and ½ teaspoon garlic powder
- 2 tablespoons olive oil or melted butter
- Cooking spray

Method

1. An adult heats the oven to 425 °F (220 °C). Line the baking sheet with parchment or set a rack on it and spray it with cooking spray.
2. Wash your hands. Set up three bowls in a row: flour mixed with the salt and pepper; eggs beaten with the milk; panko mixed with the Parmesan, paprika, garlic powder and oil.
3. Pat the chicken dry with paper towels (do not rinse it). Using a fork or tongs, dip each tender in flour, then egg, then press it into the crumbs on both sides. Lay it on the pan.
4. Wash your hands well with soap after the breading. Throw away the leftover flour, egg and crumbs; they have touched raw chicken.
5. With an adult beside you, slide the pan into the oven wearing oven mitts. Bake 8 minutes, then flip each tender with tongs and bake 7–10 minutes more, until golden.
6. With an adult beside you, check the thickest tender with the thermometer. It must read 165 °F (74 °C). If it does not, bake 2–3 minutes more and check again.
7. Move the cooked tenders to a clean plate, not the one that held raw chicken. Serve with ketchup, honey mustard or a yogurt dip and a vegetable.
8. Clean up: wash the bowls, tongs and board in hot, soapy water and wipe the counter. Refrigerate leftovers within 2 hours.

Allergy check: Contains wheat (flour and panko), eggs and milk (Parmesan, milk). For an egg-free version, brush the chicken with plain yogurt or mayonnaise made without eggs instead. For milk-free, leave out the Parmesan and use water. Gluten-free flour and crumbs can replace the wheat.

Steps

1. **Ice-water test.** Fill a tall glass with ice, add cold water, and stir the thermometer in it for 30 seconds. Write what it reads. A good thermometer reads 32 °F (0 °C).
2. **Temperature hunt.** Measure and record: a cup of hot tap water, the middle shelf of the refrigerator (leave the thermometer in a glass of water there for 10 minutes), and the freezer if you can. Is the refrigerator at or below 40 °F (4 °C)?

3. **Predict.** Write how many minutes you think the tenders will need to reach 165 °F.
4. Cook the recipe. With an adult beside you, check one thin tender and one thick tender at the same moment. Write both numbers. Which is cooler, and why?
5. **Taste test.** Ask each person to rate the tenders from 1 to 5 for crunch, juiciness and flavor.
6. **Improve it.** Write one change for next time (for example, more paprika, flipping sooner, or cutting the tenders all the same size so they cook evenly).
7. Clean up: wash the thermometer probe with hot, soapy water after every use.

Tips

- Tenders cut to the same thickness finish at the same time.
- Take the temperature of more than one piece. The biggest piece is the one that matters most.
- If your thermometer reads a few degrees off in ice water, write the difference on a piece of tape on its case and add or subtract it each time.

Check your work

- ☐ I can tell how Fahrenheit made his thermometers agree and what 32 °F and 212 °F mean.
- ☐ I checked my thermometer in ice water and measured three temperatures.
- ☐ I baked chicken tenders with an adult beside me and checked that the thickest one reached 165 °F.

COOK'S NOTEBOOK

1. Draw a large thermometer from 0 °F to 220 °F. Mark and label: ice water (32 °F), the refrigerator (40 °F or below), body temperature (about 98.6 °F), the danger zone (40–140 °F), chicken (165 °F) and boiling water (212 °F).
2. Copy the chicken tender recipe in your own words. Underline every step where you washed your hands or used a clean plate.
3. Make a small table of your temperature hunt: place, what you predicted, what you measured.

From history. The Swedish astronomer Anders Celsius proposed his 100-step scale in 1742, built on the freezing and boiling of water. Most countries and all scientists now use Celsius, but American kitchens still use Fahrenheit. That is why this course gives both, like this: 165 °F (74 °C).

COMMON MISTAKES

- Judging chicken by its color. Color can fool you; only a thermometer tells you it reached 165 °F.
- Pushing the thermometer all the way through so the tip touches the pan. The pan is hotter than the food; aim for the middle of the thickest piece.
- Putting cooked chicken back on the plate that held it raw. Germs from the raw juices get onto the cooked food.

Make it a game • Fahrenheit's Guessing Game. Hide a cup of ice water, a cup of hot tap water, and a cup of room-temperature water behind a book. Your parent holds a thermometer and names a number; you guess which cup it matches. Score a point for each match, then switch roles. Finish by saying aloud why Fahrenheit needed one steady scale so every thermometer agreed.

1.2 THE DANGER ZONE

OBJECTIVES

- Explain the danger zone (40–140 °F) and why germs multiply fastest at those temperatures.
- Use the 2-hour rule (1 hour when it is above 90 °F) to plan when food goes back in the refrigerator.
- Make a chicken salad, pack it with ice packs for a picnic, and measure that it stays at or below 40 °F.

Warm-up. Pretend you are packing a picnic for a hot summer day at the park. List everything you would bring to eat. Now circle each food that would spoil if it sat in the sun all afternoon. What do the circled foods have in common?

WATCH

Food Safety in Seconds

U.S. Food and Drug Administration • 1:17

https://www.youtube.com/watch?v=iguM_pqetzo

WHEN TO WATCH

After the kitchen science. It is short: watch it twice, and the second time call out each of the four steps (Clean, Separate, Cook, Chill) as it appears.

Note: A short animation from the U.S. Food and Drug Administration showing a family meal from the store to the refrigerator.

KEY TERMS

bacteria

Living things made of a single cell, too small to see. Most are harmless or helpful, but a few kinds in food can make people sick.

danger zone

The temperatures from 40 °F to 140 °F (4–60 °C), where bacteria in food multiply fastest.

perishable

Food that spoils quickly unless it is kept cold, such as meat, milk, eggs, cooked rice and salads made with them.

2-hour rule

Perishable food goes back in the refrigerator within 2 hours, or within 1 hour if the air is above 90 °F (32 °C).

insulated

Wrapped or walled with material that slows heat from moving in or out, like a cooler or a lunch bag.

CORE IDEAS

The story. For most of history, families had no refrigerators. They kept food cool in cellars, springhouses and iceboxes, and they cooked and ate fresh food quickly. Electric refrigerators became common in American homes in the 1930s and 1940s. Then, in the 1950s, companies such as Coleman began selling insulated metal coolers for picnics and camping, so families could carry cold food outdoors. Today the U.S. Department of Agriculture (USDA) teaches every family two simple numbers to keep food safe: 40 and 140.

How they figured it out. Food scientists grew bacteria in dishes at many different temperatures and counted them. In the cold, below 40 °F (4 °C), the bacteria barely grew. When the dishes were kept hot, above 140 °F (60 °C), most bacteria could not multiply at all, and cooking heat destroyed them. But at the temperatures in between, especially near the warmth of a summer day or a human body, they multiplied very fast. The USDA says some bacteria in food can double in number in as little as 20 minutes in the danger zone. That is why perishable food should not sit out on the counter or the picnic table for more than 2 hours, or 1 hour when it is hotter than 90 °F outside.

The kitchen science. Bacteria grow by splitting in two. One becomes 2, then 4, 8, 16, 32 ... After a few hours in the danger zone, a few bacteria can become thousands or millions. Cold does not destroy most bacteria; it puts them to sleep, so they grow very slowly. That is why a refrigerator must stay at or below 40 °F (4 °C) and a freezer at 0 °F (−18 °C). A cooler works because its walls are **insulated**: they slow down heat moving in from the warm air. Ice packs soak up the heat that does sneak in. A full

cooler stays cold longer than a half-empty one, and a cooler in the shade stays cold longer than one in the sun.

Let's cook. You will make a creamy chicken salad, chill it, and pack it for a picnic lunch with ice packs. The skill to do well is **keeping cold food cold**: everything is chilled before it goes in the cooler, and you check the temperature with your thermometer. This week an adult does the chopping; next week you will learn the claw grip and take over the knife.

PICTURE STUDY



The Poultry Market at Pontoise, Camille Pissarro, 1882 · Oil on canvas · Norton Simon Museum, Pasadena, California

Image: [Wikimedia Commons](#), public domain

Camille Pissarro painted the open-air markets in the small French town of Pontoise many times. Here farm women have brought chickens, ducks and eggs to sell. There were no refrigerators in 1882, so people bought fresh food often and carried it home in baskets to cook the same day.

Look closely

- Find the baskets. What might be inside them? How would you keep those foods cool on a warm day?
- Look at the women's clothes. Do you think it is a warm day or a cool day? How can you tell?
- Find the woman closest to you. What do you think she is buying or selling?
- Look at how close together the people stand. Why would a market be busy early in the morning?

Talk about it

1. These shoppers had no refrigerators. How do you think they kept chicken and eggs from spoiling?
2. Which foods in your own refrigerator would be in the danger zone if you carried them home in a basket on a hot afternoon?

3. Why would a cook in 1882 buy a little food often instead of a lot at once?

Safety first. Keep the chicken salad in the refrigerator or a cooler with ice packs until you eat it, and put leftovers back in the cold within 2 hours (1 hour above 90 °F). This week an adult does the knife work. Wash your hands before you make the salad and before you eat.

KITCHEN PROJECT

Pack a Picnic That Stays Cold

You will make a chicken salad with cooked chicken, chill it, and pack it in a cooler with ice packs for a family picnic lunch, in the backyard, the park or even the living-room floor. You will use your thermometer to prove that it stays out of the danger zone.

You will need

- A small cooler or insulated lunch bag and 2–3 frozen ice packs (or frozen water bottles)
- An instant-read food thermometer
- A large mixing bowl, a rubber spatula, measuring cups and spoons
- A cutting board and knife for the adult
- A container with a lid for the salad, and plates or bread for serving
- A timer or clock

CREAMY CHICKEN SALAD SANDWICHES

Serves 5–6 sandwiches • Prep 20 min • Chill 1 hr

Ingredients

- 3 cups (about 1 pound / 450 g) cooked chicken, chilled (leftover baked or poached chicken, or a store rotisserie chicken)
- 2 stalks celery
- 1 cup red or green seedless grapes (or 1 apple)
- ½ cup (115 g) mayonnaise
- ¼ cup (60 g) plain Greek yogurt
- 1 tablespoon lemon juice
- ½ teaspoon salt and ¼ teaspoon black pepper
- 10–12 slices whole-wheat bread or 6 soft rolls, and lettuce leaves

Method

1. Put the ice packs in the freezer the night before. Put the cooler in a cool place.

2. Wash your hands. Rinse the celery, grapes and lettuce under cool running water.
3. An adult chops the chicken into small cubes, slices the celery thinly and cuts the grapes in half on a clean board.
4. In the bowl, stir together the mayonnaise, yogurt, lemon juice, salt and pepper.
5. Add the chicken, celery and grapes and fold everything together with the spatula until coated.
6. Spoon the salad into the container, close it, and refrigerate for at least 1 hour so it is cold through.
7. At picnic time, pack the cold salad in the cooler between the ice packs. Make sandwiches just before eating, with a lettuce leaf in each.
8. Clean up: wash the bowl and tools, wipe the counter, and put any leftover salad back in the refrigerator within 2 hours.

Allergy check: Contains eggs (mayonnaise), milk (yogurt) and wheat (bread; bread may also contain soy or sesame, so check the label). For egg-free, use all yogurt or an egg-free mayonnaise; for milk-free, use all mayonnaise; serve on lettuce cups or gluten-free bread instead of wheat bread.

Steps

1. **Plan.** Write a picnic plan: what time the food leaves the refrigerator, what time you will eat, and the latest time it must be back in the cold (2 hours, or 1 hour if it is above 90 °F outside).
2. **Predict.** Guess the temperature of the chicken salad after 1 hour in the cooler, and after 1 hour on the table with no ice.
3. Make and chill the salad. With your thermometer, measure its temperature right out of the refrigerator. Write it down.
4. **Cooler test.** Put a small cup of the salad in the cooler with the ice packs and another small cup on the counter. After 1 hour, measure both. Which one is in the danger zone? Throw the counter cup away.
5. Have your picnic. Say grace before you eat.
6. **Improve it.** Write one change to your picnic plan (more ice packs, packing the cooler fuller, keeping it in the shade).
7. Clean up: wash the cooler with warm, soapy water and leave it open to dry.

Tips

- Frozen water bottles work as ice packs and become cold drinks by the end of the picnic.
- Pack drinks in one cooler and food in another. The drink cooler gets opened often and warms up faster.
- Pack the cooler in this order: ice packs on the bottom, cold food, more ice packs on top. Cold air sinks.

Check your work

- ☐ I can explain the danger zone and the 2-hour rule.
- ☐ I measured my chicken salad and showed it stayed at or below 40 °F in the cooler.
- ☐ I made a picnic plan with times written down.

COOK'S NOTEBOOK

1. Draw a cooler cut in half so you can see inside. Draw and label the ice packs, the food and the insulated walls, and use arrows to show heat trying to get in.
2. Make a doubling chart: start with 1 bacterium and double it every 20 minutes for 3 hours. How many are there at the end? (Answer: 512.)
3. Write your picnic plan and your cooler-test temperatures.

COMMON MISTAKES

- Thinking food is fine because it looks and smells fine. Bacteria that make people sick usually do not change how food looks or smells.
- Putting warm food in a cooler. A cooler keeps cold food cold; it cannot chill warm food. Chill it in the refrigerator first.
- Leaving the picnic food out “until everyone is done.” Watch the clock: 2 hours, or 1 hour on a hot day.

Make it a game • Danger Zone Dash. Name ten foods that must stay cold or hot, such as milk, chicken or rice. For each one, tell your parent where it belongs: below 40, above 140, or never in between. Your parent draws a clock for one food and you say when it must go back in the refrigerator. Beat your score on a second round.

Scripture. “A prudent man foreseeth the evil, and hideth himself: but the simple pass on, and are punished.” (Proverbs 22:3, KJV)

A prudent cook looks ahead: he packs the ice before the picnic, not after the food gets warm. Planning ahead is a form of wisdom and of love for the people you feed.

1.3 CROSS-CONTAMINATION AND THE CLAW GRIP

OBJECTIVES

- Explain cross-contamination and how germs travel from raw meat on hands, boards, knives and towels.
- Hold a small knife with the claw grip and the bridge grip, with an adult right beside you, on a board that cannot slide.
- Cook turkey taco meat to 165 °F with an adult beside you, using separate boards for raw meat and for vegetables.

Warm-up. Rub a pinch of cinnamon on your palms like pretend germs. Now make a sandwich, open the refrigerator and hand someone a cup. Look at everything you touched. Where did the cinnamon go? Then wash your hands with soap and warm water for 20 seconds and check again.

WATCH

How Does Cross-Contamination Happen?

[USDAFoodSafety](https://www.youtube.com/watch?v=Xm_X5LJmrbw) · 3:12

https://www.youtube.com/watch?v=Xm_X5LJmrbw

WHEN TO WATCH

After the story. Count how many places the germs from the raw meat could travel in this family's kitchen.

Note: From the USDA Food Safety and Inspection Service.

BACKUP VIDEO

Knife Skills 101: Chef Ann Butler Teaches Kids to Properly Use a Knife

[InkandescentTV](https://www.youtube.com/watch?v=NS372AyUGwQ) · 4:11

<https://www.youtube.com/watch?v=NS372AyUGwQ>

Before the knife practice in Session 2. Watch how the chef teaches the children to hold the food and the knife.

KEY TERMS

cross-contamination

When germs move from one food or surface to another, such as from raw chicken to a salad, by hands, knives, boards or towels.

claw grip

Holding food with your fingertips curled under, like a cat's paw, so the knife blade rests against your knuckles and never your fingertips.

serrated knife

A knife with a saw-toothed edge that grips the skin of tomatoes and bread.

ready-to-eat food

Food that will not be cooked again before it is eaten, like salad, fruit, bread and cheese.

bridge grip

Holding a round food with your thumb on one side and fingers on the other, making a bridge, and cutting down through the gap under your hand.

CORE IDEAS

The story. In 2019 the U.S. Department of Agriculture reported on a study in which ordinary people cooked a meal of chicken thighs and a salad in test kitchens while researchers watched. Before the cooking began, the scientists had put a harmless tracer germ on the raw chicken, one that would not make anyone sick but could be found later. When the meal was done, the researchers swabbed the kitchens and the food to see where the tracer had gone.

How they figured it out. The results surprised the cooks. Most people did not wash their hands the right way after touching the raw chicken. The tracer turned up on faucet handles, spice jars and refrigerator handles, and in about one out of every four kitchens it had traveled all the way into the salad lettuce, a food that would not be cooked. The chicken itself was cooked safely, but the germs had hitched a ride somewhere else. The USDA's lesson was simple: wash hands with soap after touching raw meat, and keep raw meat and its juices away from ready-to-eat food.

The kitchen science. Raw meat, chicken, turkey, fish and eggs can carry bacteria on their surfaces. Cooking to the right temperature destroys them, but anything the raw food touches can pick them up: your hands, the cutting board, the knife, a dish towel, the counter. That is **cross-contamination**. The fix is to **separate**: use one

cutting board for raw meat and a different one (many kitchens use a different color) for vegetables, fruit and bread. Cut the vegetables first, before the raw meat comes out. Wash hands, boards and knives in hot, soapy water after raw meat. Never rinse raw chicken or turkey; the splashes carry germs up to 2 or 3 feet around the sink.

Knife skills. A sharp knife used carefully is safer than a dull one that slips. Put a damp towel under your board so it cannot slide. For the **claw grip**, curl your fingertips under like a cat's paw and rest the flat side of the blade against your knuckles; move your claw back a little after each cut. For round foods, use the **bridge grip** first: make a bridge over the food with your thumb and fingers and cut down through the gap, then lay the flat side down so it cannot roll. Fourth graders use a small serrated or paring knife only with an adult right beside them.

Let's cook. You will make turkey tacos. You will cut the tomatoes and lettuce first on the vegetable board with the claw and bridge grips, then cook the ground turkey with an adult beside you at the stove, breaking it up and checking that it reaches 165 °F (74 °C). Poultry, even ground poultry, is always cooked to 165 °F.

PICTURE STUDY



The Kitchen Maid, Jean-Siméon Chardin, 1738 • Oil on canvas • National Gallery of Art, Washington, D.C.

Image: [Wikimedia Commons](#), public domain

Jean-Siméon Chardin loved to paint quiet moments of work in French kitchens. This young woman has stopped peeling turnips for a moment and is lost in thought. Chardin painted every tool around her: the knife, the copper pot, the chopping block, the pile of vegetables still to do.

Look closely

- Find the knife in her hand. How is she holding it? Is her other hand safely out of the way?
- Find the pile of turnips and the peeled one. How much work does she still have to do?
- Find the chopping block and the copper pot. What will happen to the turnips next?
- Look at her face. What do you think she is thinking about?

Talk about it

1. Why is it dangerous to let your mind wander while you hold a knife?
2. She is working on vegetables only. Why is it smart to cut vegetables before any raw meat comes out?
3. What would you set under a cutting board so it cannot slide?

Safety first. Use a small serrated or paring knife only with an adult right beside you, on a board with a damp towel under it, using the claw and bridge grips. An adult stands beside you at the stove; turn the pan handle in. Wash your hands, the raw-meat board and tools in hot, soapy water after touching raw turkey, and cook it to 165 °F.

KITCHEN PROJECT

Two Boards, Clean Hands: Turkey Tacos

You will practice the claw and bridge grips, cut the vegetables for tacos on one board, then cook ground turkey safely with an adult beside you. A cinnamon “germ trail” test will show you why the order of jobs matters.

You will need

- Two cutting boards (one for vegetables, one for raw meat; mark them with tape if they look alike)
- A damp kitchen towel to set under each board
- A small serrated knife or paring knife
- A large skillet and a wooden spoon or spatula
- An instant-read food thermometer
- Small serving bowls, measuring spoons and a colander

TURKEY TACOS WITH FRESH TOPPINGS

Serves 4–6 (about 12 tacos) • Prep 20 min • Cook 15 min

Ingredients

- 1 pound (450 g) ground turkey
- 1 tablespoon olive or vegetable oil
- 2 teaspoons chili powder (mild)
- 1 teaspoon ground cumin
- ½ teaspoon garlic powder and ½ teaspoon onion powder
- ½ teaspoon salt
- ½ cup (120 mL) water or tomato sauce
- 12 small corn or flour tortillas
- 2 tomatoes, 2 cups thinly sliced lettuce, 1 cup grated cheddar cheese
- Plain yogurt or sour cream and salsa for serving

Method

1. Wash your hands. Rinse the tomatoes and lettuce under cool running water.
2. **Vegetables first.** On the vegetable board, with an adult right beside you, cut each tomato in half with the bridge grip, lay it flat side down, and slice and dice it with the claw grip. Slice the lettuce into thin ribbons with the claw grip. Put the toppings in bowls and refrigerate them.
3. Mix the chili powder, cumin, garlic powder, onion powder and salt in a small cup.
4. With an adult beside you, heat the oil in the skillet over medium heat. Add the turkey and break it into small crumbles with the wooden spoon. Cook 6–8 minutes, stirring, until no pink remains.
5. Stir in the spice mix and the water or tomato sauce. Simmer 3–4 minutes until most of the liquid is gone.
6. With an adult beside you, check the meat in a few places with the thermometer. It must read 165 °F (74 °C).
7. An adult warms the tortillas in a dry skillet or wrapped in a damp towel in the microwave for 30–45 seconds. Fill each with meat and toppings.
8. Clean up: wash the raw-meat board, the spoon and your hands in hot, soapy water. Wipe the counter and the faucet handle too.

Allergy check: Contains milk (cheese, yogurt or sour cream) and wheat if you use flour tortillas. Use corn tortillas for wheat-free, and leave off the cheese and yogurt for milk-free. Check spice blends and salsa labels for hidden allergens.

Steps

1. **Knife practice.** Before cooking, with an adult right beside you, practice the claw grip on a cucumber or a peeled banana and the bridge grip on a tomato. Say “claw” out loud each time you cut.
2. **Germ trail test.** Dust a little cinnamon on a paper towel “chicken.” Pretend to cut it and then make a pretend salad, touching a bowl and the faucet. Look for the brown trail. Then wash everything and plan a better order of jobs.
3. **Predict.** How many minutes will the turkey take to reach 165 °F?
4. Cook the recipe. Write down the temperature you measured and the time.

5. **Taste test.** Ask each person to rate the tacos from 1 to 5 and name his or her favorite topping.
6. **Improve it.** Write one change for next time (more cumin, a squeeze of lime, beans added to the meat).
7. Clean up and put leftovers in the refrigerator within 2 hours.

Tips

- If you only have one cutting board, cut all the vegetables first, then wash the board in hot, soapy water before raw meat touches it.
- Keep a roll of paper towels handy for raw-meat juices so they do not end up on a cloth towel you will use again.
- Slow is safe. Fast knife work comes from many careful, slow cuts.

Check your work

- ☐ I can explain cross-contamination and name three ways germs travel in a kitchen.
- ☐ I used the claw and bridge grips with an adult right beside me.
- ☐ I cooked ground turkey to 165 °F with an adult beside me and used separate boards.

COOK'S NOTEBOOK

1. Draw your hand in the claw grip and in the bridge grip, with the knife in the right place. Label the knuckles and the fingertips.
2. Draw a map of your kitchen and mark where raw meat should go and where ready-to-eat food should go. Draw arrows for the path of hands and tools.
3. Copy the taco recipe in your own words, starring the steps that keep raw meat separate.

From history. Professional kitchens often use color-coded cutting boards: one color for raw meat, another for poultry, another for fish and another for vegetables and fruit. The colors make it easy for a busy cook to grab the right board without thinking.

COMMON MISTAKES

- Rinsing raw chicken or turkey in the sink. It does not make it cleaner; it spreads germs onto the sink and counter.

- Using the same board for raw meat and then for salad without washing it in hot, soapy water.
- Holding food with flat, outstretched fingers. Curl them under into a claw so the blade can only touch your knuckles.

Make it a game · Germ Trail Detective. Set out a raw-chicken picture card, a cutting board, a knife, a towel and a bowl of salad. Trace the germs' path with a finger, saying each place they could travel. Then your parent hides one mistake, such as one board for everything, and you catch it. Finish by showing the claw grip on a banana, adult beside you.

1.4 FOOD ALLERGIES AND THE NINE MAJOR ALLERGENS

OBJECTIVES

- Explain what a food allergy is and why it is serious.
- Name the nine major food allergens in the United States and tell that sesame was added to the list in 2023.
- Read the ingredient list and the “Contains” line on a food label, and make a snack mix free of the nine major allergens.

Warm-up. Bring three packaged foods from your pantry to the table. Find the ingredient list on each. Below it, look for a line that starts with “Contains.” What words do you find there? Write them down.

WATCH

Why Can't I Eat Peanut Butter?

SciShow Kids · 3:24

<https://www.youtube.com/watch?v=yqBw4tdRw9I>

WHEN TO WATCH

After the story, before the kitchen science. Listen for what the immune system does by mistake.

BACKUP VIDEO

Have Food Allergies: Read the Label

U.S. Food and Drug Administration · 2:18

<https://www.youtube.com/watch?v=BUmfLyILCqQ>

Before Session 2, with your pantry foods in front of you. Pause to find the same parts on your own labels.

KEY TERMS

food allergy

When the body’s defense system mistakes a harmless food protein for an invader and reacts against it, sometimes seriously.

immune system

The parts of your body that fight germs and other invaders.

allergen

The part of a food (usually a protein) that causes an allergic reaction.

label

The printed information on a food package, including the ingredient list and a “Contains” line for major allergens.

cross-contact

When a tiny bit of an allergen gets into another food, from a shared spoon, pan, counter or factory line.

CORE IDEAS

The story. Some people cannot safely eat peanuts, or milk, or eggs, because their bodies react to them. To help families stay safe, Congress passed a law in 2004 that made food companies list eight major food allergens plainly on their labels: milk, eggs, fish, crustacean shellfish (such as shrimp and crab), tree nuts, peanuts, wheat and soybeans. Families asked for one more. In 2021 a new law added **sesame**, and since January 1, 2023, sesame must be labeled too. Now there are **nine** major food allergens.

How they figured it out. Doctors and scientists studied which foods cause most of the serious allergic reactions in America. They found that a small group of foods causes the great majority of them. Allergy doctors listened to families, kept careful records and showed that sesame belonged on the list too. The U.S. Food and Drug Administration (FDA) now makes sure packaged foods name these nine plainly, either in the ingredient list or in a “Contains” line right below it.

The kitchen science. Your **immune system** protects you from germs. In a person with a food allergy, it makes a mistake: it treats a harmless protein in a food, such as peanut, as if it were a dangerous invader. The body can react with itching, hives, a swollen mouth, stomach pain or trouble breathing. A serious reaction is an emergency, and some people carry medicine for it. Even a tiny amount, like a crumb on a shared knife, can cause a reaction. That is called **cross-contact**. Cooking does not remove allergens. The only way to stay safe is to keep the allergen out of the food, so cooks read every label, wash hands and tools, and ask before they share food. Families decide about allergies and special diets with their own doctor.

Let's cook. You will make a crunchy cinnamon snack mix made only from ingredients that do not contain any of the nine major allergens: oat cereal, rice cereal, sunflower and pumpkin seeds and dried fruit. The skill to do well is **label reading**: you will check every package before it goes in the bowl. An adult stands beside you when the pan goes into and comes out of the oven.

PICTURE STUDY



The Grocer's Shop, Gerrit Dou, 1647 · Oil on panel · Musée du Louvre, Paris

Image: [Wikimedia Commons](#), public domain

Gerrit Dou was a Dutch painter famous for tiny, careful details. Here he looks through a shop window in the town of Leiden. A shopkeeper weighs food on a hanging scale for her customer. In Dou's day there were no packages and no labels. Shoppers had to ask the shopkeeper what was in the food they bought.

Look closely

- Find the small hanging balance. What is the shopkeeper doing with it?
- Find the jars and boxes on the shelves. What might be stored in them?
- Find the carrots on the ledge. Which other foods can you find?
- Look at the faces of the shopkeeper and the customers. What might they be asking her?

Talk about it

1. This shop had no labels. How would a shopper with a food allergy stay safe here?
2. What does a food label tell you today that a shopkeeper would have had to tell you in 1647?
3. Why is it kind to ask a guest about allergies before you serve food?

Safety first. Always check with each person (and his or her parents) about food allergies before you share food; read every label, even for foods you have bought before, because recipes change. An adult stands beside you when the pan goes in and out of the oven; wear oven mitts.

Read the Label: A Top-9-Free Snack Mix

You will become a label detective, checking every ingredient for the nine major allergens, and then bake a crunchy cinnamon snack mix that friends with those allergies can share. You will also learn how to keep it free of cross-contact.

You will need

- A large rimmed baking sheet and parchment paper
- A very large mixing bowl and a large spoon
- A small saucepan or microwave-safe cup for warming the syrup and oil
- Measuring cups and spoons, oven mitts and a timer
- A clean, freshly washed counter and freshly washed tools
- Jars or bags with labels for storing

CINNAMON MAPLE CRUNCH SNACK MIX (FREE OF THE NINE MAJOR ALLERGENS)

Serves About 8 cups (12–16 snack servings) · Prep 15 min · Bake 25 min · Cool 20 min

Ingredients

- 3 cups toasted oat “O” cereal (check the label for wheat and other allergens)
- 3 cups rice cereal squares (check the label)
- ½ cup (70 g) roasted, unsalted sunflower seeds
- ½ cup (65 g) pumpkin seeds (pepitas)
- 3 tablespoons pure maple syrup
- 3 tablespoons vegetable or olive oil
- 1 teaspoon ground cinnamon
- ¼ teaspoon salt
- 1 cup raisins or dried cranberries (added after baking)

Method

1. Read every label first. Set aside any package whose ingredient list or “Contains” line names milk, eggs, fish, shellfish, tree nuts, peanuts, wheat, soy or sesame, or that says “may contain” one your guests must avoid.
2. An adult heats the oven to 300 °F (150 °C). Wash your hands, and line the baking sheet with parchment.
3. Pour the two cereals and the seeds into the big bowl.
4. Stir the maple syrup, oil, cinnamon and salt together in a small saucepan over low heat for 1 minute with an adult beside you (or warm them in the microwave for 20 seconds with an adult nearby).
5. Pour the warm syrup over the cereal and stir gently until everything is shiny.
6. Spread the mix on the baking sheet. With an adult beside you, bake 25 minutes, stirring once halfway through, wearing oven mitts.
7. Let the mix cool on the pan; it gets crunchy as it cools. Then stir in the raisins or cranberries.
8. Store in jars or bags labeled with the date and every ingredient. Clean up: wash the bowl, pan and spoons and wipe the counter.

Allergy check: Made only with ingredients that are not among the nine major allergens, but cereals and seeds are sometimes made in factories that also handle wheat, nuts or soy. Read every label each time, and for a guest with a severe allergy, ask the family to check the packages too. Contains no honey; maple syrup is used.

Steps

1. **Label detective.** Collect five packaged foods. For each, write its name and every major allergen you find on its label. Which one had the most? Which had none?
2. **Find the hidden ones.** Look for allergens hiding under other names in the ingredient list: “whey” and “casein” (milk), “semolina” (wheat), “lecithin from soy.” Check whether the “Contains” line names them too.
3. **Prevent cross-contact.** Before cooking, wash the counter, the bowl and every spoon, and wash your hands. Write why this matters even if the food is safe.

4. Make the snack mix. Pack one small bag to share with a friend, and write a label listing every ingredient.
5. **Taste test.** Rate the mix for crunch and sweetness from 1 to 5.
6. **Improve it.** Write one change (less syrup, more cinnamon, a different dried fruit). Check that the new ingredient is free of the nine allergens too.
7. Clean up and put the mix away in a labeled container.

Tips

- Memory trick for the nine: “Milk, eggs, fish and shellfish; tree nuts, peanuts, wheat, soy and sesame.”
- Recipes on packages can change. Read the label every time, even for a food you have bought for years.
- When you share food with a friend, give the label too, so his or her parents can check it.

Check your work

- ☐ I can name the nine major food allergens.
- ☐ I can find the ingredient list and the “Contains” line on a package.
- ☐ I made a snack mix free of the nine major allergens and labeled it.

COOK’S NOTEBOOK

1. Make a poster of the nine major food allergens with a small drawing of each one. Put a star on sesame, the newest one.
2. Tape in (or copy) one food label and circle the ingredient list and the “Contains” line.
3. Copy the snack mix recipe in your own words and write a label for your jar.

From history. In some other countries, the list of major allergens is different. Many European countries also list celery, mustard and lupin (a bean). Labels are written for the people who eat the food, and doctors in each country study which foods cause the most reactions there.

COMMON MISTAKES

- Thinking cooking or baking removes an allergen. It does not; the allergen must be left out.

- Using the same knife for peanut butter and a friend's sandwich. A tiny smear can cause a reaction.
- Reading only the front of the package. The allergen information is on the back, in the ingredient list.

Make it a game · Nine at the Table. Set a timer for sixty seconds and write or say the nine major allergens from memory, remembering that sesame joined in 2023. Count your score, then try to beat it. Next, your parent reads a snack label aloud, slowly, and you raise a hand the moment an allergen word appears. Explain why cross-contact matters.

UNIT 1

KITCHEN & FOOD SAFETY

Every good cook is first a safe cook. In this unit you will meet Daniel Fahrenheit, the instrument maker whose thermometer gave us the numbers on every oven dial and food thermometer in America, and you will learn to use a food thermometer yourself. You will learn the **danger zone**, the temperatures between 40 °F and 140 °F where germs multiply fastest, and you will plan a picnic that stays cold.

Then you will learn how germs ride from raw meat to a salad on hands, knives and cutting boards, and how to stop them. You will learn the **claw grip** and the **bridge grip** for a real knife, used with an adult right beside you. Last, you will learn the nine major food allergens and cook a snack that friends with allergies can share. A parent or responsible adult supervises all cooking in this course, and every family checks every recipe against its own food allergies.

PREREQUISITES

- Can wash hands well with soap and water for 20 seconds
- Can read numbers up to 500 and read a simple dial or digital display
- Can measure with cups and spoons with help
- Agrees to the kitchen rule: an adult is beside you for every sharp or hot job

MASTERY CHECKLIST

- ☐ I can tell how Daniel Fahrenheit made a reliable thermometer and what 32 °F and 212 °F mean.
- ☐ I can use a food thermometer in the thickest part of a food and name the safe temperatures for chicken (165 °F), ground meat (160 °F) and leftovers (165 °F).
- ☐ I can explain the 40–140 °F danger zone and the 2-hour rule (1 hour above 90 °F).
- ☐ I can explain cross-contamination and keep raw meat away from ready-to-eat food with separate boards, clean hands and clean tools.
- ☐ I can use the claw grip and the bridge grip with a small knife, with an adult right beside me.
- ☐ I can name the nine major food allergens and read the allergen line on a food label.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **Fight BAC! (Partnership for Food Safety Education)**: Free. Printable handouts and activities on Clean, Separate, Cook and Chill and safe cooking temperatures, from a partnership that works with the USDA, FDA and CDC. Good for Lessons 1.1–1.3 and the unit challenge.
- **FDA: Food Allergies: What You Need to Know**: Free. The nine major food allergens and how to read a label, from the U.S. Food and Drug Administration. Read it with a parent for Lesson 1.4.
- **An instant-read food thermometer and a refrigerator thermometer**: Inexpensive and used all year. If you buy one tool for this course, make it the food thermometer.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

1.1 Daniel Fahrenheit and the Thermometer	2 sessions of 45–60 minutes
1.2 The Danger Zone	2 sessions of 45–60 minutes
1.3 Cross-Contamination and the Claw Grip	2 sessions of 45–60 minutes
1.4 Food Allergies and the Nine Major Allergens	2 sessions of 45–60 minutes

UNIT 1 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

Who was Daniel Fahrenheit, and what did he do to make thermometers better?

2. 5 pts

At what temperature does water freeze on the Fahrenheit scale? At what temperature does it boil (at sea level)?

3. (5 pts)

Give the safe internal temperature for chicken or turkey, for ground beef, and for reheated leftovers.

4. (5 pts)

What is the danger zone, and what is the 2-hour rule?

5. (5 pts)

Predict: one cup of chicken salad sits in a cooler with ice packs and another sits on a sunny picnic table for 2 hours. Which one is safe to eat, and why?

6. (5 pts)

What is cross-contamination? Give two ways to prevent it.

7. (5 pts)

Describe the claw grip and the bridge grip. Who must be beside you when you use a knife?

8. (5 pts)

Name the nine major food allergens. Which was added most recently?

9. (5 pts)

Predict: a cook makes a peanut-free sandwich for a friend with a peanut allergy but uses the same knife she just used for peanut butter. What might happen, and what should she do instead?

10. (5 pts)

Why should the thermometer go into the thickest part of the food?

ANSWER KEY

1. He was an instrument maker born in Danzig in 1686 who worked in the Netherlands. He made mercury thermometers (1714) that agreed with each other, using fixed points such as freezing water, and he described his scale in 1724.
2. It freezes at 32 °F and boils at 212 °F.
3. Chicken or turkey 165 °F; ground beef 160 °F; leftovers 165 °F.
4. The danger zone is 40–140 °F, where bacteria multiply fastest. Perishable food must go back in the refrigerator within 2 hours, or within 1 hour if it is above 90 °F.
5. The cooler cup is safe because it stayed below 40 °F, where bacteria grow very slowly. The cup on the table warmed into the danger zone, where bacteria multiplied fast, so it should be thrown away.
6. Germs moving from one food or surface to another, such as from raw chicken to salad. Any two: separate boards for raw meat and ready-to-eat food; cut vegetables first; wash hands with soap after touching raw meat; wash boards and knives in hot, soapy water; do not rinse raw poultry; use a clean plate for cooked meat.
7. Claw: fingertips curled under so the blade rests against the knuckles. Bridge: thumb and fingers make a bridge over a round food and you cut through the gap. An adult must be right beside me.
8. Milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, soybeans and sesame. Sesame was added most recently (labeling required from January 1, 2023).
9. A tiny bit of peanut could get on the sandwich (cross-contact) and cause an allergic reaction. She should use a clean knife and board and wash her hands first.
10. Heat moves from the outside in, so the thickest part is the last to get hot. If the thickest part is at a safe temperature, the rest is too.

UNIT CHALLENGE: A SAFE FAMILY PICNIC

Plan, prepare and serve a family picnic lunch (outdoors, or on a blanket indoors) that is safe from start to finish. Make at least one dish with a cooked meat or a mayonnaise-based salad, and one snack that is free of the nine major allergens.

Write a picnic safety plan: the time the food leaves the refrigerator, the latest time it must go back, how you will keep raw and ready-to-eat foods separate while cooking, and an allergy check for each person. Record the cooler temperature with your thermometer when you pack it and again just before eating. Finish with a short report and a family rating.

LOOK FOR	WHAT IT MEANS
Planning	A written menu and safety plan with times, an allergy check for each person and a packing list.
Safety in the kitchen	Hands washed, separate boards used, meat cooked to its safe temperature and checked with the thermometer, adult beside for knife and stove work.
Keeping food cold	Cooler packed with ice packs; temperatures measured and recorded at or below 40 °F; food back in the cold within the time limit.
Cleanup and service	Kitchen and cooler cleaned; meal served with thanks.
Reflection	Family ratings recorded and one honest improvement planned for next time.

UNIT 2

FOOD GROUPS & THE BALANCED MEAL

God has filled the world with good things to eat, and each kind of food does a different job in the body. In this unit you will see how Americans learned to plan balanced meals, from the wartime “Basic Seven” chart of 1943 to the MyPlate picture of today. You will discover what vitamins are by following British sailors who kept well on long voyages by drinking lemon and lime juice.

Then you will learn that protein comes from both plants and animals, and that grains and beans eaten together, like the bread in Ezekiel 4:9 or a pot of rice and beans, make a strong team. Last, you will follow Lewis and Clark across the continent and see how explorers packed food that would last. Every week you will cook a meal or snack that shows the food groups at work.

PREREQUISITES

- Uses a food thermometer and knows the safe temperatures for meat (Unit 1)
- Uses the claw and bridge grips with an adult right beside (Unit 1)
- Knows the danger zone and the 2-hour rule (Unit 1)
- Can read the allergen line on a label (Unit 1)

MASTERY CHECKLIST

- ☐ I can tell how American food guides changed from the Basic Seven (1943) to MyPlate (2011).
- ☐ I can name the five MyPlate food groups and build a balanced plate with all five.
- ☐ I can explain what vitamins are and tell the story of the sailors, the citrus juice and scurvy.
- ☐ I can name protein foods from plants and from animals and explain why grains and beans make a good team.
- ☐ I can tell what Lewis and Clark carried and ate, and pack a balanced trail lunch.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **MyPlate Kids:** Free at MyPlate.gov. Games, activity sheets and the MyPlate food groups for children, from the U.S. Department of Agriculture. Good for Lesson 2.1 and the unit challenge.
- **MyPlate Kitchen:** Free at MyPlate.gov. A USDA collection of simple family recipes you can search by food group, for planning the balanced dinners in the unit challenge.
- **A sturdy divided plate or a paper plate marked into sections:** Helpful for seeing the MyPlate portions at a glance. Any plate works.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

2.1 From the Basic Seven to MyPlate	2 sessions of 45–60 minutes
2.2 Vitamins: The Sailors’ Lemons and Limes	2 sessions of 45–60 minutes
2.3 Protein from Plants and Animals	2 sessions of 45–60 minutes
2.4 Lewis and Clark’s Provisions	2 sessions of 45–60 minutes

UNIT 2 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

Put these USDA food guides in order from oldest to newest: MyPlate, Basic Seven, Food Guide Pyramid, Basic Four. Give a year for each.

2. 5 pts

Name the five MyPlate food groups and one job each one does in the body.

3. 5 pts

What is scurvy, and how did the Royal Navy prevent it?

4. (5 pts)

Name four foods that are good sources of vitamin C.

5. (5 pts)

Predict: you cut an apple and leave one slice plain and brush another with lemon juice. What will they look like after an hour, and why?

6. (5 pts)

What does protein do in the body? Name two protein foods from animals and two from plants.

7. (5 pts)

Why are rice and beans called a protein team?

8. (5 pts)

What was portable soup, and why did it keep for so long?

9. (5 pts)

Predict: you cook rice and lift the lid three times to check it. What will probably happen?

10. (5 pts)

Plan a balanced lunch for a hike with one food from each of the five food groups. Which items must be kept cold?

ANSWER KEY

1. Basic Seven (1943), Basic Four (1956), Food Guide Pyramid (1992), MyPlate (2011).
2. Grains: energy (and fiber). Vegetables and fruits: vitamins, minerals, fiber and water. Protein: building and repairing the body. Dairy: calcium for bones and teeth.
3. Scurvy is a sickness caused by too little vitamin C; gums bleed and cuts do not heal. From 1795 the navy gave sailors a daily ration of lemon juice (later lime juice).
4. Any four: oranges, lemons, limes, grapefruit, strawberries, kiwi, red bell peppers, broccoli, tomatoes.
5. The plain slice turns brown from oxidation when air touches it. The lemon slice stays lighter because the lemon's acid and vitamin C slow the browning.
6. It builds and repairs muscles, skin, blood and other parts. Animal: any two of meat, chicken, fish, eggs, milk, cheese. Plant: any two of beans, lentils, peas, peanuts, nuts, seeds, grains.
7. Grains are low in some essential amino acids that beans have, and beans are low in some that grains have. Eaten together they give a complete set.
8. Meat broth boiled down into hard cakes. Almost all the water was removed, and germs need water to grow.
9. Steam escapes each time, so the rice may cook unevenly, stay hard or need more water and time.
10. Answers vary; for example: whole-wheat wrap (grain), turkey (protein), cheese (dairy), apple (fruit), carrot sticks (vegetable). The turkey and cheese must be kept cold with an ice pack.

UNIT CHALLENGE: THREE BALANCED FAMILY DINNERS

Plan three balanced family dinners for one week, each with all five MyPlate food groups. Use at least one dish from this unit and one plant protein meal. Write each menu, a shopping list, and a MyPlate check for each dinner.

Help cook all three dinners with an adult beside you, doing at least one main job yourself each night. Photograph or sketch each plate filled the MyPlate way, and record a family rating and one improvement for each dinner.

LOOK FOR	WHAT IT MEANS
Planning	Three written menus with all five food groups, a shopping list and a MyPlate check for each.
Cooking and safety	Hands washed, knife and stove used only with an adult beside, meats checked with the thermometer, leftovers chilled within 2 hours.
Record-keeping	A photo or sketch of each plate, the main job you did, and family ratings.
Cleanup and service	Kitchen cleaned after each meal; the table set and grace said.
Improvement	One honest improvement written for each dinner, with a plan to try one of them.

2.1 FROM THE BASIC SEVEN TO MYPLATE

OBJECTIVES

- Tell how the USDA's food guides changed from the Basic Seven (1943) to the Food Guide Pyramid (1992) and MyPlate (2011).
- Name the five MyPlate food groups and one food from each.
- Cook a balanced family dinner of pasta with meat sauce, green beans and fruit, and check it against MyPlate.

Warm-up. Draw a circle for a dinner plate. Think of last night's dinner and draw each food on your plate. Now color each food: red for fruit, green for vegetables, orange for grains, purple for protein, and put a blue circle on the side for milk, yogurt or cheese. Which colors are missing?

WATCH

Food Groups & MyPlate

All About Nutrition · 5:51

<https://www.youtube.com/watch?v=L7QOUiQCb5E>

WHEN TO WATCH

After the kitchen science. Play along: when the video asks "What food group?", pause and answer before it tells you.

