Nursing Entrance Exam Review (TEAS 7 & HESI A2)

Grades 11–12+ · College | 8 pages

Reading, math, science (anatomy & physiology, biology, chemistry, physics) and English, with a side-by-side look at both exams. Not affiliated with or endorsed by ATI or Elsevier; TEAS and HESI are their owners' trademarks.

1 The two exams · 2 Reading: ideas · 3 Reading: sources · 4 Numbers · 5 Algebra & ratios · 6 Measurement · 7 Geometry & data · 8 Scientific reasoning · 9 A&P: organization · 10 A&P: control · 11 A&P: heart & lungs · 12 A&P: digestion · 13 Biology · 14 Chemistry · 15 Physics · 16 Conventions · 17 Grammar · 18 Language & vocab · 19 Practice

1 THE TWO EXAMS AT A GLANCE

confirm with your program

Format, from public information (Oct 2026)

	TEAS 7 (ATI)	HESI A2 (Elsevier)
Sections	4, always in this order: Reading, Math, Science, English & Language Usage	chosen by each program from Reading, Vocabulary, Grammar, Math, A&P, Biology, Chemistry (Physics in some)
Questions	170 (150 scored + 20 unscored pretest)	55 per English or math section, 30 per science section (5 unscored pilot items in each)
Time	209 min, sections timed separately; optional 10-min break after Math	≈ 60 min Reading; 50 Vocabulary, Grammar, Math; 25 each science; total often 4–5 h
Scoring	one score per section and a total; no penalty for guessing	percent correct per section; each program sets its own minimum
Item types	multiple choice, select all that apply, fill in the blank, ordered response, hot spot	mostly multiple choice, some fill-in
Calculator	on-screen calculator in Math	on-screen basic calculator if the program allows it

TEAS 7 blueprint (ATI)

Section	Items	Min	What it covers (scored items)
Reading	45	55	key ideas & details 15 · craft & structure 9 · integration of knowledge & ideas 15
Math	38	57	numbers & algebra 18 · measurement & data 16
Science	50	60	anatomy & physiology 18 · biology 9 · chemistry 8 · scientific reasoning 9
English & Language Usage	37	37	conventions of standard English 12 · knowledge of language 11 · vocabulary 10

HESI-only sections

- **Vocabulary & General Knowledge**: everyday and health-care words (§18).
- **Grammar**: its own section (§16, §17).
- **Physics**: some programs (§15).
- Learning Style, Personality Profile: **unscored** questionnaires.

Where each subject lives

- TEAS: vocabulary and grammar sit inside **English & Language Usage**; A&P, biology, chemistry and **scientific reasoning** share one Science section. HESI tests each as its own section.

Test-day habits

- Pace: TEAS allows ≈ 1.2 min per Reading or Science item, ≈ 1.5 per Math item, 1 per English item.
- Answer every item: a blank is always wrong.

2 READING: KEY IDEAS & CRAFT

what it says and how

Key ideas & details

Skill	Ask yourself
Main idea	What one point does every paragraph support? Often in the first or last sentence.
Supporting details	Which facts, examples or numbers back the main idea?
Inference	What must be true from the text, though it is never stated?
Summary	Main idea + key points, in your words, no opinions
Sequence	What happens first, next, last? Watch for then, after, before, finally.
Following directions	Do each step in order, exactly as written

Text structure

Structure	Signal words
Chronological	first, then, in 1900, later
Cause and effect	because, so, as a result, therefore
Compare / contrast	like, both / however, unlike, whereas
Problem and solution	the problem, one answer, to fix this
Description	looks, sounds, is made of

MEMORY TRICK **PIE + E**

An author writes to **P**ersuade, **I**nform or **E**ntertain (Traditional PIE), or to **E**xpress feelings.

Craft terms

Fact — can be checked: "The clinic opens at 7 a.m."

Opinion — a judgment: "The clinic has the friendliest staff."