BACKUP VIDEO

The History of Government Nutrition Resources

Yuma County Library · 8:15

<https://www.youtube.com/watch?v=iNoN8IAbbYU>

Optional, for the story. A librarian shows the old government food posters, from World War I to MyPlate.

KEY TERMS

food group

A set of foods that give the body similar nutrients, such as the fruit group or the grain group.

nutrient

Something in food that the body needs to grow, move, heal and stay well, such as protein, vitamins and minerals.

MyPlate

The USDA picture, introduced in 2011, of a plate divided into fruits, vegetables, grains and protein, with a cup of dairy beside it.

balanced meal

A meal with foods from several food groups, so the body gets many different nutrients.

CORE IDEAS

The story. In 1943, during World War II, Americans were asked to grow gardens, save food and stay strong for hard work. The U.S. Department of Agriculture (USDA) printed a colorful poster called the **Basic Seven**. It showed seven groups of foods to eat every day: green and yellow vegetables; oranges, tomatoes and other fruits and raw salad greens; potatoes and other vegetables and fruits; milk and milk products; meat, poultry, fish, eggs and dried beans; bread, flour and cereals; and butter or fortified margarine. Families taped it to their kitchen walls.

How they figured it out. Seven groups were hard to remember, so in 1956 the USDA made it simpler: the “Basic Four” (milk, meat, vegetables and fruits, and breads and cereals). As scientists learned more about how the body uses food, the guides changed again. In 1992 the USDA drew the **Food Guide Pyramid**, with grains at the wide bottom and fats and sweets at the narrow top. Many people found the pyramid confusing, because nobody eats off a pyramid. So in 2011 the USDA drew something everyone uses three times a day: a plate. **MyPlate** is divided into four parts (fruits, vegetables, grains and protein) with a cup of dairy beside it. Half the plate is fruits and vegetables.

The kitchen science. Each food group does a special job. **Grains** (bread, rice, pasta, oats) give energy; whole grains also give fiber. **Vegetables** and **fruits** give vitamins, minerals, fiber and water. **Protein** foods (meat, poultry, fish, eggs, beans, nuts) build and repair muscles and every other part of you. **Dairy** (milk, yogurt, cheese) gives calcium for strong bones and teeth. Healthy fats, like olive oil, help your body use some vitamins. No single food has everything, so we eat many kinds. That is what a **balanced meal** means.

Let’s cook. You will cook a balanced dinner of whole-wheat pasta with meat sauce, green beans and orange slices, with a glass of milk. The skill to do well is **browning ground beef safely**: with an adult beside you at the stove, break it into small

crumbles and cook it until it reaches 160 °F (71 °C). An adult drains the heavy pot of pasta water.

PICTURE STUDY



The Basic 7 Food Groups, U.S. Department of Agriculture, 1943 · Printed poster · National Agricultural Library and National Archives, United States

Image: [Wikimedia Commons](#), public domain

This is one of the posters the USDA printed in 1943 to teach families to eat well while the country was at war. It was made to be read quickly from across a room, so it uses bright colors and simple drawings.

Look closely

- Count the sections. How many food groups do you find?
- Find the section with milk and cheese. Find the one with meat, fish, eggs and beans. Where would these be on MyPlate today?
- Find a group that is not on MyPlate as its own group. Why do you think it was taken off?
- Read the words in the middle. Why did the country need people to be strong in 1943?

Talk about it

1. How is this poster like MyPlate? How is it different?
2. Which is easier to remember: seven groups or five? Why did the USDA keep changing the picture?

3. If you made a poster to teach a younger child to eat a balanced meal, what would you draw?

Safety first. An adult stands beside you at the stove; turn pot handles in and keep your face back from steam. Cook ground beef to 160 °F (71 °C). An adult carries and drains the pot of boiling pasta water.

KITCHEN PROJECT

A MyPlate Dinner: Pasta with Meat Sauce

You will cook a complete dinner for your family and check that every MyPlate food group is on the table. Then you will fill a plate the MyPlate way and compare it with how your family usually serves dinner.

You will need

- A large pot for pasta and a colander
- A large skillet or saucepan and a wooden spoon
- A medium saucepan with a lid or a steamer basket for the green beans
- An instant-read food thermometer
- A cutting board, a damp towel and a small knife
- Measuring cups and spoons, oven mitts and a timer

WHOLE-WHEAT PASTA WITH MEAT SAUCE, GREEN BEANS AND ORANGE SLICES

Serves 6 • Prep 15 min • Cook 30 min

Ingredients

- 1 pound (450 g) whole-wheat spaghetti or penne
- 1 pound (450 g) lean ground beef (or ground turkey, cooked to 165 °F)
- 1 small onion
- 1 (24-ounce / 680 g) jar marinara sauce, or 1 (28-ounce) can crushed tomatoes plus 1 teaspoon dried Italian herbs and ½ teaspoon salt
- 1 pound (450 g) fresh green beans (or frozen)
- 1 teaspoon olive oil and a pinch of salt for the beans
- 3 oranges
- ½ cup (45 g) grated Parmesan cheese
- Milk to drink (or water)

Method

1. Wash your hands. Rinse the green beans and snap off the stem ends with your fingers. Rinse the oranges.
2. With an adult right beside you, peel the onion, cut it in half with the bridge grip, lay it flat, and chop it with the claw grip.
3. An adult fills the large pot with water, sets it on high heat and adds 1 tablespoon salt. When it boils, you add the pasta with a long spoon, standing back from the steam, and cook it as the package says.
4. Meanwhile, with an adult beside you, cook the beef and onion in the skillet over medium heat for 7–8 minutes, breaking it into crumbles, until no pink remains. Check that it reads 160 °F (71 °C).
5. Stir in the sauce. Turn the heat to low, cover, and simmer 10 minutes, stirring now and then.
6. Put the green beans in the saucepan with ½ cup water, cover, and cook over medium heat 5–7 minutes until bright green and tender. An adult drains them. Toss with olive oil and a pinch of salt.
7. An adult drains the pasta in the colander in the sink. Cut the oranges into wedges with the claw grip.
8. Serve: pasta with sauce and Parmesan, green beans, orange wedges and a glass of milk. Clean up: wash the pots, board and spoons and wipe the stove when it is cool.

Allergy check: Contains wheat (pasta) and milk (Parmesan, milk to drink). Check the sauce label for other allergens. Use gluten-free pasta for wheat-free, and leave off the cheese for milk-free.

Steps

1. **MyPlate check.** Before cooking, list each food in the meal under its food group: fruit, vegetable, grain, protein, dairy. Are all five there?
2. Cook the dinner with an adult beside you. Record the temperature of the cooked beef.
3. **Plate it.** Fill one plate the MyPlate way: half fruits and vegetables, a quarter pasta, a quarter meat sauce, and milk beside it. Take a photo or sketch it.
4. **Compare.** Look at how your family usually fills a plate. Which part is bigger or smaller than MyPlate shows?

5. **Taste test.** Ask each person to rate the meal from 1 to 5 and name his or her favorite part.
6. **Improve it.** Write one change to make the meal more balanced or tastier next time (more vegetables in the sauce, a salad, a different fruit).
7. Clean up and put leftovers in the refrigerator within 2 hours.

Tips

- Add a grated carrot or a handful of chopped spinach to the meat sauce. It disappears into the sauce and adds a vegetable.
- Save ½ cup of the pasta water before draining (an adult scoops it out). A splash makes the sauce cling to the pasta.
- Frozen green beans are just as good as fresh and need no trimming.

Check your work

- ☐ I can tell how the food guides changed from the Basic Seven to MyPlate.
- ☐ I can name the five food groups and one job each one does.
- ☐ I cooked a balanced dinner with an adult beside me and checked the beef reached 160 °F.

COOK'S NOTEBOOK

1. Draw MyPlate and label the five food groups. In each section, draw two foods your family likes.
2. Make a timeline: 1943 Basic Seven, 1956 Basic Four, 1992 Food Guide Pyramid, 2011 MyPlate. Draw a tiny picture of each.
3. Copy the dinner recipe in your own words and sketch the plate you filled.

From history. Between the Pyramid and MyPlate, the USDA used “MyPyramid” (2005), which turned the pyramid’s layers into tall colored stripes with a figure climbing steps. The guides keep changing because scientists keep learning, and because a good picture is one that people can actually use at the table.

COMMON MISTAKES

- Thinking a meal is balanced because it is big. Balance means many food groups, not a large amount.
- Forgetting fruits and vegetables. MyPlate fills half the plate with them.

- Pouring boiling pasta water yourself. The pot is heavy and the steam burns; that is an adult's job.

Make it a game • Plate Builder. Draw a big circle on paper and divide it into the five MyPlate groups from memory. Your parent calls out a food and you point to its group, scoring a point for each correct answer. Then you pick one food per group to plan tonight's pasta dinner. Your parent sneaks in one wrong group to see if you notice.

Scripture. “He causeth the grass to grow for the cattle, and herb for the service of man: that he may bring forth food out of the earth;” (Psalm 104:14, KJV)

Every food group on MyPlate, from grain to green beans to milk, comes in the end from the plants God causes to grow. A balanced plate is a small picture of how richly He provides.

2.2 VITAMINS: THE SAILORS' LEMONS AND LIMES

OBJECTIVES

- Tell how British sailors stayed well on long voyages by drinking lemon and lime juice, and how they came to be called “limeys.”
- Explain what vitamins are and name foods rich in vitamin C.
- Make a citrus fruit salad, cutting fruit safely with the claw grip, and test how lemon juice keeps cut apples from browning.

Warm-up. Line up an orange, a lemon, a lime and an apple. Smell each one. Squeeze a drop of lemon and a drop of orange on your tongue (one at a time). Which is more sour? Which do you think has more vitamin C? Write your guess.

WATCH

Dr. Joe Schwarcz on lemon, lime, scurvy and vitamin C

Montreal Gazette • 4:12

https://www.youtube.com/watch?v=1XYNVWH_o2E

WHEN TO WATCH

After the story. Listen for how the navy switched from lemons to limes and why that mattered.

Note: Dr. Joe Schwarcz is a chemistry professor and director of McGill University’s Office for Science and Society. He shows a vitamin C bottle while discussing the history; this course does not recommend supplements.

KEY TERMS

vitamin

A nutrient the body needs in small amounts to work properly. Vitamins have letter names, like vitamin A and vitamin C.

vitamin C

A vitamin found in citrus fruits, strawberries, peppers, broccoli and many other fruits and vegetables. It helps heal cuts and keeps gums and skin healthy.

scurvy

A sickness caused by going a long time without vitamin C. Long ago it struck sailors on long voyages.

citrus

A family of juicy, tangy fruits with thick peels: oranges, lemons, limes and grapefruit.

oxidation

A change that happens when air touches cut fruit, turning apples and bananas brown.

CORE IDEAS

The story. In the 1700s, sailing ships carried sailors across oceans on voyages that lasted many months. Their food was what would keep without spoiling: hard biscuits, salted meat, dried peas. After a few months at sea, many sailors grew weak and tired. Their gums swelled and bled, and old cuts would not heal. This sickness was called **scurvy**, and it was one of the great troubles of every long voyage.

How they figured it out. Ship's doctors noticed that sailors who reached land and ate fresh fruit and vegetables got well. In 1747 a Scottish navy surgeon, James Lind, tried different foods on sick sailors and found that oranges and lemons helped most. It took years for the navy to act, but in 1795 Britain's Royal Navy began giving every sailor a daily ration of lemon juice, and scurvy nearly disappeared from its ships. Later the navy switched to limes grown in British colonies in the Caribbean, and other sailors began calling British sailors "limeys." But nobody knew *what* in the juice did the work until the 1930s, when the Hungarian scientist Albert Szent-Györgyi and others isolated **vitamin C**, and Szent-Györgyi won a Nobel Prize in 1937.

The kitchen science. **Vitamins** are nutrients your body needs in tiny amounts. Your body cannot make vitamin C, so it must come from food. It helps build collagen, the strong fibers that hold skin, gums and blood vessels together and help cuts heal. Citrus fruits are famous for vitamin C, but strawberries, kiwi, red bell peppers and broccoli have plenty too. Vitamin C is fragile: long cooking and long storage destroy some of it, so fresh, raw fruit is a great source. Lemon juice also keeps cut apples from turning brown, because its acid and its vitamin C slow down **oxidation**, the change that happens when air touches the cut fruit.

Let's cook. You will make a bright citrus fruit salad with oranges, strawberries, kiwi and apple, tossed with a honey-lime dressing. The skill to do well is **cutting round fruit safely**: slice a flat side off first so the fruit cannot roll, then cut with the claw grip, with an adult right beside you.

PICTURE STUDY



Still Life with Lemons, Oranges and a Rose, Francisco de Zurbarán, 1633 · Oil on canvas · Norton Simon Museum, Pasadena, California

Image: [Wikimedia Commons](#), public domain

Francisco de Zurbarán was a Spanish painter who lived in Seville, a city full of orange trees. In this painting he set a few simple things on a table in a beam of light: lemons, oranges still with their leaves and blossoms, a cup of water and a rose. Many people have found the painting peaceful, almost like a prayer.

Look closely

- Find the lemons on the left. How did Zurbarán make their bumpy peel look real?
- Find the oranges in the basket. What is growing with them? What does that tell you about how fresh they are?
- Look at the light. Where is it coming from? What does it do to the fruit?
- Find the cup of water. Why do you think the painter put it there?

Talk about it

1. A sailor in 1795 would have been glad to see this table. Why?
2. Which fruit in the painting is the most sour? Which would make the best juice?

3. Zurbarán set out only a few simple things. What simple, fresh food would you choose to paint?

Safety first. Use a small serrated or paring knife only with an adult right beside you, on a board with a damp towel under it; cut a flat side first and use the claw grip. Wash all fruit under running water before cutting, even fruit you will peel. Honey is never given to babies under one year old; use maple syrup if a baby will eat this.

Vitamin C Fruit Salad and the Brown Apple Test

You will run a simple test to see how lemon juice protects cut apples, then make a citrus fruit salad full of vitamin C. You will practice cutting round fruit safely.

You will need

- A cutting board, a damp towel and a small serrated or paring knife
- A large bowl and a small jar with a lid for the dressing
- A citrus juicer or a fork for squeezing
- Three small plates and masking tape for labels
- Measuring cups and spoons

CITRUS FRUIT SALAD WITH HONEY-LIME DRESSING

Serves 6 (about $\frac{3}{4}$ cup each) • Prep 25 min

Ingredients

- 3 navel oranges (or 4 small clementines)
- 2 cups (about 10 ounces / 285 g) strawberries
- 2 kiwis
- 1 red apple
- 1 cup seedless grapes
- **Dressing:** juice of 1 lime (about 2 tablespoons)
- 1 tablespoon honey (or maple syrup)
- A few fresh mint leaves (optional)

Method

1. Wash your hands. Rinse all the fruit under cool running water and pat it dry.
2. Make the dressing: squeeze the lime, then shake the lime juice and honey in the jar until the honey dissolves.
3. Peel the oranges with your fingers. Pull them into segments and cut each segment in half on the board.

4. With an adult right beside you, cut the green tops off the strawberries and slice them with the claw grip.
5. Cut both ends off each kiwi so it stands flat. An adult can peel it with a peeler, or you can halve it and scoop it with a spoon. Slice it with the claw grip.
6. Stand the apple on the board. Cut slices off the four sides, away from the core, then lay each slice flat and cut it into bite-size pieces.
7. Put all the fruit and the grapes in the bowl, pour on the dressing, and toss gently. Tear a few mint leaves over the top.
8. Serve right away or chill up to 4 hours. Clean up: wash the board and knife, compost the peels, and wipe the counter.

Allergy check: Contains none of the nine major allergens. Honey is not for babies under one year; use maple syrup instead if a baby will eat this. Check with guests about fruit allergies, such as kiwi or strawberry.

Steps

1. **Brown apple test.** Cut three apple slices. Leave slice A plain, brush slice B with lemon juice and dip slice C in water. Label the plates.
2. **Predict.** Which slice will be brownest after 1 hour? Write your guess and why.
3. Make the fruit salad while you wait.
4. After 1 hour, look at the three slices and record what you see. Which kept its color best? Use the word *oxidation* in your answer.
5. **Taste test.** Ask each person to rate the salad from 1 to 5 for sweetness and tang, and name the fruit he or she liked best.
6. **Improve it.** Write one change (a different fruit with vitamin C, more lime, less honey).
7. Clean up and refrigerate leftovers in a covered container.

Tips

- Roll a lime firmly on the counter under your palm before you cut it. It will give more juice.
- Cut the apple last so it has less time to brown, and toss it with the dressing right away.

- Red bell pepper has even more vitamin C than an orange. Try red pepper strips with dip as a snack this week.

Check your work

- ☐ I can tell the story of the sailors, the citrus juice and scurvy.
- ☐ I can explain what vitamin C does and name four foods that have it.
- ☐ I cut round fruit safely with a flat side down and the claw grip, with an adult beside me.

COOK'S NOTEBOOK

1. Draw a sailing ship and, in a crate on the deck, the foods sailors ate. Add a barrel labeled "lemon juice" and write a sentence about what it did.
2. Draw your three apple slices after 1 hour and label them A, B and C with what you found.
3. Make a list of ten foods with vitamin C, and star the ones you have eaten this week.

From history. Captain James Cook kept his crews well on his long Pacific voyages of the 1760s and 1770s by stopping often for fresh food and serving sauerkraut and greens. Today scurvy is very rare, because fresh fruits and vegetables are easy to get all year.

COMMON MISTAKES

- Thinking only oranges have vitamin C. Peppers, broccoli, strawberries and kiwi are full of it too.
- Cutting a round fruit that rolls. Always cut a flat side first and lay it down.
- Skipping the wash for fruit you will peel. Germs on the peel can ride the knife into the fruit.

Make it a game • Limey Lookout. Play the ship's captain. Your parent is a sailor with sore gums who asks what to eat. Answer with foods rich in vitamin C, naming as many as you can in sixty seconds. Then explain why sailors were called limeys and what scurvy is. Switch parts, and the sailor tries to stump the captain.

2.3 PROTEIN FROM PLANTS AND ANIMALS

OBJECTIVES

- Explain what protein does in the body and name protein foods from plants and from animals.
- Tell why grains and beans eaten together, as in Ezekiel 4:9 and in rice and beans, make a strong protein team.
- Cook a pot of rice and a skillet of black beans with an adult beside you, measuring the water carefully.

Warm-up. Look through your refrigerator and pantry. Make two lists: protein foods that come from animals and protein foods that come from plants. Which list is longer? Were any foods hard to place?

WATCH

What is Protein? | Nutrition Education for Kids | Learn with Tito Time

Tito Time - Fun Learning • 5:30

<https://www.youtube.com/watch?v=24bUitZP8b0>

WHEN TO WATCH

After the kitchen science. Play the “animal or plant?” game at the end and keep score.

Note: A small puppet-show channel made for children. Simple and clear about what protein does and where it comes from.

KEY TERMS

protein

A nutrient the body uses to build and repair muscles, skin, blood and every other part. Meat, fish, eggs, milk, beans, nuts and grains all have some.

amino acids

The small building blocks that proteins are made of, like beads on a string.

essential amino acids

The nine amino acids your body cannot make, so they must come from food.

legume

A plant whose seeds grow in pods: beans, peas, lentils and peanuts.

complementary proteins

Two plant foods, such as a grain and a bean, that fill in each other's missing amino acids when eaten in the same day.

CORE IDEAS

The story. About 2,600 years ago, God told the prophet Ezekiel to make a bread from wheat, barley, beans, lentils, millet and spelt (“fitches”), all in one vessel (Ezekiel 4:9). It was a hard time, and this mixed bread was to be his food for many days. Today bakers make “Ezekiel bread” from the same mix of grains and beans. And all over the world, families have long eaten grains and beans together: rice and beans in Latin America and the Caribbean, lentils and rice in India, peanut soup with millet in West Africa, beans and cornbread in the American South.

How they figured it out. Cooks did not know the chemistry, but they knew these meals kept people strong. In the 1930s an American scientist, William Cumming Rose, at the University of Illinois, carefully tested which **amino acids** the body needs from food. He found that some amino acids are **essential**: the body cannot make them. Later scientists measured foods and found that grains are low in one essential amino acid (lysine) while beans have plenty of it, and beans are low in another (methionine) while grains have more. Eaten together, they make a complete set.

The kitchen science. Proteins are long chains of amino acids, like strings of beads. When you eat protein, your body takes the chains apart and uses the beads to build its own proteins for muscles, skin, hair, blood and the immune system. Animal foods (meat, poultry, fish, eggs, milk) contain all the essential amino acids in one food. Many plant foods have some but not all in good amounts, so it helps to eat a variety: grains with beans, peanut butter on whole-wheat bread, oatmeal with milk. You do not have to eat them in the very same bite; eating them over the same day works too.

Let's cook. You will cook a pot of fluffy rice and a skillet of seasoned black beans, a protein team that feeds a family for very little money. The skill to do well is **measuring and timing rice:** the right amount of water, a lid that stays on, and low heat. An adult stands beside you at the stove.

PICTURE STUDY



The Gleaners, Jean-François Millet, 1857 · Oil on canvas · Musée d'Orsay, Paris

Image: [Wikimedia Commons](#), public domain

Jean-François Millet grew up on a farm in France and painted the hard, honest work of country people. These three women are gleaners: after the harvest, the poor were allowed to gather the grain left behind in the field. It is the same custom we read about in the Bible, when Ruth gleaned in the field of Boaz.

Look closely

- Find the three women. What is each one doing with her hands?
- Look far back in the field. What is piled up there? Who does it belong to?
- Find the bundles of grain the women hold. How long would it take to gather enough to make a loaf of bread?
- Look at the colors of the field and the sky. What time of year is it?

Talk about it

1. Grain was the most important food for these women. What would they have to do before it became bread?
2. These women would have eaten grain with beans or a little cheese. Why would that make a strong meal?
3. God's law told farmers to leave grain for the poor to glean. Why is that a kind rule?

Safety first. An adult stands beside you at the stove; turn pot handles in and lift lids away from your face so steam escapes away from you. If you dice the onion, use the bridge and claw grips with an adult right beside you. Refrigerate leftover rice within 2 hours.

KITCHEN PROJECT

A Protein Team: Rice and Black Beans

You will cook rice and seasoned black beans and serve them together, then compare the protein in a serving of rice and beans with a serving of meat using real label numbers.

You will need

- A medium saucepan with a tight lid
- A large skillet and a wooden spoon
- A can opener and a colander or strainer
- A cutting board, a damp towel and a small knife
- Measuring cups and spoons and a timer

FLUFFY RICE AND SKILLET BLACK BEANS

Serves 6 • Prep 10 min • Cook 25 min

Ingredients

- **Rice:** 1½ cups (285 g) long-grain white rice (or brown rice; see tips)
- 2¼ cups (530 mL) water
- ½ teaspoon salt and 1 teaspoon oil or butter
- **Beans:** 1 tablespoon olive oil
- 1 small onion
- 1 green or red bell pepper
- 2 (15-ounce / 425 g) cans black beans
- 1 teaspoon ground cumin, ½ teaspoon dried oregano, ¼ teaspoon garlic powder
- ½ cup (120 mL) water or broth
- Juice of ½ lime and salt to taste
- For serving (optional): grated cheese, plain yogurt or sour cream, salsa

Method

1. Wash your hands. Measure the rice into the strainer and rinse it under cool water until the water runs almost clear.
2. With an adult beside you, bring the water, salt and oil to a boil in the saucepan. Stir in the rice, turn the heat to low, cover tightly, and set a timer for 18 minutes. Do not lift the lid.
3. With an adult right beside you, chop the onion and the pepper using the bridge and claw grips.
4. With an adult beside you, warm the oil in the skillet over medium heat. Cook the onion and pepper 5 minutes, stirring, until soft.
5. Open the beans (an adult helps with the can opener), drain and rinse them. Add them to the skillet with the spices and water. Simmer 8–10 minutes, mashing a few beans with the spoon to make it creamy.
6. When the rice timer rings, turn off the heat and let the pot sit, still covered, 5 minutes. Then fluff the rice with a fork.
7. Stir the lime juice into the beans and taste for salt. Serve the beans over the rice with toppings.
8. Clean up: soak the rice pot, wash the skillet and board, and refrigerate leftovers within 2 hours.

Allergy check: Rice and beans contain none of the nine major allergens. Optional toppings: cheese and yogurt or sour cream contain milk; check the broth and salsa labels.

Steps

1. **Label math.** Read the Nutrition Facts on the bean can and the rice bag. How many grams of protein are in one serving of each? Add them together.
2. **Compare.** Find the protein on a package of meat, cheese or eggs in your kitchen. How does one serving compare with your rice-and-beans total?
3. **Predict.** What will happen if you lift the rice lid in the middle of cooking? Write your guess (you will not actually do it!).
4. Cook the recipe and serve it to your family.
5. **Taste test.** Rate the dish from 1 to 5. Ask: does it fill you up?
6. **Improve it.** Write one change (brown rice, a different bean, more lime, a fried egg on top).

7. Clean up and record your notebook page.

Tips

- Brown rice is a whole grain with more fiber. It needs about 2½ cups water for 1 cup of rice and about 40–45 minutes on low.
- If the lid lets steam escape, lay a clean dish towel over the pot under the lid (an adult folds the corners up away from the burner).
- Rinsing canned beans washes away some of the salty, starchy liquid.

Check your work

- ☐ I can name protein foods from plants and from animals and tell what protein does.
- ☐ I can explain why grains and beans make a good team.
- ☐ I cooked rice and beans with an adult beside me.

COOK'S NOTEBOOK

1. Draw a protein as a string of colored beads. Draw rice with some colors missing, beans with other colors missing, and show how together they make a full string.
2. Make a T-chart of animal proteins and plant proteins with at least five foods on each side.
3. Copy the rice and beans recipe in your own words. Write your protein label math.

From history. Peanuts are legumes, not true nuts: they grow underground in pods, like beans. That is why a peanut-butter sandwich on whole-wheat bread is another grain-and-legume team.

COMMON MISTAKES

- Lifting the lid to peek at the rice. Steam escapes and the rice cooks unevenly.
- Thinking protein comes only from meat. Beans, lentils, peanuts, grains, milk and eggs all give protein.
- Leaving cooked rice out on the counter overnight. Cooked rice belongs in the refrigerator within 2 hours.

Make it a game • Protein Team Charades. Act out protein foods without speaking while your parent guesses, such as a chicken, a bean plant, a cow and an egg. After each guess, say whether the protein is from a plant or an animal. Last round, pair a grain and a bean for a team, and explain how Ezekiel 4:9 and rice and beans fit together.

Scripture. “Take thou also unto thee wheat, and barley, and beans, and lentiles, and millet, and fitches, and put them in one vessel, and make thee bread thereof,” (Ezekiel 4:9, KJV)

Ezekiel’s bread mixed grains and beans in one vessel. God’s provision for His prophet in a hard time was simple, humble food that kept him strong.

2.4 LEWIS AND CLARK'S PROVISIONS

OBJECTIVES

- Tell what the Corps of Discovery packed and ate on its journey from 1804 to 1806, including “portable soup.”
- Explain why some foods travel and keep well and others spoil.
- Make a balanced trail lunch with homemade toasted trail mix and pocket wraps, and pack it safely.

Warm-up. Imagine you are leaving on a two-year walk across a land with no stores. You may carry only what fits in a backpack and a canoe. List the five foods you would take. Now ask: which of them would spoil in a week?

WATCH

The Poor Explorer's Feast: Lewis and Clark Expedition

Townsend • 12:20

<https://www.youtube.com/watch?v=70x3urGBIjU>

WHEN TO WATCH

After the story. Write down every food Mr. Townsend mentions that the Corps of Discovery carried or found.

Note: Townsends teaches 18th- and early 19th-century cooking with historical sources. He reads from the expedition's journals.

KEY TERMS

provisions

The supply of food packed for a journey.

portable soup

Meat broth boiled down until it set into a hard, glue-like cake that could be carried for months and melted in hot water for soup.

preserve

To keep food from spoiling, by drying, salting, smoking, cooling or sealing it.

trail mix

A mix of dried foods such as grains, seeds, nuts and dried fruit that is light to carry and gives lasting energy.

CORE IDEAS

The story. In 1803 President Thomas Jefferson asked Meriwether Lewis and William Clark to lead a team west across North America to the Pacific Ocean. The Corps of Discovery set out up the Missouri River in May 1804 and returned in September 1806. Before leaving, Lewis shopped in Philadelphia for supplies, and one of the strangest was 193 pounds of **portable soup**, meat broth boiled down into hard cakes. The Corps also carried flour, cornmeal, salt pork, salt, sugar, coffee, dried beans and lard.

How they figured it out. For most of the journey, the men hunted: deer, elk and bison gave them most of their food, and a hardworking man ate a great deal of meat in a day. Sacagawea, the young Shoshone woman who traveled with them, showed them how to find wild roots and berries. In September 1805, crossing the snowy Bitterroot Mountains, they could find almost no game, and they ate the portable soup they had carried for over a year. Nobody liked it, but it kept them going. When they came down from the mountains, the Nez Perce people gave them dried salmon and bread made from camas roots. The explorers learned that the best travel food is light, keeps without spoiling and gives lasting energy.

The kitchen science. Germs and molds need water to grow. Foods that are dry, like grains, dried beans, dried fruit, nuts and seeds, keep for months. Drying, salting and smoking take water away or make it hard for germs to use. Portable soup kept because nearly all its water had been boiled away. For a long walk, the best foods give steady energy: whole grains and dried fruit give carbohydrates for energy, and nuts, seeds, cheese and meat give protein and fat that keep you going longer. A balanced trail lunch has several food groups, just like a balanced dinner.

Let's cook. You will toast a batch of oat-and-seed trail mix in the oven and roll pocket wraps for a trail lunch. The skills to do well are **measuring and stirring a hot pan safely** with an adult beside you, and **packing perishable food cold**, using what you learned in Unit 1.

PICTURE STUDY



Lewis and Clark on the Lower Columbia, Charles Marion Russell, 1905 · Opaque and transparent watercolor over graphite on paper · Amon Carter Museum of American Art, Fort Worth, Texas

Image: [Wikimedia Commons](#), public domain

Charles Russell, a painter of the American West, painted this scene a hundred years after the journey. The Corps of Discovery meets Chinook people in canoes on the Columbia River, near the end of the trip west. Sacagawea stands in the canoe and signals friendship.

Look closely

- Find Sacagawea in the explorers' canoe. What is she doing with her hand? Why would that matter when meeting strangers?
- Find the two kinds of canoes. How are they different?
- Look at the river and the forest. What foods might the travelers find here?
- Look for anything the explorers carry. What would they need to keep dry?

Talk about it

1. The Chinook people lived by the river and caught salmon. Why would the explorers want to trade with them for food?
2. How would the men keep flour, cornmeal and portable soup dry in a canoe?
3. Which foods from your trail lunch would have been welcome in this canoe?

Safety first. An adult stands beside you when the pan goes into and comes out of the oven; wear oven mitts and stir on the stovetop, not inside the oven. Keep the wraps with cheese or meat cold in an insulated bag with an ice pack. Trail mix often contains nuts: check for allergies before you share.

KITCHEN PROJECT

An Explorer's Trail Lunch

You will make a batch of toasted trail mix and pocket wraps, pack a balanced trail lunch with an ice pack, and take it on a walk or hike with your family. You will also try a taste of “portable soup” the modern way.

You will need

- A large rimmed baking sheet and parchment paper
- A large bowl, a spoon and measuring cups and spoons
- A cutting board, a damp towel and a small knife
- Small bags or containers for the trail mix
- An insulated lunch bag and an ice pack
- Oven mitts and a timer

TOASTED EXPLORER'S TRAIL MIX AND POCKET WRAPS

Serves 6 (about 6 cups trail mix and 6 wraps) · Prep 20 min · Bake 20 min

Ingredients

- **Trail mix:** 2 cups (180 g) old-fashioned rolled oats
- 1 cup (140 g) roasted peanuts or almonds (or sunflower seeds for nut-free)
- ½ cup (65 g) pumpkin seeds
- 2 tablespoons maple syrup or honey and 2 tablespoons vegetable oil
- ½ teaspoon cinnamon and a pinch of salt
- 1 cup raisins or dried cranberries and ½ cup chopped dried apricots
- **Pocket wraps:** 6 whole-wheat tortillas (8-inch)
- 6 slices cheddar cheese and 6 slices turkey (or ½ cup peanut or sunflower-seed butter)
- 1 apple, thinly sliced, and a handful of spinach leaves

Method

1. An adult heats the oven to 325 °F (165 °C). Wash your hands and line the baking sheet with parchment.

2. Stir the oats, peanuts or almonds and pumpkin seeds in the bowl. Add the syrup, oil, cinnamon and salt and stir until coated.
3. Spread the mix on the pan. With an adult beside you, bake 18–20 minutes, taking the pan out halfway (oven mitts on) to stir on the stovetop, until golden.
4. Cool the pan completely, then stir in the dried fruit. Scoop $\frac{3}{4}$ cup into each bag.
5. Wash and dry the apple and spinach. With an adult right beside you, cut the apple in quarters, remove the core, and slice thinly with the claw grip.
6. Lay a tortilla flat. Add a slice of cheese, a slice of turkey (or a thin layer of seed butter), apple slices and a few spinach leaves. Fold in the sides and roll it up tightly. Cut it in half.
7. Pack each wrap in a container in the insulated bag with the ice pack. Eat within 4 hours.
8. Clean up: wash the bowl, pan and board and wipe the counter.

Allergy check: Contains peanuts or tree nuts (almonds), wheat (tortillas) and milk (cheese). For nut-free, use sunflower seeds in the mix and sunflower-seed butter or turkey in the wraps. Use gluten-free tortillas for wheat-free and leave out the cheese for milk-free. Honey is not for babies under one year.

Steps

1. **Pack like an explorer.** List every food in your trail lunch under its MyPlate group. Is it balanced? Which foods would keep for a month, and which must stay cold?
2. **Portable soup today.** With an adult, dissolve a bouillon cube in 1 cup of hot water (an adult pours the water). Bouillon cubes are the modern cousin of portable soup. Taste it and describe it.
3. Make the trail mix and wraps. Weigh or measure one bag of trail mix.
4. Take your trail lunch on a family walk or hike. Note the time you packed it and the time you ate it.
5. **Taste test.** Rate the trail mix and the wraps from 1 to 5. Which gave you the most energy for the walk?

6. **Improve it.** Write one change (a different dried fruit, more seeds, a different wrap filling).

7. Clean up the lunch bag and containers.

Tips

- Trail mix keeps in a sealed jar for 2 weeks. Keep it cool and dry.
- Roll wraps tightly and cut them on a slant so they hold together.
- Freeze a water bottle overnight; it works as an ice pack and becomes a cold drink by lunch.

Check your work

- ☐ I can tell what Lewis and Clark carried and how portable soup kept.
- ☐ I can explain why dry foods keep and perishable foods need cold.
- ☐ I made and packed a balanced trail lunch.

COOK'S NOTEBOOK

1. Draw a canoe packed with the Corps of Discovery's provisions. Label each barrel, bag and crate.
2. Draw a map of your family walk and mark where you ate your trail lunch.
3. Copy the trail mix recipe in your own words and invent a name for your own mix.

From history. The men of the expedition kept daily journals, and many of them wrote about food: what they hunted, what they traded for, and how hungry they were in the Bitterroot Mountains. Those journals are some of the best food records we have of the early American West, and you can read parts of them online through the University of Nebraska's Lewis and Clark journals project.

COMMON MISTAKES

- Packing cheese or meat wraps without an ice pack. They are perishable and must stay cold.
- Taking the trail mix out of the oven too late. Oats go from golden to burnt quickly; set a timer.
- Forgetting to check for nut allergies before you share trail mix.

Make it a game • Pack the Canoe. Pretend you are loading a canoe with Lewis and Clark's provisions. Lay out ten household foods and choose five that will keep for months, saying why each one travels well. Your parent names a food that would spoil and you explain what goes wrong. Score a point each time you can tell how portable soup was made.

Scripture. “Give us this day our daily bread.” (Matthew 6:11, KJV)

The explorers never knew where tomorrow’s meal would come from. Jesus teaches us to ask our Father each day for what we need, and to thank Him when it comes.

UNIT 2

FOOD GROUPS & THE BALANCED MEAL

God has filled the world with good things to eat, and each kind of food does a different job in the body. In this unit you will see how Americans learned to plan balanced meals, from the wartime “Basic Seven” chart of 1943 to the MyPlate picture of today. You will discover what vitamins are by following British sailors who kept well on long voyages by drinking lemon and lime juice.

Then you will learn that protein comes from both plants and animals, and that grains and beans eaten together, like the bread in Ezekiel 4:9 or a pot of rice and beans, make a strong team. Last, you will follow Lewis and Clark across the continent and see how explorers packed food that would last. Every week you will cook a meal or snack that shows the food groups at work.

PREREQUISITES

- Uses a food thermometer and knows the safe temperatures for meat (Unit 1)
- Uses the claw and bridge grips with an adult right beside (Unit 1)
- Knows the danger zone and the 2-hour rule (Unit 1)
- Can read the allergen line on a label (Unit 1)

MASTERY CHECKLIST

- ☐ I can tell how American food guides changed from the Basic Seven (1943) to MyPlate (2011).
- ☐ I can name the five MyPlate food groups and build a balanced plate with all five.
- ☐ I can explain what vitamins are and tell the story of the sailors, the citrus juice and scurvy.
- ☐ I can name protein foods from plants and from animals and explain why grains and beans make a good team.
- ☐ I can tell what Lewis and Clark carried and ate, and pack a balanced trail lunch.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **MyPlate Kids:** Free at MyPlate.gov. Games, activity sheets and the MyPlate food groups for children, from the U.S. Department of Agriculture. Good for Lesson 2.1 and the unit challenge.
- **MyPlate Kitchen:** Free at MyPlate.gov. A USDA collection of simple family recipes you can search by food group, for planning the balanced dinners in the unit challenge.
- **A sturdy divided plate or a paper plate marked into sections:** Helpful for seeing the MyPlate portions at a glance. Any plate works.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

2.1 From the Basic Seven to MyPlate	2 sessions of 45–60 minutes
2.2 Vitamins: The Sailors' Lemons and Limes	2 sessions of 45–60 minutes
2.3 Protein from Plants and Animals	2 sessions of 45–60 minutes
2.4 Lewis and Clark's Provisions	2 sessions of 45–60 minutes

UNIT 2 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

Put these USDA food guides in order from oldest to newest: MyPlate, Basic Seven, Food Guide Pyramid, Basic Four. Give a year for each.

2. 5 pts

Name the five MyPlate food groups and one job each one does in the body.

3. 5 pts

What is scurvy, and how did the Royal Navy prevent it?

4. (5 pts)

Name four foods that are good sources of vitamin C.

5. (5 pts)

Predict: you cut an apple and leave one slice plain and brush another with lemon juice. What will they look like after an hour, and why?

6. (5 pts)

What does protein do in the body? Name two protein foods from animals and two from plants.

7. (5 pts)

Why are rice and beans called a protein team?

8. (5 pts)

What was portable soup, and why did it keep for so long?

9. (5 pts)

Predict: you cook rice and lift the lid three times to check it. What will probably happen?

10. (5 pts)

Plan a balanced lunch for a hike with one food from each of the five food groups. Which items must be kept cold?

ANSWER KEY

1. Basic Seven (1943), Basic Four (1956), Food Guide Pyramid (1992), MyPlate (2011).
2. Grains: energy (and fiber). Vegetables and fruits: vitamins, minerals, fiber and water. Protein: building and repairing the body. Dairy: calcium for bones and teeth.
3. Scurvy is a sickness caused by too little vitamin C; gums bleed and cuts do not heal. From 1795 the navy gave sailors a daily ration of lemon juice (later lime juice).
4. Any four: oranges, lemons, limes, grapefruit, strawberries, kiwi, red bell peppers, broccoli, tomatoes.
5. The plain slice turns brown from oxidation when air touches it. The lemon slice stays lighter because the lemon's acid and vitamin C slow the browning.
6. It builds and repairs muscles, skin, blood and other parts. Animal: any two of meat, chicken, fish, eggs, milk, cheese. Plant: any two of beans, lentils, peas, peanuts, nuts, seeds, grains.
7. Grains are low in some essential amino acids that beans have, and beans are low in some that grains have. Eaten together they give a complete set.
8. Meat broth boiled down into hard cakes. Almost all the water was removed, and germs need water to grow.
9. Steam escapes each time, so the rice may cook unevenly, stay hard or need more water and time.
10. Answers vary; for example: whole-wheat wrap (grain), turkey (protein), cheese (dairy), apple (fruit), carrot sticks (vegetable). The turkey and cheese must be kept cold with an ice pack.

UNIT CHALLENGE: THREE BALANCED FAMILY DINNERS

Plan three balanced family dinners for one week, each with all five MyPlate food groups. Use at least one dish from this unit and one plant protein meal. Write each menu, a shopping list, and a MyPlate check for each dinner.

Help cook all three dinners with an adult beside you, doing at least one main job yourself each night. Photograph or sketch each plate filled the MyPlate way, and record a family rating and one improvement for each dinner.

LOOK FOR	WHAT IT MEANS
Planning	Three written menus with all five food groups, a shopping list and a MyPlate check for each.
Cooking and safety	Hands washed, knife and stove used only with an adult beside, meats checked with the thermometer, leftovers chilled within 2 hours.
Record-keeping	A photo or sketch of each plate, the main job you did, and family ratings.
Cleanup and service	Kitchen cleaned after each meal; the table set and grace said.
Improvement	One honest improvement written for each dinner, with a plan to try one of them.

UNIT 3

TASTE, SMELL & YOUR TASTE BUDS

God made your tongue and nose to enjoy the good gifts of His creation. In this unit you will test a famous mistake, the “tongue map,” and find out with cotton swabs that every part of your tongue can taste every taste. You will learn why some people find broccoli and Brussels sprouts much more bitter than others do, and how farmers have made milder sprouts.

Then you will taste what salt does to food, and why Job asked, “Can that which is unsavoury be eaten without salt?” Last, you will learn that food is not only tasted but felt: thick, thin, smooth, crunchy. You will blend smoothies thick and thin and rate their **mouthfeel**. Before any taste test, check with each taster about food allergies.

PREREQUISITES

- Uses the claw and bridge grips with an adult right beside (Unit 1)
- Uses the stove and oven only with an adult beside (Units 1–2)
- Knows the five food groups (Unit 2)
- Checks for food allergies before a taste test (Unit 1)

MASTERY CHECKLIST

- ☐ I can name the five basic tastes: sweet, salty, sour, bitter and umami.
- ☐ I can explain why the tongue map is a myth and prove it with a cotton-swab test.
- ☐ I can explain why some people taste bitterness more strongly, and why tastes change as we grow and keep trying foods.
- ☐ I can tell what salt does to the flavor of food and season a soup in small steps.
- ☐ I can describe mouthfeel and change a smoothie from thin to thick on purpose.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **Cotton swabs, small cups and blue food coloring:** Inexpensive supplies for the taste tests in Lessons 3.1 and 3.2.
- **A blender:** For Lesson 3.4. If you do not have one, mash very ripe bananas and whisk them with yogurt and milk for a hand-made smoothie.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

3.1 The Tongue-Map Myth	2 sessions of 45–60 minutes
3.2 Supertasters and Bitterness	2 sessions of 45–60 minutes
3.3 Salt and Flavor	2 sessions of 45–60 minutes
3.4 Mouthfeel: Thick and Thin	2 sessions of 45–60 minutes

UNIT 3 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. **5 pts**

Name the five basic tastes and a food for each.

2. **5 pts**

What is the tongue map, and why is it a myth?

3. **5 pts**

Predict: you dab sugar water on the back of your tongue. Will you taste it? Explain.

4. **5 pts**

What is a supertaster? Who named supertasters?

5. (5 pts)

Give three ways a cook can make a bitter vegetable taste milder.

6. (5 pts)

What does salt do to food besides make it salty?

7. (5 pts)

Why did salt companies begin adding iodine to salt in 1924?

8. (5 pts)

Why should you add salt to soup a little at a time?

9. (5 pts)

Predict: you make a smoothie with frozen fruit and less milk, and another with fresh fruit and more milk. Which will be thicker, and why?

10. (5 pts)

List three blender safety rules.

ANSWER KEY

1. Sweet (sugar, ripe fruit), salty (salt, pretzels), sour (lemon, vinegar), bitter (cocoa, grapefruit, some greens), umami (broth, tomatoes, Parmesan).
2. A picture showing sweet, salty, sour and bitter in separate zones. It came from a misreading of Hänig's 1901 study in Boring's 1942 graph. Every part of the tongue can taste every taste.
3. Yes. Taste buds all over the tongue have receptors for sweet, so the back of the tongue can taste sweet too.
4. A person who tastes bitterness and other tastes more strongly than most, often with more taste bumps. Linda Bartoshuk of Yale named them in the 1990s.
5. Any three: roast it to caramelize its sugars; add a little salt; add a little sweet such as honey; add a little sour such as lemon; avoid overcooking.
6. It quiets bitterness and makes sweet and savory flavors taste stronger; it is a flavor enhancer.
7. Many people in some regions lacked iodine and developed goiters. Adding iodine to salt, which nearly everyone uses, prevented this.
8. You can always add more but you cannot take it out; tasting after each addition lets you stop when it tastes just right.
9. The frozen-fruit smoothie with less milk will be thicker, because ice crystals and very cold fruit thicken it and there is less liquid.
10. Any three: an adult beside you; lid on before starting; start on low; never put a hand or spoon inside while it is plugged in; unplug before scraping or cleaning.

UNIT CHALLENGE: THE FAMILY TASTE LAB

Hold a family taste lab. Choose one vegetable that someone in your family does not like and prepare it three ways (for example raw with dip, steamed, and roasted), with an adult beside you for any knife or heat. Serve small tastes blind, without saying which is which.

Make a results chart of each person's ratings for sweetness, bitterness, saltiness and mouthfeel. Write what you learned about how cooking and seasoning change taste, and make a "try it again" plan to serve the favorite version at least twice more in the next month.

LOOK FOR	WHAT IT MEANS
Fair test	The same vegetable prepared three ways, served blind in equal small tastes, with allergies checked first.
Safety and cleanliness	Hands and produce washed; knife and heat used only with an adult beside; kitchen cleaned.
Results chart	Clear ratings from every taster, with taste and mouthfeel words.
Conclusion and plan	A short explanation of what changed the taste and a written "try it again" plan.

3.1 THE TONGUE-MAP MYTH

OBJECTIVES

- Name the five basic tastes and a food for each.
- Tell how the “tongue map” came from a misreading of a 1901 study, and prove with a cotton-swab test that all parts of the tongue taste all tastes.
- Cook honey-lemon glazed carrots with an adult beside you and taste how sweet, sour and salty balance.

Warm-up. Look at your tongue in a mirror. Find the tiny bumps on top. Do they look the same at the tip, the sides and the back? Draw what you see. Where do you think you taste sweet things?

WATCH

Your Tongue: The Taste-Maker!

SciShow Kids · 3:52

<https://www.youtube.com/watch?v=C4rdqXXzPGU>

WHEN TO WATCH

After the story. Listen for what papillae are and where the taste buds hide.

BACKUP VIDEO

The Tongue Map is a Myth

University of Florida · 1:20

<https://www.youtube.com/watch?v=leusvLYgkgc>

After the cotton-swab test. A one-minute review of how the tongue map began and why it is wrong.

KEY TERMS

taste bud

A tiny cluster of taste cells, mostly inside the little bumps on your tongue. You have thousands of them.

papillae

The small bumps on the tongue. Many of them hold taste buds. Say it “puh-PILL-ee.”

umami

The savory, meaty taste of foods like broth, tomatoes, mushrooms and Parmesan cheese. Say it “oo-MAH-mee.”

myth

Something many people believe that is not true.

fair test

An experiment where you change only one thing at a time, so you know what caused the result.

CORE IDEAS

The story. For most of the 1900s, schoolbooks showed a picture of the tongue divided into zones: sweet at the tip, salty and sour along the sides, bitter at the back. Millions of children learned it. But it was wrong. It began in 1901, when a German scientist, D. P. Hänig, carefully dabbed tastes on the edges of people’s tongues in Leipzig. He found that some spots were a little more sensitive to some tastes than others, but every spot could taste every taste.

How they figured it out. In 1942 an American psychologist at Harvard, Edwin Boring, wrote a history book about the senses and drew a graph of Hänig’s results. Readers misunderstood the graph and thought it meant each taste could be sensed *only* in one zone. The mistake was copied into textbooks for years. In 1974 another scientist, Virginia Collings, tested the whole tongue again and showed that the differences were tiny. Later, scientists found the actual taste receptor cells, and they found receptors for every taste in taste buds all over the tongue. Anyone can test it with a cotton swab, which is what you will do.

The kitchen science. You have thousands of **taste buds**, most of them tucked inside the bumps (**papillae**) on your tongue, with a few on the roof of your mouth and in your throat. Each taste bud holds taste cells that send messages to your brain. Taste cells are replaced about every week or two. Scientists agree on five basic tastes: **sweet** (sugar, ripe fruit), **salty** (salt), **sour** (lemon, vinegar), **bitter** (cocoa, coffee, some greens) and **umami** (savory: broth, tomatoes, cheese). A good cook balances tastes: a little sour brightens something sweet, and a little salt calms bitterness.

Let's cook. You will make honey-lemon glazed carrots, a side dish where sweet, sour and salty work together. The skill to do well is **slicing carrots into even coins** with the claw grip, so they cook in the same time, and **tasting as you go**. An adult stands beside you at the stove.

PICTURE STUDY



Still Life with Oranges and Walnuts, Luis Egidio Meléndez, 1772 · Oil on canvas · National Gallery, London

Image: [Wikimedia Commons](#), public domain

Luis Meléndez was a Spanish painter who spent much of his life painting the foods of Spanish kitchens: fruit, bread, nuts, cheese and the boxes and jugs that held them. He painted so carefully that you can almost feel the bumpy orange peel and the hard walnut shells.

Look closely

- Find the oranges. Which of the five tastes do you expect from an orange?
- Find the walnuts. Some are cracked open. How would a walnut taste different from an orange?
- Find the melon. Is it ripe? How can you tell?
- Look at the round and long wooden boxes and the jugs. What do you think is stored in them?

Talk about it

1. If you made a five-tastes tray from this table, which foods would you use, and what would you need to add?
2. Meléndez painted textures carefully. Which food here would feel smooth, which bumpy, and which hard?

3. Why do you think a painter would spend so much time on plain foods?

Safety first. Check with every taster about food allergies before a taste test. Use a new clean swab for every dip, and never put a used swab back into a cup. An adult stands beside you at the stove and when you slice carrots; honey is never given to babies under one year old.

KITCHEN PROJECT

Bust the Tongue Map: Cotton-Swab Test and Glazed Carrots

You will run a fair test with cotton swabs to see where your tongue can sense each taste, then cook glazed carrots and balance their taste with honey, lemon and salt.

You will need

- Five small cups and a box of cotton swabs
- A glass of water for rinsing between tastes
- A large drawing of a tongue for recording
- A cutting board, a damp towel, a small knife and a vegetable peeler
- A large skillet with a lid and a wooden spoon
- Measuring cups and spoons

HONEY-LEMON GLAZED CARROTS

Serves 4–6 • Prep 15 min • Cook 15 min

Ingredients

- 1½ pounds (680 g) carrots (about 8 medium)
- ½ cup (120 mL) water
- 2 tablespoons butter (or olive oil)
- 1½ tablespoons honey (or maple syrup)
- 1 tablespoon lemon juice
- ¼ teaspoon salt and a pinch of black pepper
- 1 tablespoon chopped fresh parsley (optional)

Method

1. Wash your hands. Rinse the carrots and peel them with the peeler, stroking away from your hand.
2. With an adult right beside you, cut off the ends. Slice the carrots into coins about ¼ inch (6 mm) thick with the claw grip. Cut thick ends in half first so the coins are all about the same size.

3. Put the carrots, water, butter and salt in the skillet. With an adult beside you, bring to a simmer over medium heat, cover, and cook 6–8 minutes until a fork just slides in.
4. Lift the lid away from your face. Turn the heat to medium-high and cook, stirring, until most of the water has boiled away, 3–4 minutes.
5. Stir in the honey and cook 1–2 minutes more, stirring, until the carrots are shiny and glazed.
6. Turn off the heat. Stir in the lemon juice and pepper. Taste one carrot (let it cool first). Add a pinch more salt or a squeeze more lemon if needed.
7. Sprinkle with parsley and serve. Clean up: wash the skillet, board and peeler, and compost the peels.

Allergy check: Contains milk (butter); use olive oil for milk-free. No other major allergens. Honey is not for babies under one year; use maple syrup instead.

Steps

1. **Set up.** Make five cups: sugar water (sweet), salt water (salty), lemon juice (sour), unsweetened cocoa stirred into warm water (bitter) and a little broth (umami). Label them.
2. **Predict.** On your tongue drawing, mark where you think you will taste each one most strongly.
3. **Fair test.** With a fresh swab each time, touch one taste to the tip, the side and the back of your tongue. Rinse with water between tastes. Record on the drawing where you could taste it. Test all five.
4. **Conclude.** Did every part of your tongue taste every taste? Write one sentence that busts the tongue map.
5. Cook the glazed carrots. Taste one carrot before adding the lemon and one after. Write what changed.
6. **Improve it.** Ask your family to rate the carrots from 1 to 5. Write one change (more lemon, a pinch of cinnamon, less honey).
7. Clean up: throw away the used swabs and wash the cups.

Tips

- Swallow or rinse between tastes, and wait a few seconds; tastes can linger.

- Pat your tongue dry with a clean paper towel before each test. Taste needs saliva, and it is fun to see what a dry tongue can and cannot taste.
- Cut carrots the same size and they will all be tender at the same moment.

Check your work

- ☐ I can name the five basic tastes.
- ☐ I proved with a fair test that all parts of the tongue taste all tastes.
- ☐ I balanced sweet, sour and salty in glazed carrots.

COOK'S NOTEBOOK

1. Draw your tongue test results: a large tongue with your marks for all five tastes.
2. Write the story of the tongue-map myth in four sentences: Hänig, Boring, the textbooks and the truth.
3. Copy the glazed carrot recipe in your own words and write what the lemon did.

From history. Umami was named in 1908 by the Japanese chemist Kikunae Ikeda, who found the savory taste of his kombu seaweed broth came from glutamate. For many years Western scientists counted only four tastes. In the 2000s, scientists found the receptors on the tongue that sense umami, and it was accepted as the fifth basic taste.

COMMON MISTAKES

- Believing the tongue map because it is in an old book. Test it yourself; scientists do.
- Reusing a swab after it has been in your mouth. Use a fresh swab every time.
- Adding all the salt or lemon at once. Add a little, taste, then add more.

Make it a game • Tongue Map Showdown. Draw the old tongue map from memory, then draw a big X through it. With a parent, taste tiny dabs of salt water, lemon, and honey water on different parts of your tongue using clean cotton swabs. Say the five basic tastes in sixty seconds and a food for each. Explain why the map was a myth.

Scripture. “O taste and see that the LORD is good: blessed is the man that trusteth in him.” (Psalm 34:8, KJV)

God gave us taste so that even eating can remind us of His goodness. Every good flavor is a small invitation to thank Him.

3.2 SUPERTASTERS AND BITTERNESS

OBJECTIVES

- Explain why some people taste bitterness much more strongly than others (supertasters).
- Tell how plant scientists found the bitter compounds in Brussels sprouts and grew milder ones.
- Roast Brussels sprouts with an adult beside you and compare them with steamed sprouts in a family taste test.

Warm-up. Ask everyone in your family to rate how much they like broccoli, Brussels sprouts, dark chocolate and grapefruit, from 1 (not at all) to 5 (love it). Write the answers in a chart. Does everyone agree?

WATCH

Are You A Supertaster | Test Your Tongue

ABC Science • 2:23

<https://www.youtube.com/watch?v=jExqPBLgf-o>

WHEN TO WATCH

Before the papillae test. Watch how the blue dye shows the bumps on the tongue, then try it yourself.

Note: From the Australian Broadcasting Corporation's science unit.

KEY TERMS

bitter

A sharp taste found in foods like cocoa, coffee, grapefruit peel and some green vegetables.

supertaster

A person who tastes bitterness and other tastes much more strongly than most, often because he or she has more taste bumps.

glucosinolates

Natural compounds in Brussels sprouts, broccoli and cabbage that give them their bitter bite. Say it “gloo-ko-SIN-o-lates.”

caramelize

To brown sugars with heat, making sweet, nutty flavors. Roasting caramelizes vegetables.

CORE IDEAS

The story. Brussels sprouts once had a bad name at many dinner tables. Children (and many grown-ups) found them bitter. In the 1990s a Dutch plant scientist, Hans van Doorn, set out to learn why. He found that the bitterness came from natural compounds called **glucosinolates**. Seed companies then searched their collections of old sprout varieties for ones with less of these compounds and crossed them with high-yielding modern plants. Over many seasons they grew new sprouts that are sweeter and milder. Many cooks say Brussels sprouts today taste quite different from the ones their grandparents ate.

How they figured it out. Scientists had long noticed that people disagree about bitter foods. In the 1990s Linda Bartoshuk, a taste scientist at Yale University, studied people who tasted bitter compounds very strongly and named them **supertasters**. She found that many supertasters have more taste bumps (papillae) on their tongues than other people. You can count yours: a drop of blue food coloring stains the tongue but not the bumps, so they show up as pink dots.

The kitchen science. Plants make bitter compounds to protect themselves from insects. Your tongue has special receptors for bitterness, and the number and kind you have depend partly on the genes God gave you. Children are often more sensitive to bitterness than adults, which is one reason tastes change as we grow up. Cooks can soften bitterness in three ways: **roasting**, which caramelizes the sugars in the vegetable and makes it sweet and nutty; adding a little **salt**, which quiets bitterness; and adding a little **sweet or sour**, such as honey or lemon. Boiling sprouts too long makes them smell and taste stronger.

Let's cook. You will roast Brussels sprouts with olive oil and salt, finished with a drizzle of honey. The skill to do well is **halving small round vegetables** safely with the bridge grip, then laying them cut side down on the pan for the best browning. An adult stands beside you whenever the oven is open.

PICTURE STUDY



Still Life with Cabbage and Clogs, Vincent van Gogh, 1881 · Oil on paper on panel · Van Gogh Museum, Amsterdam

Image: [Wikimedia Commons](#), public domain

This is one of the very first paintings Vincent van Gogh ever made, when he was 28 and just learning to paint in oils. He chose the plainest things in a Dutch farmhouse: a cabbage, some potatoes and a pair of wooden shoes. Cabbage is a close cousin of the Brussels sprout.

Look closely

- Find the cabbage. How did Van Gogh show its curled, crinkly leaves?
- Find the potatoes. How many can you count?
- Find the clogs. Who do you think wore them, and where had they been?
- Look at the colors. Is this a bright painting or a dark one? Why might he have chosen these colors?

Talk about it

1. Cabbage, broccoli and Brussels sprouts belong to the same plant family. What taste do they share?
2. How could a cook make this cabbage taste sweeter and less bitter?
3. Van Gogh painted the things farm families used every day. What everyday thing in your kitchen would you paint?

Safety first. Cut sprouts with a small knife only with an adult right beside you, using the bridge grip on a board with a damp towel under it. An adult stands beside you when the pan goes in and out of a 425 °F oven; wear oven mitts and set the hot pan on a trivet. Honey is never given to babies under one year old.

KITCHEN PROJECT

Count Your Taste Buds and Roast the Sprouts

You will count the taste bumps on your tongue with a drop of blue food coloring, then cook Brussels sprouts two ways and hold a family taste test to see how heat changes bitterness.

You will need

- Blue food coloring, cotton swabs and a hand mirror
- A paper reinforcement ring (the small round sticker for notebook paper) or a hole punched in wax paper
- A magnifying glass (optional)
- A cutting board, a damp towel and a small knife
- A large rimmed baking sheet and a small saucepan with a steamer basket or lid
- Oven mitts, a trivet and a timer

ROASTED BRUSSELS SPROUTS WITH A HONEY DRIZZLE

Serves 4–6 • Prep 15 min • Roast 20–25 min

Ingredients

- 1½ pounds (680 g) Brussels sprouts
- 2 tablespoons olive oil
- ½ teaspoon salt and ¼ teaspoon black pepper
- 1 tablespoon honey (or maple syrup)
- 1 teaspoon lemon juice
- 2 tablespoons grated Parmesan (optional)

Method

1. An adult heats the oven to 425 °F (220 °C). Wash your hands and rinse the sprouts.
2. With an adult right beside you, trim the dry stem end of each sprout and pull off any yellow outer leaves. Cut each sprout in half with the bridge grip.

3. Set aside 6 halves for the steamed comparison. Toss the rest on the baking sheet with the oil, salt and pepper. Turn them cut side down.
4. With an adult beside you, slide the pan into the oven. Roast 20–25 minutes, without stirring, until the cut sides are deep brown and a fork slides in.
5. Meanwhile, with an adult beside you, steam the 6 reserved halves over simmering water, covered, for 6–7 minutes.
6. Stir the honey and lemon juice together. With oven mitts, an adult sets the pan on a trivet. Drizzle the honey mixture over the roasted sprouts and toss. Sprinkle with Parmesan.
7. Clean up: wash the board, knife and saucepan, and soak the baking sheet.

Allergy check: Contains milk if you add Parmesan. No other major allergens. Honey is not for babies under one year; use maple syrup instead.

Steps

1. **Count your bumps.** Swab a little blue food coloring on the tip of your tongue. Put the reinforcement ring on the tip (or hold the wax-paper hole there). Using the mirror, count the pink bumps inside the circle. Have family members do it too and record everyone's count.
2. **Predict.** Who in your family do you think will find the sprouts most bitter? Why?
3. Cook the sprouts both ways.
4. **Blind taste test.** Give each taster one roasted and one steamed half without saying which is which. Ask each to rate bitterness and sweetness from 1 to 5.
5. **Compare.** Did the people with the most bumps rate the sprouts as more bitter? Did roasting lower the bitterness?
6. **Improve it.** Write one change (more honey, a squeeze more lemon, Parmesan, a longer roast). Plan to try sprouts again in a few weeks: tastes change with repeated tries.
7. Clean up.

Tips

- Leave space between sprouts on the pan. Crowded sprouts steam instead of browning.
- Small sprouts are usually milder than large ones.
- Do not give up on a vegetable you dislike. Many people need to taste a new food 8 to 15 times before they come to like it.

Check your work

- ☐ I can explain what a supertaster is.
- ☐ I counted my taste bumps and compared with my family.
- ☐ I roasted Brussels sprouts with an adult beside me and compared roasted with steamed.

COOK'S NOTEBOOK

1. Draw the circle on your tongue and the pink bumps you counted. Make a bar graph of everyone's counts.
2. Make a taste-test chart: each person's bitterness and sweetness ratings for roasted and steamed sprouts.
3. Write three ways a cook can make a bitter vegetable taste milder.

From history. Brussels sprouts get their name from Brussels, in what is now Belgium, where they were grown in large amounts by the 1700s. Each sprout is a tiny cabbage-like bud growing along a tall, thick stalk. In autumn some stores sell the whole stalk.

COMMON MISTAKES

- Boiling Brussels sprouts a long time. They turn gray and smell and taste stronger.
- Stirring the sprouts during roasting. Leave them cut side down so they brown.
- Saying "I don't like it" after one bite. Try it cooked a different way, and try again in a few weeks.

Make it a game • Brussels Sprout Court. Hold a mock trial. Your parent plays a supertaster who says sprouts taste far too bitter, and you are the judge. Explain, from memory, why some people taste bitterness more strongly and how plant scientists grew milder sprouts. Say the word caramelize and what roasting does to bitterness. Switch roles and let your parent explain.

3.3 SALT AND FLAVOR

OBJECTIVES

- Explain how salt brings out flavor, softens bitterness and makes food taste more like itself.
- Tell how Morton Salt made salt pour freely and how iodized salt began in 1924.
- Cook a pot of vegetable soup with an adult beside you and season it in small steps, tasting as you go.

Warm-up. Taste a slice of tomato with no salt. Then sprinkle a few grains of salt on another slice and taste it. Describe the difference in three words. Did the salt just make it salty, or did it change the tomato taste too?

WATCH

Why Does Salt Make Food Taste Better?

SciShow · 4:11

<https://www.youtube.com/watch?v=ATrSoMlx5PE>

WHEN TO WATCH

After the kitchen science. Listen for what salt does to bitter tastes.

Note: The video ends with a sponsor message; you can stop when the teaching ends.

KEY TERMS

sodium chloride

The chemical name for table salt.

season

To add salt, herbs, spices or acid to food to bring out its flavor.

iodized salt

Table salt with a tiny bit of iodine added. Iodine is a mineral the body needs to make important messengers that control growth and energy.

flavor enhancer

An ingredient, like salt, that makes the other flavors in a food taste stronger.

CORE IDEAS

The story. Salt has always been precious. Long ago people traveled great distances to trade for it, used it to keep meat and fish from spoiling, and seasoned bread with it. Job, in one of the oldest books of the Bible, asked: “Can that which is unsavoury be eaten without salt?” But for a long time table salt had a problem: in damp weather it clumped into hard lumps. In 1911 the Morton Salt Company in Chicago began adding a little magnesium carbonate to keep the grains apart. In 1914 it printed a famous slogan on the blue box with the girl and the umbrella: “When it rains it pours.”

How they figured it out. In the early 1900s doctors noticed that in some regions, especially around the Great Lakes and in the mountain states, many people had a swelling in the neck called a goiter. Scientists learned that the soil and water there had very little **iodine**, a mineral the body needs. Doctors in Michigan urged that a little iodine be added to table salt, since nearly everyone uses salt. In 1924 Morton began selling iodized salt across the country, and goiter became rare. It was a simple way to use something in every kitchen to keep families well.

The kitchen science. Salt is **sodium chloride**. On your tongue, the sodium tastes salty. But salt does much more. It quiets bitter tastes, so a pinch of salt makes greens, coffee cake or grapefruit taste less bitter. It makes sweet and savory flavors seem stronger, so salted soup tastes more like its vegetables. That is why salt is called a **flavor enhancer**. Too little salt and food tastes flat; too much and salt is all you taste. Good cooks add salt a little at a time and taste between additions, because you can always add more, but you cannot take it out.

Let’s cook. You will make a pot of vegetable soup and season it in small steps, tasting after each pinch to find the point where it tastes just right. The skills to do well are **dicing vegetables evenly** with an adult beside you, and **tasting safely**: spoon a little soup into a small bowl, let it cool, and use a clean spoon for every taste.

PICTURE STUDY



The Soup Distribution, Albert Anker, 1893 · Oil on canvas

Image: [Wikimedia Commons](#), public domain

Albert Anker was a Swiss painter who loved to paint the children and old people of his village. In this painting, hot soup is served to poor families and hungry schoolchildren in a big kitchen. A pot of soup was one of the simplest ways to feed many people from a few vegetables, a little salt and water.

Look closely

- Find the woman with the ladle. How is she serving the soup?
- Find the children holding their bowls. How do they wait?
- Look at the steam. Is the soup hot? How can you tell?
- Find the oldest person in the painting. How is he or she being cared for?

Talk about it

1. What vegetables might be in this soup? What would make it taste good with only a few ingredients?
2. Why is a pot of soup a good food for feeding many people?
3. How does this painting show kindness? How could your family share a pot of soup with someone?

Safety first. An adult stands beside you at the stove; turn pot handles in and stir with a long spoon. Taste soup only after spooning a little into a small bowl and letting it cool; use a clean spoon for every taste. Dice vegetables only with an adult right beside you.

KITCHEN PROJECT

The Salt Ladder: Vegetable Soup Seasoned Step by Step

You will cook a pot of vegetable soup with no salt at first, then add salt a pinch at a time, tasting at every step, to find the point where the soup tastes best. You will see how salt changes flavor, not just saltiness.

You will need

- A large soup pot with a lid and a long wooden spoon
- A cutting board, a damp towel, a small knife and a vegetable peeler
- Small tasting cups and several clean spoons
- Measuring cups and spoons (including $\frac{1}{4}$ teaspoon)
- A ladle and soup bowls

SIMPLE VEGETABLE SOUP

Serves 6 (about 10 cups) • Prep 25 min • Cook 30 min

Ingredients

- 2 tablespoons olive oil
- 1 onion, 2 carrots and 2 celery stalks
- 2 cloves garlic (or $\frac{1}{2}$ teaspoon garlic powder)
- 2 medium potatoes
- 1 (14.5-ounce / 411 g) can diced tomatoes
- 6 cups (1.4 L) low-sodium chicken or vegetable broth
- 1 teaspoon dried thyme or Italian herbs
- 1 cup green beans, cut in short pieces (fresh or frozen)
- 1 cup frozen corn or peas
- Salt (about 1–1 $\frac{1}{2}$ teaspoons in total, added in steps) and black pepper

Method

1. Wash your hands and rinse the vegetables. Peel the carrots and potatoes.

2. With an adult right beside you, dice the onion, carrots, celery and potatoes into small, even cubes with the bridge and claw grips. An adult minces the garlic.
3. With an adult beside you, warm the oil in the pot over medium heat. Cook the onion, carrots and celery 6–8 minutes, stirring, until soft.
4. Add the garlic and cook 30 seconds. Add the potatoes, tomatoes, broth and herbs. Do not add salt yet.
5. Bring to a boil, then turn the heat down so it simmers gently. Cover with the lid tipped and cook 15 minutes, until the potatoes are tender.
6. Add the green beans and corn or peas and simmer 5 minutes more.
7. Now climb the salt ladder (see the project steps), adding salt $\frac{1}{4}$ teaspoon at a time and tasting each time. Add pepper to taste.
8. Ladle into bowls. Clean up: wash the pot and board, and refrigerate leftovers within 2 hours; reheat them to 165 °F.

Allergy check: Check the broth label; some broths contain soy, wheat or milk. Otherwise this soup contains none of the nine major allergens.

Steps

1. **Predict.** How many quarter-teaspoons of salt do you think the soup will need to taste just right?
2. **Step 0.** Before adding any salt, spoon a little soup into a tasting cup, let it cool, and taste. Write three words to describe it.
3. **Climb the ladder.** Stir in $\frac{1}{4}$ teaspoon salt. Wait 1 minute, then taste a fresh cup with a clean spoon. Record. Repeat until it tastes just right. Stop before it tastes salty.
4. **Find the top.** In one small cup only, add a pinch too much salt. Taste it. What happened to the vegetable flavor?
5. **Family test.** Serve the soup and ask each person to rate it from 1 to 5. Did anyone want more salt? Less?
6. **Improve it.** Write one change (a squeeze of lemon at the end, fresh herbs, a different vegetable).
7. Clean up.

Tips

- Use low-sodium broth so you control the salt.
- A squeeze of lemon juice at the end brightens a soup so it needs less salt.
- Soup often tastes even better the next day, after the flavors have mingled.

Check your work

- ☐ I can explain how salt brings out flavor and softens bitterness.
- ☐ I can tell the story of Morton Salt and iodized salt.
- ☐ I seasoned a soup step by step, tasting safely, with an adult beside me.

COOK'S NOTEBOOK

1. Draw your salt ladder: each step labeled with the amount of salt and your words for how it tasted.
2. Draw a salt shaker and label three things salt does to food.
3. Copy the soup recipe in your own words. Mark the step where you season it.

From history. Our word *salary* may come from the Latin word for salt, *sal*, and the old saying that a lazy worker is “not worth his salt” shows how much people valued it. Today salt comes from underground salt mines, from salty wells, and from seawater dried in shallow ponds in the sun.

COMMON MISTAKES

- Adding all the salt at the start. Soup cooks down and gets saltier; season near the end and taste.
- Tasting straight from the pot with the stirring spoon. Spoon some into a cup and use a clean spoon.
- Thinking more salt is always better. The goal is flavor, not saltiness.

Make it a game • Salt Ladder Lineup. Stir pinches of salt into three small cups of plain broth, from none to a little to plenty. Taste a teaspoon of each with a clean spoon each time and rank them from flat to just right to too salty. Then tell your parent how salt helps a food taste more like itself, and who made salt pour freely.

Scripture. “Can that which is unsavoury be eaten without salt?” (Job 6:6, KJV)

Even in his suffering, Job knew how flat food tastes without salt. Jesus called His followers the salt of the earth: a little salt makes a great difference.

3.4 MOUTHFEEL: THICK AND THIN

OBJECTIVES

- Explain mouthfeel and name words for how food feels: thick, thin, creamy, icy, smooth, gritty, crunchy.
- Tell how the electric blender came into American kitchens in the 1930s.
- Make fruit smoothies thick and thin on purpose, using a blender safely with an adult beside you.

Warm-up. Close your eyes and have someone give you a spoonful of applesauce and then a bite of apple. Then a sip of milk and a spoonful of yogurt. Without saying the names, describe only how each one *feels* in your mouth.

WATCH

Understanding Mouthfeel: The Hidden Sensation of Eating

MonellCenter · 2:40

<https://www.youtube.com/watch?v=qgl60H8AtPs>

WHEN TO WATCH

After the kitchen science. Listen for the senses besides taste that tell us about food.

Note: From the Monell Chemical Senses Center in Philadelphia, a research institute that studies taste and smell. Scientists there explain how we feel food in the mouth.

KEY TERMS

mouthfeel

How a food or drink feels in your mouth: thick or thin, smooth or gritty, creamy or icy, crisp or soft.

viscosity

How thick a liquid is, or how slowly it pours. Honey has high viscosity; water has low viscosity.

texture

The way a food's surface and inside feel when you touch, bite and chew it.

ice crystals

Tiny pieces of frozen water. Small crystals feel smooth; big ones feel icy and crunchy.

CORE IDEAS

The story. In 1922 Stephen Poplawski, of Racine, Wisconsin, invented a drink mixer with a spinning blade at the bottom of a cup. Then a team led by an engineer named Fred Osius worked on an improved blender, and the popular bandleader Fred Waring helped pay for it and sell it. In 1937 the “Waring Blendor” was shown at a restaurant show in Chicago. Soda fountains used it to make malted milks and fruit drinks, and after World War II it became common in home kitchens. Hospitals also used blenders to make soft foods for patients.

How they figured it out. Cooks learned that the same ingredients could feel completely different depending on how they were mixed and how cold they were. Frozen fruit made a thick, spoonable drink; fresh fruit and more milk made a thin one that could be sipped through a straw. Later, food scientists measured how thick liquids are (**viscosity**) and studied how the tongue and mouth feel texture. They learned that people judge food by its feel as much as by its taste: a soggy cracker or an icy ice cream tastes “wrong” even when the flavor is fine.

The kitchen science. Your tongue and the inside of your mouth have many touch sensors. They feel how thick a food is, whether it is smooth or gritty, and whether it is warm or cold. That feeling is **mouthfeel**. In a smoothie, thickness comes from three things: **frozen fruit** (tiny ice crystals and very cold fruit make it thick and frosty), **banana** and **yogurt** (their soft fibers and proteins trap liquid), and **less liquid**. More milk or juice makes it thinner. A blender’s blade spins very fast, breaking fruit into smaller and smaller bits; the longer you blend, the smoother it gets.

Let’s cook. You will blend a thick banana-berry smoothie and a thin one from the same ingredients, changing only one thing, and rate their mouthfeel. The skill to do well is **using a blender safely**: lid on before you start, start on low, never put a spoon or hand inside while it is plugged in, and an adult beside you.

PICTURE STUDY



Still Life with Apples and Pears in a Round Basket, Camille Pissarro, 1872 · Oil on canvas · Princeton University Art Museum, New Jersey

Image: [Wikimedia Commons](#), public domain

Camille Pissarro is best known for painting French villages and farm fields, but sometimes he painted fruit from the market on his own table. Look how differently he paints the shiny skins of the apples and the rougher, speckled skins of the pears.

Look closely

- Find an apple and a pear. How do their skins look different?
- Imagine biting each one. Which would be crisp and which juicy and soft?
- Find the woven basket. How did Pissarro show the texture of the weaving?
- Look at the white tablecloth. What colors do you see in it besides white?

Talk about it

1. How would an apple feel in your mouth whole, sliced, cooked into applesauce and blended into a smoothie?
2. Which fruit in this basket would make the thickest smoothie? Why?
3. Painters show texture with brushstrokes. Cooks change texture with tools. Which kitchen tools change how food feels?

Safety first. Use the blender only with an adult beside you. Put the lid on before you switch it on, start on low, and never put a spoon, spatula or hand inside while it is plugged in; unplug it before scraping or cleaning the blade. Check for fruit and dairy allergies before you share.

Smoothie Lab: Thick and Thin

You will blend smoothies from the same ingredients but change one thing at a time to make them thicker or thinner, then rate their mouthfeel with your family.

You will need

- A blender
- Measuring cups and spoons
- A spoon and a rubber spatula (for use only when the blender is unplugged)
- Clear glasses and straws
- A timer

BANANA-BERRY SMOOTHIES, THICK AND THIN

Serves 4 (about 1 cup each) · Prep 10 min

Ingredients

- **Thick smoothie:** 1 ripe banana, broken in chunks (frozen if you can)
- 1 cup (140 g) frozen mixed berries or strawberries
- ½ cup (120 g) plain or vanilla yogurt
- ½ cup (120 mL) milk
- **Thin smoothie:** 1 ripe banana (not frozen)
- 1 cup (140 g) fresh or thawed berries
- ¼ cup (60 g) yogurt
- 1 cup (240 mL) milk or 100% orange juice
- Optional: 1 teaspoon honey, a handful of spinach (it disappears)

Method

1. Wash your hands. Rinse fresh berries.
2. **Thick:** put the milk and yogurt in the blender first, then the banana and frozen berries. Liquids on the bottom help the blade spin.

3. Put the lid on firmly. With an adult beside you and your hand on the lid, blend on low for 10 seconds, then high for 30–45 seconds until smooth. If it stops moving, turn it off, unplug it, and stir with the spatula, or add 2 tablespoons milk.
4. Pour into glasses.
5. **Thin:** rinse the blender. Put in the milk or juice, yogurt, fresh banana and berries, lid on, and blend the same way.
6. Pour and compare side by side. Serve right away.
7. Clean up: unplug the blender. Fill it halfway with warm soapy water, put the lid on, plug it in and blend 10 seconds with an adult beside you. Unplug, rinse and dry.

Allergy check: Contains milk (yogurt, milk). For milk-free, use a plant yogurt and an oat or soy milk (soy is a major allergen). Honey is not for babies under one year.

Steps

1. **Predict.** Which smoothie will be thicker? Which change matters most: frozen fruit, more yogurt or less liquid?
2. **Spoon test.** Stand a spoon in each glass. Does it stand up or fall over? Time how long a spoonful takes to slide off the spoon.
3. **Straw test.** Sip each through a straw. Which is easy and which is hard to drink?
4. **Mouthfeel chart.** Ask each person to rate each smoothie for thickness, smoothness, coldness and taste from 1 to 5. Write the words they use.
5. **One more change.** Make a third smoothie, changing only one ingredient (for example, the thin recipe with frozen fruit). Did it get thicker?
6. **Improve it.** Write the recipe for your perfect smoothie and why.
7. Clean up the blender safely.

Tips

- Peel and freeze ripe bananas in chunks in a bag. They make smoothies thick and sweet without ice.
- A smoothie is a good place to add a handful of spinach. You will taste the fruit, not the leaves.

- Smoothies separate if they sit. Drink them right away, or stir before drinking.

Check your work

- ☐ I can describe mouthfeel with at least five words.
- ☐ I made a thick and a thin smoothie by changing ingredients on purpose.
- ☐ I used a blender safely with an adult beside me.

COOK'S NOTEBOOK

1. Draw your two smoothies side by side with the spoon test. Label which is thick and which is thin, and why.
2. Make a word bank of at least ten mouthfeel words: creamy, crunchy, chewy, icy, gritty, silky...
3. Write your perfect smoothie recipe with a name.

From history. Scientists who design foods use machines that measure texture, pressing and pulling on food to test how hard, chewy or springy it is. They also gather trained tasters who describe mouthfeel with careful words, just as you did with your family.

COMMON MISTAKES

- Putting frozen fruit in first with no liquid. The blade spins in the air and nothing blends.
- Reaching into the blender to unstick fruit while it is plugged in. Always unplug first.
- Adding ice instead of frozen fruit. Ice makes it watery as it melts; frozen fruit keeps the flavor.

Make it a game • Mouthfeel Word Bank. Gather ten foods such as yogurt, crackers, ice, honey, applesauce and pickles. Close your eyes, take a small taste or touch, and describe its mouthfeel using one word, such as creamy, gritty, icy or crunchy. Your parent scores a point for each fitting word. Then explain thick and thin in a smoothie and when the blender was invented.

UNIT 3

TASTE, SMELL & YOUR TASTE BUDS

God made your tongue and nose to enjoy the good gifts of His creation. In this unit you will test a famous mistake, the “tongue map,” and find out with cotton swabs that every part of your tongue can taste every taste. You will learn why some people find broccoli and Brussels sprouts much more bitter than others do, and how farmers have made milder sprouts.

Then you will taste what salt does to food, and why Job asked, “Can that which is unsavoury be eaten without salt?” Last, you will learn that food is not only tasted but felt: thick, thin, smooth, crunchy. You will blend smoothies thick and thin and rate their **mouthfeel**. Before any taste test, check with each taster about food allergies.

PREREQUISITES

- Uses the claw and bridge grips with an adult right beside (Unit 1)
- Uses the stove and oven only with an adult beside (Units 1–2)
- Knows the five food groups (Unit 2)
- Checks for food allergies before a taste test (Unit 1)

MASTERY CHECKLIST

- ☐ I can name the five basic tastes: sweet, salty, sour, bitter and umami.
- ☐ I can explain why the tongue map is a myth and prove it with a cotton-swab test.
- ☐ I can explain why some people taste bitterness more strongly, and why tastes change as we grow and keep trying foods.
- ☐ I can tell what salt does to the flavor of food and season a soup in small steps.
- ☐ I can describe mouthfeel and change a smoothie from thin to thick on purpose.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **Cotton swabs, small cups and blue food coloring:** Inexpensive supplies for the taste tests in Lessons 3.1 and 3.2.
- **A blender:** For Lesson 3.4. If you do not have one, mash very ripe bananas and whisk them with yogurt and milk for a hand-made smoothie.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

3.1 The Tongue-Map Myth	2 sessions of 45–60 minutes
3.2 Supertasters and Bitterness	2 sessions of 45–60 minutes
3.3 Salt and Flavor	2 sessions of 45–60 minutes
3.4 Mouthfeel: Thick and Thin	2 sessions of 45–60 minutes

UNIT 3 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. **5 pts**

Name the five basic tastes and a food for each.

2. **5 pts**

What is the tongue map, and why is it a myth?

3. **5 pts**

Predict: you dab sugar water on the back of your tongue. Will you taste it? Explain.

4. **5 pts**

What is a supertaster? Who named supertasters?

5. (5 pts)

Give three ways a cook can make a bitter vegetable taste milder.

6. (5 pts)

What does salt do to food besides make it salty?

7. (5 pts)

Why did salt companies begin adding iodine to salt in 1924?

8. (5 pts)

Why should you add salt to soup a little at a time?

9. (5 pts)

Predict: you make a smoothie with frozen fruit and less milk, and another with fresh fruit and more milk. Which will be thicker, and why?

10. (5 pts)

List three blender safety rules.

ANSWER KEY

1. Sweet (sugar, ripe fruit), salty (salt, pretzels), sour (lemon, vinegar), bitter (cocoa, grapefruit, some greens), umami (broth, tomatoes, Parmesan).
2. A picture showing sweet, salty, sour and bitter in separate zones. It came from a misreading of Hänig's 1901 study in Boring's 1942 graph. Every part of the tongue can taste every taste.
3. Yes. Taste buds all over the tongue have receptors for sweet, so the back of the tongue can taste sweet too.
4. A person who tastes bitterness and other tastes more strongly than most, often with more taste bumps. Linda Bartoshuk of Yale named them in the 1990s.
5. Any three: roast it to caramelize its sugars; add a little salt; add a little sweet such as honey; add a little sour such as lemon; avoid overcooking.
6. It quiets bitterness and makes sweet and savory flavors taste stronger; it is a flavor enhancer.
7. Many people in some regions lacked iodine and developed goiters. Adding iodine to salt, which nearly everyone uses, prevented this.
8. You can always add more but you cannot take it out; tasting after each addition lets you stop when it tastes just right.
9. The frozen-fruit smoothie with less milk will be thicker, because ice crystals and very cold fruit thicken it and there is less liquid.
10. Any three: an adult beside you; lid on before starting; start on low; never put a hand or spoon inside while it is plugged in; unplug before scraping or cleaning.

UNIT CHALLENGE: THE FAMILY TASTE LAB

Hold a family taste lab. Choose one vegetable that someone in your family does not like and prepare it three ways (for example raw with dip, steamed, and roasted), with an adult beside you for any knife or heat. Serve small tastes blind, without saying which is which.

Make a results chart of each person's ratings for sweetness, bitterness, saltiness and mouthfeel. Write what you learned about how cooking and seasoning change taste, and make a "try it again" plan to serve the favorite version at least twice more in the next month.

LOOK FOR	WHAT IT MEANS
Fair test	The same vegetable prepared three ways, served blind in equal small tastes, with allergies checked first.
Safety and cleanliness	Hands and produce washed; knife and heat used only with an adult beside; kitchen cleaned.
Results chart	Clear ratings from every taster, with taste and mouthfeel words.
Conclusion and plan	A short explanation of what changed the taste and a written "try it again" plan.

UNIT 4

HEAT & COLD

Cooking is mostly the art of moving heat into food, and keeping food is mostly the art of keeping heat out. In this unit you will meet Percy Spencer, the engineer who found a melted candy bar in his pocket and invented the microwave oven. You will learn how heat travels through a pan by **conduction**, and why a cast-iron skillet makes golden cornbread while a wooden spoon handle stays cool.

Then you will look at the two oldest ways to keep food: sealing it and drying it. You will hear how John Landis Mason's screw-top jar changed home canning, learn why canning is an adult job done with tested recipes, and make a fresh salsa that keeps in the refrigerator. Last, you will learn how drying keeps food, from raisins in the sun to the food astronauts eat in space, and make your own fruit leather.

PREREQUISITES

- Uses the stove and oven only with an adult beside, pot handles turned in and oven mitts on (Units 1–3)
- Uses the claw and bridge grips with an adult right beside (Unit 1)
- Knows the danger zone and the safe internal temperatures (Unit 1)
- Knows that bacteria need water and warmth to grow (Units 1–2)

MASTERY CHECKLIST

- ☐ I can tell how Percy Spencer discovered microwave cooking in 1945 and explain how a microwave oven heats food.
- ☐ I can explain conduction and name materials that conduct heat well and poorly.
- ☐ I can tell how the Mason jar changed home canning and explain why canning must follow tested recipes and is an adult job.
- ☐ I can explain how drying keeps food from spoiling and make fruit leather with an adult.
- ☐ I can use the microwave, stove and oven safely with an adult beside or nearby.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **National Center for Home Food Preservation**: Free. Tested, science-based recipes and guides for canning, freezing and drying, from the University of Georgia. The source for any home canning a parent decides to do (Lesson 4.3).
- **A cast-iron skillet**: Optional. Lasts for generations and is perfect for the cornbread in Lesson 4.2. Any oven-safe skillet or an 8-inch square baking pan also works.
- **Oven thermometer**: Optional. Hang it in the oven to see whether the dial tells the truth. Helpful for the low-heat fruit leather in Lesson 4.4.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

4.1 Percy Spencer and the Melted Candy Bar	2 sessions of 45–60 minutes
4.2 Conduction: Iron Skillets and Wooden Spoons	2 sessions of 45–60 minutes
4.3 The Mason Jar and Safe Canning	2 sessions of 45–60 minutes
4.4 Drying Food: From Raisins to Astronauts	2 sessions of 45–90 minutes

UNIT 4 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. **5 pts**

How did Percy Spencer discover microwave cooking?

2. **5 pts**

How does a microwave oven heat food? Why should you stir microwaved food and let it stand?

3. **5 pts**

Predict: a metal, a wooden and a plastic spoon stand in a mug of hot water with butter on their handles. Which butter melts first? Why?

4. (5 pts)

Why does cornbread baked in a preheated cast-iron skillet get a crisp crust?

5. (5 pts)

What did John Landis Mason invent, and when?

6. (5 pts)

Why must low-acid foods like green beans be canned in a pressure canner, and who does home canning?

7. (5 pts)

How long can fresh refrigerator salsa be kept, and where?

8. (5 pts)

Why does dried fruit keep longer than fresh fruit?

9. (5 pts)

Predict: you spread fruit purée very thin at one end of the pan and very thick at the other. What will happen in the oven?

10. (5 pts)

Who was the first American to eat in space, and what did he eat?

ANSWER KEY

1. In 1945, standing near a working magnetron at Raytheon, he found the candy bar in his pocket had melted. He tested popcorn and an egg and realized the microwaves were heating the food.
2. Microwaves make water molecules twist back and forth very fast, which makes heat. They reach only about an inch in, so food heats unevenly; stirring and standing time let the heat spread evenly.
3. The metal spoon's butter melts first, because metal is a good conductor. Wood and plastic are insulators and carry heat slowly.
4. The thick, hot iron holds a lot of heat and conducts it into the batter right away, so the bottom and sides sizzle and brown.
5. A glass jar with a threaded neck and a screw-on lid, patented in 1858.
6. A dangerous germ can survive boiling in low-acid foods; a pressure canner reaches about 240 °F to destroy it. Home canning is an adult's job using tested recipes.
7. About 1 week, in a covered jar in the refrigerator.
8. Most of its water has evaporated, and germs and molds need water to grow.
9. The thin end will dry first and may get brittle or brown, while the thick end stays wet and sticky.
10. John Glenn, on February 20, 1962, aboard Friendship 7. He ate applesauce from a tube.

UNIT CHALLENGE: ONE FOOD, THREE HEATS

Choose one vegetable, such as potato, carrot or sweet potato, and cook equal pieces three ways with an adult beside you: in the microwave, in a skillet on the stovetop (with a thin film of oil), and roasted in the oven. Cut all the pieces the same size with the claw grip.

Record the time each method took, the color and texture of the outside and inside, and a family taste rating. Explain which kind of heat (microwaves, conduction from the pan, or hot oven air) made each result. Finish with your favorite method and one improvement.