Point of view — first person (I, we), second (you), third (he, she, they)

Tone — the author's attitude: objective, critical, hopeful, urgent, sarcastic

Bias — one-sided slant: loaded words, missing other views

3 READING: SOURCES, EVIDENCE & GRAPHICS

weigh it, read the chart

Integration of knowledge & ideas

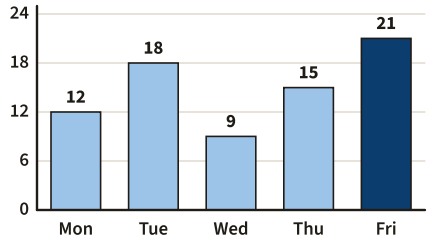
Primary source — first-hand: a diary, a lab report, a photo, an interview

Secondary source — about a primary source: a textbook, a review article, an encyclopedia

Evidence — data, examples, expert testimony; strong evidence is relevant, current and from a reliable source

Argument — claim + reasons + evidence; check whether the evidence really supports the claim

Comparing texts — same topic: what do both say, where do they differ, which is better supported?



Visits to a school clinic, one week (an original data set).

A short passage (original)

Hand washing became standard in hospitals only after doctors such as Ignaz Semmelweis in the 1840s showed that it cut deaths among new mothers. His colleagues resisted at first; years passed before the practice spread.

Reading the chart WORKED

Busiest day: **Friday (21)**; quietest: **Wednesday (9)**

Total = 12 + 18 + 9 + 15 + 21 = **75**; mean = 75 ÷ 5 = **15**

Wed → Thu: (15 − 9) ÷ 9 ≈ **67 % increase**

Three questions on it WORKED

Main idea: hand washing proved its worth but was slow to be accepted

Inference: some doctors doubted that unseen causes could spread illness

not stated, but implied

"Resisted" most nearly means **opposed**

context clue

4 NUMBERS & OPERATIONS

fractions, decimals, percents

Order of operations

- **P**arentheses → **E**xponents → **M**ultiply / **D**ivide (left to right) → **A**dd / **S**ubtract (left to right).

EX $18 - 4 \times (5-2)^2 \div 6 = 18 - 4 \times 9 \div 6 = 18 - 6 = \mathbf{12}$

Number sense

Task	Example
Round	7.846 → 7.8 (tenths), 7.85 (hundredths)
Signed numbers	−8 − (−3) = −5; (−6)(−4) = 24; −20 ÷ 5 = −4
Compare	$0.6 > 0.58 > \frac{4}{7} \approx 0.571$
Absolute value	$\lvert -9 \rvert = 9$

Fractions

Operation	Rule	Example
Add / subtract	common denominator	$\frac{2}{3}+\frac{3}{4}=\frac{8+9}{12}=\frac{17}{12}=1\frac{5}{12}$
Multiply	tops × tops, bottoms × bottoms	$\frac{3}{5}\times\frac{10}{9}=\frac{30}{45}=\frac{2}{3}$
Divide	multiply by the reciprocal	$2\frac{1}{2}\div\frac{3}{4}=\frac{5}{2}\times\frac{4}{3}=\frac{10}{3}=3\frac{1}{3}$

Roman numerals (HESI math)

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

A smaller numeral before a larger one subtracts: IV = 4, IX = 9, XL = 40, XC = 90. XLIV = 44; XIX = 19; MMXXVI = 2026.

Conversions

Fraction	Decimal	Percent
$\frac{1}{8}$	0.125	12.5 %
$\frac{1}{5}$	0.2	20 %
$\frac{1}{4}$	0.25	25 %
$\frac{1}{3}$	0.333…	$33\frac{1}{3}$ %
$\frac{3}{8}$	0.375	37.5 %
$\frac{2}{3}$	0.666…	$66\frac{2}{3}$ %

Decimal → percent: move the point 2 places right (0.06 = 6 %). Fraction → decimal: divide top by bottom.

5 ALGEBRA, RATIOS & WORD PROBLEMS

set it up, then solve

Solve for x WORKED

$3x - 7 = 2x + 5 \rightarrow \mathbf{x = 12}$ *subtract 2x, add 7*

$2(x + 4) = 5x - 7 \rightarrow 2x + 8 = 5x - 7 \rightarrow \mathbf{x = 5}$ *distribute first*

$-3x + 4 > 19 \rightarrow -3x > 15 \rightarrow \mathbf{x < -5}$ *dividing by a negative flips the sign*

Percent equation

35 % of 240 = 0.35 × 240 = **84**; 18 is what % of 72? 18 ÷ 72 = **25 %**; 45 is 60 % of what? 45 ÷ 0.6 = **75**.

part = percent × whole

Translate

Words	Symbol
sum, more than, increased by	+
difference, less than, decreased by	−
product, of, times	×
quotient, per, ratio	÷
is, equals, results in	=

"5 less than x" is x − 5 (order flips). Example: 3 more than twice a number is 27 → 2n + 3 = 27 → **n = 12**.