LOOK FOR	WHAT IT MEANS
Fair test	Same vegetable, same size pieces, same seasoning; only the heat method changed.
Safety	Knife, stove, oven and microwave used with an adult beside or nearby; pot handles in; mitts used; cleanup done.
Records	A chart of times, colors, textures and family ratings for all three methods.
Explanation	A clear explanation of how each kind of heat cooked the vegetable, using the words conduction and microwaves.
Improvement	A favorite method chosen and one honest improvement planned.

4.1 PERCY SPENCER AND THE MELTED CANDY BAR

OBJECTIVES

- Tell how Percy Spencer discovered in 1945 that microwaves could cook food.
- Explain how a microwave oven heats food by making water molecules move, and why food can heat unevenly.
- Make a microwave mug muffin with an adult nearby and use the microwave safely.

Warm-up. Look at your microwave oven (do not turn it on). Find the window, the turntable and the door latch. Read any warning labels inside the door. What do you think makes food hot inside a microwave, when there is no flame and no hot coil?

WATCH

Invention Of Microwave - The Dr. Binocs Show | Best Learning Videos For Kids | Peekaboo Kidz

Peekaboo Kidz · 5:37

<https://www.youtube.com/watch?v=qCRm503O0po>

WHEN TO WATCH

After the story. Watch for what Percy Spencer tried after the candy bar melted.

Note: A cartoon telling of Percy Spencer's life and invention. It briefly mentions his hard childhood.

KEY TERMS

microwaves

Invisible waves of energy, a kind of radio wave, that make water molecules in food move and heat up.

molecule

The tiniest bit of a substance, such as water, that is still that substance.

magnetron

The part inside a microwave oven that makes the microwaves. It was first built for radar.

standing time

The minute or two after microwaving when heat keeps spreading through the food and evens out hot and cold spots.

CORE IDEAS

The story. Percy Spencer grew up poor in Maine and left school young, but he taught himself so much about electricity that he became one of the best engineers at the Raytheon Company in Massachusetts. During World War II, Raytheon built magnetrons, the tubes that make the radio waves for radar. One day in 1945, while Spencer was standing near a working magnetron, he noticed that a candy bar in his pocket had melted.

How they figured it out. Spencer was curious. He set a bag of popcorn kernels in front of the magnetron, and they popped all over the lab. He tried an egg, and it heated so fast inside that it burst. Spencer realized the invisible waves were heating the food. Raytheon filed a patent for cooking with microwaves in 1945, and in 1947 sold the first microwave oven, the “Radarange.” It was nearly as tall as a man and very heavy, used in restaurants and ships. Engineers kept making it smaller, and in 1967 a countertop microwave oven for homes went on sale. Today most American kitchens have one.

The kitchen science. Microwaves are a kind of radio wave. Inside the oven, the magnetron sends them bouncing around the metal box. Water molecules in the food are lopsided (one end a little positive, one end a little negative), and the microwaves make them twist back and forth billions of times a second. All that jiggling makes the food hot. Microwaves reach only about an inch into food; the middle heats as warmth spreads inward by conduction. That is why microwaved food can have hot spots and cold spots, why we stir it, and why we let it stand a minute. Metal reflects microwaves and can spark, so it never goes in a microwave oven.

Let’s cook. You will make a warm blueberry muffin in a mug in about a minute and a half. The skills to do well are **mixing a small batter completely** and **using the microwave safely**: a microwave-safe mug only, short bursts of time, an adult nearby, and a pot holder, because the mug gets hot.

PICTURE STUDY



The Milkmaid, Johannes Vermeer, about 1657–1658 · Oil on canvas · Rijksmuseum, Amsterdam

Image: [Wikimedia Commons](#), public domain

Johannes Vermeer painted a Dutch kitchen maid pouring milk by a sunny window. In 1658 there were no microwaves, no gas stoves and no electric lights. Heat came from a fire. Look down at the floor by the wall: the little wooden box is a foot warmer, which held a pot of hot coals to keep a person's feet warm.

Look closely

- Find the stream of milk. Why is she pouring so slowly?
- Find the foot warmer on the floor. How did it keep someone warm without a flame showing?
- Find the bread on the table. Is it fresh or hard? How can you tell?
- Look at the light from the window. Where does it fall?

Talk about it

1. If this maid wanted warm milk, how would she heat it? How would you heat it today?
2. The foot warmer heated from hidden coals; a microwave heats with invisible waves. How are they alike and different?
3. Vermeer gave one quiet kitchen task his full care. What kitchen job do you do carefully?

Safety first. Use only microwave-safe mugs and bowls, never metal or foil, and microwave in short bursts with an adult nearby. The mug and steam will be hot: lift it out with a pot holder and let it cool 1–2 minutes. Never microwave an egg in its shell, and never taste uncooked batter (uncooked flour and eggs can carry germs).

KITCHEN PROJECT

A Mug Muffin and the Hot-Spot Test

You will find the hot and cold spots in your microwave with a simple test, then make a blueberry mug muffin and check it for doneness.

You will need

- A large microwave-safe mug (about 12 ounces)
- A small bowl, a fork and measuring spoons
- A microwave-safe plate and a sheet of wax paper
- Mini marshmallows or chocolate chips (for the hot-spot test)
- A pot holder, a toothpick and a timer

BLUEBERRY MUG MUFFIN

Serves 1 (make one for each person) · Prep 5 min · Cook about 1½ min

Ingredients

- 4 tablespoons (30 g) all-purpose flour
- 1½ tablespoons sugar
- ¼ teaspoon baking powder
- A pinch of salt and a pinch of cinnamon
- 1 large egg
- 2 tablespoons milk
- 1 tablespoon vegetable oil or melted butter
- 2 tablespoons blueberries (fresh or frozen)

Method

1. Wash your hands. In the mug, stir the flour, sugar, baking powder, salt and cinnamon with a fork.
2. Crack the egg into a small bowl first (to catch any shell), then add it to the mug with the milk and oil. Wash your hands after handling the egg.
3. Stir with the fork until no dry flour is left, scraping the bottom and the corners. Gently stir in the blueberries.

4. Wipe the rim of the mug. Set it on a microwave-safe plate. With an adult nearby, microwave on high for 60 seconds.
5. Check: the top should look dry and spring back when touched lightly with a fork. If it is still wet, microwave 10–15 seconds more, then check again. (Most take 70–90 seconds.)
6. Lift the mug out with a pot holder and let it stand 1–2 minutes. A toothpick pushed into the middle should come out clean or with dry crumbs, not wet batter.
7. Eat it from the mug or tip it onto a plate. Clean up: soak the mug in warm soapy water and wipe the microwave.

Allergy check: Contains wheat (flour), eggs and milk. For milk-free, use water or oat milk and oil. For egg-free, use 3 tablespoons applesauce plus ¼ teaspoon more baking powder in place of the egg. Gluten-free flour blends can replace the wheat flour.

Steps

1. **Hot-spot test.** Take out the turntable (an adult helps). Cover a microwave-safe plate with wax paper and spread mini marshmallows or chocolate chips evenly over it. With an adult nearby, microwave on high for 20–30 seconds, watching closely. Which spots melted or puffed first? Draw a map.
2. **Predict.** How many seconds will your mug muffin need? Write your guess.
3. Make the mug muffin. Record the total time and what the top looked like at each check.
4. **Doneness test.** Use the toothpick test and write what you saw.
5. **Taste test.** Rate your muffin from 1 to 5 for softness, sweetness and how evenly it cooked.
6. **Improve it.** Write one change (a different fruit, less sugar, a sprinkle of cinnamon sugar on top, 10 seconds less time).
7. Clean up.

Tips

- Microwaves differ in power. Write down the time that works for yours.
- Overcooked mug muffins turn tough and rubbery. Check early.
- Put the turntable back after the hot-spot test. It turns the food so the hot spots move around.

Check your work

- ☐ I can tell the story of Percy Spencer and the melted candy bar.
- ☐ I can explain how microwaves heat food and why food can heat unevenly.
- ☐ I made a mug muffin and used the microwave safely with an adult nearby.

COOK'S NOTEBOOK

1. Draw your microwave hot-spot map from the marshmallow test.
2. Draw water molecules twisting back and forth as microwaves pass through, with arrows.
3. Copy the mug muffin recipe in your own words, with your best cooking time.

From history. Percy Spencer received about 300 patents in his life, even though he never finished grammar school. He liked to say he learned by reading and by trying things himself, the same way a cook learns.

COMMON MISTAKES

- Thinking microwaves cook food from the inside out. They heat the outer inch; the middle warms by conduction.
- Putting a metal spoon, foil or a mug with gold trim in the microwave. Metal can spark.
- Tasting the batter before it is cooked. Uncooked flour and eggs can carry germs.

Make it a game • Hot Spot Hunt. Place small squares of bread, spread evenly on a microwave-safe plate, and ask an adult to heat them briefly. Feel which bits are warm or cool, with an adult checking first. Then, in sixty seconds, tell the story of Percy Spencer's melted candy bar and why water molecules move. Explain why standing time evens the heat.

4.2 CONDUCTION: IRON SKILLETS AND WOODEN SPOONS

OBJECTIVES

- Explain conduction and compare how metal, wood and plastic conduct heat.
- Tell how Abraham Darby’s way of casting iron pots in sand (1707) made iron cookware common.
- Bake cornbread in a hot skillet with an adult handling the hot pan, and observe the crust that conduction makes.

Warm-up. Touch a metal spoon, a wooden spoon and a plastic spoon that have been sitting on the counter. Which feels coldest? They are all the same temperature. Why do you think the metal one feels colder?

WATCH

Heat Conductivity – Spoon Test

Next Generation Science • 2:37

https://www.youtube.com/watch?v=_5xOyWvYwOM

WHEN TO WATCH

Before you try the spoon test yourself. Predict which spoon will be warmest before the video tells you.

BACKUP VIDEO

The Science of Heat Conduction in Aluminum and Cast-Iron Pans

America's Test Kitchen • 1:23

<https://www.youtube.com/watch?v=PjeBhXcJ0JQ>

After the kitchen science. Watch how butter melts differently in an aluminum pan and a cast-iron pan.

KEY TERMS

conduction

Heat moving through a solid, or from one thing to another that touches it, from the hotter part to the cooler part.

conductor

A material that lets heat move through it quickly, like copper, aluminum and iron.

insulator

A material that slows heat down, like wood, plastic, cloth and air.

cast iron

Iron melted and poured into a mold. A cast-iron pan is heavy, heats slowly and holds heat a long time.

CORE IDEAS

The story. For thousands of years, cooks baked bread and cakes right on hot stones or in the coals of a fire, like the cake an angel set before Elijah, “baken on the coals” (1 Kings 19:6). Iron pots were known, but they were expensive and hard to make. In 1707 an English ironmaster named Abraham Darby patented a way to cast thin iron pots in molds of sand. His works at Coalbrookdale, in England, could now make good iron pots cheaply, and soon families everywhere cooked in them. Iron kettles, Dutch ovens and skillets crossed the ocean to America, and cornbread baked in a cast-iron skillet became a favorite in the American South.

How they figured it out. Cooks learned by feel which pans browned food best and which handles would burn their hands. Scientists later measured how fast heat moves through different materials. They found that metals, like copper, aluminum and iron, are good **conductors**: heat races through them. Wood, plastic, cloth and air are **insulators**: heat moves through them slowly. That is why pots are metal and spoons and handles are often wood or plastic.

The kitchen science. In **conduction**, heat passes from fast-jiggling molecules to their slower neighbors, touch by touch. A metal spoon feels cold because it pulls heat out of your fingers quickly. Cast iron is not the fastest conductor, but it is thick and heavy, so it soaks up a lot of heat and holds it. When cold batter hits a preheated iron skillet, the hot metal pours heat into the bottom and sides at once, and the batter sizzles into a crisp, golden crust. In a cold pan, the crust is pale and soft. Thick, heavy pans also hold heat and give off a lot of it to anything that touches them, so they are dangerous to grab.

Let’s cook. You will bake golden skillet cornbread. The skills to do well are **mixing a quick batter without overmixing**, and **respecting a hot pan**: an adult takes the very hot skillet out of the oven and pours in the batter while you stand back, and a mitt or towel always covers the handle afterward.

PICTURE STUDY



Still Life with Copper Cauldron, Jean-Siméon Chardin, about 1735 · Oil on panel · Musée Cognacq-Jay, Paris

Image: [Wikimedia Commons](#), public domain

Chardin painted the pots and pans of an 18th-century French kitchen as carefully as other painters painted kings. Here a heavy copper cauldron sits on a kitchen ledge with a few other things a cook would use. Look how the copper glows.

Look closely

- Find the copper cauldron. Copper is one of the best heat conductors. Why would a cook want it?
- Find the wooden mortar and pestle. Would wood get hot if it sat by the fire?
- Find the onions and the knife. What could a cook make with them?
- Look at the light shining on the copper. Where is it coming from?

Talk about it

1. Which things in this picture are conductors and which are insulators?
2. What would happen to a cook who grabbed a hot copper pot with a bare hand?
3. How is a copper pot over a fire like Elijah's cake on the coals and like your skillet on the stove?

Safety first. An adult takes the 425 °F skillet out of the oven and pours in the batter while you stand back; never touch a hot skillet, and cover its handle with a mitt or towel as a reminder that it stays hot for a long time. Never taste the uncooked batter. For the spoon test, an adult pours the hot water.

The Spoon Test and Skillet Cornbread

You will test how fast heat travels up metal, wooden and plastic spoons, then bake cornbread in a preheated skillet and compare its crust with a small batch baked in a cold pan.

You will need

- A 10-inch cast-iron or other oven-safe skillet (or an 8-inch square baking pan)
- A small muffin cup or ramekin (for the cold-pan comparison)
- Two mixing bowls, a whisk and a spatula
- A metal spoon, a wooden spoon and a plastic spoon; a little butter; a heat-proof mug
- Oven mitts, a trivet and a timer

GOLDEN SKILLET CORNBREAD

Serves 8 wedges · Prep 15 min · Bake 20–25 min

Ingredients

- 1 cup (140 g) yellow cornmeal
- 1 cup (125 g) all-purpose flour
- 2 tablespoons sugar (or honey)
- 1 tablespoon baking powder
- ½ teaspoon salt
- 1 cup (240 mL) milk
- 2 large eggs
- ¼ cup (60 mL) vegetable oil or melted butter, plus 1 tablespoon for the skillet

Method

1. An adult puts the skillet with 1 tablespoon oil in the cold oven and heats the oven to 425 °F (220 °C). The skillet heats up with the oven.

2. Wash your hands. In one bowl, whisk the cornmeal, flour, sugar, baking powder and salt.
3. In the other bowl, whisk the milk, eggs and $\frac{1}{4}$ cup oil. Wash your hands after cracking the eggs.
4. Pour the wet ingredients into the dry ones and stir with the spatula just until no dry flour shows. A few lumps are fine.
5. Spoon 3 tablespoons of batter into a greased muffin cup that is cold (for the comparison).
6. Stand back. An adult, wearing oven mitts, takes the hot skillet out, sets it on the stovetop, and pours in the batter. Listen for the sizzle.
7. An adult returns the skillet and the muffin cup to the oven. Bake 20–25 minutes (the muffin cup about 15) until golden and a toothpick in the center comes out clean.
8. An adult takes the skillet out and sets it on a trivet; put a mitt over the handle. Cool 10 minutes, then cut into wedges. Clean up when the skillet is cool.

Allergy check: Contains wheat (flour), eggs and milk. For milk-free, use oat milk with 1 tablespoon lemon juice and oil instead of butter. For wheat-free, use a gluten-free flour blend. Honey is not for babies under one year.

Steps

1. **Spoon test.** Put a tiny dab of butter at the top of the handle of each spoon. Stand the spoons in a heat-proof mug. An adult pours in very hot water. Time how long each dab takes to start melting. Record.
2. **Predict.** Will the cornbread from the hot skillet and the one from the cold muffin cup look different on the bottom? How?
3. Make the cornbread. Listen for the sizzle when the batter hits the skillet, and write what you hear.
4. **Compare crusts.** When both are cool, turn them over. Describe the color and the crunch of each bottom.
5. **Taste test.** Ask your family to rate the cornbread from 1 to 5 for crust, softness and flavor.

6. **Improve it.** Write one change (a little more sugar or none, corn kernels stirred in, a drizzle of honey on top).
7. Clean up: when the skillet is cool, an adult shows you how to wash, dry and oil a cast-iron pan.

Tips

- Overmixing makes cornbread tough. Stir only until the flour disappears.
- Cast iron should be dried right away and rubbed with a thin film of oil so it does not rust.
- Leftover cornbread is good split and toasted the next morning.

Check your work

- ☐ I can explain conduction and name conductors and insulators.
- ☐ I timed the spoon test and explained the results.
- ☐ I baked skillet cornbread while an adult handled the hot pan.

COOK'S NOTEBOOK

1. Draw the three spoons in the mug and color them to show how far the heat traveled up each one. Write the melt times.
2. Draw a cross-section of the skillet with the batter. Use arrows to show heat moving from the metal into the batter.
3. Copy the cornbread recipe in your own words and draw the two crusts side by side.

From history. Many families pass cast-iron skillets down from grandparents to grandchildren. A well-cared-for pan gets better with use as layers of cooked-on oil, called seasoning, build up and make it smooth and nonstick.

COMMON MISTAKES

- Grabbing the skillet handle a few minutes after it comes out of the oven. Cast iron stays hot a long time; keep a mitt on the handle.
- Pouring batter into a cold pan and expecting a crisp crust. Preheat the pan.
- Stirring the batter until smooth. Lumps are fine; overmixing makes it tough.

Make it a game • Spoon Detective. Put a metal spoon, a wooden spoon and a plastic spoon in a cup of hot tap water, handles up. After a minute, touch each handle with a finger and rank them from warmest to coolest. Say which are conductors and which are insulators. Then explain why cast iron stays hot and what Abraham Darby changed in 1707.

Scripture. “And he looked, and, behold, there was a cake baked on the coals, and a cruse of water at his head. And he did eat and drink, and laid him down again.” (1 Kings 19:6, KJV)

When Elijah was worn out and afraid, God fed him with a simple cake baked on hot coals, and gave him rest. God cares for tired people through ordinary food.

4.3 THE MASON JAR AND SAFE CANNING

OBJECTIVES

- Tell how John Landis Mason’s screw-top jar (1858) changed home canning.
- Explain why canning keeps food, why only tested recipes are used, and why low-acid foods need a pressure canner, an adult job.
- Make a fresh refrigerator salsa, cutting vegetables with the claw grip with an adult beside you, and store it safely in the refrigerator.

Warm-up. Find a jar of something in your pantry or refrigerator: jam, pickles, salsa, tomato sauce. Look at the lid. Press the middle. Does it pop? Read the label: does it say to refrigerate after opening? Why would it say that?

WATCH

Unsafe Outdated Food Preservation Methods

UMN Extension Dept. of Family, Health & Wellbeing • 5:21

<https://www.youtube.com/watch?v=NU8nal9D2QI>

WHEN TO WATCH

After the kitchen science, with a parent. Listen for the old canning shortcuts that are no longer considered safe.

Note: From University of Minnesota Extension. Written for adults who can food; watch it together.

BACKUP VIDEO

Canning Tips

College of Family and Consumer Sciences • 2:36

<https://www.youtube.com/watch?v=oVsJZnkLC84>

Optional, for parents: canning tips from the University of Georgia, home of the National Center for Home Food Preservation.

KEY TERMS

canning

Keeping food by sealing it in jars or cans and heating it enough to destroy germs, so it can be stored for a long time.

acid

A sour substance, like lemon juice or vinegar. Acid helps stop some germs from growing.

tested recipe

A canning recipe that scientists have checked in a laboratory to make sure it is safe.

Mason jar

A glass jar with a threaded neck and a screw-on lid, patented by John Landis Mason in 1858.

pressure canner

A heavy pot with a locking lid that traps steam to reach temperatures higher than boiling water. Low-acid foods like green beans must be canned this way.

CORE IDEAS

The story. In 1810 a French cook, Nicolas Appert, showed that food sealed in glass jars and boiled would keep for months. But sealing a jar was hard: cooks used corks, wax and wire. In 1858 a young tinsmith in New York City, John Landis Mason, patented a glass jar with a threaded neck and a metal lid that screwed on tight. Now any family could seal jars at home. In the 1880s the five Ball brothers began making glass jars too, and moved their factory to Muncie, Indiana, in 1887. By the 1900s, farm families canned tomatoes, peaches and beans every summer to feed themselves through the winter, and county fairs gave ribbons for the best jars.

How they figured it out. Some home-canned food spoiled, and a few kinds of spoiled food made people very sick. Scientists studied why. They found that boiling water (212 °F at sea level) is hot enough to make acidic foods like jams, pickles and most fruits safe in a sealed jar. But a rare and very dangerous germ can survive boiling in low-acid foods like green beans, corn and meat, and grow inside the airless jar. Those foods need the higher heat of a **pressure canner**, about 240 °F (116 °C). Today the U.S. Department of Agriculture and the National Center for Home Food

Preservation at the University of Georgia publish **tested recipes** so families can can safely.

The kitchen science. Germs that spoil food need water, warmth and time. Canning stops them two ways: **heat** destroys the germs inside the jar, and the **seal** keeps new germs out. As the hot jar cools, the air inside shrinks and pulls the lid down tight; that is the “pop” you hear. **Acid** helps too, because many germs cannot grow in sour food. Home canning uses boiling water, heavy jars and steam, and it must follow a tested recipe exactly, so it is an adult’s job. Fresh salsa that is *not* canned is safe for about a week in the refrigerator, because the cold slows germs down.

Let’s cook. You will make a fresh refrigerator salsa in a clean jar. The skill to do well is **dicing tomatoes and onions** into small, even pieces with the bridge and claw grips, with an adult right beside you. An adult handles the hot pepper, because its juice burns skin and eyes.

PICTURE STUDY



Farm Security Administration client with her canned goods, Photographer of the Farm Security Administration, about 1939 · Photograph · Library of Congress, Washington, D.C.

Image: [Wikimedia Commons](#), public domain

In the 1930s and early 1940s, the U.S. government's Farm Security Administration helped struggling farm families and sent photographers to record their lives. This woman is showing the food she canned to feed her family through the winter. Count the jars, and think of the hours of summer work on those shelves.

Look closely

- Count the jars in one row. How many might there be in all?
- Look at the colors and shapes inside the jars. Which foods can you guess?
- Look at the woman. How do you think she feels about her work?
- Find the lids. What kind of jars are these?

Talk about it

1. Why would a farm family in 1939 need so many jars of food before winter?
2. Which of these foods could be canned in a boiling-water pot, and which would need a pressure canner?
3. Joseph stored grain in the good years for the years of famine. How is a canning shelf like Joseph's storehouses?

Safety first. Cut tomatoes and onions only with an adult right beside you; an adult cuts the hot pepper and washes the board and knife afterward, and you never touch your eyes after handling pepper. Home canning with boiling water or a pressure canner is an adult's job and always follows a tested recipe; this salsa is not canned and is kept in the refrigerator for up to 1 week.

Fresh Refrigerator Salsa

You will make a jar of fresh tomato salsa that keeps in the refrigerator, test how acid changes it, and visit (or read about) the safe way grown-ups can food at home.

You will need

- A cutting board, a damp towel and a small serrated knife
- A medium bowl and a spoon
- A clean glass jar with a lid (washed in hot, soapy water)
- A citrus juicer or fork
- Measuring spoons and a label for the jar
- Disposable gloves for the adult who cuts the pepper

FRESH TOMATO SALSA (REFRIGERATOR SALSA)

Serves About 2½ cups · Prep 25 min · Chill 30 min

Ingredients

- 5 ripe Roma tomatoes (about 1¼ pounds / 570 g)
- ½ small white or red onion
- ½ jalapeño pepper (optional; leave it out for a mild salsa)
- ¼ cup chopped fresh cilantro (or parsley)
- 2 tablespoons lime juice (1 lime)
- ½ teaspoon salt
- Tortilla chips or vegetable sticks for serving

Method

1. Wash your hands. Rinse the tomatoes, onion, pepper and cilantro under cool running water.
2. With an adult right beside you, cut each tomato in half with the bridge grip, lay it flat side down, and dice it with the claw grip. Put it in the bowl.

3. Dice the onion the same way into very small pieces.
4. An adult, wearing gloves, cuts the jalapeño in half, scrapes out the seeds and white ribs, and minces it. The adult washes the board and knife right away.
5. Pull the cilantro leaves off the stems and chop them, or tear them into small bits.
6. Add the onion, pepper, cilantro, lime juice and salt to the tomatoes. Stir. Taste on a chip and add more lime or salt if needed.
7. Spoon the salsa into the clean jar, close it, and label it with the date. Refrigerate at least 30 minutes. Use within 1 week.
8. Clean up: wash the board, knife and bowl and wipe the counter.

Allergy check: Contains none of the nine major allergens. Check the tortilla chip label (some contain wheat or are made where other allergens are processed).

Steps

1. **Acid test.** Before adding the lime juice, set aside 2 tablespoons of the tomato mix in a small dish. Add the lime to the rest. Taste both after 30 minutes. Which tastes fresher and brighter?
2. **Pop test.** Press the lid of a store-bought canned jar in your pantry. It should not move or pop. Ask an adult why a lid that pops up and down means the jar should not be used.
3. Make and chill the salsa.
4. **Taste test.** Serve the salsa with chips or vegetable sticks and ask each person to rate it from 1 to 5 for heat, tang and freshness.
5. **Canning interview.** Ask a grandparent or older friend whether his or her family canned food. What did they can? Who did the work? Write two things you learned.
6. **Improve it.** Write one change (more lime, a little corn or black beans, a milder or hotter pepper).
7. Clean up.

Tips

- Roma tomatoes are meaty and less watery, so the salsa does not get soupy.

- If the salsa is too hot, add more diced tomato. If too sour, a pinch of sugar balances it.
- Never pour fresh salsa into jars to store on the shelf. Only tested, properly canned recipes are shelf-safe.

Check your work

- ☐ I can tell how the Mason jar changed home canning.
- ☐ I can explain why canning must follow tested recipes and is an adult's job.
- ☐ I diced tomatoes and onions with the claw and bridge grips with an adult beside me.

COOK'S NOTEBOOK

1. Draw a Mason jar and label the jar, the threads, the lid and the band. Draw arrows showing air leaving as it is heated and the lid being pulled down as it cools.
2. Make a two-column chart: high-acid foods (boiling-water canning) and low-acid foods (pressure canner). Put at least four foods in each.
3. Copy your salsa recipe and label for the jar.

From history. John Landis Mason's patent was dated November 30, 1858. That is why the words "Mason's Patent Nov 30th 1858" are molded into the glass of many old jars, even ones made many years later.

COMMON MISTAKES

- Using an old family canning recipe that has not been tested. Use only tested recipes from the USDA or the National Center for Home Food Preservation.
- Rubbing your eyes after touching hot pepper. Let the adult handle it, and wash hands well.
- Keeping fresh salsa for weeks. It is safe in the refrigerator for about a week.

Make it a game • Jar Rules. Take turns being the canning expert. You get three cards: Mason jar, acid, tested recipe. For each card, explain what it does, in your own words. Your parent asks a tricky question, such as whether you can invent your own canning recipe, and you answer. Say why low-acid foods need an adult with a pressure canner.

Scripture. “And let them gather all the food of those good years that come, and lay up corn under the hand of Pharaoh, and let them keep food in the cities.” (Genesis 41:35-36, KJV)

Joseph planned ahead and stored food in the years of plenty. Families who can and preserve food in summer are following the same wise pattern.

4.4 DRYING FOOD: FROM RAISINS TO ASTRONAUTS

OBJECTIVES

- Explain how drying keeps food from spoiling by removing the water germs need.
- Tell how John Glenn became the first American to eat in space in 1962, and how space food is dried.
- Make oven-dried fruit leather with an adult using the oven, and measure how much water left the fruit.

Warm-up. Compare a grape and a raisin, or a fresh apple slice and a dried apple ring. How are they different in size, color, taste and feel? Which do you think would keep longer on the shelf, and why?

WATCH

What Do Astronauts Eat Aboard the International Space Station?

America's Test Kitchen · 9:02

<https://www.youtube.com/watch?v=sBAQRAwMxWg>

WHEN TO WATCH

After the story. Watch how the astronaut on the space station adds water to dried food.

BACKUP VIDEO

Chris Hadfield's Space Kitchen

Canadian Space Agency · 2:27

<https://www.youtube.com/watch?v=AZx0RIV0wss>

Optional. Astronaut Chris Hadfield makes a snack aboard the International Space Station.

KEY TERMS

dehydrate

To remove water from food by drying it.

evaporation

When liquid water turns into water vapor and leaves, as from a drying puddle or a tray of fruit.

freeze-drying

Freezing food and then removing the ice as vapor in a vacuum, leaving light, dry food that keeps its shape.

rehydrate

To add water back to dried food.

CORE IDEAS

The story. Drying is one of the oldest ways to keep food. Long ago, people dried grapes into raisins, figs and dates in the sun, and dried meat and fish over fires. Native American peoples dried corn, berries and meat for winter. Then, in the 1960s, Americans began traveling into space, and scientists wondered whether a person could even swallow without gravity. On February 20, 1962, astronaut John Glenn orbited the earth three times in his capsule, *Friendship 7*, and squeezed applesauce from a tube into his mouth. He swallowed it easily. He was the first American to eat in space.

How they figured it out. Early space food came in tubes and bite-size cubes, and astronauts did not like it much. NASA worked with food companies to make better meals that were light (every ounce costs a great deal to lift into space), that would not spoil, and that would not float away in crumbs. They used **freeze-drying**: food is frozen, then put in a vacuum chamber where the ice turns straight into vapor and leaves. Apollo astronauts in the late 1960s added water to freeze-dried meals through a little water gun. Astronauts on the International Space Station still eat many dried foods today.

The kitchen science. Germs and molds need water to grow. Fresh fruit is mostly water: an apple is about 85 percent water. When food is dried, the water **evaporates**, and what is left is too dry for most germs to grow. The sugar in dried fruit becomes more concentrated, so it tastes sweeter. Low, gentle heat dries food without cooking or burning it, and moving air carries the water vapor away. That is why fruit leather is dried in an oven set very low, around 170 °F (77 °C), for hours, often with the door propped open a crack to let the moist air out.

Let's cook. You will purée strawberries and applesauce and dry them into fruit leather in a low oven. The skills to do well are **spreading the purée evenly thin** so it dries at the same rate, and **testing doneness by touch**. An adult handles the oven.

PICTURE STUDY



Astronauts Taste-Testing Space Food, NASA photographer, 1974 · Photograph · NASA Johnson Space Center, Houston, Texas

Image: [Wikimedia Commons](#), public domain

This NASA photograph was taken in 1974, before the Apollo-Soyuz mission of 1975, when an American and a Soviet spacecraft met and docked in orbit. Astronauts tasted the foods planned for the flight and rated them, because food that tastes good on the ground helps crews stay strong in space. Many of these foods were dried or freeze-dried.

Look closely

- Find the small food containers on the table. How big are the portions?
- Find the man writing notes. What do you think he is recording?
- Look at the faces of the men tasting. Do they like what they are eating?
- Look for spoons, cups and wrappers. How is this table different from your dinner table?

Talk about it

1. Why would NASA ask astronauts to taste the food before the flight?
2. Why does space food need to be light, dry and sealed?
3. If you were rating a space food, what would you write in your notes?

Safety first. An adult turns on the oven, puts in and takes out the pans, and props the door; the oven stays low but the pan and racks are still hot, so wear oven mitts. Use the blender only with an adult beside you, lid on, unplugged before scraping. Honey is never given to babies under one year old.

Strawberry-Apple Fruit Leather

You will weigh or measure fruit purée before and after drying to find out how much water leaves, and make chewy fruit leather that keeps for weeks.

You will need

- A blender or food processor
- A large rimmed baking sheet and parchment paper (not wax paper)
- An offset spatula or the back of a spoon
- A kitchen scale (optional) or measuring cups
- Kitchen scissors and plastic wrap
- Oven mitts and a timer

STRAWBERRY-APPLE FRUIT LEATHER

Serves About 12 strips · Prep 15 min · Dry 4–6 hr

Ingredients

- 3 cups (about 1 pound / 450 g) strawberries, fresh or thawed frozen
- 1 cup (245 g) unsweetened applesauce
- 1–2 tablespoons honey or sugar (optional)
- 1 teaspoon lemon juice

Method

1. An adult heats the oven to its lowest setting, about 170 °F (77 °C). Line the baking sheet with parchment.
2. Wash your hands. Rinse the strawberries and pull off the green tops.
3. Put the strawberries, applesauce, honey and lemon juice in the blender. With an adult beside you and the lid on, blend until completely smooth.
4. Pour the purée onto the parchment. Spread it evenly about 1/8 inch (3 mm) thick with the spatula, a little thicker at the edges, which dry faster.

5. An adult puts the pan in the oven and props the door open a crack with a wooden spoon handle so moist air can escape.
6. Dry 4–6 hours, until the leather is no longer sticky in the center when touched lightly and peels away from the parchment.
7. An adult takes out the pan. Cool completely. Cut into strips with scissors, parchment and all, roll them up, and wrap.
8. Clean up: wash the blender (unplugged) and spatula. Store the leather in an airtight container for up to 2 weeks.

Allergy check: Contains none of the nine major allergens. Honey is not for babies under one year; use sugar or leave it out.

Steps

1. **Measure the water.** Weigh the purée on a kitchen scale (or measure it in cups) before drying. Weigh the finished leather. How much was lost? That was water.
2. **Predict.** What fraction of the purée do you think is water? Write your guess before you weigh the leather.
3. **Drying log.** Check the leather every hour (an adult opens the oven) and record how it looks and feels: wet, tacky, almost dry, dry.
4. **Rehydrate test.** Drop one small piece of leather and one raisin into a cup of water overnight. What happens by morning?
5. **Taste test.** Rate the leather for sweetness, chewiness and flavor from 1 to 5. Is it sweeter than the fresh fruit? Why?
6. **Improve it.** Write one change (a different fruit, thinner spreading, a pinch of cinnamon).
7. Clean up.

Tips

- Spread it evenly. Thin spots turn brittle while thick spots stay sticky.
- Peaches, mangoes, raspberries and apples all make good leather. Mix a juicy fruit with applesauce to help it dry smoothly.
- If your oven's lowest setting is above 200 °F, ask an adult to check the leather often so it does not brown.

Check your work

- ☐ I can explain how drying keeps food from spoiling.
- ☐ I can tell how John Glenn became the first American to eat in space.
- ☐ I made fruit leather with an adult handling the oven and measured the water lost.

COOK'S NOTEBOOK

1. Draw a fresh strawberry and a piece of fruit leather. Use arrows and drops to show water leaving.
2. Make a drying log chart with the time and how the leather felt each hour.
3. Copy the fruit leather recipe in your own words and record your before-and-after weights.

From history. Raisins have been made for thousands of years. Most American raisins today are dried right in the vineyards of California's San Joaquin Valley, where bunches of grapes are laid on paper trays between the rows and dried by the sun for two to three weeks.

COMMON MISTAKES

- Turning the oven up to dry it faster. High heat cooks and browns the fruit instead of drying it gently.
- Spreading the purée unevenly. Thin edges burn while the middle stays wet.
- Using wax paper. Wax paper sticks and can melt; use parchment paper.

Make it a game • Dry It Out. Cut four thin apple slices. Put two in the sun or a warm window and two in the refrigerator in a bowl. Predict aloud which will dry out and why, then check tomorrow. While you wait, act out John Glenn eating in space, and tell how dried food and rehydrate work. Your parent names what germs need to grow.

UNIT 4

HEAT & COLD

Cooking is mostly the art of moving heat into food, and keeping food is mostly the art of keeping heat out. In this unit you will meet Percy Spencer, the engineer who found a melted candy bar in his pocket and invented the microwave oven. You will learn how heat travels through a pan by **conduction**, and why a cast-iron skillet makes golden cornbread while a wooden spoon handle stays cool.

Then you will look at the two oldest ways to keep food: sealing it and drying it. You will hear how John Landis Mason's screw-top jar changed home canning, learn why canning is an adult job done with tested recipes, and make a fresh salsa that keeps in the refrigerator. Last, you will learn how drying keeps food, from raisins in the sun to the food astronauts eat in space, and make your own fruit leather.

PREREQUISITES

- Uses the stove and oven only with an adult beside, pot handles turned in and oven mitts on (Units 1–3)
- Uses the claw and bridge grips with an adult right beside (Unit 1)
- Knows the danger zone and the safe internal temperatures (Unit 1)
- Knows that bacteria need water and warmth to grow (Units 1–2)

MASTERY CHECKLIST

- ☐ I can tell how Percy Spencer discovered microwave cooking in 1945 and explain how a microwave oven heats food.
- ☐ I can explain conduction and name materials that conduct heat well and poorly.
- ☐ I can tell how the Mason jar changed home canning and explain why canning must follow tested recipes and is an adult job.
- ☐ I can explain how drying keeps food from spoiling and make fruit leather with an adult.
- ☐ I can use the microwave, stove and oven safely with an adult beside or nearby.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **National Center for Home Food Preservation**: Free. Tested, science-based recipes and guides for canning, freezing and drying, from the University of Georgia. The source for any home canning a parent decides to do (Lesson 4.3).
- **A cast-iron skillet**: Optional. Lasts for generations and is perfect for the cornbread in Lesson 4.2. Any oven-safe skillet or an 8-inch square baking pan also works.
- **Oven thermometer**: Optional. Hang it in the oven to see whether the dial tells the truth. Helpful for the low-heat fruit leather in Lesson 4.4.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

4.1 Percy Spencer and the Melted Candy Bar	2 sessions of 45–60 minutes
4.2 Conduction: Iron Skillets and Wooden Spoons	2 sessions of 45–60 minutes
4.3 The Mason Jar and Safe Canning	2 sessions of 45–60 minutes
4.4 Drying Food: From Raisins to Astronauts	2 sessions of 45–90 minutes

UNIT 4 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. **5 pts**
How did Percy Spencer discover microwave cooking?
2. **5 pts**
How does a microwave oven heat food? Why should you stir microwaved food and let it stand?
3. **5 pts**
Predict: a metal, a wooden and a plastic spoon stand in a mug of hot water with butter on their handles. Which butter melts first? Why?

4. (5 pts)

Why does cornbread baked in a preheated cast-iron skillet get a crisp crust?

5. (5 pts)

What did John Landis Mason invent, and when?

6. (5 pts)

Why must low-acid foods like green beans be canned in a pressure canner, and who does home canning?

7. (5 pts)

How long can fresh refrigerator salsa be kept, and where?

8. (5 pts)

Why does dried fruit keep longer than fresh fruit?

9. (5 pts)

Predict: you spread fruit purée very thin at one end of the pan and very thick at the other. What will happen in the oven?

10. (5 pts)

Who was the first American to eat in space, and what did he eat?

ANSWER KEY

1. In 1945, standing near a working magnetron at Raytheon, he found the candy bar in his pocket had melted. He tested popcorn and an egg and realized the microwaves were heating the food.
2. Microwaves make water molecules twist back and forth very fast, which makes heat. They reach only about an inch in, so food heats unevenly; stirring and standing time let the heat spread evenly.
3. The metal spoon's butter melts first, because metal is a good conductor. Wood and plastic are insulators and carry heat slowly.
4. The thick, hot iron holds a lot of heat and conducts it into the batter right away, so the bottom and sides sizzle and brown.
5. A glass jar with a threaded neck and a screw-on lid, patented in 1858.
6. A dangerous germ can survive boiling in low-acid foods; a pressure canner reaches about 240 °F to destroy it. Home canning is an adult's job using tested recipes.
7. About 1 week, in a covered jar in the refrigerator.
8. Most of its water has evaporated, and germs and molds need water to grow.
9. The thin end will dry first and may get brittle or brown, while the thick end stays wet and sticky.
10. John Glenn, on February 20, 1962, aboard Friendship 7. He ate applesauce from a tube.

UNIT CHALLENGE: ONE FOOD, THREE HEATS

Choose one vegetable, such as potato, carrot or sweet potato, and cook equal pieces three ways with an adult beside you: in the microwave, in a skillet on the stovetop (with a thin film of oil), and roasted in the oven. Cut all the pieces the same size with the claw grip.

Record the time each method took, the color and texture of the outside and inside, and a family taste rating. Explain which kind of heat (microwaves, conduction from the pan, or hot oven air) made each result. Finish with your favorite method and one improvement.

LOOK FOR	WHAT IT MEANS
Fair test	Same vegetable, same size pieces, same seasoning; only the heat method changed.
Safety	Knife, stove, oven and microwave used with an adult beside or nearby; pot handles in; mitts used; cleanup done.
Records	A chart of times, colors, textures and family ratings for all three methods.
Explanation	A clear explanation of how each kind of heat cooked the vegetable, using the words conduction and microwaves.
Improvement	A favorite method chosen and one honest improvement planned.

FOOD CHEMISTRY

Every recipe is a little chemistry experiment. In this unit you will meet the ingredients that do the most work. You will watch **starch** grains swell and thicken a pan of gravy, shake **oil and vinegar** into an emulsion for a pasta salad, and see **baking soda and baking powder** make bubbles that lift a batch of biscuits, the leavening that Eben Horsford of Harvard helped bring to every American kitchen.

Last, you will meet a living ingredient. **Yeast** is a tiny fungus that eats sugar and breathes out the gas that makes bread rise, and in a sourdough starter it works alongside friendly bacteria that make bread tangy. You will hear how the prospectors of the California Gold Rush guarded their sourdough, and how Jesus compared the kingdom of heaven to leaven working through dough (Matthew 13:33).

PREREQUISITES

- Measures dry and liquid ingredients with cups and spoons (Units 1–4)
- Uses the stove and oven only with an adult beside, pot handles turned in and oven mitts on (Units 1–4)
- Cooks chicken to 165 °F and egg dishes to 160 °F and checks with a thermometer (Unit 1)
- Knows conduction and how heat moves into food (Unit 4)

MASTERY CHECKLIST

- ☐ I can explain how starch granules soak up water and swell to thicken a gravy, and why a cold slurry prevents lumps.
- ☐ I can explain why oil and vinegar separate and how mustard helps hold an emulsion together.
- ☐ I can explain how baking soda and baking powder make carbon dioxide bubbles, and tell the story of Eben Horsford.
- ☐ I can explain that yeast is alive, how it makes bread rise, and how a sourdough starter works.
- ☐ I can never taste uncooked dough or batter, and I can explain why.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **King Arthur Baking: Learn to bake guides**: Free step-by-step baking guides with photographs, from the King Arthur Baking Company. Helpful for the biscuits and the yeast pancakes in Lessons 5.3–5.4.
- **A pastry blender or a box grater**: Optional. Either one makes it easier to work cold butter into flour for biscuits. Two table knives or your fingertips also work.
- **Balloons and small clean bottles**: For the yeast balloon test in Lesson 5.4.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

5.1 Starch and a Smooth Gravy	2 sessions of 45–60 minutes
5.2 Oil and Vinegar: An Emulsion	2 sessions of 45–60 minutes
5.3 Baking Soda, Baking Powder and Eben Horsford	2 sessions of 45–60 minutes
5.4 Sourdough and the Gold Rush	2 sessions of 60–90 minutes

UNIT 5 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. **5 pts**
What is gelatinization?
2. **5 pts**
Predict: you dump a spoonful of dry cornstarch into hot broth, and stir another spoonful into cold water first. What happens to each?
3. **5 pts**
Why do oil and vinegar separate?
4. **5 pts**
What does an emulsifier do? Name two.

5. (5 pts)

What gas makes biscuits and pancakes rise, and how do baking soda and baking powder make it?

6. (5 pts)

Who was Eben Horsford, and why did baking powder matter to home cooks?

7. (5 pts)

Why should the butter be cold for biscuits?

8. (5 pts)

Predict: one bottle has yeast, sugar and warm water, and another has only yeast and warm water, each with a balloon on top. What happens?

9. (5 pts)

What two kinds of living things work in a sourdough starter, and what does each do?

10. (5 pts)

Why should you never taste uncooked dough or batter?

ANSWER KEY

1. When starch granules are heated in liquid, soak up water, swell and release long chains that tangle and thicken the liquid.
2. The dry cornstarch makes lumps because the outside of each clump thickens and traps dry powder inside. The slurry thickens the broth smoothly because every granule is wet and separate before it heats.
3. Water molecules cling to each other and oil molecules cannot fit in, so they push apart and the lighter oil floats on top.
4. It coats oil droplets, with one end liking oil and one liking water, so the droplets cannot join. Mustard and egg yolk (lecithin).
5. Carbon dioxide. Baking soda makes it when it meets an acid in a wet batter; baking powder contains soda and a dry acid, so it makes gas when wet and again when hot.
6. A Harvard chemistry professor who developed a phosphate baking powder in the 1850s–1860s with the Rumford Chemical Works. Cooks no longer had to guess how much acid to add, so quick breads came out right every time.
7. Cold pieces of butter melt in the oven and turn to steam, puffing the dough into flaky layers.
8. The balloon on the bottle with sugar grows, because the yeast eats the sugar and gives off carbon dioxide. The other barely changes.
9. Wild yeast makes carbon dioxide so bread rises; lactic acid bacteria make acids that give the sour, tangy taste.
10. Uncooked flour and uncooked eggs can carry germs that make people sick.

UNIT CHALLENGE: THE BISCUIT LAB

Bake three small batches of biscuits (half the recipe each), changing only one thing each time: for example, cold butter versus soft butter, folded versus not folded, or baking powder versus no baking powder. An adult is beside you at the oven every time.

Measure the height of three biscuits from each batch, photograph a biscuit from each broken open, and hold a family taste test. Make a chart of your results and write which change made the biggest difference and why, using the words carbon dioxide and steam.

LOOK FOR	WHAT IT MEANS
Fair test	Only one thing changed between batches; everything else measured the same.
Safety and cleanliness	Hands washed, no uncooked dough tasted, adult beside at the oven, kitchen cleaned.
Measurements and records	Heights measured and charted; photos or sketches of each batch; family ratings.
Explanation	A clear explanation of the results using carbon dioxide, steam and leavening.
Improvement	A best recipe written down with one more improvement to try.

5.1 STARCH AND A SMOOTH GRAVY

OBJECTIVES

- Explain what starch is, where it comes from, and what happens when starch granules are heated in liquid.
- Show why a cold cornstarch slurry thickens without lumps while dry cornstarch in hot liquid makes lumps.
- Cook pan-seared chicken to 165 °F and make a smooth pan gravy to serve over rice, with an adult beside you.

Warm-up. Stir 1 tablespoon of cornstarch into 1 tablespoon of cold water with your finger. Press it hard and fast, then let your finger sink in slowly. What strange thing happens? Then find three foods in the pantry that are mostly starch.

WATCH

[How to Make a Cornstarch Slurry](#) | [Cornstarch Slurry](#) | [Cornstarch Slurry](#) | [How to Thicken a Sauce](#)

[The Sauce and Gravy Channel](#) · 6:00

https://www.youtube.com/watch?v=gT5MaPCCw_U

WHEN TO WATCH

After the kitchen science and before you cook. Watch how the cook stirs the slurry until smooth before it goes into the hot liquid.

Note: A cooking channel devoted to sauces and gravies; the slurry method is shown clearly at the stove.

BACKUP VIDEO

[How to Make a Quick Emergency Roux to Thicken Gravy at the Last Minute](#)

[America's Test Kitchen](#) · 1:01

<https://www.youtube.com/watch?v=JTxiBwhnzWc>

Optional. A quick look at the other way to thicken gravy: flour cooked in butter (a roux).

KEY TERMS

starch

A carbohydrate that plants store in tiny grains in seeds, roots and tubers, such as corn, wheat, rice and potatoes.

granule

A tiny grain. Starch is packed in granules too small to see without a microscope.

gelatinization

When starch granules are heated in liquid, soak up water, swell and release long chains that thicken the liquid.

slurry

Cornstarch or flour stirred into a little cold liquid until smooth, so it can go into a hot liquid without lumps.

pan drippings

The browned bits and juices left in a pan after cooking meat. They give gravy its flavor.

CORE IDEAS

The story. Starch is everywhere in the kitchen, but for a long time nobody could see it. In 1814 two French chemists, Jean-Jacques Colin and Henri-François Gaultier de Claubry, discovered that a few drops of iodine turn starch a deep blue-black. Suddenly scientists had a way to find starch in a potato, a grain of wheat or a leaf. Under the microscope, they saw that plants store starch in tiny hard grains called **granules**, each kind of plant with its own shape.

How they figured it out. Cooks had long known that flour or cornstarch thickens gravy, and that it makes lumps if you dump it into hot liquid. Scientists watched starch granules under a microscope while they heated them in water. In cold water the granules just sank. As the water got hot (around 140–160 °F for most starches), the granules soaked up water, swelled many times their size, and finally burst, letting long starch chains spill out and tangle into a net. That net traps water and makes the liquid thick. They named this **gelatinization**.

The kitchen science. If you drop dry cornstarch into hot broth, the outside of each clump gelatinizes at once into a sticky skin, and the dry powder inside stays trapped. That is a lump. If you first stir the starch into *cold* liquid to make a **slurry**, every granule is wet and separate before the heat reaches it, so the gravy thickens smoothly. Cornstarch is nearly pure starch and makes a clear, glossy gravy; flour is

about three-quarters starch and makes a cloudier one, so you need about twice as much flour. Either way, the gravy must come to a bubble to thicken fully.

Let's cook. You will pan-sear chicken pieces, then make a pan gravy from the browned bits, broth and a cornstarch slurry, and serve it over rice. The skills to do well are **searing in a thin film of oil** with an adult beside you, turning the chicken away from you, and **whisking the gravy** as it thickens.

PICTURE STUDY



The Potato Eaters, Vincent van Gogh, 1885 · Oil on canvas · Van Gogh Museum, Amsterdam

Image: [Wikimedia Commons](#), public domain

Vincent van Gogh wanted to show the honest life of farm families who worked the soil with their own hands. Here a family gathers at the end of the day for a supper of potatoes they grew themselves. Potatoes are full of starch, the same starch that thickens your gravy.

Look closely

- Find the platter of potatoes. Is the food hot? How can you tell?
- Find the lamp. How much light does this family have?
- Look at the hands of the people. What do they tell you about their work?
- Find the woman pouring from the kettle. What might she be pouring?

Talk about it

1. Potatoes are mostly starch and water. What happens to a potato's starch when it is boiled?
2. This family eats a simple meal together. What makes a simple meal a good one?
3. How could this family stretch their potatoes into more meals?

Safety first. An adult stands beside you at the stove. Use only a thin film of oil, lay the chicken in the pan by placing it away from you, and turn it with tongs; if the oil smokes, turn the heat down. Cook chicken to 165 °F (74 °C), wash hands after touching raw chicken, and keep raw chicken off the board you use for anything else.

KITCHEN PROJECT

The Lump Test and Chicken with Pan Gravy

You will run a lump test to see why a slurry matters, then cook chicken and turn its pan drippings into a smooth gravy to spoon over rice.

You will need

- A large skillet (not nonstick, if you have one, for better browning) and tongs
- A whisk and a heat-proof spatula
- A small cup or jar for the slurry
- A medium saucepan with a lid for the rice
- An instant-read food thermometer
- Two small mugs and a spoon for the lump test
- Measuring cups and spoons and oven mitts

PAN-SEARED CHICKEN WITH SMOOTH GRAVY OVER RICE

Serves 4–6 • Prep 15 min • Cook 35 min

Ingredients

- **Rice:** 1½ cups long-grain rice, 2¼ cups water and ½ teaspoon salt (cooked as in Lesson 2.3)
- **Chicken:** 1½ pounds (680 g) boneless, skinless chicken breasts or thighs, cut into cutlets about ½ inch thick (an adult cuts them, or buy thin cutlets)
- ½ teaspoon salt, ¼ teaspoon pepper and ½ teaspoon paprika
- 1 tablespoon vegetable or olive oil
- **Gravy:** 2 cups (480 mL) low-sodium chicken broth
- 2 tablespoons cornstarch
- ¼ cup (60 mL) cold water or cold broth
- 1 tablespoon butter (optional) and ¼ teaspoon dried thyme
- Salt and pepper to taste

Method

1. Start the rice as in Lesson 2.3 so it is ready with the chicken.
2. Wash your hands. Pat the chicken dry with paper towels. Sprinkle both sides with salt, pepper and paprika. Wash your hands.
3. With an adult beside you, heat the oil in the skillet over medium-high heat until it shimmers. With tongs, lay the chicken in, placing each piece away from you.
4. Cook without moving 4–5 minutes until golden underneath, then turn and cook 3–5 minutes more, until the thickest piece reads 165 °F (74 °C). Move the chicken to a clean plate.
5. Make the slurry: in the cup, stir the cornstarch into the cold water until completely smooth.
6. Turn the heat to medium. Pour the broth into the skillet and scrape up the brown bits with the spatula. Add the thyme and bring to a simmer.
7. Stir the slurry again and pour it in slowly while you whisk. Keep whisking until the gravy bubbles and thickens, 1–2 minutes. Stir in the butter, taste, and add salt and pepper.
8. Slice the chicken, spoon it over rice, and pour on the gravy. Clean up: wash the skillet, tongs and board in hot, soapy water and refrigerate leftovers within 2 hours.

Allergy check: Contains milk if you add butter (leave it out for milk-free). Check the broth label for wheat, soy or other allergens. No eggs, wheat or nuts in the recipe itself.

Steps

1. **Lump test.** An adult pours $\frac{1}{2}$ cup very hot water into each of two mugs. Into mug A, dump 1 teaspoon dry cornstarch and stir. Into mug B, stir in 1 teaspoon cornstarch first mixed with 1 tablespoon cold water. Which has lumps? Write why, using the word *slurry*.
2. **Predict.** How long will the gravy take to thicken after the slurry goes in?
3. Cook the chicken and gravy. Record the chicken's temperature and the time the gravy took to thicken.
4. **Cool test.** Spoon a little gravy onto a cold plate. After 5 minutes, is it thicker or thinner than in the pan?

5. **Taste test.** Ask your family to rate the meal from 1 to 5. Was the gravy smooth?
6. **Improve it.** Write one change (mushrooms in the gravy, a splash of milk for creamy gravy, more thyme).
7. Clean up.

Tips

- Leave the chicken alone while it browns. If it sticks, it is not ready to turn.
- If the gravy is too thick, whisk in a little more broth. If too thin, make a little more slurry.
- The brown bits in the pan are flavor, not burnt food. Scrape them into the gravy.

Check your work

- ☐ I can explain gelatinization and why a slurry prevents lumps.
- ☐ I seared chicken in a thin film of oil to 165 °F with an adult beside me.
- ☐ I made a smooth gravy and served a full meal.

COOK'S NOTEBOOK

1. Draw starch granules three times: cold and hard, swelling in hot liquid, and burst with chains tangling. Label each.
2. Draw your two lump-test mugs and explain the difference.
3. Copy the chicken and gravy recipe in your own words. Star the step where gelatinization happens.

From history. Tapioca comes from the starchy root of the cassava plant, grown in South America, Africa and Asia. The little pearls in tapioca pudding are balls of starch that turn clear and soft when they gelatinize.

COMMON MISTAKES

- Dumping dry cornstarch into hot gravy. Always make a cold slurry first.
- Taking the gravy off the heat before it bubbles. Starch must reach a simmer to thicken fully.
- Crowding the pan with chicken. Pieces steam instead of browning; cook in two batches if needed.

Make it a game • Lump Test Duel. Stir one spoon of cornstarch into cold water first, then add it to hot liquid, while an adult pours dry cornstarch straight into another cup of hot water. Watch which one forms lumps, and say why. Then explain slurry and gelatinization to your parent as if they were a new cook. Now they quiz you with one wrong fact.

5.2 OIL AND VINEGAR: AN EMULSION

OBJECTIVES

- Explain why oil and vinegar separate and what an emulsion is.
- Tell how lecithin, the emulsifier in egg yolks, was discovered, and how mustard helps hold a dressing together.
- Make a mustard vinaigrette and a pasta salad, timing how long the dressing stays mixed.

Warm-up. Pour a little water into a clear glass and add a spoonful of oil. Stir hard and watch for a minute. Then look in the refrigerator door for foods that contain both oil and water but do not separate. How many can you find?

WATCH

The Science of Food: Emulsions

Houston Museum of Natural Science · 4:19

<https://www.youtube.com/watch?v=cuPpVQ14320>

WHEN TO WATCH

After the kitchen science. Watch how slowly the oil is poured in while the chef whisks.

Note: From the Houston Museum of Natural Science.

BACKUP VIDEO

Science: How to Make Salad Dressing Vinaigrette That Doesn't Separate or Break by Using an Emulsion

America's Test Kitchen · 2:52

<https://www.youtube.com/watch?v=tETrZUhqaQo>

Before your jar test. Watch which emulsifier keeps the test kitchen's dressing together longest.

KEY TERMS

emulsion

A mixture of two liquids that normally do not mix, such as oil and vinegar, with tiny droplets of one spread through the other.

lecithin

An emulsifier found in egg yolks and soybeans.

ratio

How much of one thing compared with another. A vinaigrette is about 3 parts oil to 1 part vinegar.

emulsifier

An ingredient whose molecules have one end that likes water and one that likes oil, so it holds droplets apart. Mustard and egg yolk are emulsifiers.

vinaigrette

A salad dressing of oil, an acid such as vinegar or lemon juice, and seasonings. Say it “vin-uh-GRET.”

CORE IDEAS

The story. Cooks have dressed vegetables with oil and vinegar since ancient times, and every one of them saw the same thing: shake the bottle, it turns cloudy, and a few minutes later the oil floats on top again. Cooks found that a spoonful of mustard or an egg yolk made a sauce stay mixed much longer. In the 1840s a French chemist, Théodore Gobley, studied egg yolks in his laboratory in Paris. He found a fatty substance in them, and in 1850 he named it **lecithin**, from the Greek word for egg yolk, *lekithos*.

How they figured it out. Later chemists learned why lecithin works. Its molecules have two different ends: one end that is attracted to water and one end that is attracted to oil. Molecules like this are called **emulsifiers**. Mustard seeds contain compounds that work in a similar way, and ground mustard also thickens a dressing so oil droplets move slowly. Today food makers use lecithin, often from soybeans, in many foods to keep them smooth.

The kitchen science. Water molecules cling tightly to each other, and oil molecules cannot fit in, so oil and water push apart and the lighter oil floats. Shaking or whisking breaks the oil into tiny droplets spread through the vinegar: an **emulsion**. But the droplets bump and join, and the layers separate. An emulsifier lines up

around each oil droplet like a coat, oil-loving end inside and water-loving end outside, so the droplets cannot join. Milk, butter, mayonnaise and many dressings are emulsions. We do not make homemade mayonnaise with uncooked egg yolks, because uncooked eggs can carry germs; mustard does the job safely in a vinaigrette.

Let's cook. You will shake a mustard vinaigrette in a jar and toss it with pasta and vegetables for a cold pasta salad. The skills to do well are **measuring a ratio** (3 parts oil to 1 part vinegar) and **cutting cherry tomatoes and cucumbers** with the bridge and claw grips, with an adult beside you. An adult drains the hot pasta.

PICTURE STUDY



Still Life with Quince, Cabbage, Melon and Cucumber, Juan Sánchez Cotán, about 1602 · Oil on canvas · San Diego Museum of Art, California
Image: [Wikimedia Commons](#), public domain

Juan Sánchez Cotán was a Spanish painter who later became a lay brother in a monastery. He painted simple vegetables and fruit in a stone window, called a *cantarero*, where food was kept cool. Look how the foods form a curve from the top left down to the bottom right.

Look closely

- Find the quince and the cabbage. Why are they hanging on strings?
- Find the cucumber sticking out over the edge. Does it look like it could fall?
- Find the melon and the slice. What color is the inside?
- Trace the curve that the foods make with your finger. Where does it start and end?

Talk about it

1. Which of these foods could go into a salad with an oil and vinegar dressing?
2. Why would a cook in 1602 hang food in a cool stone window instead of a refrigerator?
3. Sánchez Cotán painted plain food with great care. How can a cook take great care with a plain salad?

Safety first. Use a small knife only with an adult right beside you, on a board with a damp towel under it; halve round cherry tomatoes with the bridge grip or by holding them between two plastic lids. An adult carries and drains the pot of boiling pasta water. Hold the jar lid tightly with both hands when you shake.

Jar Test and Pasta Salad

You will run a fair test with two jars to see what mustard does, then make a vinaigrette and toss it with pasta and vegetables for a picnic-style salad.

You will need

- Two clean clear jars with tight lids, the same size
- A large pot and a colander
- A cutting board, a damp towel and a small serrated knife
- A large bowl and a big spoon
- Measuring cups and spoons, masking tape and a timer

GARDEN PASTA SALAD WITH MUSTARD VINAIGRETTE

Serves 6–8 (about 8 cups) · Prep 25 min · Cook 12 min · Chill 30 min

Ingredients

- **Vinaigrette:** ¼ cup (60 mL) apple cider vinegar
- 1 tablespoon Dijon or yellow mustard
- 1 teaspoon honey or sugar
- ½ teaspoon dried oregano or Italian herbs, ½ teaspoon salt, ¼ teaspoon pepper
- ¾ cup (180 mL) olive oil
- **Salad:** 12 ounces (340 g) short pasta (rotini, bow ties or penne)
- 1 pint (about 2 cups) cherry tomatoes
- 1 cucumber
- 1 bell pepper (any color)
- 1 cup (115 g) cubed mozzarella or cheddar (optional)
- 1 (15-ounce) can chickpeas, drained and rinsed (optional)

Method

1. An adult brings a large pot of salted water to a boil. Add the pasta with a long spoon, standing back from the steam, and cook as the package

says. An adult drains it and rinses it with cold water.

2. Wash your hands and rinse the vegetables.
3. With an adult right beside you, halve the cherry tomatoes. Cut the cucumber in half lengthwise with the bridge grip, lay it flat, and slice with the claw grip. Cut the pepper in half, pull out the seeds, lay it skin side down and dice it.
4. Make the vinaigrette: put the vinegar, mustard, honey, herbs, salt and pepper in a jar, close it and shake. Add the oil, close tightly and shake hard for 30 seconds until creamy.
5. Put the cooled pasta, vegetables, cheese and chickpeas in the bowl. Shake the dressing again and pour about two-thirds over the salad. Toss well.
6. Chill at least 30 minutes. Before serving, toss with the rest of the dressing; pasta soaks it up as it sits.
7. Clean up: wash the pot, colander, board and jars. Keep the salad cold and refrigerate leftovers within 2 hours.

Allergy check: Contains wheat (pasta) and milk (cheese, optional). Check the mustard label. Use gluten-free pasta for wheat-free and leave out the cheese for milk-free. Honey is not for babies under one year.

Steps

1. **Fair test.** Label two jars A and B. Put 2 tablespoons vinegar and 6 tablespoons oil in each. Add 1 teaspoon mustard to jar B only.
2. **Predict.** Which jar will stay mixed longer? Why?
3. Shake each jar for exactly 30 seconds and set them side by side. Check every minute and record when a clear oil layer appears in each. Keep checking for 20 minutes.
4. **Ratio check.** In your recipe, how many tablespoons of oil are there for each tablespoon of vinegar? ($\frac{3}{4}$ cup = 12 tablespoons; $\frac{1}{4}$ cup = 4 tablespoons.)
5. Make the pasta salad and serve it. Ask each person to rate it from 1 to 5 for tang and flavor.
6. **Improve it.** Write one change (lemon juice instead of vinegar, fresh basil, olives, a little Parmesan).
7. Clean up.

Tips

- Once you know the 3-to-1 ratio, you can make any amount of dressing.
- Olive oil can turn cloudy and thick in the refrigerator. Let the dressing stand at room temperature 10 minutes and shake it again.
- Rinse pasta for a cold salad so it stops cooking and does not clump.

Check your work

- ☐ I can explain why oil and vinegar separate and what an emulsifier does.
- ☐ I ran a fair test and timed how long each jar stayed mixed.
- ☐ I made a vinaigrette using a 3-to-1 ratio and a pasta salad.

COOK'S NOTEBOOK

1. Draw an oil droplet coated with emulsifier molecules. Label the oil-loving and water-loving ends.
2. Make a chart of your jar test: minutes until the oil layer appeared in jars A and B.
3. Copy the vinaigrette as a ratio recipe: 3 parts oil, 1 part vinegar, plus mustard and seasonings.

From history. Egg yolks were the first emulsifier many cooks knew. Today the store-bought mayonnaise in your refrigerator is made with pasteurized eggs, which are gently heated to destroy germs while keeping the yolk able to emulsify.

COMMON MISTAKES

- Thinking oil and vinegar will stay mixed if you shake long enough. Without an emulsifier, they always separate.
- Making mayonnaise or Caesar dressing with uncooked egg yolks at home. Uncooked eggs can carry germs.
- Dressing the pasta while it is hot and leaving it out. Cool it, dress it and keep it cold.

Make it a game • Shake and Watch. Pour oil and vinegar into a jar, shake it for ten seconds, and set a timer to see how fast it separates. Try again with a dab of mustard added and compare the times. Predict first, then check. Say what an emulsion is and why egg yolk lecithin helps. Beat your own prediction on a third jar.

5.3 BAKING SODA, BAKING POWDER AND EBEN HORSFORD

OBJECTIVES

- Explain how baking soda and an acid, or baking powder, make carbon dioxide gas that lifts baked goods.
- Tell how Eben Horsford of Harvard developed a phosphate baking powder in the 1850s and 1860s, and why baking powder changed home baking.
- Bake buttermilk biscuits with an adult beside you at the oven, working cold butter into flour for flaky layers.

Warm-up. Put 1 teaspoon of baking soda in a glass. Add 2 tablespoons of vinegar. What happens? Now put 1 teaspoon of baking soda in a glass of plain water. What happens this time? What was different?

WATCH

Fifth Grade Lesson 3.1 Baking Soda vs Baking Powder

American Chemical Society • 4:52

<https://www.youtube.com/watch?v=JnRzKANMrEY>

WHEN TO WATCH

After the kitchen science. Pause at each slide and predict which cup will bubble before it shows you.

Note: A lesson from the American Chemical Society's middle-school chemistry series, shown as slides with experiment photos.

BACKUP VIDEO

How to Make the Absolute Easiest Ever Biscuits

America's Test Kitchen • 7:23

https://www.youtube.com/watch?v=gQ9_JCSlptk

Before Session 2. Watch how the test cook handles the dough gently and cuts the biscuits.

KEY TERMS

leavening

An ingredient that makes dough or batter rise by filling it with gas bubbles: yeast, baking soda or baking powder.

baking powder

Baking soda already mixed with a dry acid and a little starch. It makes gas when it gets wet and again when it gets hot.

flaky

Made of thin layers that separate when you pull them apart, like a good biscuit.

baking soda

Sodium bicarbonate, a base that makes carbon dioxide gas when it meets an acid, such as buttermilk, yogurt or lemon juice.

carbon dioxide

The gas in the bubbles that makes biscuits, pancakes and bread rise. You breathe it out, too.

CORE IDEAS

The story. For most of history, bread and cakes rose only with yeast, which takes hours, or with eggs beaten for a long time. In the 1790s American cooks began using pearl ash (a kind of potash) to make quick breads rise, and later baking soda. But soda needs exactly the right amount of acid, like sour milk, or the bread tastes bitter and soapy. In 1843 an English chemist, Alfred Bird, mixed a powder of soda and a dry acid for his wife, who could not eat eggs or yeast. Across the ocean, Eben Norton Horsford, a chemistry professor at Harvard, worked on the same problem.

How they figured it out. Horsford was looking for a dry acid that would work with baking soda, keep well in a tin, and even add something good to bread. In 1856 he patented a way to make a phosphate acid powder. He and a business partner, George Wilson, ran the Rumford Chemical Works in Rhode Island, named after Count Rumford, the scientist whose name was on Horsford's professorship at Harvard. By the 1860s they were selling a baking powder that housewives could simply stir into flour. No more guessing how sour the milk was: biscuits, pancakes and cakes came out right every time.

The kitchen science. Baking soda is a base. When it meets an acid in a wet batter, they react and make bubbles of **carbon dioxide** gas. The bubbles are trapped in the dough, and in the hot oven they swell, so the biscuits puff up before the dough sets. **Baking powder** is soda with its acid already mixed in (and a little cornstarch to keep it dry). Most baking powder today is “double-acting”: it makes some bubbles when it gets wet and more when it gets hot. Biscuits also get help from **cold butter**: little pieces of butter melt in the oven and turn to steam, puffing the dough into **flaky** layers.

Let's cook. You will bake tall buttermilk biscuits, which use both baking powder and baking soda (the soda reacts with the acid in the buttermilk). The skills to do well are **keeping the butter cold, mixing gently** so the biscuits stay tender, and **cutting straight down** without twisting. An adult is beside you at the 450 °F oven.

PICTURE STUDY



Paul Hermann Baking Rye Bread, Marjory Collins, 1943 · Photograph · Library of Congress, Washington, D.C.

Image: [Wikimedia Commons](#), public domain

Marjory Collins took this photograph in 1943 for the U.S. Office of War Information. Paul Hermann is baking round loaves of rye bread in a Lithuanian bakery in Pittsburgh, Pennsylvania. A bakery like this baked hundreds of loaves a day for its neighborhood.

Look closely

- Find the racks of loaves on the left. Are they baked yet, or still rising?
- Look at how the baker holds the hot tray. What protects his hand?
- Find the oven doors. Why might a bakery need such a big oven?
- Look at his clothes and cap. Why do bakers wear clean white clothes and cover their hair?

Talk about it

1. The dough on the racks is still rising. What gas is making it grow, and what makes the gas?
2. A bakery makes many loaves at once. How would a baker change a recipe to make ten times as much?
3. Why does bread rise even more in the first minutes in a hot oven?

Safety first. An adult stands beside you when the pan goes in and out of a 450 °F (230 °C) oven; wear oven mitts. Never taste uncooked dough: uncooked flour can carry germs. Wash your hands after working butter into flour.

Bubble Tests and Buttermilk Biscuits

You will test baking soda and baking powder in different liquids to see when they make gas, then bake buttermilk biscuits and compare one baked with leavening and one tiny test biscuit baked without.

You will need

- Four clear cups, measuring spoons and a timer
- A large mixing bowl, a pastry blender (or box grater or two table knives) and a fork
- A floured counter or board and a 2½-inch round cutter (or a glass)
- A baking sheet and parchment paper
- Oven mitts and a ruler

TALL BUTTERMILK BISCUITS

Serves About 10 biscuits • Prep 20 min • Bake 12–15 min

Ingredients

- 2 cups (250 g) all-purpose flour, plus a little for the counter
- 1 tablespoon baking powder
- ½ teaspoon baking soda
- 1 teaspoon salt
- 1 tablespoon sugar (optional)
- 6 tablespoons (85 g) cold butter
- ¾ cup plus 2 tablespoons (210 mL) cold buttermilk (or 1 tablespoon lemon juice plus milk to make ¾ cup plus 2 tablespoons; let it sit 5 minutes)

Method

1. An adult heats the oven to 450 °F (230 °C). Line the baking sheet with parchment.
2. Wash your hands. Whisk the flour, baking powder, baking soda, salt and sugar in the bowl.

3. Cut the cold butter into small cubes (or grate it on the large holes of a box grater). Add it to the flour and work it in with the pastry blender or your fingertips until the pieces are the size of peas.
4. Pour in the buttermilk and stir with a fork just until a shaggy dough forms. Do not overmix.
5. Turn the dough onto a floured counter. Pat it into a rectangle about 1 inch thick, fold it in half, and pat it out again. Repeat twice more. This makes layers.
6. Cut biscuits straight down with the cutter; do not twist. Place them on the pan just touching each other. Press the scraps together gently and cut again.
7. With an adult beside you, bake 12–15 minutes until tall and golden. An adult takes the pan out.
8. Serve warm with butter, honey or jam. Clean up: wash the bowl and tools and wipe the floury counter.

Allergy check: Contains wheat (flour) and milk (butter, buttermilk). For milk-free, use cold plant-based butter and oat milk with 1 tablespoon lemon juice. Gluten-free flour blends can replace the wheat flour, though the biscuits will be less tall. Honey is not for babies under one year.

Steps

1. **Bubble tests.** Label four cups. Cup 1: $\frac{1}{2}$ teaspoon baking soda + 2 tablespoons water. Cup 2: $\frac{1}{2}$ teaspoon baking soda + 2 tablespoons buttermilk or lemon juice. Cup 3: $\frac{1}{2}$ teaspoon baking powder + 2 tablespoons cold water. Cup 4: $\frac{1}{2}$ teaspoon baking powder + 2 tablespoons hot tap water (an adult pours). Record the bubbles in each.
2. **Predict.** Which cup will bubble most? Which will not bubble at all?
3. Make the biscuit dough. Before adding the buttermilk, take out 2 tablespoons of the flour mixture and make one tiny “no-rise” test biscuit with plain milk and no baking powder (mix a separate pinch of flour, butter and milk). Bake it on the same pan.
4. **Measure.** With a ruler, measure the height of a biscuit before and after baking, and the height of the no-rise test biscuit.

5. **Taste test.** Break open a biscuit and look for layers. Ask your family to rate the biscuits from 1 to 5 for height, flakiness and flavor.
6. **Improve it.** Write one change (colder butter, fewer folds, grated cheese and chives, a pinch more salt).
7. Clean up.

Tips

- Keep everything cold. If the butter gets soft and greasy, put the bowl in the freezer for 10 minutes.
- Twisting the cutter seals the edges, and the biscuits rise crooked. Press straight down and lift.
- Biscuits placed touching each other help each other rise tall.

Check your work

- ☐ I can explain how baking soda and baking powder make bubbles.
- ☐ I can tell the story of Eben Horsford and baking powder.
- ☐ I baked buttermilk biscuits with an adult beside me and measured how much they rose.

COOK'S NOTEBOOK

1. Draw your four bubble-test cups and write what happened in each.
2. Draw a biscuit cut in half and label the layers, the bubbles and where the butter melted into steam.
3. Copy the biscuit recipe in your own words and record your before-and-after heights.

From history. Before baking powder, American cooks of the late 1700s used pearl ash, made by soaking wood ashes in water and baking what was left. Amelia Simmons's 1796 cookbook, which you will meet in Unit 8, is one of the first to use it in recipes.

COMMON MISTAKES

- Using soft or melted butter. You need cold pieces of butter to make steam and flaky layers.
- Stirring and kneading biscuit dough like bread. Overworking makes biscuits tough and flat.
- Using old baking powder. Test it: a spoonful in hot water should fizz right away.

Make it a game • Fizz Predictions. Set out baking soda, baking powder, vinegar and water in small cups. Before you test each, write down whether you think it will fizz. Then stir a spoonful into each and score yourself. Explain that carbon dioxide lifts biscuits and who Eben Horsford was. Race your parent to say why baking powder changed home baking.

Scripture. “And Abraham hastened into the tent unto Sarah, and said, Make ready quickly three measures of fine meal, knead it, and make cakes upon the hearth.” (Genesis 18:6-8, KJV)

When three guests appeared at his tent, Abraham hurried to serve them quick-baked cakes. Quick breads like biscuits are still a way to welcome guests warmly on short notice.

5.4 SOURDOUGH AND THE GOLD RUSH

OBJECTIVES

- Explain that yeast is a living fungus that eats sugar and makes carbon dioxide, and that Louis Pasteur proved it alive.
- Tell how the prospectors of the California Gold Rush and the Klondike kept sourdough starter, and how scientists in 1971 named the bacteria that make San Francisco sourdough tangy.
- Make overnight yeasted pancakes with a tangy “sourdough-style” flavor, and cook them on a griddle with an adult beside you.

Warm-up. Stir 1 teaspoon of yeast and 1 teaspoon of sugar into $\frac{1}{2}$ cup of warm water (like a warm bath, not hot). Set a timer for 10 minutes and watch. What do you see? What do you smell? Is the yeast alive?

WATCH

Secrets of Sourdough: Science on the SPOT | KQED

KQED • 8:04

<https://www.youtube.com/watch?v=y5xOpss4j5E>

WHEN TO WATCH

After the story. Watch the starter bubble and listen for the two kinds of tiny living things that work in it.

BACKUP VIDEO

Building a Sourdough Starter

King Arthur Baking Company • 7:02

<https://www.youtube.com/watch?v=S9hyqmROlMQ>

Optional, for families who want to start a real sourdough starter. It takes about a week of daily feeding.

KEY TERMS

yeast

A living fungus, too small to see one at a time, that eats sugar and gives off carbon dioxide gas.

fermentation

The work yeast and bacteria do as they eat sugars and make gas, acids and flavor.

leaven

An old word for anything that makes dough rise, especially a piece of sour, bubbly dough saved from the last batch.

sourdough starter

A living mix of flour and water full of wild yeast and friendly bacteria, fed and kept going to raise bread.

lactic acid bacteria

Friendly bacteria in sourdough and yogurt that make tangy acids.

CORE IDEAS

The story. In January 1848, gold was found at Sutter’s Mill in California, and in 1849 tens of thousands of people rushed west to dig for it. There were few stores and no packets of yeast. Many miners carried a pot of **sourdough starter**, a bubbling mix of flour and water saved from the last batch, and used it to raise their bread, biscuits and flapjacks. On cold nights some kept the pot close to their bodies so the starter would not freeze. In 1849 a baker named Isidore Boudin began baking sourdough bread in San Francisco, and his bakery is still baking today. Fifty years later, prospectors in the Klondike gold rush in Canada and Alaska carried starter too, and old-timers there were called “sourdoughs.”

How they figured it out. For thousands of years bakers saved a lump of **leaven** from each batch without knowing why it worked. In the late 1850s the French scientist Louis Pasteur showed that fermentation is the work of living yeast cells, not a chemical accident. A century later, in 1971, scientists at a U.S. Department of Agriculture laboratory in Albany, California, studied San Francisco sourdough under the microscope. They found a wild yeast working together with a kind of lactic acid bacteria, which they named after the city: *Lactobacillus sanfranciscensis*. The yeast makes the bread rise; the bacteria make it tangy.

The kitchen science. Yeast is a tiny fungus, a living thing God made. When it is warm and wet and has sugar to eat (from the flour), it grows and gives off bubbles of **carbon dioxide**. Stretchy wheat protein (gluten) traps the bubbles, and the dough or batter rises. Cold slows yeast down, which gives it more time to make flavor. In a sourdough starter, friendly bacteria also eat the flour’s sugars and make lactic and acetic acids, which give the sour taste. The heat of baking or cooking ends the yeast’s work and sets the bubbles in place.

Let's cook. You will mix a yeast batter the night before, let it ferment slowly in the refrigerator, and cook tangy, fluffy pancakes in the morning, a quick cousin of the miners' sourdough flapjacks. The skills to do well are **checking the water temperature** for the yeast and **cooking on a griddle** with an adult beside you, flipping when bubbles pop and stay open.

PICTURE STUDY



Woman Baking Bread, Jean-François Millet, 1854 · Oil on canvas · Kröller-Müller Museum, Otterlo, Netherlands

Image: [Wikimedia Commons](#), public domain

Jean-François Millet painted French farm families at their daily work. Here a woman slides loaves of bread into a big brick oven heated by a wood fire. Her bread was raised with leaven saved from the last baking, just like the miners' sourdough.

Look closely

- Find the oven's opening. How hot do you think it is in there?
- Find the long wooden paddle. Why does she use it instead of her hands?
- Look at the woman's arms and face. How hard is this work?
- Look for the loaves. How many might she bake at once?

Talk about it

1. What made this woman's bread rise before it went in the oven?
2. Why would a family bake many loaves at once in a big oven?
3. Jesus said the kingdom of heaven is like leaven hidden in meal. What does a little leaven do to a whole batch of dough?

Safety first. An adult stands beside you at the griddle; use a long spatula, turn the handle in, and use only a thin film of butter or oil. Never taste uncooked batter (uncooked flour and eggs can carry germs). Check warm water for the yeast with a thermometer or your wrist: warm, not hot.

The Balloon Test and Overnight Yeast Pancakes

You will prove yeast is alive with a balloon test, then mix a yeast batter in the evening, keep a rise log, and cook tangy pancakes in the morning.

You will need

- Two small clean plastic bottles and two balloons
- A large bowl (the batter will grow), plastic wrap and masking tape
- An instant-read thermometer
- A large griddle or skillet and a wide spatula
- A ladle or $\frac{1}{4}$ -cup measure, measuring cups and spoons

OVERNIGHT YEAST PANCAKES (SOURDOUGH-STYLE)

Serves 4–6 (about 16 pancakes) · Evening: 10 min · Rest overnight · Morning: Cook 20 min

Ingredients

- **Evening:** 2 cups (250 g) all-purpose flour (or 1 cup whole-wheat and 1 cup all-purpose)
- 2 tablespoons sugar
- $2\frac{1}{4}$ teaspoons (1 packet) instant or active dry yeast
- 2 cups (480 mL) milk, warmed to about 105–110 °F (40–43 °C)
- **Morning:** 2 large eggs
- 3 tablespoons melted butter or oil, plus a little for the griddle
- $\frac{1}{2}$ teaspoon salt
- $\frac{1}{2}$ teaspoon baking soda

Method

1. **Evening.** Wash your hands. With an adult beside you, warm the milk in a saucepan or microwave and check it with the thermometer: 105–110 °F, warm like a bath.
2. In the large bowl, stir the flour, sugar and yeast. Pour in the warm milk and stir until smooth. The batter will be thick.

3. Cover the bowl with plastic wrap, mark the top of the batter with tape on the outside, and refrigerate overnight (8–12 hours).
4. **Morning.** The batter will be bubbly and taller, with a tangy smell. Whisk in the eggs, melted butter and salt. Wash your hands after the eggs.
5. Sprinkle the baking soda over the batter and stir gently. Watch it foam: the soda reacts with the acids the yeast and bacteria made.
6. With an adult beside you, heat the griddle over medium heat and brush with a thin film of butter. Pour $\frac{1}{4}$ -cup scoops of batter.
7. Cook until bubbles pop on top and stay open and the edges look dry, 2–3 minutes. Flip with the spatula, away from you, and cook 1–2 minutes more until golden and cooked through.
8. Serve with fruit, yogurt or a little maple syrup. Clean up: wash the bowl, griddle and spatula.

Allergy check: Contains wheat (flour), milk (milk, butter) and eggs. For milk-free, use oat milk and oil. Gluten-free flour does not rise well with yeast; for wheat-free, use a gluten-free pancake recipe instead.

Steps

1. **Balloon test.** In bottle A, put 1 teaspoon yeast, 1 teaspoon sugar and $\frac{1}{2}$ cup warm water. In bottle B, put 1 teaspoon yeast and $\frac{1}{2}$ cup warm water with no sugar. Stretch a balloon over each neck. Check after 15, 30 and 45 minutes. Which balloon grew? Why?
2. **Rise log.** Mark the batter's height at bedtime and measure how far above the tape it is in the morning. Smell it and describe the smell.
3. **Predict.** What will happen when you stir in the baking soda?
4. Cook the pancakes. Cut one open and look for the holes the gas left behind.
5. **Taste test.** Rate the pancakes from 1 to 5 for fluffiness and tang. Compare with regular pancakes if you have had them this year.
6. **Improve it.** Write one change (half whole-wheat flour, blueberries, a longer rest for more tang).
7. Clean up.

Tips

- Milk that is too hot (above 130 °F) can kill the yeast. Check it with the thermometer.
- The first pancake is often a practice pancake. Adjust the heat after it.
- Leftover pancakes freeze well. Reheat them in the toaster.

Check your work

- ☐ I can explain that yeast is alive and how it makes bubbles.
- ☐ I can tell how the Gold Rush miners kept sourdough and what makes sourdough tangy.
- ☐ I kept a rise log and cooked pancakes on a griddle with an adult beside me.

COOK'S NOTEBOOK

1. Draw your two balloon bottles and explain the difference.
2. Draw a miner's sourdough pot and write what was living inside it.
3. Write your rise log and copy the pancake recipe in your own words.

From history. Some families have kept the same sourdough starter alive for many years by feeding it flour and water and saving a little from every batch. A starter can be shared: give a spoonful to a friend, and it grows into a whole new pot.

COMMON MISTAKES

- Using hot milk. Very hot liquid can kill yeast; warm like a bath is right.
- Tasting the uncooked batter. Uncooked flour and eggs can carry germs.
- Flipping pancakes too soon. Wait until bubbles pop and stay open and the edges look dry.

Make it a game • Starter Story Chain. Tell a story chain with your parent about a Gold Rush prospector keeping sourdough starter warm. You each add one sentence, and every sentence must include a fact: yeast is alive, it eats sugar, it makes carbon dioxide, Pasteur proved it, lactic acid bacteria make it tangy. Whoever runs out of facts first helps wash the dishes.

Scripture. “Another parable spake he unto them; The kingdom of heaven is like unto leaven, which a woman took, and hid in three measures of meal, till the whole was leavened.” (Matthew 13:33, KJV)

A little leaven quietly works through a whole bowl of dough until all of it rises. Jesus used this kitchen picture to show how God's kingdom grows from small beginnings.

FOOD CHEMISTRY

Every recipe is a little chemistry experiment. In this unit you will meet the ingredients that do the most work. You will watch **starch** grains swell and thicken a pan of gravy, shake **oil and vinegar** into an emulsion for a pasta salad, and see **baking soda and baking powder** make bubbles that lift a batch of biscuits, the leavening that Eben Horsford of Harvard helped bring to every American kitchen.

Last, you will meet a living ingredient. **Yeast** is a tiny fungus that eats sugar and breathes out the gas that makes bread rise, and in a sourdough starter it works alongside friendly bacteria that make bread tangy. You will hear how the prospectors of the California Gold Rush guarded their sourdough, and how Jesus compared the kingdom of heaven to leaven working through dough (Matthew 13:33).

PREREQUISITES

- Measures dry and liquid ingredients with cups and spoons (Units 1–4)
- Uses the stove and oven only with an adult beside, pot handles turned in and oven mitts on (Units 1–4)
- Cooks chicken to 165 °F and egg dishes to 160 °F and checks with a thermometer (Unit 1)
- Knows conduction and how heat moves into food (Unit 4)

MASTERY CHECKLIST

- ☐ I can explain how starch granules soak up water and swell to thicken a gravy, and why a cold slurry prevents lumps.
- ☐ I can explain why oil and vinegar separate and how mustard helps hold an emulsion together.
- ☐ I can explain how baking soda and baking powder make carbon dioxide bubbles, and tell the story of Eben Horsford.
- ☐ I can explain that yeast is alive, how it makes bread rise, and how a sourdough starter works.
- ☐ I can never taste uncooked dough or batter, and I can explain why.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **King Arthur Baking: Learn to bake guides:** Free step-by-step baking guides with photographs, from the King Arthur Baking Company. Helpful for the biscuits and the yeast pancakes in Lessons 5.3–5.4.
- **A pastry blender or a box grater:** Optional. Either one makes it easier to work cold butter into flour for biscuits. Two table knives or your fingertips also work.
- **Balloons and small clean bottles:** For the yeast balloon test in Lesson 5.4.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

5.1 Starch and a Smooth Gravy	2 sessions of 45–60 minutes
5.2 Oil and Vinegar: An Emulsion	2 sessions of 45–60 minutes
5.3 Baking Soda, Baking Powder and Eben Horsford	2 sessions of 45–60 minutes
5.4 Sourdough and the Gold Rush	2 sessions of 60–90 minutes

UNIT 5 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. **5 pts**
What is gelatinization?
2. **5 pts**
Predict: you dump a spoonful of dry cornstarch into hot broth, and stir another spoonful into cold water first. What happens to each?
3. **5 pts**
Why do oil and vinegar separate?
4. **5 pts**
What does an emulsifier do? Name two.

5. (5 pts)

What gas makes biscuits and pancakes rise, and how do baking soda and baking powder make it?

6. (5 pts)

Who was Eben Horsford, and why did baking powder matter to home cooks?

7. (5 pts)

Why should the butter be cold for biscuits?

8. (5 pts)

Predict: one bottle has yeast, sugar and warm water, and another has only yeast and warm water, each with a balloon on top. What happens?

9. (5 pts)

What two kinds of living things work in a sourdough starter, and what does each do?

10. (5 pts)

Why should you never taste uncooked dough or batter?

ANSWER KEY

1. When starch granules are heated in liquid, soak up water, swell and release long chains that tangle and thicken the liquid.
2. The dry cornstarch makes lumps because the outside of each clump thickens and traps dry powder inside. The slurry thickens the broth smoothly because every granule is wet and separate before it heats.
3. Water molecules cling to each other and oil molecules cannot fit in, so they push apart and the lighter oil floats on top.
4. It coats oil droplets, with one end liking oil and one liking water, so the droplets cannot join. Mustard and egg yolk (lecithin).
5. Carbon dioxide. Baking soda makes it when it meets an acid in a wet batter; baking powder contains soda and a dry acid, so it makes gas when wet and again when hot.
6. A Harvard chemistry professor who developed a phosphate baking powder in the 1850s–1860s with the Rumford Chemical Works. Cooks no longer had to guess how much acid to add, so quick breads came out right every time.
7. Cold pieces of butter melt in the oven and turn to steam, puffing the dough into flaky layers.
8. The balloon on the bottle with sugar grows, because the yeast eats the sugar and gives off carbon dioxide. The other barely changes.
9. Wild yeast makes carbon dioxide so bread rises; lactic acid bacteria make acids that give the sour, tangy taste.
10. Uncooked flour and uncooked eggs can carry germs that make people sick.

UNIT CHALLENGE: THE BISCUIT LAB

Bake three small batches of biscuits (half the recipe each), changing only one thing each time: for example, cold butter versus soft butter, folded versus not folded, or baking powder versus no baking powder. An adult is beside you at the oven every time.

Measure the height of three biscuits from each batch, photograph a biscuit from each broken open, and hold a family taste test. Make a chart of your results and write which change made the biggest difference and why, using the words carbon dioxide and steam.

LOOK FOR	WHAT IT MEANS
Fair test	Only one thing changed between batches; everything else measured the same.
Safety and cleanliness	Hands washed, no uncooked dough tasted, adult beside at the oven, kitchen cleaned.
Measurements and records	Heights measured and charted; photos or sketches of each batch; family ratings.
Explanation	A clear explanation of the results using carbon dioxide, steam and leavening.
Improvement	A best recipe written down with one more improvement to try.

UNIT 6

CRAVINGS, REWARD & A BALANCED DIET

God made us able to enjoy sweet, salty and rich foods, and He gave us feasts and treats as good gifts. He also gave us minds that can learn, choose and wait. In this unit you will learn why sweet foods taste so good, how your brain learns to *want* foods, and why some snack foods are easy to keep eating after you are full.