Percent change

80 → 92: $\frac{12}{80} = \mathbf{+15\ \%}$; 250 → 200: $\frac{-50}{250} = \mathbf{-20\ \%}$.

$$\%\ \text{change} = \frac{\text{new} - \text{old}}{\text{old}} \times 100$$

Proportions: cross-multiply WORKED

$\frac{3}{8} = \frac{x}{56} \rightarrow 8x = 168 \rightarrow \mathbf{x = 21}$

Staff-to-patient ratio 2 : 7 with 63 patients: $\frac{2}{7} = \frac{x}{63} \rightarrow$ **18 staff**

A liquid has 250 mg per 5 mL; 400 mg is in $\frac{400 \times 5}{250} =$ **8 mL**

math practice only

MEMORY TRICK **Is over of**

For percent problems: $\frac{\text{is}}{\text{of}} = \frac{\%}{100}$. "18 **is** what % **of** 72" → $\frac{18}{72} = \frac{x}{100} \rightarrow x = 25$.

6 MEASUREMENT & CONVERSIONS

metric, household, time

Metric ladder

Prefix	kilo- (k)	hecto- (h)	deka- (da)	base	deci- (d)	centi- (c)	milli- (m)
× base	1,000	100	10	g, L, m	0.1	0.01	0.001

Each step right multiplies by 10. Also micro- (mc or μ) = 0.000001: 1 mg = 1,000 mcg. 1 mL = 1 cm^3 (cc).

MEMORY TRICK

King Henry (Traditional)

"**K**ing **H**enry **D**ied **B**y **D**rinking **C**hocolate **M**ilk": kilo, hecto, deka, base, deci, centi, milli.

Dimensional analysis WORKED

154 lb × $\frac{1\text{ kg}}{2.2\text{ lb}}$ = **70 kg** *units cancel*

5 ft 6 in = 66 in × 2.54 = **167.6 cm**

3 tbsp = 9 tsp ≈ **45 mL**; 2.5 L = **2,500 mL**

750 mg = **0.75 g**; 0.4 mg = **400 mcg**

Equivalents

Household / US	Equals	≈ Metric
1 teaspoon (tsp)		5 mL
1 tablespoon (tbsp)	3 tsp	15 mL
1 fluid ounce (fl oz)	2 tbsp	30 mL
1 cup	8 fl oz	240 mL
1 pint; 1 quart	2 cups; 2 pints	≈ 473 mL; ≈ 946 mL
1 gallon	4 quarts	≈ 3.79 L
1 pound (lb)	16 oz	≈ 454 g (2.2 lb ≈ 1 kg)
1 inch		2.54 cm (exact)

Temperature

Water freezes at 0 °C = 32 °F and boils at 100 °C = 212 °F. Body ≈ 37 °C = 98.6 °F. 101.3 °F = **38.5 °C**; 25 °C = **77 °F**.

$$°F = \frac{9}{5}°C + 32$$

$$°C = \frac{5}{9}(°F - 32)$$

Military time (HESI math)

Four digits, no a.m./p.m.: 12:30 a.m. = **0030**, 7:05 a.m. = **0705**, noon = **1200**. After noon add 12 to the hour: 4:15 p.m. = **1615**, 9:30 p.m. = **2130**. Midnight = 0000.

7 GEOMETRY, DATA & STATISTICS

shapes, averages, graphs

Plane figures

Shape	Perimeter	Area
Rectangle l × w	2l + 2w	lw
Square side s	4s	s^2
Triangle	add the sides	$\frac{1}{2}bh$
Circle radius r	$C = 2\pi r = \pi d$	πr^2
Trapezoid	add the sides	$\frac{1}{2}(b_1 + b_2)h$

Solids

Solid	Volume
Box l × w × h	lwh
Cube side s	s^3
Cylinder	$\pi r^2 h$
Sphere	$\frac{4}{3}\pi r^3$
Cone; pyramid	$\frac{1}{3}$ × base area × h

Right triangle: $a^2 + b^2 = c^2$; legs 6 and 8 → hypotenuse **10**.

Center and spread

Mean sum ÷ count

Median middle value in order (average the two middles if the count is even)

Mode most frequent value

Range largest − smallest

One data set WORKED

4, 7, 7, 9, 13: mean $\frac{40}{5}$ = **8**, median **7**, mode **7**, range **9**

Add 20: mean $\frac{60}{6}$ = **10**, median $\frac{7+9}{2}$ = **8**

an outlier moves the mean more

8 SCIENTIFIC REASONING

how science tests ideas

The scientific method

- **Observe** and ask a question.
- Form a **hypothesis**: a testable "if…, then…" prediction.
- **Experiment**, changing one variable at a time.
- **Analyze** the data; draw a **conclusion**.
- **Report** so others can repeat it.

Terms

Independent variable what the experimenter changes

Dependent variable what is measured in response

Controlled variables kept the same in every trial

Control group gets no treatment; the baseline for comparison

Name the variables WORKED

Plants under 4, 8 or 12 hours of light; height measured after 3 weeks

independent: **hours of light**; dependent: **height**

controlled: plant type, water, soil, pot, temperature

Data

Accurate close to the true value

Precise repeated results close to each other

Quantitative / qualitative numbers / descriptions

Scientific notation $0.00052 = 5.2 \times 10^{-4}$; $3{,}400{,}000 = 3.4 \times 10^6$

Lab tools

Tool	Measures	Unit
Balance	mass	g, kg
Graduated cylinder	liquid volume (read the meniscus at eye level)	mL
Thermometer	temperature	°C, K
Ruler; meter stick	length	mm, cm, m
Microscope	small objects	× power

Microscope total power = ocular × objective: 10× × 40× = **400×**.

9 A&P: BODY ORGANIZATION

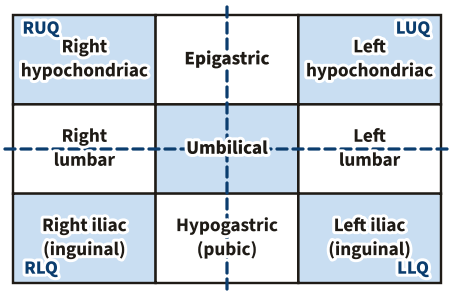
the map of the body

Levels

- **Chemical → cell → tissue → organ → organ system → organism.**
- Anatomical position: standing, facing forward, palms forward; left and right are the **patient's**.

Planes

Plane	Divides
Sagittal (midsagittal)	left / right
Frontal (coronal)	front / back
Transverse	top / bottom



Nine abdominopelvic regions and four quadrants (patient's right is on your left).

Directional terms

Term	Means	Opposite
Superior	toward the head	inferior
Anterior (ventral)	front	posterior (dorsal)
Medial	toward the midline	lateral
Proximal	nearer the limb's attachment	distal
Superficial	toward the surface	deep

The elbow is proximal to the wrist; the sternum is medial to the arms.

Cavities

Cavity	Holds
Cranial; spinal	brain; spinal cord
Thoracic	lungs, heart
Abdominal	stomach, intestines, liver, spleen
Pelvic	bladder, rectum, reproductive organs

The **diaphragm** separates thoracic from abdominal.

Four tissue types

Tissue	Job	Example
Epithelial	covers, lines, secretes	skin surface, gut lining
Connective	supports, binds, stores	bone, tendon, fat, blood
Muscle	contracts	skeletal, cardiac, smooth
Nervous	signals	brain, nerves

Homeostasis

- **Negative feedback** reverses a change (most systems): body temperature, blood glucose.
- **Positive feedback** amplifies until an end point: labor contractions, blood clotting.