You will hear about Walter Mischel's famous "marshmallow test" and practice the skill of waiting well. You will learn to read the Nutrition Facts label and find the added sugar, and you will plan a week of filling snacks with fiber, protein and water. Along the way you will cook with less sugar and discover that your taste buds can learn to love it. In this course we call foods "everyday foods" and "sometimes foods," and we never talk about bodies, only about wise, thankful habits.

PREREQUISITES

- Knows the five food groups and what they do (Unit 2)
- Knows the five basic tastes (Unit 3)
- Uses the stove and oven only with an adult beside (Units 1-5)
- Reads an ingredient list for allergens (Unit 1)

MASTERY CHECKLIST

- ☐ I can explain that God made us able to enjoy sweet foods, and that even newborn babies prefer sweet tastes.
- ☐ I can explain, simply, how the brain learns to want foods, and why it takes about 20 minutes to feel full.
- ☐ I can tell about the marshmallow test and name ways to wait well.
- ☐ I can find the added sugars on a Nutrition Facts label and change grams into teaspoons (4 grams $\approx$ 1 teaspoon).
- ☐ I can plan snacks with fiber, protein and water that keep me satisfied, and enjoy treats in their place.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **FDA: The Nutrition Facts Label:** Free. The U.S. Food and Drug Administration's guides and activity sheets for reading the label, including materials for children. Use with Lesson 6.3.
- **A teaspoon and a small bowl of sugar:** For the sugar-spoon display in Lesson 6.3. Return the sugar to the canister afterward.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

6.1	Why We Crave Sweet Foods	2 sessions of 45–60 minutes
6.2	Walter Mischel's Marshmallow Test	2 sessions of 45–60 minutes
6.3	The Nutrition Facts Label	2 sessions of 45–60 minutes
6.4	Snack Planning: Full and Satisfied	2 sessions of 45–60 minutes

UNIT 6 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

What did Jacob Steiner's photographs of newborn babies show?

2. 5 pts

What does dopamine do in the brain's reward system?

3. 5 pts

About how long does it take for your brain to get the message that you are full?
What does that mean for seconds?

4. 5 pts

Predict: a family eats less added sugar for three weeks. How might a plain apple taste to them afterward?

5. **5 pts**

Describe the marshmallow test. Name two strategies children used to wait.

6. **5 pts**

What did the 2012 University of Rochester study add about waiting?

7. **5 pts**

A drink label says 32 grams of added sugar per serving and 2 servings per bottle. How many teaspoons of added sugar are in the whole bottle?

8. **5 pts**

When did the Added Sugars line come to the Nutrition Facts label, and why is it helpful?

9. **5 pts**

Which three things in food help you feel full longest? Give a food for each.

10. **5 pts**

Plan one after-school snack with a fiber food and a protein food, and explain why it is a good choice.

ANSWER KEY

1. Babies only hours old relaxed and seemed to want more when given a sweet taste, and frowned at bitter, showing that liking sweet is present from birth.
2. It is a messenger tied to wanting and looking forward to something good; it helps the brain learn what to seek out again.
3. About 20 minutes. It is wise to eat slowly and wait before taking seconds.
4. Sweeter, because taste buds adjust to less added sugar in a few weeks.
5. A child could eat one treat now or wait until the grown-up returned to get two. Any two: covering eyes, turning away, singing, playing, imagining the treat was something else.
6. Children waited much longer when the grown-up had kept earlier promises: trust makes waiting easier.
7. $32 \times 2 = 64$ grams; $64 \div 4 = 16$ teaspoons.
8. In 2016. It separates sugar added by the maker from sugar naturally in fruit and milk, so families can see hidden sugar.
9. Fiber (oatmeal, apples, beans, vegetables), protein (eggs, cheese, yogurt, beans, fish) and water (fruit, vegetables, soup).
10. Answers vary; for example, an apple with cheese or hummus with carrots. The fiber and protein help you stay satisfied until dinner.

UNIT CHALLENGE: A ONE-WEEK DRINK AND SNACK SWAP

For one week, swap one sweetened drink or sweet snack each day for water, milk or a planned fiber-and-protein snack. Make the swap snacks yourself, including at least one recipe from this unit.

Keep a daily log: what you swapped, what you ate instead, how long it kept you satisfied, and what you noticed about how sweet foods tasted. At the end of the week, write a short report: what was easy, what was hard, what your taste buds noticed, and which swaps you will keep, with a treat planned in its place.

LOOK FOR	WHAT IT MEANS
Planning	A written plan of seven swaps with at least one homemade snack recipe.
Daily log	Seven honest daily entries with swaps, snacks and how long each kept you satisfied.
Cooking and safety	Snacks prepared with clean hands, safe knife and appliance use and an adult nearby; kitchen cleaned.
Reflection	A short report on what was learned, what tasted different, and which habits to keep, with treats enjoyed in their place.

6.1 WHY WE CRAVE SWEET FOODS

OBJECTIVES

- Tell how Jacob Steiner's photographs of newborn babies showed that people prefer sweet tastes from birth.
- Explain, simply, how the brain learns to want foods, and why waiting 20 minutes helps you notice when you are full.
- Bake a fruit crisp with half the usual sugar and rate how sweet it tastes before and after a week of less added sugar.

Warm-up. Rate how much you want each of these right now, from 1 to 5: an apple, a cookie, a carrot, a piece of candy, a slice of bread. Now think: why might your numbers be different before dinner and after dinner?

WATCH

The Science Behind Why Kids Love Sweets

Eater • 1:33

<https://www.youtube.com/watch?v=9T-emjj19Y8>

WHEN TO WATCH

After the kitchen science. Listen for why children like sweeter tastes than grown-ups do.

Note: A short explainer about research at the Monell Chemical Senses Center on children and sweet taste.

BACKUP VIDEO

Easy Blueberry Crisp Recipe

Preppy Kitchen • 6:20

<https://www.youtube.com/watch?v=Kj6Mj3ocf10>

Before Session 2. Watch how the crisp topping is mixed and spread over the fruit.

KEY TERMS

craving

A strong wanting for a particular food.

dopamine

A messenger chemical in the brain tied to wanting and looking forward to something good. It helps us learn what to seek out.

added sugar

Sugar or syrup put into a food when it is made, not the sugar that is naturally in fruit or milk.

reward system

Parts of the brain that help us learn what is good and want it again.

full (satisfied)

The feeling that you have eaten enough. Your stomach takes about 20 minutes to send the message to your brain.

CORE IDEAS

The story. In the 1970s a scientist in Jerusalem, Jacob Steiner, wanted to know whether liking sweet food is something babies learn or something they are born with. With their parents' permission, he placed a tiny drop of sweet, sour or bitter liquid on the tongues of newborn babies, only hours old, before they had ever been fed, and photographed their faces. At a drop of sweet, the babies' faces relaxed and they sucked as if they wanted more. At sour, they pursed their lips. At bitter, they frowned and pushed it out.

How they figured it out. Steiner and other scientists who repeated his work concluded that liking sweet tastes is present from birth. God made us able to enjoy sweet foods like ripe fruit, honey and milk, which give us energy to grow. Later, brain scientists learned that when we expect or get something good, the brain releases a messenger called **dopamine**. Dopamine is not "pleasure" itself. It is more like a highlighter that says, "Remember this, and look for it again." That is how the brain *learns to want* foods we have enjoyed.

The kitchen science. Because our brains learn, what we eat often shapes what we want. If we eat lots of very sweet foods, plain fruit can taste less sweet. If we cut back on added sugar for a few weeks, our taste buds adjust, and fruit tastes sweeter again. Your stomach also needs time: it takes about **20 minutes** after you start eating for

your brain to get the “I’m satisfied” message. Eating slowly, and waiting a bit before seconds, helps you notice it. Fruit is sweet and also brings fiber and water, which help you feel full. A sweet dessert is a good gift, enjoyed in its place.

Let’s cook. You will bake an apple-berry crisp with half the sugar of many recipes and a crunchy oat topping. The skills to do well are **slicing apples** with the claw grip and **tasting thoughtfully**: slowly, with attention to how sweet it really is. An adult stands beside you at the oven.

PICTURE STUDY



Basket of Wild Strawberries, Jean-Siméon Chardin, about 1761 · Oil on canvas · Private collection

Image: [Wikimedia Commons](#), public domain

Chardin painted this basket of wild strawberries when he was an old man. Wild strawberries are tiny and very sweet, and in France they were gathered by hand from the woods. He piled them into a little mountain and set beside them a plain glass of water.

Look closely

- Find the strawberries. How are they stacked? How many do you think are in the basket?
- Find the glass of water. How did Chardin show that it is clear?
- Find the peaches and the cherry. What other sweet fruits would you add?
- Find the white flowers. What do they add to the picture?

Talk about it

1. These strawberries are sweet with sugar God put in them. How is a bowl of strawberries different from a bowl of candy?
2. Why do you think Chardin put a glass of water next to the fruit?
3. How could you serve fresh fruit as a dessert that feels special, like this painting?

Safety first. Slice apples only with an adult right beside you, using the claw grip on a board with a damp towel under it. An adult stands beside you at the 375 °F oven; the bubbling fruit is very hot, so let the crisp cool 15 minutes before serving.

KITCHEN PROJECT

Half-Sugar Apple-Berry Crisp

You will bake a fruit crisp with less sugar, rate how much you want a dessert before and after eating, and plan a one-week experiment to see whether your taste buds adjust.

You will need

- An 8-inch square or 9-inch round baking dish
- A cutting board, a damp towel, a small knife and a vegetable peeler
- Two mixing bowls, a fork and measuring cups and spoons
- Oven mitts, a trivet and a timer

HALF-SUGAR APPLE-BERRY CRISP

Serves 6–8 • Prep 20 min • Bake 35–40 min

Ingredients

- **Fruit:** 4 medium apples (about 1½ pounds / 680 g)
- 2 cups (280 g) berries, fresh or frozen
- 1 tablespoon lemon juice
- 2 tablespoons sugar
- 1 tablespoon cornstarch
- 1 teaspoon cinnamon
- **Topping:** 1 cup (90 g) old-fashioned oats
- ½ cup (60 g) all-purpose or whole-wheat flour
- 3 tablespoons brown sugar
- ½ teaspoon cinnamon and a pinch of salt
- 4 tablespoons (55 g) butter, melted

Method

1. An adult heats the oven to 375 °F (190 °C). Wash your hands and rinse the fruit.

2. Peel the apples. With an adult right beside you, cut each into quarters, cut out the core, lay each quarter flat and slice thinly with the claw grip.
3. In the baking dish, toss the apples and berries with the lemon juice, sugar, cornstarch and cinnamon.
4. In a bowl, stir the oats, flour, brown sugar, cinnamon and salt. Pour in the melted butter and mix with a fork until crumbly.
5. Sprinkle the topping evenly over the fruit.
6. With an adult beside you, bake 35–40 minutes, until the fruit bubbles at the edges and the topping is golden.
7. An adult sets the dish on a trivet. Cool at least 15 minutes. Serve with a spoonful of plain yogurt if you like.
8. Clean up: wash the bowls, board and peeler and wipe the counter.

Allergy check: Contains wheat (flour) and milk (butter). For wheat-free, use certified gluten-free oats and oat flour; for milk-free, use coconut oil or a plant-based butter. Oats may be processed with wheat; check the label.

Steps

1. **Wanting scale.** Before dinner, rate how much you want dessert from 1 to 5. After dinner and a small serving of crisp, eaten slowly, rate it again 20 minutes later. Did the number change?
2. **Sweetness rating.** Rate how sweet the crisp tastes from 1 to 5. Ask your family to rate it too. Did anyone notice it had less sugar?
3. **One-week experiment.** For one week, choose fruit instead of one sweet snack each day, and skip sweetened drinks. At the end of the week, taste an apple slice and rate its sweetness again. Write what you notice.
4. **Improve it.** Write one change (a different fruit, more cinnamon, a sprinkle of chopped nuts).
5. Clean up.

Tips

- Cinnamon and vanilla make food seem sweeter without adding sugar.
- Very ripe fruit is sweeter and needs less added sugar.
- Leftover crisp makes a fine breakfast with yogurt.

Check your work

- ☐ I can tell about Jacob Steiner's newborn-taste study.
- ☐ I can explain how the brain learns to want foods and why waiting 20 minutes helps.
- ☐ I baked a half-sugar crisp and recorded how sweet it tasted.

COOK'S NOTEBOOK

1. Draw three baby faces: sweet, sour and bitter. Label each.
2. Make a chart of your wanting scale before and after dessert, and your apple-sweetness rating before and after the one-week experiment.
3. Copy the crisp recipe in your own words and circle the sugar amounts.

COMMON MISTAKES

- Thinking dessert is bad. Sweet foods are good gifts; the question is how much and how often.
- Eating seconds right away. Wait about 20 minutes and see if you are still hungry.
- Thinking a recipe must have lots of sugar to taste good. Ripe fruit and spices bring plenty of sweetness.

Make it a game • Baby Taste Test Charades. Act out a baby tasting something sweet, then something sour, and have your parent guess the taste. Explain why Jacob Steiner's photographs showed that babies prefer sweet. Then play the twenty-minute pause: eat slowly for five minutes and say how your stomach feels. Name three foods with added sugar and three without.

Scripture. "More to be desired are they than gold, yea, than much fine gold: sweeter also than honey and the honeycomb." (Psalm 19:10, KJV)

The psalmist compared God's words to the sweetest thing he knew, honey from the comb. God made sweetness good, and He made His Word sweeter still.

6.2 WALTER MISCHEL'S MARSHMALLOW TEST

OBJECTIVES

- Tell the story of the marshmallow test at Stanford's Bing Nursery School in the late 1960s and early 1970s.
- Name strategies that help people wait for something better, and connect waiting well to the fruit of the Spirit called temperance (self-control).
- Make a marshmallow crispy treat that must set before it can be cut, and practice waiting well.

Warm-up. Think of a time you had to wait for something you really wanted: a birthday, a trip, a meal. What helped you wait? What made waiting harder? Write two ideas for each.

WATCH

The Marshmallow Test | Igniter Media | Church Video

Igniter Media · 3:28

https://www.youtube.com/watch?v=QX_oy9614HQ

WHEN TO WATCH

After the story. Watch what each child does to try to wait.

Note: A re-creation of the marshmallow test with children, made by Igniter Media, a producer of church videos.

BACKUP VIDEO

Walter Mischel - The Marshmallow Test

The Brainwaves Video Anthology · 4:22

<https://www.youtube.com/watch?v=XcmrCLL7Rtw>

Optional, for parents and older students: Walter Mischel himself explains his study.

KEY TERMS

self-control

Choosing what is best even when you want something else right now. The King James Bible calls it temperance.

delayed reward

A bigger or better good that comes if you wait.

strategy

A plan for doing something hard well.

trust

Believing that someone will keep his or her word.

CORE IDEAS

The story. In the late 1960s and early 1970s, a psychologist named Walter Mischel ran a simple experiment with four- and five-year-olds at the Bing Nursery School at Stanford University in California. A child sat at a table with a treat, such as a marshmallow, a cookie or a pretzel. The grown-up said: “I have to leave the room for a while. You may eat this one now. But if you wait until I come back, you can have two.” Then the grown-up left, sometimes for up to 15 minutes.

How they figured it out. Some children ate the treat right away. Others waited. Mischel and his team watched what the waiters did. They covered their eyes, turned their chairs around, sang songs, kicked the table, or pretended the marshmallow was a cotton ball or a cloud. Children who kept their eyes and minds off the treat waited much longer. Later scientists added an important discovery: in 2012, researchers at the University of Rochester found that children waited much longer when the grown-up had kept earlier promises. Waiting is easier when we trust the one who promised.

The kitchen science. When you see or smell a treat, your brain’s reward system lights up with *wanting*. The closer and more tempting it is, the stronger the pull. That is why the strategies work: putting food out of sight, keeping your hands busy and thinking about something else turn the wanting down. In the kitchen, waiting is often part of the recipe: dough must rise, gravy must thicken, and treats must set. Self-control is a fruit of the Spirit (Galatians 5:23), and like every skill it grows with practice.

Let’s cook. You will make marshmallow crispy treats, a sometimes food that must cool and set for an hour before it can be cut neatly. The skills to do well are **melting**

over low heat, stirring the whole time with an adult beside you, and waiting well while it sets.

PICTURE STUDY



Saying Grace, Jean-Siméon Chardin, 1740 · Oil on canvas · Musée du Louvre, Paris

Image: [Wikimedia Commons](#), public domain

Chardin painted a mother serving dinner to her two little daughters. The food is on the table and smells good, but the children wait. The youngest is saying grace, and her mother and sister watch and listen.

Look closely

- Find the youngest child. What are her hands doing?
- Find the food on the table. Is it hot? Is it ready to eat?
- Look at the mother's face. Is she hurrying the child or waiting patiently?
- Find the older sister. What is she doing while she waits?

Talk about it

1. Why do we wait to say grace before eating, even when we are hungry?
2. How is waiting to give thanks like the children in the marshmallow test?
3. What helps you wait patiently at the table?

Safety first. An adult stands beside you at the stove; melt the butter and marshmallows over low heat and stir constantly, because melted marshmallow is very hot and sticky and can burn skin. Let it cool before touching it. These treats contain gelatin; families who avoid gelatin can use a gelatin-free marshmallow.

Wait for It: Marshmallow Crispy Treats

You will make a pan of crispy treats, then practice waiting well while they set for an hour, trying out the strategies the children in Mischel's study used.

You will need

- A large pot and a heat-proof spatula
- A 9 × 13-inch pan, lightly buttered, and a sheet of wax paper
- Measuring cups
- A timer and a knife for cutting (after setting)

MARSHMALLOW CRISPY TREATS

Serves 24 small squares · Prep 10 min · Cook 5 min · Set 1 hr

Ingredients

- 3 tablespoons butter
- 1 (10-ounce / 283 g) bag mini marshmallows (about 6 cups)
- 6 cups crisp rice cereal
- ½ teaspoon vanilla extract and a pinch of salt

Method

1. Wash your hands. Butter the pan and measure the cereal into a large bowl so it is ready.
2. With an adult beside you, melt the butter in the large pot over low heat.
3. Add the marshmallows and stir constantly with the spatula until completely melted and smooth, 3–4 minutes. Do not turn up the heat.
4. Turn off the heat. Stir in the vanilla and salt, then the cereal, folding until every piece is coated.
5. Scrape the mixture into the pan. Lay the wax paper on top and press it down gently and evenly with your hands. Do not pack it hard.
6. Wait at least 1 hour at room temperature for the treats to set.

7. Cut into 24 small squares. Clean up: fill the pot with hot water right away to soak off the marshmallow, then wash it.

Allergy check: Contains milk (butter). Check the cereal label (some crisp rice cereals contain wheat or barley malt) and the marshmallow label. For milk-free, use a plant-based butter.

Steps

1. **Waiting strategies.** Before you start, write three strategies you will use while the treats set (for example: cover the pan, go outside, read a book, help with the dishes).
2. Make the treats and set a timer for 1 hour.
3. **Waiting log.** Every 15 minutes, write how much you want a treat (1 to 5) and which strategy you are using. Which one helped most?
4. **Compare.** Cut one corner piece at 15 minutes (with permission) and one at 1 hour. How are they different? Why does waiting make better squares?
5. **Share.** Serve the squares as a sometimes food after a meal or for a special occasion, and give some away.
6. **Improve it.** Write one change (a little less butter, a sprinkle of salt on top, whole-grain cereal).
7. Clean up.

Tips

- Low heat is the secret. High heat makes the marshmallow tough and the treats hard.
- Butter your hands or the spatula lightly so the mix does not stick.
- Pressing too hard makes the treats dense. Press gently.

Check your work

- ☐ I can tell the story of the marshmallow test and what helped children wait.
- ☐ I can name three strategies for waiting well.
- ☐ I made crispy treats with an adult beside me and waited for them to set.

COOK'S NOTEBOOK

1. Draw a comic strip of a child in the marshmallow test using a waiting strategy.
2. Write your waiting log and circle the strategy that worked best.

3. Copy the recipe in your own words and write one sentence about why some recipes need waiting.

From history. Marshmallows were once made from the root of the marsh mallow plant, which grows in wet, marshy ground near the sea. Today they are made of sugar, corn syrup and gelatin whipped full of air.

COMMON MISTAKES

- Melting marshmallows over high heat. They scorch and the treats turn hard.
- Cutting the treats before they set. They fall apart.
- Thinking self-control means never enjoying treats. It means enjoying them at the right time and in the right amount.

Make it a game • Waiting Strategies Game. Place one cracker in front of you and set a timer for two minutes. Your goal is to wait for the second cracker. Try a strategy each time, such as covering your eyes, singing, or thinking of something else. Count how many strategies you can name. Then say what temperance means and how it connects to the fruit of the Spirit.

Scripture. “But the fruit of the Spirit is love, joy, peace, longsuffering, gentleness, goodness, faith, Meekness, temperance: against such there is no law.” (Galatians 5:22-23, KJV)

Temperance is the old word for self-control. It grows in us like fruit, by God’s Spirit, as we practice choosing what is best.

6.3 THE NUTRITION FACTS LABEL

OBJECTIVES

- Tell how the Nutrition Facts label began (a 1990 law, labels on packages in 1994) and when the Added Sugars line was added (2016).
- Read a label for serving size, fiber, protein and added sugars, and change grams of sugar into teaspoons (4 grams $\approx$ 1 teaspoon).
- Bake homemade granola bars and compare their label numbers with a store-bought bar.

Warm-up. Take a box of cereal and a granola bar from your pantry. Find the Nutrition Facts box on each. What is the first line you see? What is the serving size? Is one serving the whole package?

WATCH

Nutrition Facts Labels - How to Read - For Kids - Dr. Smarty

DrSmarty · 4:30

<https://www.youtube.com/watch?v=yly0w04AAVk>

WHEN TO WATCH

After the story, with a label in your hand. Pause to find each part on your own package.

Note: A cartoon review of the label. It mentions the food-energy line at the top of the label; in this course we focus on serving size, fiber, protein and added sugars.

KEY TERMS

Nutrition Facts label

The box on packaged food that tells the serving size and how much of each nutrient is in one serving.

serving size

The amount of food that all the numbers on the label are for, such as 1 cup or 2 bars.

gram (g)

A small unit of weight. A paper clip weighs about 1 gram.

fiber

The part of plant foods the body cannot digest. It helps you feel full and keeps your digestion healthy.

added sugars

Sugars and syrups put into a food when it was made. The label lists them on their own line.

CORE IDEAS

The story. Before the 1990s, many packaged foods did not tell shoppers what was inside them in a way that was easy to compare. In 1990 Congress passed the Nutrition Labeling and Education Act, and by 1994 most packaged foods in America carried the same black-and-white **Nutrition Facts** box. In 2016 the U.S. Food and Drug Administration (FDA) updated the label: the serving sizes became more realistic, and a new line was added for **added sugars**, so families could tell the sugar naturally in fruit and milk from sugar added by the maker.

How they figured it out. Nutrition scientists and doctors had learned that most Americans ate more added sugar than was good for them, often without knowing it, because it was hidden in drinks, cereals, sauces and snack bars. The *Dietary Guidelines for Americans* advise keeping added sugars to less than one-tenth of what we eat each day. The new label line made the hidden sugar easy to see. A simple rule turns grams into something you can picture: **4 grams of sugar is about 1 teaspoon.**

The kitchen science. Read a label from the top. First, the **serving size**: every number below is for one serving, and a package may hold two or more. Then look for the nutrients that help you feel full and strong: **fiber** and **protein**. Then find **added sugars**. Divide the grams by 4 to find the teaspoons. A drink with 40 grams of added sugar has about 10 teaspoons. When you bake at home, you choose how much sugar goes in, and you can make bars with oats, seeds and fruit that bring fiber and protein along with the sweetness.

Let's cook. You will bake chewy oat granola bars, sweetened with a little honey and dried fruit, and then work out how much added sugar is in one of your bars

compared with a store bar. The skills to do well are **measuring sticky ingredients** (oil the cup first) and **pressing the mix firmly** so the bars hold together.

PICTURE STUDY



Inside a Piggly Wiggly Grocery Store, Photographer for Clarence Saunders, 1918 · Photograph · Library of Congress, Washington, D.C.

Image: [Wikimedia Commons](#), public domain

In 1916 Clarence Saunders opened the first Piggly Wiggly in Memphis, Tennessee, the first grocery store where shoppers took food from the shelves themselves instead of asking a clerk. This photograph shows a Piggly Wiggly store around 1918, long before Nutrition Facts labels. Shoppers chose food by the brand name and the picture on the can.

Look closely

- Find the stacks of sacks in front. What do you think is inside? Find their price tags.
- Find the cans and boxes on the shelves. What information could a shopper read on them?
- Follow the aisles with your eyes. Why would a self-service store need aisles?
- Find the date and name written at the bottom of the photograph.

Talk about it

1. What would a shopper in this store have wanted to know that the labels did not tell?
2. How does a Nutrition Facts label help a family today?

3. If you could add one line to every food label, what would it be?

Safety first. An adult stands beside you when the pan goes in and out of the oven; wear oven mitts. Let the bars cool completely before cutting with a knife, with an adult beside you. Honey is never given to babies under one year old.

Label Detective: Homemade Granola Bars

You will make a sugar-spoon display from real labels, bake a pan of granola bars, and figure out the added sugar in one of your bars.

You will need

- Three or four packaged foods or drinks with Nutrition Facts labels
- A teaspoon, a small bowl of sugar and clear cups for the display
- An 8-inch square pan and parchment paper
- A large bowl, a spatula and measuring cups and spoons
- Oven mitts, a knife and a calculator (optional)

CHEWY OAT AND FRUIT GRANOLA BARS

Serves 12 bars · Prep 15 min · Bake 20–25 min · Cool 1 hr

Ingredients

- 2 cups (180 g) old-fashioned oats
- ½ cup (70 g) sunflower seeds or chopped nuts
- ½ cup (75 g) raisins or chopped dried apricots
- ¼ cup (35 g) ground flaxseed or whole-wheat flour
- ½ teaspoon cinnamon and ¼ teaspoon salt
- ½ cup (130 g) peanut butter or sunflower-seed butter
- ⅓ cup (110 g) honey
- 2 tablespoons vegetable oil
- 1 teaspoon vanilla extract
- 1 large egg

Method

1. An adult heats the oven to 350 °F (175 °C). Line the pan with parchment, letting it hang over two sides.
2. Wash your hands. In the large bowl, stir the oats, seeds, dried fruit, flaxseed, cinnamon and salt.

3. In another bowl, stir the peanut butter, honey, oil and vanilla until smooth. (Oil the measuring cup first so the honey slides out.) Beat in the egg. Wash your hands after cracking the egg.
4. Pour the wet mixture over the oat mixture and stir until everything is coated.
5. Scrape it into the pan and press it down very firmly and evenly with the back of the spatula or a cup.
6. With an adult beside you, bake 20–25 minutes until golden at the edges.
7. Cool in the pan at least 1 hour. Lift out by the parchment and cut into 12 bars with an adult beside you.
8. Clean up. Store the bars in a covered container for up to 1 week.

Allergy check: Contains peanuts (or tree nuts if you use nuts) and eggs; may contain wheat if you use whole-wheat flour. For peanut- and nut-free, use sunflower seeds and sunflower-seed butter. For egg-free, leave out the egg and add 2 tablespoons more seed butter; the bars will be a little more crumbly. Honey is not for babies under one year.

Steps

1. **Sugar-spoon display.** For each package, find the added sugars in grams for one serving. Divide by 4. Measure that many teaspoons of sugar into a clear cup and label it. Line the cups up. Which surprised you?
2. **Serving check.** For one package, how many servings are in the whole thing? How much added sugar would be in the whole package?
3. Bake the granola bars.
4. **Bar math.** Your bars have $\frac{1}{3}$ cup honey, about 90 grams of sugar in all. Divide by 12 bars. About how many grams of added sugar are in one bar? How many teaspoons? Compare with a store granola bar's label.
5. **Taste test.** Rate your bar and a store bar from 1 to 5 for sweetness, chewiness and how full you feel an hour later.
6. **Improve it.** Write one change (less honey and more dried fruit, more seeds, a few chocolate chips as a treat).
7. Clean up and pour the display sugar back into the canister.

Tips

- Press the mix very hard into the pan. Loose bars crumble.

- Cut the bars only when they are completely cool.
- Wrap single bars in wax paper for lunch boxes and trail snacks.

Check your work

- ☐ I can read serving size, fiber, protein and added sugars on a label.
- ☐ I can change grams of sugar into teaspoons.
- ☐ I baked granola bars and compared their added sugar with a store bar.

COOK'S NOTEBOOK

1. Copy or tape in a Nutrition Facts label and label the serving size, fiber, protein and added sugars lines.
2. Draw your sugar-spoon display with the number of teaspoons under each cup.
3. Write your bar math step by step.

From history. The Nutrition Facts box was designed to be read quickly, with bold black lines and a plain typeface, so that it would look the same on every package. Many countries now use labels inspired by it.

COMMON MISTAKES

- Forgetting the serving size. If you eat two servings, double every number.
- Looking only at the front of the package. Words like “natural” do not tell you how much added sugar is inside; read the label.
- Thinking all sugar is added sugar. The sugar in plain milk and whole fruit is natural, not added.

Make it a game • Label Detective Duel. Pick two snack boxes from the cupboard. Race your parent to find the serving size, fiber, protein, and added sugars on each. Divide the grams of sugar by four to get teaspoons and say the number aloud. The one who gets there first earns a point. Explain when the label began, and when added sugars joined it.

6.4 SNACK PLANNING: FULL AND SATISFIED

OBJECTIVES

- Tell how Susanne Holt’s 1995 study measured how filling different foods are.
- Explain how fiber, protein and water help you feel satisfied, and plan a week of balanced snacks.
- Make creamy homemade hummus with vegetables and whole-grain crackers, and keep a “how long until hungry” log.

Warm-up. List the snacks you ate this week. Next to each, write how long you think it kept you from feeling hungry: a little while, a couple of hours, or until the next meal. What do the longest-lasting snacks have in common?

WATCH

How to Make Ultracreamy Hummus

America's Test Kitchen • 7:54

https://www.youtube.com/watch?v=ycmanXPT_GY

WHEN TO WATCH

Before Session 2. Watch how the test cook makes the hummus smooth and creamy.

KEY TERMS

satiety

The full, satisfied feeling after eating that keeps you from feeling hungry for a while. Say it “suh-TY-uh-tee.”

chickpeas

Round, beige legumes, also called garbanzo beans, full of protein and fiber. Hummus is made from them.

snack

A small amount of food between meals, best planned to hold you over until the next meal.

tahini

A smooth paste made from ground sesame seeds, used in hummus.

CORE IDEAS

The story. In 1995 a nutrition scientist named Susanne Holt and her team at the University of Sydney, in Australia, asked a simple question: which foods keep people

full longest? They fed volunteers equal amounts of food energy from 38 different foods, one at a time, and every 15 minutes for two hours asked them how full they felt. They also let them eat freely at a buffet afterward and measured how much they ate.

How they figured it out. The results surprised many people. Plain boiled potatoes were the most filling food in the study. Fish, oatmeal, oranges, apples, beans and whole-grain pasta were also very filling. Croissants, doughnuts, candy bars and cake were among the least filling, even though they are rich and sweet. The filling foods had more **fiber, protein or water**, or all three. The less filling foods had more fat and sugar packed into a small bite.

The kitchen science. Fiber and water take up room in the stomach and slow digestion. Protein takes longer to digest and sends “I’m satisfied” signals to the brain. Some packaged snack foods are made so they are crunchy, salty and sweet, melt quickly in the mouth and have little fiber or water, so it is easy to keep eating them past full. That says something about how the food is made, not about the person eating it. A wise snack has two parts: a fiber food (fruit, vegetables, whole grains) and a protein food (beans, cheese, yogurt, nuts, eggs). Plan snacks ahead, put a portion on a plate, sit down, eat it slowly and drink water.

Let’s cook. You will make a bowl of creamy hummus from chickpeas and serve it with vegetable sticks and whole-grain crackers, a snack with fiber, protein and water. The skills to do well are **using a blender or food processor safely** with an adult beside you, and **cutting vegetable sticks** with the claw grip.

PICTURE STUDY



The Harvesters, Pieter Bruegel the Elder, 1565 · Oil on wood · Metropolitan Museum of Art, New York

Image: [Wikimedia Commons](#), public domain

Pieter Bruegel painted this harvest scene for a series about the months of the year. At noon, the workers stop to rest and eat under a tree. Their meal is simple and filling: bread, porridge or soup, cheese and fresh pears.

Look closely

- Find the workers eating under the tree. What foods can you see?
- Find the man asleep. Why is he so tired?
- Find the workers still cutting wheat. What will the wheat become?
- Look far into the distance. What else can you see in the valley?

Talk about it

1. Which foods in this meal have fiber, protein or water to keep the workers going all afternoon?
2. Why would a hardworking harvester need a filling meal at noon?
3. This meal is shared and eaten sitting down together. Why is that a good way to eat a snack or a meal?

Safety first. Use the blender or food processor only with an adult beside you, lid on, and unplug it before scraping. Cut vegetable sticks with the claw grip with an adult right beside you. Hummus contains sesame (tahini), one of the nine major allergens: check for allergies, and use the sesame-free swap if needed.

KITCHEN PROJECT

Hummus Snack Plates and a Week of Snacks

You will make homemade hummus, build snack plates with fiber and protein, and plan a week of snacks. You will keep a log to see how long different snacks keep you satisfied.

You will need

- A food processor or blender
- A can opener and a colander
- A cutting board, a damp towel and a small knife
- Measuring cups and spoons and a rubber spatula
- Small plates or containers for snack plates

CREAMY HUMMUS SNACK PLATES

Serves 6 (about 2 cups hummus) · Prep 20 min

Ingredients

- 1 (15-ounce / 425 g) can chickpeas
- ¼ cup (60 g) tahini (sesame paste)
- 3 tablespoons lemon juice (about 1 lemon)
- 1 small clove garlic (or ¼ teaspoon garlic powder)
- ½ teaspoon salt and ½ teaspoon ground cumin
- 2 tablespoons olive oil, plus a little for the top
- 3–4 tablespoons cold water
- **For dipping:** 3 carrots, 1 cucumber, 1 bell pepper, a handful of snap peas, and whole-grain crackers or pita

Method

1. Wash your hands. An adult opens the can of chickpeas. Drain and rinse them in the colander.
2. Put the tahini and lemon juice in the food processor. With an adult beside you, lid on, blend 1 minute until creamy.

3. Add the chickpeas, garlic, salt, cumin and olive oil. Blend 1 minute. Unplug, scrape down the sides, then blend again.
4. With the machine running, add the cold water a spoonful at a time until the hummus is very smooth, 1–2 minutes more. Taste and add salt or lemon if needed.
5. Rinse the vegetables. With an adult right beside you, peel the carrots and cut all the vegetables into sticks with the claw grip.
6. Spoon hummus onto small plates, swirl the top and drizzle with a little oil. Arrange vegetable sticks and crackers around it.
7. Clean up: unplug and wash the processor and blade carefully (the blade is sharp; an adult handles it). Refrigerate leftover hummus up to 5 days.

Allergy check: Contains sesame (tahini). Crackers or pita may contain wheat, milk or soy; check the labels. For sesame-free hummus, leave out the tahini and add 2 tablespoons more olive oil and 1 tablespoon more lemon juice, or use sunflower-seed butter.

Steps

1. **Plan a week.** Make a chart for seven days. For each day, plan one after-school snack with a fiber food and a protein food (for example: apple and cheese, yogurt and berries, hummus and carrots). Include one sometimes-food treat in its place during the week.
2. Make the hummus and snack plates.
3. **Hunger log.** For three days, write what snack you ate, the time, and the time you first felt hungry again. Which snack lasted longest?
4. **Compare.** On one day, eat a small bag of chips or crackers alone as your snack. On another, eat hummus and vegetables. How long did each keep you satisfied?
5. **Taste test.** Ask your family to rate the hummus from 1 to 5. Try it with a new vegetable.
6. **Improve it.** Write one change (roasted red pepper blended in, more lemon, paprika on top).
7. Clean up.

Tips

- Ice-cold water and a long blend make hummus fluffy and smooth.

- Put your snack on a plate and sit down. Eating from the package makes it hard to notice how much you ate.
- Prepare vegetable sticks for the week and keep them in water in a covered container in the refrigerator.

Check your work

- ☐ I can tell about the 1995 satiety study and which foods were most filling.
- ☐ I can plan snacks with fiber and protein.
- ☐ I made hummus and kept a hunger log.

COOK'S NOTEBOOK

1. Draw your favorite snack plate and label the fiber food and the protein food.
2. Write your week of snacks chart.
3. Make a bar graph from your hunger log: hours until hungry for each snack.

From history. Hummus has been eaten for centuries in the lands of the eastern Mediterranean, around Lebanon, Syria and Israel. The word *hummus* means “chickpea” in Arabic.

COMMON MISTAKES

- Grazing all afternoon. Plan a snack, eat it at the table, and stop.
- Choosing a snack with no fiber or protein. It is gone fast and you are hungry again soon.
- Forgetting water. Thirst can feel like hunger; drink water with your snack.

Make it a game • Full and Satisfied Plan. Plan a week of snacks on paper, one for each day. Each snack must have at least two of these: fiber, protein, water. Tell your parent why each one will keep you satisfied, using the word satiety. Your parent challenges one choice, and you defend it. Say what chickpeas and tahini add to the hummus plate.

Scripture. “Hast thou found honey? eat so much as is sufficient for thee,” (Proverbs 25:16, KJV)

Honey is good, and Solomon does not forbid it. He teaches us to eat what is enough: a wise snack satisfies and then we stop.

UNIT 6

CRAVINGS, REWARD & A BALANCED DIET

God made us able to enjoy sweet, salty and rich foods, and He gave us feasts and treats as good gifts. He also gave us minds that can learn, choose and wait. In this unit you will learn why sweet foods taste so good, how your brain learns to *want* foods, and why some snack foods are easy to keep eating after you are full.

You will hear about Walter Mischel's famous "marshmallow test" and practice the skill of waiting well. You will learn to read the Nutrition Facts label and find the added sugar, and you will plan a week of filling snacks with fiber, protein and water. Along the way you will cook with less sugar and discover that your taste buds can learn to love it. In this course we call foods "everyday foods" and "sometimes foods," and we never talk about bodies, only about wise, thankful habits.

PREREQUISITES

- Knows the five food groups and what they do (Unit 2)
- Knows the five basic tastes (Unit 3)
- Uses the stove and oven only with an adult beside (Units 1-5)
- Reads an ingredient list for allergens (Unit 1)

MASTERY CHECKLIST

- ☐ I can explain that God made us able to enjoy sweet foods, and that even newborn babies prefer sweet tastes.
- ☐ I can explain, simply, how the brain learns to want foods, and why it takes about 20 minutes to feel full.
- ☐ I can tell about the marshmallow test and name ways to wait well.
- ☐ I can find the added sugars on a Nutrition Facts label and change grams into teaspoons (4 grams $\approx$ 1 teaspoon).
- ☐ I can plan snacks with fiber, protein and water that keep me satisfied, and enjoy treats in their place.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **FDA: The Nutrition Facts Label:** Free. The U.S. Food and Drug Administration's guides and activity sheets for reading the label, including materials for children. Use with Lesson 6.3.
- **A teaspoon and a small bowl of sugar:** For the sugar-spoon display in Lesson 6.3. Return the sugar to the canister afterward.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

6.1	Why We Crave Sweet Foods	2 sessions of 45–60 minutes
6.2	Walter Mischel's Marshmallow Test	2 sessions of 45–60 minutes
6.3	The Nutrition Facts Label	2 sessions of 45–60 minutes
6.4	Snack Planning: Full and Satisfied	2 sessions of 45–60 minutes

UNIT 6 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

What did Jacob Steiner's photographs of newborn babies show?

2. 5 pts

What does dopamine do in the brain's reward system?

3. 5 pts

About how long does it take for your brain to get the message that you are full?
What does that mean for seconds?

4. 5 pts

Predict: a family eats less added sugar for three weeks. How might a plain apple taste to them afterward?

5. **5 pts**

Describe the marshmallow test. Name two strategies children used to wait.

6. **5 pts**

What did the 2012 University of Rochester study add about waiting?

7. **5 pts**

A drink label says 32 grams of added sugar per serving and 2 servings per bottle. How many teaspoons of added sugar are in the whole bottle?

8. **5 pts**

When did the Added Sugars line come to the Nutrition Facts label, and why is it helpful?

9. **5 pts**

Which three things in food help you feel full longest? Give a food for each.

10. **5 pts**

Plan one after-school snack with a fiber food and a protein food, and explain why it is a good choice.

ANSWER KEY

1. Babies only hours old relaxed and seemed to want more when given a sweet taste, and frowned at bitter, showing that liking sweet is present from birth.
2. It is a messenger tied to wanting and looking forward to something good; it helps the brain learn what to seek out again.
3. About 20 minutes. It is wise to eat slowly and wait before taking seconds.
4. Sweeter, because taste buds adjust to less added sugar in a few weeks.
5. A child could eat one treat now or wait until the grown-up returned to get two. Any two: covering eyes, turning away, singing, playing, imagining the treat was something else.
6. Children waited much longer when the grown-up had kept earlier promises: trust makes waiting easier.
7. $32 \times 2 = 64$ grams; $64 \div 4 = 16$ teaspoons.
8. In 2016. It separates sugar added by the maker from sugar naturally in fruit and milk, so families can see hidden sugar.
9. Fiber (oatmeal, apples, beans, vegetables), protein (eggs, cheese, yogurt, beans, fish) and water (fruit, vegetables, soup).
10. Answers vary; for example, an apple with cheese or hummus with carrots. The fiber and protein help you stay satisfied until dinner.

UNIT CHALLENGE: A ONE-WEEK DRINK AND SNACK SWAP

For one week, swap one sweetened drink or sweet snack each day for water, milk or a planned fiber-and-protein snack. Make the swap snacks yourself, including at least one recipe from this unit.

Keep a daily log: what you swapped, what you ate instead, how long it kept you satisfied, and what you noticed about how sweet foods tasted. At the end of the week, write a short report: what was easy, what was hard, what your taste buds noticed, and which swaps you will keep, with a treat planned in its place.

LOOK FOR	WHAT IT MEANS
Planning	A written plan of seven swaps with at least one homemade snack recipe.
Daily log	Seven honest daily entries with swaps, snacks and how long each kept you satisfied.
Cooking and safety	Snacks prepared with clean hands, safe knife and appliance use and an adult nearby; kitchen cleaned.
Reflection	A short report on what was learned, what tasted different, and which habits to keep, with treats enjoyed in their place.

UNIT 7

FIRE, THE GRILL & SPICE

This is the fun unit: fire, smoke, spice and bold flavor. You will follow Christopher Columbus, who sailed west in 1492 looking for the spices of Asia and found the chili pepper instead, a plant that soon spread around the whole world. You will learn what makes a pepper “hot” when it is not hot at all. Then you will read how God told Israel to roast the Passover lamb with fire, and you will learn the grill safety rules every family should know.

You will discover the difference between herbs and spices and make a bright green chimichurri sauce, and you will learn how good cooks pair flavors: sweet with salty, sour with rich. At the grill, an adult lights the fire and does all the grilling while you prepare the food and watch from 3 feet back. Every grilled recipe also works under the oven broiler or in a grill pan, with an adult, for families without a grill.

PREREQUISITES

- Knows the safe internal temperatures: ground meat 160 °F, poultry 165 °F, whole cuts 145 °F with a 3-minute rest (Unit 1)
- Keeps raw meat separate and washes hands after touching it (Unit 1)
- Knows how heat moves by conduction (Unit 4)
- Knows the five basic tastes (Unit 3)

MASTERY CHECKLIST

- ☐ I can tell how Columbus’s voyages brought chili peppers to the rest of the world, and explain what capsaicin does.
- ☐ I can name the fire triangle and the grill safety rules, and I know that only adults light and run the grill.
- ☐ I can explain the difference between herbs and spices and name examples of each.
- ☐ I can pair flavors (sweet + salty, sour + rich, hot + cool) to balance a dish.
- ☐ I can shape burgers safely and check that ground meat reaches 160 °F.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **NFPA: Grilling safety:** Free. Grilling safety tips and a printable tip sheet from the National Fire Protection Association. Read it together before Lesson 7.2.
- **For the adult griller: long-handled tongs, a spatula and a chimney starter:** Long tools keep hands away from the heat. A chimney starter lights charcoal with crumpled newspaper, so no liquid starter is needed; a gas grill needs neither. Not required: every recipe also works under the oven broiler or in a grill pan.
- **Kitchen scissors:** A clean pair kept for food makes snipping fresh herbs quick and safe (Lesson 7.3).

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

7.1	Columbus, the Spice Route and the Chili Pepper	2 sessions of 45–60 minutes
7.2	The Passover Lamb and Grill Safety	2 sessions of 45–60 minutes
7.3	Herbs and Spices: Chimichurri	2 sessions of 45–60 minutes
7.4	Flavor Friends: Sweet, Salty, Sour and Rich	2 sessions of 45–60 minutes

UNIT 7 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

Why did Columbus call the Caribbean ají a “pepper”?

2. 5 pts

What is capsaicin, and why does milk cool a chili burn better than water?

3. 5 pts

Name the three sides of the fire triangle. How does closing a grill lid stop a flare-up?

4. **5 pts**

List four grill safety rules.