Normal values

Vital sign	Typical adult
Temperature	≈ 37 °C (98.6 °F)
Heart rate	60–100 /min
Breathing rate	12–20 /min
Blood pressure	< 120/80 mm Hg
Blood pH	7.35–7.45

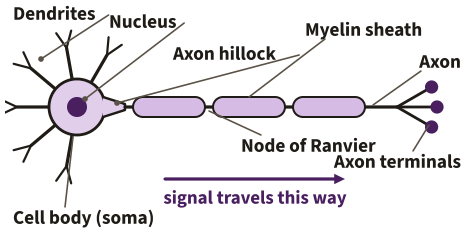
10 A&P: SUPPORT, MOVEMENT & CONTROL

skin, bones, muscles, nerves, hormones

Integumentary system

Layer	Contents
Epidermis	keratinized cells, melanin; no blood vessels
Dermis	collagen, vessels, nerves, sweat and oil glands, hair follicles
Hypodermis	fat and loose connective tissue

Skin protects, holds in water, regulates temperature and makes vitamin D.



Dendrites receive; the axon sends; myelin speeds the signal.

Special senses

Sense	Key parts
Sight	cornea and lens focus light on the **retina**: rods (dim light), cones (color); optic nerve
Hearing	outer ear → eardrum → ossicles (malleus, incus, stapes) → **cochlea**
Balance	inner ear: semicircular canals
Smell; taste	olfactory receptors; taste buds

Skeletal system

Fact	Detail
Bones	206 in an adult: 80 axial (skull, spine, ribs, sternum), 126 appendicular (limbs, girdles)
Jobs	support, protection, movement, mineral (Ca) storage, blood-cell making (red marrow)
Joints	ball-and-socket (hip), hinge (elbow, knee), pivot (neck)
Connectors	ligament: bone to bone; tendon: muscle to bone

Muscular system

Muscle	Look	Control	Where
Skeletal	striated	voluntary	attached to bones
Cardiac	striated, intercalated discs	involuntary	heart
Smooth	not striated	involuntary	gut, vessels, bladder

Contraction: Ca^{2+} and ATP let actin and myosin filaments slide past each other.

MEMORY TRICK **Insulin lets sugar in**

Insulin moves glucose **in**to cells (blood sugar falls); **glucagon** is sent when the glucose is **gone** (blood sugar rises).

Nervous system

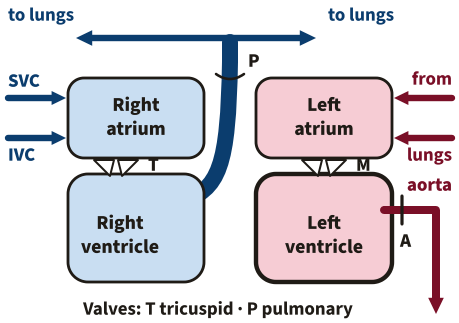
Part	Role
CNS	brain and spinal cord
PNS	nerves outside the CNS
Cerebrum	thought, senses, voluntary movement
Cerebellum	balance and coordination
Brainstem (medulla)	breathing, heart rate, blood pressure
Sympathetic	"fight or flight": ↑ heart rate, dilates pupils
Parasympathetic	"rest and digest": ↓ heart rate, ↑ digestion

Endocrine system

Gland	Hormone → effect
Pituitary	GH (growth), TSH, ACTH; ADH (keeps water), oxytocin
Thyroid	T_3, T_4 (metabolic rate)
Parathyroid	PTH (raises blood Ca^{2+})
Adrenal	cortisol, aldosterone (keeps Na^+), epinephrine
Pancreas	insulin (lowers glucose), glucagon (raises it)
Ovaries; testes	estrogen, progesterone; testosterone

11 A&P: HEART, BLOOD, DEFENSE & BREATHING

transport and gas exchange



Valves: T tricuspid · P pulmonary M mitral (bicuspid) · A aortic

Front view: patient's right on your left

Blue: oxygen-poor (right side). Red: oxygen-rich (left side).

Blood

Blood part	Job
Plasma (≈ 55 %)	water, proteins, nutrients, wastes
Red cells	carry O_2 on hemoglobin
White cells	defense (neutrophils most common)
Platelets	clotting

Type O^- red cells can go to anyone (universal donor); AB^+ can receive any type (universal recipient).

Path of blood

- Body → venae cavae → **right atrium** → tricuspid → **right ventricle** → pulmonary valve → pulmonary arteries → **lungs**.
- Lungs → pulmonary veins → **left atrium** → mitral (bicuspid) → **left ventricle** → aortic valve → **aorta** → body.

Vessels

Arteries carry blood **away** from the heart (thick walls)

Veins carry blood back (valves, thinner walls)

Capillaries one cell thick; exchange with tissues

Exception pulmonary arteries carry oxygen-poor blood; pulmonary veins carry oxygen-rich

ABO blood types

Type	Antigens on red cells	Antibodies in plasma	Can receive
A	A	anti-B	A, O
B	B	anti-A	B, O
AB	A and B	neither	A, B, AB, O
O	neither	anti-A and anti-B	O

Rh^- people receive Rh^- blood; Rh^+ can receive either.

MEMORY TRICK

Valves: Try Pulling My Arm

Blood passes the valves in this order: **T**ricuspid, **P**ulmonary, **M**itral (bicuspid), **A**ortic (original).

Immune and lymphatic

Innate skin, mucus, fever, inflammation, phagocytes: fast, general

Adaptive **B cells** make antibodies; **T cells** kill infected cells and direct the response; memory makes the 2nd response faster

Lymphatic lymph nodes filter lymph; spleen filters blood; thymus trains T cells; returns fluid to the blood

Respiratory path

- Nose → pharynx → larynx → trachea → bronchi → bronchioles → **alveoli** (gas exchange by diffusion).
- Inhale: **diaphragm** contracts and flattens, chest volume ↑, pressure ↓, air flows in. Exhale: it relaxes.
- Breathing rate is set mainly by blood **CO_2** (sensed in the brainstem).

12 A&P: DIGESTION, EXCRETION & REPRODUCTION

nutrients in, wastes out

Digestive system

Organ	Job
Mouth	chewing; salivary amylase starts starch digestion
Esophagus	peristalsis to the stomach
Stomach	acid (HCl) and pepsin start protein digestion
Small intestine	most digestion and **absorption** (villi): duodenum, jejunum, ileum
Liver; gallbladder	makes bile; stores bile (fat emulsifier)
Pancreas	enzymes for all nutrients; bicarbonate
Large intestine	absorbs water; forms feces

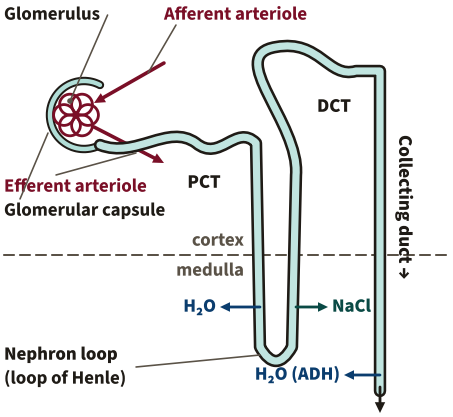
Reproductive system

Male testes make sperm and testosterone; sperm pass through the epididymis, vas deferens and urethra

Female ovaries release an egg and make estrogen and progesterone; the egg travels the uterine (fallopian) tube to the uterus

Fertilization usually in the uterine tube; the embryo implants in the uterine wall

Cycle about 28 days; ovulation near day 14, triggered by an LH surge



A nephron: blood is filtered in the glomerulus; the tubule takes back what the body needs.

Urinary system

- Kidneys → ureters → bladder → urethra.
- Each kidney has ≈ 1 million **nephrons**: **filtration** (glomerulus) → **reabsorption** (water, glucose, salts) → **secretion** → urine.
- Kidneys balance water, salts and pH, remove urea, and release renin and erythropoietin (red-cell signal).

All eleven systems

System	Main organs	One-line job
Integumentary	skin, hair, nails	protects
Skeletal	bones, joints	supports
Muscular	muscles	moves
Nervous	brain, cord, nerves	signals fast
Endocrine	glands	signals by hormones
Cardiovascular	heart, vessels	transports
Lymphatic / immune	nodes, spleen, thymus	defends
Respiratory	lungs, airways	exchanges gases
Digestive	GI tract, liver	breaks down food
Urinary	kidneys, bladder	filters blood
Reproductive	gonads	makes offspring

13 BIOLOGY

cells, molecules, genes, energy

Macromolecules

Molecule	Built from	Job
Carbohydrates	monosaccharides (glucose)	quick energy; cellulose in plant walls
Lipids	fatty acids + glycerol	stored energy, membranes, hormones
Proteins	amino acids (20 kinds)	enzymes, structure, transport, antibodies
Nucleic acids	nucleotides	DNA stores and RNA uses genetic information

Enzymes are proteins that speed reactions by lowering activation energy; heat or wrong pH **denatures** them.