5. **5 pts**

What is the safe temperature for burgers? For a steak? Why are they different?

6. **5 pts**

Predict: you shape one burger with a thumbprint dent and one without. How will they look after grilling?

7. **5 pts**

What is the difference between an herb and a spice? Give two of each.

8. **5 pts**

What was the Capitulare de villis, and why does it matter to cooks?

9. **5 pts**

Predict: you sprinkle a tiny pinch of salt on a slice of watermelon. Will it taste saltier or sweeter? Explain.

10. **5 pts**

Name four kinds of flavor pairs and an example of each.

ANSWER KEY

1. He was looking for the spices of Asia, including black pepper, and hoped he had found it, so he called the ají pimiento, Spanish for pepper. The plants are not related.
2. The compound in chili peppers that triggers the heat-sensing nerves in the mouth. It dissolves in fat, so milk (with fat and protein) washes it away; water only spreads it.
3. Heat, fuel and oxygen. The lid takes away oxygen.
4. Any four: only adults light and run the grill; children stay 3 feet back; grill outdoors on flat ground away from the house, railings, overhangs and dry leaves; no liquid fire starter; long tools; hose or extinguisher nearby; never leave a lit grill alone; let coals cool 24–48 hours before an adult disposes of them in a metal can.
5. Burgers 160 °F; steak 145 °F with a 3-minute rest. Ground meat is mixed, so surface germs can be inside; a whole steak's germs are on the outside, which gets very hot.
6. The undented burger puffs up in the middle into a dome; the dented one stays flatter and cooks more evenly.
7. Herbs are leaves (parsley, basil, oregano, mint, thyme); spices come from seeds, bark, roots, berries or buds (cumin, cinnamon, ginger, black pepper, cloves).
8. An order from Charlemagne around the year 800 listing the plants every royal garden should grow, including many herbs. It helped spread herb gardens across Europe.
9. Sweeter. A little salt makes sweetness seem stronger and quiets any bitterness.
10. Sweet + salty (salted watermelon), sour + rich (lemon on fish, vinaigrette on salad), hot + cool (spicy beans with yogurt), herb + citrus (mint and lime).

UNIT CHALLENGE: A FAMILY COOKOUT (GRILL OR BROILER)

Plan and prepare a family cookout dinner with a main dish, a vegetable, a sauce or spice blend you make yourself, and a grilled fruit dessert. You prepare, season and set out everything; an adult lights and runs the grill (or broiler) while you watch from 3 feet back and check the temperatures together.

Make a safety checklist before the cookout and a flavor-pairing chart showing at least three pairs in your menu. Record the safe temperature of each meat, ask each person to rate the meal, and write one improvement.

LOOK FOR	WHAT IT MEANS
Planning	A written menu, shopping list, safety checklist and simple timeline.
Safety	Raw meat kept separate, hands washed, adult at the grill, kid-free zone kept, temperatures checked and recorded.
Flavor	A homemade sauce or spice blend written so it can be made again, and at least three flavor pairs named and used.
Cleanup and service	Kitchen and tools cleaned, table set, meal served with thanks.
Reflection	Family ratings recorded and one honest improvement planned.

7.1 COLUMBUS, THE SPICE ROUTE AND THE CHILI PEPPER

OBJECTIVES

- Tell how Columbus sailed west in 1492 seeking the spices of Asia, found chili peppers in the Caribbean, and how they spread around the world.
- Explain that capsaicin makes peppers feel hot by triggering heat-sensing nerves, and why milk soothes the burn better than water.
- Cook a mild chili-spiced bean and corn skillet with an adult beside you.

Warm-up. Smell a jar of black pepper, then a jar of chili powder or paprika. Are they related? Do they come from the same plant? Guess where each one first grew.

WATCH

Some Like It Hot: The Story of Chili Peppers (Accessible Preview)

Described and Captioned Media Program • 3:46

<https://www.youtube.com/watch?v=hM2XSSb9sVk>

WHEN TO WATCH

After the story. Listen for why Columbus called the new fruit a “pepper.”

Note: From the Described and Captioned Media Program (U.S. Department of Education funded), a short documentary with captions.

KEY TERMS

spice

A flavoring from the seeds, bark, roots, berries or buds of a plant, usually dried: pepper, cinnamon, cumin, nutmeg.

capsaicin

The compound in chili peppers that makes them feel hot. Say it “cap-SAY-uh-sin.”

chili pepper

The fruit of a pepper plant first grown in the Americas, from mild bell peppers to very hot habaneros.

receptor

A tiny sensor on a nerve cell that responds to one kind of signal, such as heat or a taste.

CORE IDEAS

The story. In the 1400s, black pepper, cinnamon, cloves and nutmeg came to Europe from far-off Asia, passing through many traders' hands. They were so costly that people locked them in boxes. Christopher Columbus believed he could reach the spice lands of Asia by sailing west across the Atlantic. In 1492 he reached the islands of the Caribbean instead. There the Taíno people grew and ate a fiery fruit they called *ají*. Columbus, hoping he had found black pepper, called it *pimiento*, Spanish for pepper, and the name stuck, though the plants are not related at all.

How they figured it out. On Columbus's second voyage, which set out in 1493, a ship's doctor, Diego Álvarez Chanca, wrote about the *ají* the islanders used to season fish and meat, and chili seeds were carried back to Spain. Chilies grew easily in warm places, and within about a hundred years Portuguese and Spanish traders had carried them to Africa, India, China and Southeast Asia. Today many of the world's spiciest dishes, from Indian curries to Thai and Korean cooking, use chili peppers that came, long ago, from the Americas.

The kitchen science. A chili pepper is not really hot. It contains **capsaicin**, which fits into the same nerve **receptors** in your mouth that sense real heat, so your brain thinks your mouth is burning. Most of the capsaicin is in the white ribs and seeds; scraping them out makes a pepper milder. Capsaicin dissolves in fat, not water, so a drink of water spreads it around, while milk, yogurt or cheese help wash it away. Mild chili powder, paprika and bell peppers give chili flavor with little or no burn. Capsaicin on your fingers can burn your eyes, so an adult handles hot peppers.

Let's cook. You will cook a skillet of pinto beans, corn and tomatoes seasoned with mild chili powder and cumin, and serve it with warm tortillas and cheese. The skills to do well are **blooming spices** (stirring them in hot oil for 30 seconds to wake up their flavor) and **tasting and adjusting**. An adult is beside you at the stove.

PICTURE STUDY



Brazilian Fruits, Albert Eckhout, 1640s · Oil on canvas · National Museum of Denmark, Copenhagen

Image: [Wikimedia Commons](#), public domain

Albert Eckhout was a Dutch painter who traveled to Brazil in the 1630s and 1640s and painted the plants, fruits and people he found there. To Europeans, these foods of the Americas were brand-new, just as the chili pepper had been to Columbus's sailors.

Look closely

- Find the pineapple and the watermelon. Which fruits here do you know?
- Find the red and yellow cashew fruits at the bottom. Each one has a nut hanging below it. Can you find the nuts?
- Find the flower with the fringed petals. It is a passion flower.
- Imagine the smells of this pile of fruit. Which would smell strongest?

Talk about it

1. Chili peppers, tomatoes, corn, potatoes and pineapples all first grew in the Americas. Which of them do you eat?
2. Why would sailors want to carry these new foods back home?
3. If you had never seen a chili pepper, how would you describe it to someone back home?

Safety first. An adult cuts any hot pepper, wearing gloves, and washes the board and knife afterward; never touch your eyes after handling peppers. An adult stands beside you at the stove; spices bloom fast, so keep stirring and keep your face back. Check for allergies before the taste test.

KITCHEN PROJECT

Pepper Science and a Chili-Spiced Bean Skillet

You will compare mild and hot pepper flavors in small, careful tastes, test whether milk or water cools the burn faster, and cook a mild chili-spiced bean skillet for your family.

You will need

- A large skillet and a wooden spoon
- A cutting board, a damp towel and a small knife
- A can opener and a colander
- Small cups of milk and water and a timer
- Measuring cups and spoons

CHILI-SPICED PINTO BEAN AND CORN SKILLET

Serves 4–6 • Prep 15 min • Cook 20 min

Ingredients

- 1 tablespoon olive or vegetable oil
- 1 small onion
- 1 red or green bell pepper
- 2 teaspoons mild chili powder
- 1 teaspoon ground cumin and $\frac{1}{2}$ teaspoon smoked paprika
- 2 (15-ounce / 425 g) cans pinto beans, drained and rinsed
- 1 (14.5-ounce / 411 g) can diced tomatoes
- $1\frac{1}{2}$ cups (210 g) corn, frozen or drained canned
- $\frac{1}{2}$ teaspoon salt and juice of $\frac{1}{2}$ lime
- For serving: warm corn or flour tortillas, grated cheese, plain yogurt or sour cream, chopped cilantro

Method

1. Wash your hands and rinse the vegetables.

2. With an adult right beside you, dice the onion and bell pepper with the bridge and claw grips.
3. With an adult beside you, heat the oil in the skillet over medium heat. Cook the onion and pepper 5–6 minutes, stirring, until soft.
4. Add the chili powder, cumin and paprika. Stir for 30 seconds until they smell toasty. This is blooming the spices.
5. Add the beans, tomatoes and corn. Bring to a simmer and cook 10 minutes, stirring now and then, until thick.
6. Turn off the heat. Stir in the salt and lime juice. Taste and adjust.
7. Serve in warm tortillas or bowls with cheese, yogurt and cilantro. Clean up: wash the skillet and board and refrigerate leftovers within 2 hours.

Allergy check: The skillet contains none of the nine major allergens. Toppings: cheese and yogurt contain milk; flour tortillas contain wheat (use corn tortillas for wheat-free). Check the chili powder label.

Steps

1. **Pepper parade.** Look at a bell pepper and (if you have one) a jalapeño cut open by an adult. Find the white ribs and seeds. Do not touch the jalapeño's inside.
2. **Spice smell test.** Smell chili powder, cumin and smoked paprika, then smell them again after blooming in oil. Describe the difference.
3. **Cool-down test.** With an adult's permission, taste a tiny pinch of chili-spiced beans with a little extra chili powder. Sip water and time how long the warmth lasts. Next time, sip milk instead. Which worked faster? Why?
4. Cook the skillet and serve it.
5. **Taste test.** Ask each person to rate the spice level and flavor from 1 to 5. Too mild? Too hot?
6. **Improve it.** Write one change (more cumin, a little jalapeño for those who like it, black beans instead of pinto).
7. Clean up.

Tips

- Add spice slowly. You can stir more into one bowl, but you cannot take it out of the whole pot.

- Serve cool toppings like yogurt or sour cream for anyone who finds it too warm.
- Smoked paprika gives a grilled, smoky flavor without a grill.

Check your work

- ☐ I can tell how chili peppers traveled from the Americas around the world.
- ☐ I can explain capsaicin and why milk cools the burn.
- ☐ I bloomed spices and cooked a bean skillet with an adult beside me.

COOK'S NOTEBOOK

1. Draw a world map with arrows showing chili peppers traveling from the Caribbean to Spain, Africa, India and China.
2. Draw a chili pepper cut in half and label the flesh, the white ribs and the seeds. Circle where most capsaicin is.
3. Copy the bean skillet recipe in your own words and record your cool-down test.

From history. The bell pepper and the hottest chilies are the same kind of plant. Plant breeders have grown peppers in every shape and heat, from sweet bell peppers with no capsaicin at all to tiny peppers so hot that cooks wear gloves just to cut them.

COMMON MISTAKES

- Rubbing your eyes after touching hot peppers. Let an adult handle them and wash hands well.
- Drinking water to cool a chili burn. Milk, yogurt or cheese work better.
- Burning the spices while blooming them. Thirty seconds is enough; then add the next ingredients.

Make it a game • Hot Pepper Riddles. Take turns giving riddles about Columbus and the chili pepper. For example, say, I sailed in 1492 looking for spice. The other person answers Columbus. Mix in riddles about capsaicin and why milk cools the burn better than water. Keep score. Then explain what the nerve receptors do when you eat a pepper.

7.2 THE PASSOVER LAMB AND GRILL SAFETY

OBJECTIVES

- Tell how God commanded Israel to roast the Passover lamb with fire (Exodus 12) and connect it to Christ, our Passover.
- Name the fire triangle and the family grill safety rules, and explain why only adults light and run the grill.
- Shape burgers safely, watch from 3 feet back while an adult grills them, and check that they reach 160 °F.

Warm-up. Draw a triangle and write HEAT, FUEL and OXYGEN on its three sides. Can you think of a way to put out a fire by taking away each side? Write one idea for each.

WATCH

Grill Safety Tips

CityofPG • 3:51

<https://www.youtube.com/watch?v=N9LC6L5l6lg>

WHEN TO WATCH

With the whole family, before anyone lights the grill. A fire prevention officer shows how to check a gas grill safely; stop and check each tip against your own grill.

Note: From the City of Prince George, British Columbia, fire department.

BACKUP VIDEO

How to Grill Burgers on a Charcoal Grill

Certified Angus Beef® • 2:15

<https://www.youtube.com/watch?v=4n1Z5MJ6Hso>

Before Session 2. Watch how the chef shapes the patties and checks the burgers with a thermometer. (In our course, an adult does the grilling.)

KEY TERMS

fire triangle

The three things every fire needs: heat, fuel and oxygen. Take away any one and the fire goes out.

radiant heat

Heat that travels as invisible rays from hot coals or flames straight to the food, and to anyone standing too close.

flare-up

A sudden burst of flame when fat drips onto hot coals or burners.

kid-free zone

The 3-foot circle around a grill where children never stand while it is lit or cooling.

CORE IDEAS

The story. The night before God brought Israel out of Egypt, He gave each family careful instructions for a meal. They were to take a lamb, roast it with fire, and eat it with unleavened bread and bitter herbs, dressed for travel, ready to leave in haste (Exodus 12). That meal became the **Passover**, and Jewish families have remembered it every year for more than three thousand years. Long afterward, Jesus ate the Passover with His disciples the night before He was crucified, and Paul wrote that “Christ our passover is sacrificed for us” (1 Corinthians 5:7).

How they figured it out. People have cooked over open fires since the beginning, and they learned the hard way that fire is a wonderful servant and a dangerous master. Firefighters later taught the **fire triangle**: a fire needs heat, fuel and oxygen. Smother it with a lid and you take away oxygen. Today the National Fire Protection Association reports that grills start thousands of home fires in the United States every year, most often in summer, and many burns happen to children who get too close. That is why every family needs grill rules, and why only adults light and run a grill.

The kitchen science. A grill cooks mostly by **radiant heat**: invisible heat rays travel from glowing coals or flames straight up into the food and brown it quickly. The same rays reach anyone standing nearby, which is why children stay 3 feet back. When fat drips onto the coals, it can catch fire in a **flare-up**; closing the lid takes away oxygen and calms it. Ground meat has been mixed, so germs from the surface can be anywhere inside, and burgers must reach 160 °F (71 °C) in the middle. A small

dent pressed into the center of each patty keeps it from puffing up into a ball as it cooks.

Let's cook. You will shape beef or lamb burgers with a thumbprint in the middle, season them, and carry them out on a clean platter. An adult lights the grill and does all the grilling while you watch from 3 feet back and check the temperature together. Then the cooked burgers go on a *clean* platter, never the one that held them raw. Without a grill, an adult cooks them under the oven broiler or in a grill pan.

PICTURE STUDY



Camp Fire, Winslow Homer, 1880 · Oil on canvas · Metropolitan Museum of Art, New York

Image: [Wikimedia Commons](#), public domain

Winslow Homer loved the woods and waters of the Adirondack Mountains in New York. In this painting, a woodsman rests in a bark shelter beside a blazing campfire at night. Sparks fly up into the dark, and the fire lights the trees.

Look closely

- Find the fire. How did Homer show the sparks?
- Find the woodsman resting in the shelter. How close is he to the flames?
- Look at the shelter. What is it made of? Could it catch fire?
- Look at the dark woods. How far does the firelight reach?

Talk about it

1. Name the three things this fire needs to keep burning.
2. What should the woodsman do before he goes to sleep?
3. How is cooking over a campfire like a grill? How is it different?

Safety first. Only adults light and run the grill; you stay 3 feet back while it is lit and cooling, and no one ever uses or handles any liquid fire starter (our recipes need none). Grill outdoors only, on a flat surface away from the house, railings, overhangs and dry leaves, with a hose or extinguisher nearby; never leave a lit grill alone, and let coals cool fully (24–48 hours) before an adult disposes of them in a metal can. Wash your hands after shaping raw meat and cook burgers to 160 °F (71 °C).

Grill Safety Walk-Around and Thumbprint Burgers

You will walk around your grill (or your oven broiler) with an adult and make a safety checklist, then shape burgers and check them with the thermometer while an adult grills them.

You will need

- A large bowl and a clean plate or tray for raw patties
- A second clean platter for cooked burgers
- An instant-read food thermometer
- For the adult griller: long-handled tongs and spatula, a grill brush, a hose or fire extinguisher
- Indoor option: a broiler pan or grill pan and oven mitts
- Measuring spoons

THUMBPRINT BURGERS (BEEF OR LAMB)

Serves 6 burgers · Prep 15 min · Grill 10–12 min

Ingredients

- 2 pounds (900 g) ground beef (80–85% lean) or ground lamb
- 1 teaspoon salt and ½ teaspoon black pepper
- 1 teaspoon garlic powder and 1 teaspoon dried oregano (optional)
- 6 hamburger buns, toasted if you like
- Toppings: lettuce, tomato and onion slices, cheese, pickles, ketchup and mustard

Method

1. An adult lights the grill and heats it to medium-high (about 400–450 °F), or heats the oven broiler with the rack about 4 inches below it.
2. Wash your hands. Gently divide the meat into 6 equal pieces. Shape each into a patty about ¾ inch thick and a little wider than the bun. Do not squeeze or knead it.

3. Press your thumb into the middle of each patty to make a shallow dent. Sprinkle both sides with salt, pepper, garlic powder and oregano.
4. Wash your hands well with soap. Wash the bowl. Carry the patties out on their plate.
5. From 3 feet back, watch the adult grill the burgers 4–5 minutes, flip them once with a spatula, and grill 4–5 minutes more. If there is a flare-up, the adult closes the lid.
6. The adult slides the thermometer into the side of the thickest burger. It must read 160 °F (71 °C). Add cheese in the last minute if you like.
7. The adult moves the burgers to the clean platter. Build your burgers with toppings.
8. Clean up: wash the raw-meat plate, bowl and your hands in hot, soapy water. The adult turns off the gas or closes the vents, and the coals cool for 24–48 hours.

Allergy check: Contains wheat (buns; buns may also contain milk, eggs, soy or sesame: check the label) and milk if you add cheese. Use lettuce wraps or gluten-free buns for wheat-free, and leave off the cheese for milk-free. Check condiment labels.

Steps

1. **Safety walk-around.** With an adult, walk around the grill. Check: flat ground, away from the house, railings, overhangs and dry leaves; a hose or extinguisher ready; long tools; no liquid starter. Mark a 3-foot kid-free zone with chalk or a rope. Write a checklist.
2. **Predict.** Will the burgers with a thumbprint stay flatter than one without? Make one patty without a dent to find out.
3. Shape the burgers and watch from the kid-free zone while the adult grills.
4. **Temperature check.** Record each burger's temperature with the adult. Which was hottest? Which needed more time?
5. **Taste test.** Rate the burgers from 1 to 5. Compare the dented and undented patties' shapes.
6. **Improve it.** Write one change (a different seasoning, thinner patties, a homemade sauce).
7. Clean up.

Tips

- Handle ground meat gently. Squeezing makes burgers tough.
- Do not press burgers flat with the spatula while they cook; it squeezes out the juices and causes flare-ups.
- Color is not a safe guide. Some burgers turn brown before they reach 160 °F; use the thermometer.

Check your work

- ☐ I can name the fire triangle and the grill safety rules.
- ☐ I shaped burgers safely and washed my hands after touching raw meat.
- ☐ I stayed 3 feet back while an adult grilled, and we checked 160 °F together.

COOK'S NOTEBOOK

1. Draw the fire triangle and write one way to take away each side.
2. Draw your grill area from above with the 3-foot kid-free zone, the hose or extinguisher, and the house.
3. Copy the burger recipe in your own words and write your temperature log.

From history. Unleavened bread, eaten at Passover, has no yeast because the Israelites left Egypt in such a hurry that their dough had no time to rise (Exodus 12:39). Jewish families still eat flat, crisp matzah during the Passover week.

COMMON MISTAKES

- Standing close to watch. Radiant heat and flare-ups reach farther than you think; stay 3 feet back.
- Putting cooked burgers back on the raw-meat plate.
- Using water on a grease flare-up. Close the lid to take away oxygen.

Make it a game • Grill Safety Walk-Around. Walk outside with an adult. Without touching the grill, point to the places where the fire triangle could appear: heat, fuel, air. Name every family grill safety rule you can remember and mark the kid-free zone with chalk. Your parent plays the careless grill helper and you correct each mistake. Then retell Exodus 12 in your own words.

Scripture. “And they shall eat the flesh in that night, roast with fire, and unleavened bread; and with bitter herbs they shall eat it.” (Exodus 12:8, KJV)

God gave Israel a meal to remember His rescue: roasted lamb, flat bread and bitter herbs. Christians remember that Christ is our Passover, who rescued us.

7.3 HERBS AND SPICES: CHIMICHURRI

OBJECTIVES

- Explain the difference between herbs and spices and name five of each.
- Tell how Charlemagne's order of about the year 800 listed herbs for every royal garden, and how chimichurri became the sauce of Argentina's grills.
- Make chimichurri, snipping herbs with kitchen scissors, and serve it on grilled steak or vegetables cooked by an adult.

Warm-up. Set out a few fresh herbs (parsley, cilantro, basil or mint) and a few spices (cinnamon, cumin, black pepper). Smell each with your eyes closed. Then sort them into two groups. What makes the groups different?

WATCH

Authentic Argentine CHIMICHURRI sauce

Hernan Dieguez · 6:12

<https://www.youtube.com/watch?v=1tPl6b6E0eE>

WHEN TO WATCH

Before you make the sauce. Watch how finely the herbs are chopped and the 3-to-1 ratio of oil to vinegar.

Note: An Argentine cook making chimichurri. The dark bottle on the table is vinegar.

KEY TERMS

herb

The fresh or dried leaves of a plant used for flavor, such as parsley, basil, oregano, mint and thyme.

aroma

A smell, especially a pleasant one from food.

spice

A flavoring from other parts of a plant (seeds, bark, roots, berries or buds), usually dried, such as cumin, cinnamon, ginger and pepper.

chimichurri

A green sauce from Argentina and Uruguay made of chopped parsley, oregano, garlic, oil and vinegar, served with grilled meat.

CORE IDEAS

The story. Around the year 800, the emperor Charlemagne, who ruled much of Europe, sent out an order about how his royal farms should be run. It is called the *Capitulare de villis*. Near the end it lists the plants every royal garden should grow, more than seventy of them, including sage, rosemary, parsley, mint, dill, fennel and many more. Monks copied the list, and herb gardens spread across Europe. Much later, in the 1800s, the cattle herders of Argentina and Uruguay grilled beef over open fires, and a sharp green sauce of parsley, oregano, garlic, oil and vinegar became the favorite thing to spoon on top: **chimichurri**.

How they figured it out. Cooks found by long experience which plants made food taste good and which could be dried and kept. Scientists later learned that the flavor of herbs and spices comes mostly from **aroma** oils stored in tiny pockets in the leaves, seeds and bark. Cutting, crushing, warming or chewing breaks the pockets open and releases the smell, which is why fresh-chopped herbs smell so strong and why we bloom dried spices in oil.

The kitchen science. **Herbs** are leaves. Soft herbs like parsley, cilantro and basil are best fresh and added at the end of cooking. Hardy herbs like rosemary, thyme and oregano can cook longer and dry well. **Spices** come from other parts of the plant: seeds (cumin, mustard), bark (cinnamon), roots (ginger, turmeric), berries (black pepper) and flower buds (cloves). God gave “every herb bearing seed” to people for food (Genesis 1:29), and the same plant can give both: the coriander plant’s leaves are the herb cilantro, and its seeds are the spice coriander. Acid (vinegar) and oil in chimichurri carry the herb flavor across the tongue and cut through the richness of grilled meat.

Let’s cook. You will make chimichurri, snipping the parsley and oregano finely with kitchen scissors, and spoon it over steak or vegetables grilled by an adult. The skill to do well is **finely cutting herbs** without bruising them. Steak is a whole cut: it is cooked to at least 145 °F (63 °C) and rests 3 minutes.

PICTURE STUDY



Market Woman at a Vegetable Stand, Pieter Aertsen, 1567 · Oil on panel · Gemäldegalerie, Berlin

Image: [Wikimedia Commons](#), public domain

Pieter Aertsen, a painter of Antwerp and Amsterdam, painted the busy market women of his day. This market woman sits among baskets heaped with the vegetables and greens she grew and brought to town to sell.

Look closely

- Find the vegetables you can name.
- Find any leafy greens or herbs. How would a cook use them?
- Look at the market woman's face and hands. How does she seem?
- Look behind her. What else is happening in the market?

Talk about it

1. Which foods in this picture are herbs, which are vegetables, and which could be spices?
2. Which would you snip into a green sauce like chimichurri?
3. Why would a cook buy herbs fresh at the market instead of growing them?

Safety first. Snip herbs with clean kitchen scissors, pointing the tips down and away. Only an adult lights and runs the grill or broiler; stay 3 feet back from a lit grill. Cook steak to at least 145 °F (63 °C) with a 3-minute rest, and keep raw meat and its juices away from the sauce and the vegetables.

Herb or Spice? Chimichurri on the Grill

You will sort and smell herbs and spices, snip a fresh chimichurri, and serve it with grilled steak or vegetables. You will also test fresh against dried herbs.

You will need

- Clean kitchen scissors and a tall glass or measuring cup for snipping
- A small bowl, a whisk or fork and measuring cups and spoons
- A cutting board, a damp towel and a small knife (for vegetables)
- An instant-read food thermometer
- For the adult griller: long tongs and a clean platter; indoor option: a broiler pan or grill pan

CHIMICHURRI WITH GRILLED STEAK OR VEGETABLES

Serves 6 • Prep 20 min • Rest 20 min • Grill 10–15 min

Ingredients

- **Chimichurri:** 1 large bunch flat-leaf parsley (about 1 packed cup of leaves)
- 2 tablespoons fresh oregano leaves (or 2 teaspoons dried)
- 2 cloves garlic, minced by an adult (or ½ teaspoon garlic powder)
- 3 tablespoons apple cider vinegar
- ½ cup (120 mL) olive oil
- ½ teaspoon salt, ¼ teaspoon black pepper, a pinch of red pepper flakes (optional)
- **To grill:** 1½ pounds (680 g) flank or sirloin steak, about 1 inch thick, with ½ teaspoon salt and ¼ teaspoon pepper
- **or** 2 zucchini, 2 bell peppers and 1 red onion, cut in thick slices and brushed with olive oil

Method

1. Wash your hands and the herbs; dry the herbs well on a towel.

2. Pull the parsley and oregano leaves off the thick stems. Put them in a tall glass and snip with the scissors, pointing down, until very finely cut.
3. In the bowl, stir the herbs, garlic, vinegar, salt, pepper and pepper flakes. Whisk in the olive oil. Let it stand 20 minutes so the flavors blend.
4. Season the steak on both sides with salt and pepper and wash your hands. Or, with an adult beside you, slice the vegetables into thick slices or strips and brush them with oil.
5. An adult lights the grill and grills the steak 5–7 minutes per side over medium-high heat (or the vegetables 3–5 minutes per side) while you watch from 3 feet back. Indoors, an adult uses the broiler or a grill pan.
6. The adult checks the steak in its thickest part: at least 145 °F (63 °C). It rests on a clean board for 3 minutes, then the adult slices it thinly across the grain.
7. Spoon chimichurri over the steak or vegetables. Clean up: wash the board, scissors and bowl; refrigerate leftover sauce up to 3 days.

Allergy check: Contains none of the nine major allergens. Check the vinegar label. For a meatless meal, grill vegetables or serve the sauce over beans and rice.

Steps

1. **Sort it.** Sort ten herbs and spices from your kitchen into “herb” and “spice” and write which plant part each comes from.
2. **Fresh or dried?** Smell and taste a pinch of fresh parsley and dried parsley, fresh oregano and dried oregano. Which is stronger? Which do you like better?
3. **Predict.** Will the chimichurri taste different after it rests 20 minutes? Taste a drop right away and again after resting.
4. Make the chimichurri and the grilled food with an adult.
5. **Taste test.** Ask your family to rate the meal from 1 to 5, with and without the sauce.
6. **Improve it.** Write one change (cilantro instead of oregano, lemon juice instead of vinegar, more garlic).
7. Clean up.

Tips

- Dry the herbs very well; wet herbs make a watery sauce.
- Dried herbs are stronger than fresh. Use about one-third as much dried as fresh.
- Chimichurri is also good on eggs, potatoes and bread.

Check your work

- ☐ I can explain the difference between herbs and spices.
- ☐ I can tell about Charlemagne's garden list and where chimichurri comes from.
- ☐ I made chimichurri and stayed 3 feet back while an adult grilled.

COOK'S NOTEBOOK

1. Draw a plant and label which parts give us herbs and which give us spices (leaves, seeds, bark, roots, berries, buds).
2. Make an herb-and-spice chart with ten entries and the plant part for each.
3. Copy the chimichurri recipe in your own words.

From history. Many herbs on Charlemagne's list, like sage, rosemary and thyme, were grown in monastery gardens for both cooking and home remedies. Some of those gardens have been replanted today so visitors can see them.

COMMON MISTAKES

- Using the same tongs for raw and cooked meat. Use clean tongs or wash them before taking cooked meat off.
- Adding soft fresh herbs at the start of a long cooking time. Their flavor fades; add them at the end.
- Cutting the steak right away. Let it rest 3 minutes so the juices stay inside.

Make it a game • Herb or Spice Sort. Write ten names on paper slips, such as basil, cinnamon, parsley, cumin, mint, pepper, dill, cloves, thyme and ginger. Sort them into herb and spice piles as quickly as you can with a timer. Check with your parent and note your score. Then explain what chimichurri is and what Charlemagne wanted in every royal garden.

Scripture. “And God said, Behold, I have given you every herb bearing seed, which is upon the face of all the earth, and every tree, in the which is the fruit of a tree yielding seed; to you it shall be for meat.” (Genesis 1:29, KJV)

Every herb and spice in your kitchen comes from a plant God made and gave to people. Cooking with them is enjoying His gifts.

7.4 FLAVOR FRIENDS: SWEET, SALTY, SOUR AND RICH

OBJECTIVES

- Explain flavor pairing: sweet with salty, sour with rich (fat), and hot with cool.
- Tell how Auguste Escoffier created Peach Melba in the 1890s, a famous pairing of sweet peaches, cool cream and tart raspberries.
- Serve grilled or broiled peaches with yogurt, honey and a pinch of salt, cooked by an adult, and run a flavor-pair tasting.

Warm-up. Taste a piece of watermelon. Then taste one with a tiny pinch of salt. Then taste a cracker with a little honey. Which of these surprised you? Why do you think salt can make something sweet taste better?

WATCH

Grilled Peaches

Cooking with Coit • 3:58

https://www.youtube.com/watch?v=gH_XR0oL55w

WHEN TO WATCH

Before Session 2. Watch how the peaches are cut, brushed and placed cut side down in a grill pan, a good indoor option.

BACKUP VIDEO

How to Grill Peaches (the BEST Grilled Peaches!)

From Scratch Fast • 8:28

<https://www.youtube.com/watch?v=MgulYhvRvNk>

Optional. Grilled peaches on an outdoor grill with a cool yogurt topping.

KEY TERMS

flavor pairing

Putting together foods or tastes that make each other better, like salty and sweet.

balance

When no single taste is too strong and the flavors work together.

contrast

Two different tastes or textures side by side, such as hot and cold or crunchy and creamy.

caramelize

To brown sugar with heat, making new sweet, nutty, slightly bitter flavors.

CORE IDEAS

The story. Auguste Escoffier was the most famous chef in the world in the 1890s, running the kitchen of the Savoy Hotel in London. One of his guests was Nellie Melba, an Australian singer whose voice filled the great opera houses. Around 1892–1893, Escoffier created a dessert in her honor: ripe peaches, poached gently, set on vanilla ice cream, later topped with a sweet-tart raspberry sauce. He named it *Pêche Melba*, Peach Melba. It is still served all over the world.

How they figured it out. Escoffier knew from years of tasting what good cooks have always known: flavors are better in pairs. Sweet peaches are better with something cool and creamy, and a little tartness keeps the sweetness from being too much. Cooks pair **salty with sweet** (salted caramel, ham with pineapple), **sour with rich** (lemon on fish, vinegar on fried potatoes), **hot with cool** (spicy beans with yogurt), and **herb with citrus** (mint and lime). The point is **balance**: no single taste shouting louder than the others.

The kitchen science. Remember from Unit 3 that salt quiets bitterness and makes sweetness seem stronger, so a pinch of salt on fruit makes it taste sweeter and juicier. Acid (sour) makes your mouth water and cuts through fat, so rich foods taste lighter. Fat carries flavors and coats the tongue, softening sharp tastes. Heat **caramelizes** the sugars in fruit, adding a toasty flavor and a little bitterness that pairs beautifully with cool, creamy yogurt. Good cooks taste and ask: does it need salt, acid, sweetness or richness?

Let's cook. You will halve and pit peaches, brush them with a little oil, and watch from 3 feet back while an adult grills them cut side down (or broils them indoors). Then you will top them with cool yogurt, a drizzle of honey, a few berries and a tiny pinch of salt. The skill to do well is **balancing a dish** by tasting and adjusting.

PICTURE STUDY



Three Peaches on a Stone Ledge, Adriaen Coorte, 1705 · Oil on paper on panel · Rijksmuseum, Amsterdam

Image: [Wikimedia Commons](#), public domain

Adriaen Coorte was a Dutch painter who made small, quiet pictures of just a few fruits on a stone ledge against a dark background. Here are three ripe peaches, painted so softly that you can almost feel their fuzz.

Look closely

- Look at the skin of the peaches. How did Coorte show the fuzz?
- Find the colors on each peach. Where is it red, and where is it yellow?
- Find the painter's name and date on the stone. What year was it?
- Look at the dark background. Why might Coorte have chosen it?

Talk about it

1. What flavors would you pair with these peaches: something salty, something sour, something creamy?
2. How would grilling change these peaches?
3. Coorte painted only three fruits. Why can a simple dish be as beautiful as a fancy one?

Safety first. Cut peaches with a small knife only with an adult right beside you. Only an adult lights and runs the grill or broiler; stay 3 feet back. Grilled fruit and its juice are very hot inside; let it cool 5 minutes before eating. Honey is never given to babies under one year old.

Flavor-Pair Tasting and Grilled Peaches

You will hold a flavor-pair tasting with your family and serve grilled or broiled peaches with cool yogurt, showing how sweet, salty, sour and rich work together.

You will need

- A cutting board, a damp towel and a small knife
- A pastry brush and a small bowl
- A platter and serving spoons
- For the adult griller: long tongs; indoor option: a broiler pan and oven mitts
- Small plates and toothpicks for the tasting

GRILLED PEACHES WITH YOGURT, HONEY AND BERRIES

Serves 6 • Prep 15 min • Grill 6–8 min

Ingredients

- 6 ripe but firm peaches (or nectarines)
- 1 tablespoon vegetable or olive oil
- 1½ cups (360 g) plain or vanilla Greek yogurt
- 2–3 tablespoons honey (or maple syrup)
- 1 cup raspberries or blueberries
- ½ teaspoon cinnamon
- A tiny pinch of flaky salt or table salt
- A few fresh mint leaves (optional)

Method

1. Wash your hands and rinse the peaches and berries.
2. With an adult right beside you, cut each peach in half all the way around, following the line, down to the pit. Twist the halves apart and lift out the pit with a spoon (an adult helps with stubborn pits).

3. Brush the cut sides lightly with oil.
4. An adult heats the grill to medium (or the broiler). From 3 feet back, watch the adult place the peaches cut side down and grill 4–5 minutes until marked and softened, then turn and grill 2–3 minutes more. Under the broiler, cut side up, 5–7 minutes.
5. The adult moves the peaches to the platter. Let them cool 5 minutes.
6. Top each peach half with a spoonful of yogurt, a drizzle of honey, a few berries and a sprinkle of cinnamon. Add the tiniest pinch of salt to half of them for the taste test. Tear mint over the top.
7. Clean up: wash the board, brush and bowl.

Allergy check: Contains milk (yogurt). For milk-free, use a coconut or oat yogurt. Honey is not for babies under one year; use maple syrup instead.

Steps

1. **Flavor-pair tasting.** Set out small pairs: watermelon with and without a pinch of salt; apple with and without cheddar; cucumber with and without a squeeze of lime; a cracker with and without a little honey. Ask each person which version of each pair is better and why.
2. **Predict.** Will the peaches with a pinch of salt taste sweeter or saltier?
3. Make the grilled peaches with an adult at the grill.
4. **Salt test.** Taste a peach half with salt and one without. Ask your family which they like better.
5. **Flavor chart.** Make a chart of the pairs: sweet + salty, sour + rich, hot + cool, herb + citrus. Write one food example for each from this unit.
6. **Improve it.** Write one change (a squeeze of lime, a sprinkle of granola for crunch, a different fruit).
7. Clean up.

Tips

- Choose peaches that are ripe but still firm so they hold their shape on the grill.
- Pineapple rings, plums and thick apple slices grill well too.
- A clean, oiled grill keeps fruit from sticking.

Check your work

- ☐ I can explain flavor pairing and name four kinds of pairs.
- ☐ I can tell the story of Escoffier and Peach Melba.
- ☐ I ran a flavor-pair tasting and stayed 3 feet back while an adult grilled.

COOK'S NOTEBOOK

1. Make a flavor-pair chart with a drawing for each pair.
2. Draw a grilled peach half with its toppings and label which taste each topping adds.
3. Write the results of your family's tasting choices.

From history. Escoffier also organized professional kitchens into teams called brigades, with each cook in charge of one station: sauces, fish, vegetables, pastry. Many restaurants still use his system.

COMMON MISTAKES

- Thinking salt belongs only on savory food. A tiny pinch can make fruit and desserts taste better.
- Using very soft, overripe peaches. They fall apart on the grill.
- Eating grilled fruit right off the grill. The juice inside stays very hot.

Make it a game • Flavor Friends Match. Make cards with flavor friends, such as sweet and salty, sour and rich, hot and cool. Turn them face down in two piles and play memory match with your parent. When you find a pair, say a food that proves it. Explain Peach Melba, and tell how Escoffier balanced peaches, cream and raspberries.

UNIT 7

FIRE, THE GRILL & SPICE

This is the fun unit: fire, smoke, spice and bold flavor. You will follow Christopher Columbus, who sailed west in 1492 looking for the spices of Asia and found the chili pepper instead, a plant that soon spread around the whole world. You will learn what makes a pepper “hot” when it is not hot at all. Then you will read how God told Israel to roast the Passover lamb with fire, and you will learn the grill safety rules every family should know.

You will discover the difference between herbs and spices and make a bright green chimichurri sauce, and you will learn how good cooks pair flavors: sweet with salty, sour with rich. At the grill, an adult lights the fire and does all the grilling while you prepare the food and watch from 3 feet back. Every grilled recipe also works under the oven broiler or in a grill pan, with an adult, for families without a grill.

PREREQUISITES

- Knows the safe internal temperatures: ground meat 160 °F, poultry 165 °F, whole cuts 145 °F with a 3-minute rest (Unit 1)
- Keeps raw meat separate and washes hands after touching it (Unit 1)
- Knows how heat moves by conduction (Unit 4)
- Knows the five basic tastes (Unit 3)

MASTERY CHECKLIST

- ☐ I can tell how Columbus’s voyages brought chili peppers to the rest of the world, and explain what capsaicin does.
- ☐ I can name the fire triangle and the grill safety rules, and I know that only adults light and run the grill.
- ☐ I can explain the difference between herbs and spices and name examples of each.
- ☐ I can pair flavors (sweet + salty, sour + rich, hot + cool) to balance a dish.
- ☐ I can shape burgers safely and check that ground meat reaches 160 °F.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **NFPA: Grilling safety:** Free. Grilling safety tips and a printable tip sheet from the National Fire Protection Association. Read it together before Lesson 7.2.
- **For the adult griller: long-handled tongs, a spatula and a chimney starter:** Long tools keep hands away from the heat. A chimney starter lights charcoal with crumpled newspaper, so no liquid starter is needed; a gas grill needs neither. Not required: every recipe also works under the oven broiler or in a grill pan.
- **Kitchen scissors:** A clean pair kept for food makes snipping fresh herbs quick and safe (Lesson 7.3).

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

7.1	Columbus, the Spice Route and the Chili Pepper	2 sessions of 45–60 minutes
7.2	The Passover Lamb and Grill Safety	2 sessions of 45–60 minutes
7.3	Herbs and Spices: Chimichurri	2 sessions of 45–60 minutes
7.4	Flavor Friends: Sweet, Salty, Sour and Rich	2 sessions of 45–60 minutes

UNIT 7 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

Why did Columbus call the Caribbean ají a “pepper”?

2. 5 pts

What is capsaicin, and why does milk cool a chili burn better than water?

3. 5 pts

Name the three sides of the fire triangle. How does closing a grill lid stop a flare-up?

4. (5 pts)

List four grill safety rules.

5. (5 pts)

What is the safe temperature for burgers? For a steak? Why are they different?

6. (5 pts)

Predict: you shape one burger with a thumbprint dent and one without. How will they look after grilling?

7. (5 pts)

What is the difference between an herb and a spice? Give two of each.

8. (5 pts)

What was the Capitulaire de villis, and why does it matter to cooks?

9. (5 pts)

Predict: you sprinkle a tiny pinch of salt on a slice of watermelon. Will it taste saltier or sweeter? Explain.

10. (5 pts)

Name four kinds of flavor pairs and an example of each.

ANSWER KEY

1. He was looking for the spices of Asia, including black pepper, and hoped he had found it, so he called the ají pimiento, Spanish for pepper. The plants are not related.
2. The compound in chili peppers that triggers the heat-sensing nerves in the mouth. It dissolves in fat, so milk (with fat and protein) washes it away; water only spreads it.
3. Heat, fuel and oxygen. The lid takes away oxygen.
4. Any four: only adults light and run the grill; children stay 3 feet back; grill outdoors on flat ground away from the house, railings, overhangs and dry leaves; no liquid fire starter; long tools; hose or extinguisher nearby; never leave a lit grill alone; let coals cool 24–48 hours before an adult disposes of them in a metal can.
5. Burgers 160 °F; steak 145 °F with a 3-minute rest. Ground meat is mixed, so surface germs can be inside; a whole steak's germs are on the outside, which gets very hot.
6. The undented burger puffs up in the middle into a dome; the dented one stays flatter and cooks more evenly.
7. Herbs are leaves (parsley, basil, oregano, mint, thyme); spices come from seeds, bark, roots, berries or buds (cumin, cinnamon, ginger, black pepper, cloves).
8. An order from Charlemagne around the year 800 listing the plants every royal garden should grow, including many herbs. It helped spread herb gardens across Europe.
9. Sweeter. A little salt makes sweetness seem stronger and quiets any bitterness.
10. Sweet + salty (salted watermelon), sour + rich (lemon on fish, vinaigrette on salad), hot + cool (spicy beans with yogurt), herb + citrus (mint and lime).

UNIT CHALLENGE: A FAMILY COOKOUT (GRILL OR BROILER)

Plan and prepare a family cookout dinner with a main dish, a vegetable, a sauce or spice blend you make yourself, and a grilled fruit dessert. You prepare, season and set out everything; an adult lights and runs the grill (or broiler) while you watch from 3 feet back and check the temperatures together.

Make a safety checklist before the cookout and a flavor-pairing chart showing at least three pairs in your menu. Record the safe temperature of each meat, ask each person to rate the meal, and write one improvement.

LOOK FOR	WHAT IT MEANS
Planning	A written menu, shopping list, safety checklist and simple timeline.
Safety	Raw meat kept separate, hands washed, adult at the grill, kid-free zone kept, temperatures checked and recorded.
Flavor	A homemade sauce or spice blend written so it can be made again, and at least three flavor pairs named and used.
Cleanup and service	Kitchen and tools cleaned, table set, meal served with thanks.
Reflection	Family ratings recorded and one honest improvement planned.

UNIT 8

MEAL PLANNING & THE FAMILY TABLE

A good cook is not only someone who can follow a recipe, but someone who can plan, shop, measure, change a recipe to feed more people, and welcome others to the table. In this unit you will open the first cookbook written by an American, Amelia Simmons's *American Cookery* of 1796, and cook its johnnycakes. You will read how Boaz shared bread and parched corn with Ruth at mealtime, and you will learn to double and halve a recipe with fractions.

In the last week you will plan, shop for and cook a family feast with an adult beside you, using dishes you learned this year. You will set the table, welcome your family, lead or join in giving thanks, and share what you have learned. Hospitality, making others welcome at your table, is one of the oldest and best uses of a cook's skill.