DNA → RNA → protein

- DNA bases pair **A–T** and **C–G**; RNA uses **U** instead of T (A–U).
- **Transcription** (nucleus): DNA → mRNA. **Translation** (ribosome): mRNA codons → amino acids.

EX DNA template TACGGT → mRNA **AUGCCA**; its DNA partner strand is **ATGCCA**.

Cell parts

Organelle	Job
Nucleus	holds DNA
Ribosome	makes proteins
Mitochondrion	makes ATP (cellular respiration)
ER; Golgi	make and process; package and ship
Cell membrane	controls what enters and leaves
Chloroplast; cell wall	photosynthesis; rigid support (plants)

Prokaryotes (bacteria) have no nucleus; **eukaryotes** (plants, animals, fungi, protists) do. A virus is not a cell.

Energy

- Respiration: $C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$ + ATP (mitochondria).
- Photosynthesis: $6\ CO_2 + 6\ H_2O$ + light → $C_6H_{12}O_6 + 6\ O_2$ (chloroplasts).

Microbes

Bacteria cells with no nucleus; antibiotics work on many

Viruses not cells; need a host cell

Fungi; protists yeast, molds; amoebas, algae

Cell division

	Mitosis	Meiosis
Purpose	growth, repair	eggs and sperm
Divisions	1	2
Daughter cells	2, identical, diploid (2n)	4, different, haploid (n)
Human cells	46 chromosomes	23 chromosomes

Phases: prophase, metaphase, anaphase, telophase (PMAT), then cytokinesis.

	B	b
B	**BB**	**Bb**
b	**Bb**	**bb**

Bb × Bb

Genetics WORKED

Alleles: B (dominant) masks b (recessive); BB, bb homozygous, Bb heterozygous

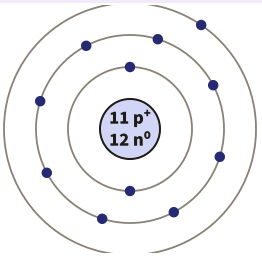
Bb × Bb: BB : Bb : bb = 1 : 2 : 1 *genotypes*

dominant : recessive look = **3 : 1**; bb = **25 %** *phenotypes*

Bb × bb: **50 %** show the recessive trait

14 CHEMISTRY

atoms, bonds, reactions, solutions



Na: atomic number 11

mass number 23

11 electrons: 2, 8, 1

valence electrons: 1

Sodium-23: protons set the element; protons + neutrons set the mass.

Inside the atom

Particle	Charge	Mass	Where
Proton	+1	1 amu	nucleus
Neutron	0	1 amu	nucleus
Electron	−1	≈ 0	shells

Isotopes: same protons, different neutrons (carbon-12, carbon-14). **Ion**: an atom that gained (−) or lost (+) electrons.

More to know

Acid + base → salt + water (neutralization)

Nuclear decay alpha (He nucleus), beta (electron), gamma (energy). Half-life: 80 g, half-life 5 days → 10 g after 15 days

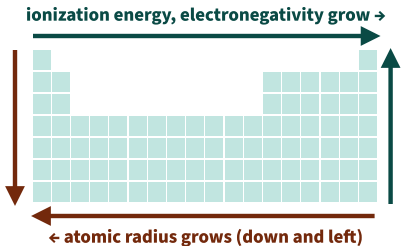
Boyle's law $P_1V_1 = P_2V_2$: 3 L at 2 atm → **6 L** at 1 atm

Periodic table

Periods rows; elements in a row have the same number of electron shells

Groups columns; same valence electrons, similar behavior (group 1 alkali metals, 17 halogens, 18 noble gases)

Metals / nonmetals left and center / upper right



Electronegativity and ionization energy rise up and to the right; atom size grows down and to the left.