PREREQUISITES

- Measures dry and liquid ingredients accurately (Units 1–7)
- Uses the knife, stove and oven safely with an adult beside (Units 1–7)
- Knows the five food groups and how to build a balanced plate (Unit 2)
- Can multiply and divide simple fractions, or is learning to

MASTERY CHECKLIST

- ☐ I can tell who Amelia Simmons was and why
*A (1796) matters.
me
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ok
ery*
- ☐ I can tell the story of Ruth and Boaz at mealtime and what parched corn was.
- ☐ I can double and halve a recipe, including fractions of cups and spoons.
- ☐ I can plan a balanced meal, write a shopping list and a cooking timeline.
- ☐ I can set the table, welcome guests and give thanks.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **Project Gutenberg: *American Cookery* by Amelia Simmons:** Free. The full text of the 1796 cookbook to read online. Find the recipe for johnnycake (Lesson 8.1).
- **MyPlate Kitchen:** Free at MyPlate.gov. Simple USDA recipes and a meal-planning tool for planning the feast menu and the week's meals.
- **Measuring cups and spoons, including $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{8}$:** You will use every size when doubling and halving recipes in Lesson 8.3.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

8.1	Amelia Simmons and the First American Cookbook	2 sessions of 45–60 minutes
8.2	Ruth and Boaz: Bread and Parched Corn	2 sessions of 45–60 minutes
8.3	Doubling and Halving a Recipe	2 sessions of 45–60 minutes
8.4	The Family Feast	2 sessions of 60–90 minutes

UNIT 8 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

Who was Amelia Simmons, and why is *American Cookery* (1796) important?

2. 5 pts

Why do johnnycakes need boiling water poured over the cornmeal?

3. 5 pts

What did Boaz give Ruth at mealtime, and what did she do with the leftovers?

4. 5 pts

Predict: you heat a popcorn kernel and a grain of barley in a hot pan. What will happen to each, and why?

5. (5 pts)

Double these amounts: $\frac{3}{4}$ cup, $\frac{1}{3}$ cup, $1\frac{1}{2}$ teaspoons.

6. (5 pts)

Halve these amounts: 1 cup, $\frac{1}{2}$ cup, 3 tablespoons.

7. (5 pts)

How many teaspoons are in a tablespoon, and how many tablespoons are in $\frac{1}{4}$ cup?

8. (5 pts)

How should leftover chili be cooled, stored and reheated?

9. (5 pts)

Why should a feast timeline be written backward from the serving time?

10. (5 pts)

Describe how to set one place at the table.

ANSWER KEY

1. An American orphan who wrote the first cookbook by an American printed in the United States. It used American foods like cornmeal, pumpkins and cranberries.
2. The boiling water makes the cornmeal's starch soak up water and soften (gelatinize), so the dough holds together on the griddle.
3. Bread to dip in vinegar and parched corn. She ate until satisfied and saved the rest for Naomi.
4. The popcorn kernel pops, because its sealed hull traps steam until it bursts. The barley toasts but does not pop, because its hull lets steam leak out.
5. $1\frac{1}{2}$ cups, $\frac{2}{3}$ cup, 3 teaspoons (1 tablespoon).
6. $\frac{1}{2}$ cup, $\frac{1}{4}$ cup, $1\frac{1}{2}$ tablespoons (1 tablespoon plus $1\frac{1}{2}$ teaspoons).
7. 3 teaspoons in a tablespoon; 4 tablespoons in $\frac{1}{4}$ cup.
8. Cool it fast in shallow containers, refrigerate within 2 hours, eat within 3–4 days or freeze, and reheat to 165 °F.
9. So that the dishes that take longest start first and everything is ready together when the meal is served.
10. Plate in the center, fork on the left with the napkin, knife (blade in) and spoon on the right, cup above the knife.

UNIT CHALLENGE: THE FAMILY FEAST

Plan, shop for, cook and serve a family feast with an adult beside you. Your feast should have a main dish, at least one vegetable, a bread or grain, and a fruit or dessert, using at least three recipes from this year.

Turn in your menu card, your shopping list (with costs if you can), your timeline with check marks, a photograph or drawing of the set table, family ratings, and a written grace or thank-you note.

LOOK FOR	WHAT IT MEANS
Planning	A balanced menu with all five food groups, an allergy check, a shopping list and a written timeline.
Cooking and safety	Safe knife, stove and oven work with an adult beside; separate boards; every meat checked with the thermometer; leftovers chilled within 2 hours.
Table and hospitality	A set table, a menu card, guests welcomed, thanks given and food served with care.
Cleanup	The kitchen cleaned and dishes washed, with family help if needed.
Reflection	Family ratings recorded and an honest reflection on what went well and what to change.

8.1 AMELIA SIMMONS AND THE FIRST AMERICAN COOKBOOK

OBJECTIVES

- Tell who Amelia Simmons was and why *American Cookery* (1796) was the first cookbook written by an American.
- Read an old recipe and rewrite it with modern measurements and steps.
- Cook johnnycakes on a griddle with an adult beside you, pouring hot water safely with help.

Warm-up. Look at a cookbook or recipe card in your kitchen. What parts does a modern recipe have? (Ingredients list? Amounts? Oven temperature? Steps?) Write them down. Now guess: which of these would a cookbook from 1796 have?

WATCH

America's First Cookbook

Library of Congress • 7:09

<https://www.youtube.com/watch?v=4iVvMZPtLn8>

WHEN TO WATCH

After the story. Look closely at the pages of the real 1796 book. Can you read the old-style letters?

Note: A Library of Congress rare-book curator shows the library's copy of *American Cookery*.

BACKUP VIDEO

250 Year Old "Johnny Cake"

Townsend • 14:52

<https://www.youtube.com/watch?v=JcGZp-udPmo>

Before Session 2. Watch how Mr. Townsend mixes the cornmeal with hot water and cooks the cakes on a griddle by the fire.

KEY TERMS

cookbook

A book of recipes and cooking advice.

johnnycake

A flat cornmeal cake cooked on a griddle, eaten in America since colonial days. Also called a hoe cake or journey cake.

cornmeal

Dried corn ground into coarse flour. Old cookbooks call it “Indian meal.”

griddle

A flat, heavy pan for cooking pancakes, johnnycakes and similar foods.

CORE IDEAS

The story. In 1796, in Hartford, Connecticut, a small book was printed with a long title that began *American Cookery*. Its author, Amelia Simmons, called herself “an American orphan.” Before this, cooks in the young United States used cookbooks from England, which did not use American foods. Amelia Simmons wrote recipes with the foods of her own country: cornmeal (which she called “Indian meal”), pumpkins, cranberries, and turkey. Her book had the first printed recipes for pumpkin pie (she called it “pompkin”), and recipes for Indian pudding, slapjacks and johnnycake. It is known as the first cookbook written by an American and printed in the United States.

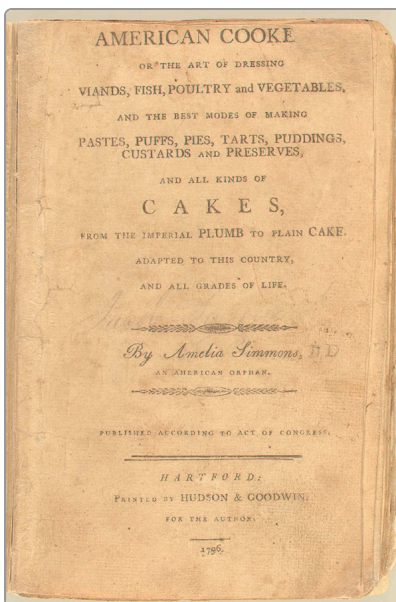
How they figured it out. Amelia Simmons learned to cook by working in other families’ kitchens. She wrote down what worked. Her recipes are short and assume the cook already knows a lot: amounts like “a pint of milk” or “a little salt,” and no oven temperatures, because ovens were heated with wood and the cook judged the heat by holding a hand inside. She also used **pearl ash**, an early leavening made from wood ashes, which helped American cooks make quick breads rise. When we read her book today, we have to translate it into modern measurements, just as you will.

The kitchen science. Cornmeal is mostly starch, with some protein but no gluten. When you pour **boiling** water over cornmeal, the starch begins to gelatinize (as in Unit 5), soaking up the water and turning the coarse meal into a soft, sticky dough that holds together on the griddle. On a hot, lightly greased griddle, conduction

browns the bottom into a crisp crust while the inside stays tender. Johnnycakes need patience: they should cook slowly until deep golden before they are turned.

Let's cook. You will make johnnycakes from cornmeal, salt, a little sugar, boiling water and milk, and cook them on a griddle. The skills to do well are **handling boiling water safely** (an adult pours it while you stir) and **waiting to flip** until the edges are golden and crisp. An adult is beside you at the stove.

PICTURE STUDY



Title page of American Cookery, Amelia Simmons (author); printed by Hudson & Goodwin, 1796 · Printed book · Library of Congress, Washington, D.C.

Image: [Wikimedia Commons](#), public domain

This is the first page of the first cookbook written by an American. Long titles were common in 1796: the title page tells the reader everything the book will teach. Look for the author's name and the city where it was printed.

Look closely

- Find the words “American Cookery.” Why do you think she chose the word *American*?
- Find Amelia Simmons’s name. How does she describe herself?
- Find the city and the year at the bottom.
- Look at the letters. Some old letters look different from ours. Can you find any?

Talk about it

1. Why did Americans need a cookbook with American foods?
2. Which foods from Amelia Simmons’s country would you put in a cookbook about where you live?
3. If you wrote a cookbook, what would you call yourself on the title page?

Safety first. An adult pours the boiling water while you stir with a long spoon, and you keep your other hand away from the bowl. An adult stands beside you at the griddle; use only a thin film of butter or oil and turn the cakes away from you with a wide spatula.

Translate an Old Recipe: Johnnycakes

You will read Amelia Simmons's recipe, rewrite it as a modern recipe card, and cook johnnycakes for breakfast or supper.

You will need

- A medium heat-proof bowl and a long wooden spoon
- A kettle or saucepan for boiling water
- A large griddle or heavy skillet and a wide spatula
- Measuring cups and spoons
- A recipe card and a pencil

JOHNNYCAKES

Serves 4 (about 12 small cakes) · Prep 10 min · Rest 5 min · Cook 20 min

Ingredients

- 1 cup (140 g) fine or medium yellow or white cornmeal
- 1 teaspoon sugar
- ½ teaspoon salt
- 1 cup (240 mL) boiling water
- ¼–½ cup (60–120 mL) milk
- 2 tablespoons butter or vegetable oil, for the griddle
- For serving: butter, maple syrup, applesauce or a fried egg

Method

1. Wash your hands. In the heat-proof bowl, stir the cornmeal, sugar and salt.
2. An adult brings the water to a full boil and pours it slowly into the bowl while you stir with the long spoon. Stir until smooth and thick. Let it rest 5 minutes.
3. Stir in milk a little at a time until the batter is like thick oatmeal that drops from a spoon.

4. With an adult beside you, heat the griddle over medium heat and add a thin film of butter or oil.
5. Drop the batter by heaping tablespoons and flatten each into a cake about ½ inch thick.
6. Cook 5–6 minutes without moving, until the bottom is deep golden and crisp at the edges. Turn with the spatula, away from you, and cook 4–5 minutes more.
7. Serve hot with butter and maple syrup or applesauce. Clean up: wash the bowl, spoon and griddle.

Allergy check: Contains milk (milk, butter). For milk-free, use water or oat milk and oil. Cornmeal contains no wheat, but check the label for “may contain wheat” if needed.

Steps

1. **Read the old recipe.** Amelia Simmons wrote her johnnycake recipe in one long sentence with no exact amounts for everything. Read it with a parent (the Project Gutenberg link in the optional books and tools box has the whole book). Underline every ingredient and amount.
2. **Translate it.** Rewrite the recipe as a modern recipe card with an ingredients list, amounts in cups and spoons, and numbered steps.
3. **Predict.** What will happen if you flip a johnnycake too soon?
4. Cook the johnnycakes. Flip one early on purpose and compare it with one cooked patiently.
5. **Taste test.** Rate them from 1 to 5. Which topping did your family like best?
6. **Improve it.** Write one change (more milk for thinner cakes, a pinch more salt, blueberries).
7. Clean up.

Tips

- The boiling water is what makes johnnycakes hold together. Do not use warm tap water.
- If the batter thickens as it sits, stir in another spoonful of milk.
- Fine cornmeal makes tender cakes; coarse cornmeal makes crunchy, rustic ones.

Check your work

- ☐ I can tell who Amelia Simmons was and why her book matters.
- ☐ I translated an old recipe into a modern recipe card.
- ☐ I cooked johnnycakes with an adult beside me.

COOK'S NOTEBOOK

1. Copy your modern recipe card for johnnycakes, with a small drawing.
2. Make a two-column chart: “How recipes were written in 1796” and “How recipes are written today.”
3. Write the title page for your own future cookbook.

From history. Nobody is sure where the name johnnycake came from. Some say it was “journey cake,” because the cakes traveled well; others think it came from “Shawnee cake” or from a word used by the native peoples of New England. Rhode Island families still argue about the right way to make them.

COMMON MISTAKES

- Flipping too soon. The cake falls apart; wait until the edges are golden and crisp.
- Using warm water instead of boiling water. The cornmeal will not soften and the cakes crumble.
- Cooking on high heat. The outside burns before the inside cooks.

Make it a game • Old Recipe Translator. Write a short old-fashioned recipe with a pinch of this and a tea cup of that, then trade with your parent. Rewrite it with modern measurements and steps. The first to finish an accurate version earns a point. Then tell who Amelia Simmons was, what American Cookery began, and what a johnnycake is.

8.2 RUTH AND BOAZ: BREAD AND PARCHED CORN

OBJECTIVES

- Tell the story of Ruth gleaning in Boaz's field and eating bread and parched corn at mealtime (Ruth 2), and what parched grain was.
- Explain why a corn kernel pops, and compare parched (toasted) grain with popcorn.
- Make stovetop popcorn with an adult beside you and serve it with bread and a dipping sauce.

Warm-up. Look at a kernel of popcorn, a dried bean and a grain of rice. Which do you think could pop? Why? Then guess: what is inside a popcorn kernel that makes it pop?

WATCH

How to Make Perfect Stovetop Popcorn with Four Flavor Variations | Today's Special

America's Test Kitchen • 2:29

<https://www.youtube.com/watch?v=01f58PxAbfc>

WHEN TO WATCH

Before Session 2. Watch how the test cook shakes the pot and listens to the pops.

BACKUP VIDEO

Corn: Treasure Of The Americas

Townsend • 20:30

<https://www.youtube.com/watch?v=jLFaBBN4kYU>

Optional. Mr. Townsend tells the long story of corn in early America, including parched corn.

KEY TERMS

parched corn

In the Bible, grain such as barley or wheat roasted in a dry pan until toasty and crunchy. In early America, dried corn kernels toasted the same way.

gleaning

Gathering the grain left in a field after the harvesters pass.

hull

The hard outer coat of a popcorn kernel.

steam

Water turned into a gas by heat. Steam takes up much more room than water.

CORE IDEAS

The story. Ruth was a young widow from the land of Moab who came to Bethlehem with her mother-in-law, Naomi. They were poor, so Ruth went out to glean barley in the field of a man named Boaz. Boaz saw her hard work and her kindness to Naomi. At mealtime he called her: “At mealtime come thou hither, and eat of the bread, and dip thy morsel in the vinegar.” He handed her **parched corn**, toasted grain, and she ate until she was satisfied and had some left over to bring home to Naomi (Ruth 2:14, 18). Ruth and Boaz later married, and they became the great-grandparents of Israel’s greatest king.

How they figured it out. In the Bible, “corn” means grain, such as barley or wheat. Toasting grain in a hot, dry pan made it crunchy, flavorful and easy to carry. In the Americas, native peoples had been growing corn (maize) for a very long time, and some kinds of corn did something amazing when heated: they popped. Early American travelers carried parched corn as trail food. In 1885 Charles Cretors of Chicago built a steam-powered popcorn machine that could pop corn right on the street, and popcorn became a favorite American snack.

The kitchen science. Every popcorn kernel holds a tiny drop of water inside a hard, sealed **hull**, packed around starch. When the kernel heats to about 355 °F (180 °C), the water turns to **steam**. The steam presses harder and harder against the hull until it bursts open. The soft starch inside puffs up into a white foam and sets as it cools. Other grains, like Ruth’s barley, have hulls that leak steam slowly, so they toast instead of popping. Popcorn is a whole grain, full of fiber.

Let’s cook. You will pop corn on the stovetop in a covered pot, then serve it with warm bread and an olive oil and vinegar dip, as Ruth dipped her morsel. The skills to do well are **listening while you cook** (when the pops slow to one every 2 seconds, it is done) and **lifting the lid away from your face**. An adult is beside you at the stove.

PICTURE STUDY



Summer (Ruth and Boaz), Nicolas Poussin, 1660–1664 · Oil on canvas · Musée du Louvre, Paris

Image: [Wikimedia Commons](#), public domain

Nicolas Poussin, a French painter, painted the four seasons as four Bible stories. For summer he chose Ruth meeting Boaz in his harvest field near Bethlehem. Look at all the work of the harvest going on around them.

Look closely

- Find Ruth and Boaz. How can you tell which is which?
- Find the harvesters cutting the grain. What tools are they using?
- Find the wagon or the sheaves of grain. Where will the grain go next?
- Look for anyone eating or resting. How would the workers get their noon meal?

Talk about it

1. What did Boaz give Ruth to eat at mealtime? Why was that kind?
2. How did Ruth share what she was given?
3. How could your family be like Boaz, giving food to someone who needs it?

Safety first. An adult stands beside you at the stove. Keep the lid on while the corn pops; when you lift it, tilt it away from your face so steam escapes away from you. Hot oil and unpopped kernels are very hot, so let the pot cool before cleaning. Popcorn is a choking hazard for children under about 4 years old; check with parents before you give any to little ones.

Pop Science: Stovetop Popcorn with Bread and Dip

You will count and compare popped and unpopped kernels, make stovetop popcorn, and serve a simple meal of bread, dip and popcorn, and give some to someone outside your family as Ruth shared with Naomi.

You will need

- A large heavy pot (about 4–6 quarts) with a lid
- Oven mitts, a large bowl and a timer
- A small bowl for the dip and a bread knife
- Measuring cups and spoons
- Paper bags or containers for giving some away

STOVETOP POPCORN WITH BREAD AND AN HERB DIP

Serves 4–6 • Prep 10 min • Cook 10 min

Ingredients

- **Popcorn:** 3 tablespoons vegetable oil
- ½ cup (100 g) popcorn kernels
- ½ teaspoon fine salt
- Optional: 2 tablespoons melted butter, or a sprinkle of cinnamon sugar or Parmesan
- **Bread and dip:** 1 loaf crusty bread
- ⅓ cup (80 mL) olive oil
- 2 tablespoons apple cider or balsamic vinegar
- ½ teaspoon dried Italian herbs, a pinch of salt and pepper

Method

1. Wash your hands. With an adult beside you, put the oil and 3 kernels in the pot over medium-high heat. Cover.
2. When all 3 kernels pop, the oil is hot enough. Lift the pot off the heat, add the rest of the kernels, cover, and count to 30. (This warms all the kernels evenly.)

3. Return the pot to the heat. When popping starts, gently shake the pot back and forth across the burner with oven mitts on, lid held closed.
4. When the pops slow to one every 2 seconds, turn off the heat and move the pot off the burner. Lift the lid tilted away from you.
5. Pour the popcorn into the big bowl. Toss with salt (and butter or another topping).
6. Make the dip: stir the olive oil, vinegar, herbs, salt and pepper in a small bowl. With an adult beside you, slice the bread.
7. Serve the bread with the dip and a bowl of popcorn. Clean up when the pot is cool.

Allergy check: Popcorn contains none of the nine major allergens. Bread contains wheat (and may contain milk, eggs, soy or sesame; check the label). Butter and Parmesan contain milk.

Steps

1. **Kernel count.** Count out 100 kernels and set them aside in a cup. After popping the rest, count how many unpopped kernels (“old maids”) are left at the bottom of the pot. What fraction did not pop?
2. **Predict.** How many times bigger will the popcorn be than the kernels? Measure $\frac{1}{2}$ cup kernels before and the popped corn in cups after.
3. **Parched grain.** With an adult beside you, toast 2 tablespoons of barley or wheat berries (or dried corn kernels that are not popcorn) in a dry skillet over medium heat, stirring, 5–8 minutes, until toasty-smelling. Taste one when cool. How is it like Ruth’s parched corn?
4. Make the popcorn, bread and dip.
5. **Share.** Pack a bag of popcorn for a neighbor, grandparent or friend, as Ruth saved food for Naomi.
6. **Improve it.** Write one change (a different topping, less salt, coconut oil).
7. Clean up.

Tips

- Shaking the pot keeps the kernels from burning on the bottom.
- Store popcorn kernels in a sealed jar. Kernels that dry out will not pop well.

- A clean brown paper bag folded twice also pops corn in the microwave, with an adult nearby.

Check your work

- ☐ I can tell the story of Ruth and Boaz and what parched corn was.
- ☐ I can explain why popcorn pops.
- ☐ I made stovetop popcorn with an adult beside me and shared some.

COOK'S NOTEBOOK

1. Draw a popcorn kernel before and after popping, labeled with the hull, the starch and the drop of water turning to steam.
2. Write your kernel count and how many times bigger the popped corn was.
3. Draw Ruth bringing her leftovers with Naomi.

From history. Boaz's invitation to dip bread "in the vinegar" describes a common meal of the time: bread dipped in a sour drink or sauce made from fruit. Ruth's story ends with a feast of a different kind: a family, a home, and a son, Obed, whose grandson became Israel's king.

COMMON MISTAKES

- Opening the lid toward your face. Steam and hot kernels can burn; tilt the lid away.
- Leaving the pot on the heat after the popping slows. The popcorn on the bottom burns.
- Giving popcorn to toddlers. It is a choking hazard for young children.

Make it a game • Gleaning Story Acts. Act out Ruth 2 with your parent, with you as Ruth and your parent as Boaz. Include gleaning, bread, and parched corn, and say aloud what parched grain was. Then explain why a kernel of popcorn pops by showing the steam inside, using your hand as a kernel that swells and bursts.

Scripture. "And Boaz said unto her, At mealtime come thou hither, and eat of the bread, and dip thy morsel in the vinegar. And she sat beside the reapers: and he reached her parched corn, and she did eat, and was sufficed, and left." (Ruth 2:14, KJV)

Boaz welcomed a poor stranger to his table and gave her more than enough. Ruth was satisfied and had food left over to share. Hospitality is a way to show God's kindness.

8.3 DOUBLING AND HALVING A RECIPE

OBJECTIVES

- Double and halve a recipe, including fractions of cups and spoons (such as $\frac{3}{4}$ cup doubled and $\frac{1}{3}$ cup halved).
- Tell how Jesus fed the five thousand and commanded the disciples to gather up the leftovers, and plan a meal that uses leftovers well.
- Cook a double batch of chili with an adult beside you, serve half, and cool and freeze the rest safely.

Warm-up. A cookie recipe needs $\frac{3}{4}$ cup of sugar and makes 24 cookies. How much sugar for 48 cookies? For 12 cookies? Use measuring cups and dry rice or beans to show your answers.

WATCH

Doubling a Recipe

Erin Rabb · 4:44

<https://www.youtube.com/watch?v=qQZbnH-Fpsg>

WHEN TO WATCH

After the kitchen science, with a pencil and paper. Pause and solve each line before the video does.

Note: A short classroom video from a teacher, working through a doubled recipe on paper.

BACKUP VIDEO

Easy & Hearty Turkey Chili Recipe – A Family Favorite!

Natashas Kitchen · 5:55

<https://www.youtube.com/watch?v=SRV89xGUmA>

Before Session 2. Watch how the chili comes together; our recipe is a little different and uses beef or turkey.

KEY TERMS

double

To multiply every ingredient amount by 2, to make twice as much.

halve

To divide every ingredient amount by 2, to make half as much.

yield

How much a recipe makes, such as 6 servings or 24 cookies.

equivalent

Different amounts that are the same, like 3 teaspoons = 1 tablespoon, or 4 tablespoons = $\frac{1}{4}$ cup.

leftovers

Cooked food saved for another meal, kept cold and eaten within 3–4 days or frozen.

CORE IDEAS

The story. One day a great crowd of about five thousand men, besides women and children, followed Jesus into the hills by the Sea of Galilee. They were hungry, and there was nowhere to buy food. A boy had five barley loaves and two small fishes. Jesus gave thanks and fed the whole crowd with them, and everyone ate as much as they wanted. Then Jesus said: “Gather up the fragments that remain, that nothing be lost.” The disciples filled twelve baskets with leftovers (John 6:9-13).

How they figured it out. Only Jesus can feed thousands with five loaves. But every family cook faces a smaller version of the same question: how do I make enough for everyone, and what do I do with what is left? Cooks learned to **scale** recipes: to multiply or divide every amount by the same number. In 1896 the Boston cooking teacher Fannie Farmer made this much easier by insisting on **level** measurements in standard cups and spoons, so that a recipe would work the same in any kitchen and could be doubled or halved exactly.

The kitchen science. To **double** a recipe, multiply every amount by 2: $\frac{3}{4}$ cup becomes $1\frac{1}{2}$ cups; $\frac{1}{3}$ cup becomes $\frac{2}{3}$ cup. To **halve**, divide by 2: $\frac{1}{2}$ cup becomes $\frac{1}{4}$ cup; $\frac{1}{3}$ cup becomes 2 tablespoons plus 2 teaspoons; 1 egg becomes 1 beaten egg, half poured out. Equivalents help: 3 teaspoons = 1 tablespoon; 4 tablespoons = $\frac{1}{4}$ cup; 16 tablespoons = 1 cup. Some things do not double exactly: a bigger pot takes longer to come to a boil, salt and spices should be added carefully and tasted, and

the pan must be big enough. Leftovers must be cooled fast (into shallow containers, into the refrigerator within 2 hours) and reheated to 165 °F.

Let's cook. You will double a chili recipe, serve half for dinner and save half for another day, so that nothing is lost. The skills to do well are **scaling the recipe on paper first** and **cooling and storing leftovers safely**. An adult is beside you at the stove.

PICTURE STUDY



Vegetable Market at Pontoise, Camille Pissarro, 1891 · Etching · National Gallery of Art, Washington, D.C.

Image: [Wikimedia Commons](#), public domain

Pissarro made this etching, a picture printed from a scratched metal plate, of the weekly market in his town of Pontoise. Cooks came with baskets and lists to buy enough vegetables for their families for several days. A cook feeding a big household had to buy in large amounts and plan carefully so nothing would spoil.

Look closely

- Find the baskets. How much food could a shopper carry home?
- Find a seller. What is he or she selling?
- Look at the crowd. How many people can you count?
- Find the buildings behind the market. What kind of town is this?

Talk about it

1. If you needed enough vegetables for a double batch of soup, how would you plan your shopping?
2. How would a cook in 1891 keep leftover food from spoiling without a refrigerator?
3. Jesus told the disciples to gather the leftovers so nothing would be lost. How can your family use leftovers well?

Safety first. An adult stands beside you at the stove; a double batch makes a heavy, hot pot, so an adult lifts and pours it. Cook ground meat to 160 °F (165 °F for turkey). Cool leftovers quickly in shallow containers, refrigerate within 2 hours, and reheat to 165 °F; freeze what you will not eat in 3–4 days.

KITCHEN PROJECT

Double the Chili, Save Half

You will rewrite a chili recipe as a double batch on paper, check your math with an adult, cook it, and store half safely for a second dinner later.

You will need

- A large heavy pot (at least 6 quarts) and a wooden spoon
- A cutting board, a damp towel and a small knife
- A can opener
- Measuring cups and spoons
- An instant-read food thermometer
- Shallow containers with lids and freezer labels

FAMILY BEEF AND BEAN CHILI (SINGLE BATCH SHOWN; YOU WILL DOUBLE IT)

Serves 6 (a double batch serves 12) • Prep 20 min • Cook 40 min

Ingredients

- 1 tablespoon vegetable oil
- 1 onion and 1 bell pepper
- 1 pound (450 g) lean ground beef or ground turkey
- 1½ tablespoons mild chili powder
- 1 teaspoon ground cumin and ½ teaspoon dried oregano
- ¾ teaspoon salt
- 1 (28-ounce / 794 g) can crushed tomatoes
- 2 (15-ounce / 425 g) cans kidney or pinto beans, drained and rinsed
- ¾ cup (180 mL) water or broth
- For serving: grated cheese, plain yogurt or sour cream, cornbread or crackers

Method

1. **Scale first.** Before cooking, rewrite every amount for a double batch on paper. Have an adult check it.
2. Wash your hands and rinse the vegetables. With an adult right beside you, dice the onion and pepper with the bridge and claw grips.
3. With an adult beside you, heat the oil in the large pot over medium heat. Cook the onion and pepper 5 minutes.
4. Add the meat and cook 8–10 minutes, breaking it up, until no pink remains. Check: 160 °F for beef, 165 °F for turkey.
5. Stir in the spices and cook 30 seconds. Add the tomatoes, beans and water. Bring to a simmer.
6. Turn the heat to low, cover with the lid tipped, and simmer 25–30 minutes, stirring now and then. A double batch may need 10 minutes more. Taste and add salt carefully.
7. Serve half with toppings. An adult ladles the other half into shallow containers to cool; refrigerate within 2 hours, or freeze for up to 3 months.
8. Clean up: soak and wash the pot, board and spoon. Label the saved chili with the date.

Allergy check: Chili contains none of the nine major allergens; check the broth and chili powder labels. Toppings: cheese and yogurt contain milk; cornbread and crackers contain wheat (and cornbread contains eggs and milk).

Steps

1. **Scaling worksheet.** Make three columns: single batch, double batch, half batch. Fill in every ingredient. Use equivalents for tricky ones (half of 1½ tablespoons = 2¼ teaspoons; half of ¾ teaspoon = ¾ teaspoon, or a little more than ¼ teaspoon).
2. **Check with cups.** Show ¾ cup doubled with real measuring cups and water. How many cups did you need?
3. **Predict.** Will the double batch take exactly the same time to cook? Why or why not?
4. **Cook the double batch.** Record the time it took to simmer and the meat temperature.

5. **Leftover plan.** Write when you will serve the saved chili and one new way to use it (over baked potatoes, in quesadillas, on rice). Reheat it to 165 °F when you do.
6. **Taste test and improve.** Rate the chili from 1 to 5 and write one change.
7. Clean up.

Tips

- Spices and salt do not always need to double exactly. Start with 1½ times as much, taste, then add more.
- Shallow containers cool food faster than one deep pot.
- Chili often tastes even better the second day.

Check your work

- ☐ I can double and halve a recipe, including fractions.
- ☐ I can tell the story of the feeding of the five thousand and why nothing should be lost.
- ☐ I cooked a double batch and stored half safely.

COOK'S NOTEBOOK

1. Copy your scaling worksheet with all three columns.
2. Draw twelve baskets of leftovers and write one sentence about John 6:12.
3. Write a leftover menu: three meals you could make from the saved chili.

From history. Cooks who feed many people every day, in camps, ships, schools and restaurants, scale recipes all the time. Large kitchens often weigh ingredients on a scale instead of using cups, because weights are easier to multiply exactly.

COMMON MISTAKES

- Doubling some ingredients and forgetting others. Check off each line as you scale it.
- Using a pot that is too small for a double batch. It boils over or cooks unevenly.
- Leaving a big pot of chili on the stove overnight to cool. Cool it fast in shallow containers and refrigerate within 2 hours.

Make it a game • Double or Halve It. Write five recipe amounts on cards, such as three-quarters cup and one-third cup. Draw a card and double it, then draw another and halve it. Check each answer with measuring cups. Beat your own record for correct answers in two minutes. Then tell how Jesus fed the five thousand, and name a way to use leftovers.

8.4 THE FAMILY FEAST

OBJECTIVES

- Plan a balanced feast menu using dishes from this year, with a shopping list and a cooking timeline.
- Cook the feast with an adult beside you, using safe knife, stove and oven skills.
- Set the table, welcome your family, give thanks and serve with hospitality.

Warm-up. Look back through your cook's notebook. Which three recipes did your family rate highest? Which one are you proudest of? Write them down: they may be on your feast menu.

WATCH

How to Set a Table - Life Skills with Griffin Churchill

[GriffinsLifeSkills](#) · 1:51

<https://www.youtube.com/watch?v=hpKYnvcx1Ao>

WHEN TO WATCH

Before you set the table for the feast. Pause and set one place as you watch.

Note: A boy demonstrates a simple everyday place setting.

KEY TERMS

hospitality

Welcoming others and caring for them, especially by giving food and a place at the table.

menu

The list of dishes for a meal.

timeline

A plan that shows what to do when, so every dish is ready at the same time.

grace

A short prayer of thanks to God before or after a meal.

CORE IDEAS

The story. One hot afternoon, Abraham looked up from his tent door and saw three travelers. He ran to meet them, bowed, and begged them to stay. Then he hurried to Sarah: “Make ready quickly three measures of fine meal, knead it, and make cakes

upon the hearth.” He chose a tender calf, prepared it, and set it before his guests with butter and milk, and stood by them under the tree while they ate (Genesis 18:1-8). Abraham did not know at first that his guests were messengers of the Lord. His quick, glad welcome is one of the first pictures of hospitality in the Bible.

How they figured it out. Every family feast has two parts: the cooking and the welcome. Cooks have learned to plan a feast by working backward from the time the meal will be served. The roast that takes longest goes in first; the rolls that bake quickly go in last; the salad is made ahead and kept cold; and the table is set before anyone is hungry. A written **timeline** keeps everything from being ready at different times.

The kitchen science. A feast brings together everything you learned this year. Safety: clean hands, separate boards, a thermometer for every meat, and leftovers chilled within 2 hours. Balance: dishes from all five food groups. Taste: a little salt, a little sour, a little sweet to balance each dish. Heat: the oven for roasting and baking, the stove for sauces and vegetables. And thankfulness: “whether therefore ye eat, or drink, or whatsoever ye do, do all to the glory of God” (1 Corinthians 10:31).

Let’s cook. You will plan and cook a family feast with an adult beside you. A model menu is herb-roasted chicken and potatoes, honey-lemon glazed carrots (Lesson 3.1), buttermilk biscuits (Lesson 5.3) and apple-berry crisp (Lesson 6.1), with milk or water. The skill to do well is **following your timeline** and staying calm when something does not go as planned.

PICTURE STUDY



Come, Lord Jesus, Be Our Guest (The Mealtime Prayer), Fritz von Uhde, 1885 · Oil on canvas · Alte Nationalgalerie, Berlin

Image: [Wikimedia Commons](#), public domain

Fritz von Uhde painted a poor German family about to eat their simple meal. Their table prayer begins, “Come, Lord Jesus, be our guest,” and Uhde painted Jesus Himself coming in at the door. The family welcomes Him to their table.

Look closely

- Find the family at the table. What are they doing with their hands?
- Find the food on the table. Is it a fancy meal or a simple one?
- Find Jesus. How do the people respond to Him?
- Look at the room. What tells you this family is poor?

Talk about it

1. What does it mean to ask Jesus to be our guest at a meal?
2. How does this family show hospitality even though they have little?
3. How will you welcome your family to your feast?

Safety first. An adult stands beside you for every knife, stove and oven step; plan the timeline so only one hot job happens at a time. Wash hands after touching raw chicken, use separate boards, and check the chicken in its thickest part for 165 °F (74 °C). Refrigerate leftovers within 2 hours.

Plan, Cook and Serve the Family Feast

You will plan a balanced feast menu, write a shopping list and a timeline, cook with an adult beside you, set the table, and welcome your family to a meal you made.

You will need

- Your cook's notebook and recipe cards from this year
- A large roasting pan or two baking sheets, and other pans for your menu
- An instant-read food thermometer
- Cutting boards (one for raw meat), a damp towel and a small knife
- Tablecloth or place mats, plates, cups, forks, knives, spoons and napkins
- Paper for a menu card and place cards

HERB-ROASTED CHICKEN AND POTATOES (THE FEAST MAIN DISH)

Serves 6 • Prep 20 min • Roast 40–45 min

Ingredients

- 3 pounds (1.4 kg) bone-in chicken thighs and drumsticks
- 2 pounds (900 g) small potatoes, halved (or large potatoes cut in chunks)
- 3 tablespoons olive oil, divided
- 1 teaspoon salt and ½ teaspoon black pepper
- 1 teaspoon dried thyme, 1 teaspoon dried rosemary (crushed) and 1 teaspoon paprika
- 1 teaspoon garlic powder
- 1 lemon, cut in wedges

Method

1. An adult heats the oven to 425 °F (220 °C).
2. Wash your hands. Rinse and scrub the potatoes. With an adult right beside you, cut them in half on the vegetable board with the bridge and

claw grips.

3. On a large roasting pan, toss the potatoes with 1 tablespoon of oil and a pinch of salt and spread them out.
 4. Stir the salt, pepper, herbs, paprika and garlic powder in a small bowl. Pat the chicken dry (do not rinse it). Rub it with 2 tablespoons of oil and the herb mix, using a fork or gloves. Wash your hands.
 5. Nestle the chicken pieces among the potatoes, skin side up. Add the lemon wedges.
 6. With an adult beside you, roast 40–45 minutes, until the skin is golden and the thickest piece reads 165 °F (74 °C), not touching bone. An adult takes the pan out.
 7. Rest 5 minutes. Squeeze the roasted lemon over the chicken and serve.
- Clean up: wash the raw-meat board and bowl in hot, soapy water.

Allergy check: The chicken and potatoes contain none of the nine major allergens. Check the allergens of the other dishes on your menu: the biscuits contain wheat and milk, the crisp contains wheat and milk, and the carrots contain milk if made with butter.

Steps

1. **Plan the menu.** Choose a main dish, one or two vegetables, a bread or grain, a fruit or dessert, and a drink. Check that all five food groups are there. Check every guest's allergies.
2. **Shopping list.** List every ingredient you need, check the pantry, and shop with a parent. Write the cost if you can.
3. **Timeline.** Decide what time the feast will be served. Work backward: when must the crisp go in? the chicken? the biscuits? Write a timeline with every step and who does it (you, or the adult for hot jobs).
4. **Cook.** Follow your timeline with an adult beside you. Check the chicken temperature. Keep cleaning as you go.
5. **Set the table.** Set each place: plate in the center, fork on the left, knife (blade facing in) and spoon on the right, cup above the knife, napkin beside the fork. Make a menu card and place cards.
6. **Welcome and give thanks.** Greet your family at the door or the table, lead or join in saying grace, and serve. Ask each person to share a favorite memory

from the year.

7. **Reflect.** After the meal, record family ratings and one thing you would do differently next time. Clean up together.

Tips

- Make the dessert in the morning so the oven is free later.
- Set the table before you start the last-minute cooking.
- If something flops, serve it anyway with a smile, or leave it out. A feast is about the people, not perfection.

Check your work

- ☐ I planned a balanced menu with a shopping list and a timeline.
- ☐ I cooked the feast with an adult beside me and checked every meat with the thermometer.
- ☐ I set the table, welcomed my family and gave thanks.

COOK'S NOTEBOOK

1. Write your feast menu card and decorate it.
2. Copy your feast timeline, with check marks for each step you finished.
3. Draw the feast table from above. Then write a thank-you note to someone who helped you cook this year.

From history. Families all over the world mark important days with a feast. In the Bible, Nehemiah told the people on a holy day to “eat the fat, and drink the sweet, and send portions unto them for whom nothing is prepared” (Nehemiah 8:10): feasting together always includes giving to others.

COMMON MISTAKES

- Trying to make too many dishes. Three or four dishes done well are better than eight rushed ones.
- Forgetting how long things take. A timeline written backward from serving time keeps you on track.
- Forgetting the welcome. Greet each person and serve with joy; that is the heart of hospitality.

Make it a game • Feast Planning Race. Plan a feast menu on paper in five minutes, using dishes you cooked this year. Include a drink, a main dish, two sides and a dessert. Write the shopping list and a cooking timeline working backward from serving time. Your parent sneaks in one mistake, such as a dish with no time to cook. Spot it, then say grace.

Scripture. “Whether therefore ye eat, or drink, or whatsoever ye do, do all to the glory of God.” (1 Corinthians 10:31, KJV)

Every meal you cook, from a bowl of popcorn to a family feast, can be done for God’s glory: with care, with thanks and with love for the people at your table.

UNIT 8

MEAL PLANNING & THE FAMILY TABLE

A good cook is not only someone who can follow a recipe, but someone who can plan, shop, measure, change a recipe to feed more people, and welcome others to the table. In this unit you will open the first cookbook written by an American, Amelia Simmons's *American Cookery* of 1796, and cook its johnnycakes. You will read how Boaz shared bread and parched corn with Ruth at mealtime, and you will learn to double and halve a recipe with fractions.

In the last week you will plan, shop for and cook a family feast with an adult beside you, using dishes you learned this year. You will set the table, welcome your family, lead or join in giving thanks, and share what you have learned. Hospitality, making others welcome at your table, is one of the oldest and best uses of a cook's skill.

PREREQUISITES

- Measures dry and liquid ingredients accurately (Units 1–7)
- Uses the knife, stove and oven safely with an adult beside (Units 1–7)
- Knows the five food groups and how to build a balanced plate (Unit 2)
- Can multiply and divide simple fractions, or is learning to

MASTERY CHECKLIST

- ☐ I can tell who Amelia Simmons was and why
*A (1796) matters.
me
ric
an
Co
ok
ery*
- ☐ I can tell the story of Ruth and Boaz at mealtime and what parched corn was.
- ☐ I can double and halve a recipe, including fractions of cups and spoons.
- ☐ I can plan a balanced meal, write a shopping list and a cooking timeline.
- ☐ I can set the table, welcome guests and give thanks.

OPTIONAL BOOKS AND TOOLS FOR THIS UNIT

- **Project Gutenberg: *American Cookery* by Amelia Simmons:** Free. The full text of the 1796 cookbook to read online. Find the recipe for johnnycake (Lesson 8.1).
- **MyPlate Kitchen:** Free at MyPlate.gov. Simple USDA recipes and a meal-planning tool for planning the feast menu and the week's meals.
- **Measuring cups and spoons, including $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{8}$:** You will use every size when doubling and halving recipes in Lesson 8.3.

Not required. Every recipe in this unit works in an ordinary home kitchen.

School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

8.1	Amelia Simmons and the First American Cookbook	2 sessions of 45–60 minutes
8.2	Ruth and Boaz: Bread and Parched Corn	2 sessions of 45–60 minutes
8.3	Doubling and Halving a Recipe	2 sessions of 45–60 minutes
8.4	The Family Feast	2 sessions of 60–90 minutes

UNIT 8 REVIEW

Answer each question. Use complete sentences for explanations. The review is worth 50 points.

1. 5 pts

Who was Amelia Simmons, and why is *American Cookery* (1796) important?

2. 5 pts

Why do johnnycakes need boiling water poured over the cornmeal?

3. 5 pts

What did Boaz give Ruth at mealtime, and what did she do with the leftovers?

4. 5 pts

Predict: you heat a popcorn kernel and a grain of barley in a hot pan. What will happen to each, and why?

5. (5 pts)

Double these amounts: $\frac{3}{4}$ cup, $\frac{1}{3}$ cup, $1\frac{1}{2}$ teaspoons.

6. (5 pts)

Halve these amounts: 1 cup, $\frac{1}{2}$ cup, 3 tablespoons.

7. (5 pts)

How many teaspoons are in a tablespoon, and how many tablespoons are in $\frac{1}{4}$ cup?

8. (5 pts)

How should leftover chili be cooled, stored and reheated?

9. (5 pts)

Why should a feast timeline be written backward from the serving time?

10. (5 pts)

Describe how to set one place at the table.

ANSWER KEY

1. An American orphan who wrote the first cookbook by an American printed in the United States. It used American foods like cornmeal, pumpkins and cranberries.
2. The boiling water makes the cornmeal's starch soak up water and soften (gelatinize), so the dough holds together on the griddle.
3. Bread to dip in vinegar and parched corn. She ate until satisfied and saved the rest for Naomi.
4. The popcorn kernel pops, because its sealed hull traps steam until it bursts. The barley toasts but does not pop, because its hull lets steam leak out.
5. 1½ cups, ⅔ cup, 3 teaspoons (1 tablespoon).
6. ½ cup, ¼ cup, 1½ tablespoons (1 tablespoon plus 1½ teaspoons).
7. 3 teaspoons in a tablespoon; 4 tablespoons in ¼ cup.
8. Cool it fast in shallow containers, refrigerate within 2 hours, eat within 3–4 days or freeze, and reheat to 165 °F.
9. So that the dishes that take longest start first and everything is ready together when the meal is served.
10. Plate in the center, fork on the left with the napkin, knife (blade in) and spoon on the right, cup above the knife.

UNIT CHALLENGE: THE FAMILY FEAST

Plan, shop for, cook and serve a family feast with an adult beside you. Your feast should have a main dish, at least one vegetable, a bread or grain, and a fruit or dessert, using at least three recipes from this year.

Turn in your menu card, your shopping list (with costs if you can), your timeline with check marks, a photograph or drawing of the set table, family ratings, and a written grace or thank-you note.

LOOK FOR	WHAT IT MEANS
Planning	A balanced menu with all five food groups, an allergy check, a shopping list and a written timeline.
Cooking and safety	Safe knife, stove and oven work with an adult beside; separate boards; every meat checked with the thermometer; leftovers chilled within 2 hours.
Table and hospitality	A set table, a menu card, guests welcomed, thanks given and food served with care.
Cleanup	The kitchen cleaned and dishes washed, with family help if needed.
Reflection	Family ratings recorded and an honest reflection on what went well and what to change.