Reaction types

Reaction	Pattern
Synthesis	A + B → AB
Decomposition	AB → A + B
Single replacement	A + BC → AC + B
Double replacement	AB + CD → AD + CB
Combustion	fuel + O_2 → CO_2 + H_2O

Bonds

Bond	How	Example
Ionic	electrons **transferred**, metal + nonmetal	NaCl
Covalent	electrons **shared**, nonmetals	H_2O, CO_2
Hydrogen bond	weak attraction **between** polar molecules	water to water, DNA strands

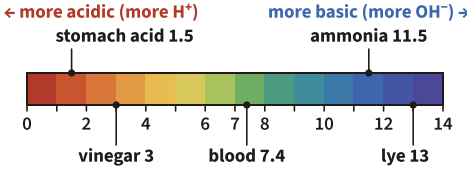
Balance and count WORKED

$CH_4 + \mathbf{2}\ O_2 \rightarrow CO_2 + \mathbf{2}\ H_2O$ *same atoms each side*

Molar mass $H_2O = 2(1.008) + 16.00 =$ **18.02 g/mol**; 36 g ≈ **2 mol**

1 mol = 6.02×10^{23} particles

0.5 mol in 250 mL: molarity = 0.5 ÷ 0.25 = **2 M**



pH below 7 is acidic, 7 is neutral (pure water), above 7 is basic. Each step is a factor of 10: pH 3 is 100 times more acidic than pH 5.

15 PHYSICS (HESI, SOME PROGRAMS)

motion, energy, waves, circuits

Formulas

Quantity	Formula	Example
Speed	$v = d \div t$	100 m in 20 s → 5 m/s
Acceleration	$a = (v_f - v_i) \div t$	0 → 12 m/s in 4 s → 3 m/s²
Force (Newton 2)	$F = ma$	10 kg × 2 m/s² = 20 N
Kinetic energy	$KE = \frac{1}{2}mv^2$	2 kg at 3 m/s → 9 J
Potential energy	$PE = mgh$	2 kg up 5 m → 98 J
Wave speed	$v = f\lambda$	680 Hz × 0.5 m = 340 m/s
Ohm's law	$V = IR$	12 V across 4 Ω → 3 A

Newton's laws

- **1** An object keeps its motion unless a net force acts (inertia).
- **2** F = ma: more force, more acceleration; more mass, less.
- **3** Every action has an equal and opposite reaction.

Ideas

Energy is conserved: it changes form (PE ⇄ KE, chemical → heat) but is not created or destroyed

Waves transverse (light) or longitudinal (sound); sound needs a medium, light does not

Heat flow conduction (touch), convection (fluid motion), radiation (no medium)

16 ENGLISH: CONVENTIONS

punctuation, sentences, common errors

Punctuation

Mark	Use	Example
Comma	items in a series; before and, but, or joining two sentences; after an intro phrase	After lunch, Ana checked the chart, and Ben restocked gloves.
Semicolon	joins two complete sentences without a conjunction	The shift ended; the reports were done.
Colon	introduces a list or explanation after a complete sentence	Bring three things: ID, a pencil and water.
Apostrophe	possession; contractions	the patient's chart; the nurses' station; it's = it is
Quotation marks	exact words; periods and commas go inside (US)	"Wash first," she said.

Sentence types

Type	Pattern
Simple	one independent clause
Compound	two independent clauses + comma + FANBOYS, or a semicolon
Complex	independent + dependent clause (because, when, although)
Compound-complex	two independent + at least one dependent

MEMORY TRICK

FANBOYS (Traditional)

The coordinating conjunctions: **F**or, **A**nd, **N**or, **B**ut, **O**r, **Y**et, **S**o.

Common errors

Fragment "Because the lab closed." Fix: add an independent clause.

Run-on / comma splice "I studied, I passed." Fix: period, semicolon, or comma + and.

Agreement singular subject, singular verb: "Each of the students **has** a badge."

17 GRAMMAR TOOLKIT (HESI)

parts of speech, usage

Parts of speech

Part	Job	Example
Noun	person, place, thing, idea	nurse, clinic, health
Pronoun	replaces a noun	she, it, who
Verb	action or state	run, is
Adjective	describes a noun	quick test
Adverb	describes a verb, adjective or adverb	very quickly
Preposition	shows relation	under, during
Conjunction	joins	and, because
Interjection	exclaims	Oh!

Commonly confused

Pair	Use
affect / effect	affect is usually the verb; effect the noun
accept / except	receive / leave out
its / it's	possessive / it is
their / there / they're	belonging / place / they are
then / than	time / comparison
fewer / less	countable / amounts
lie / lay	recline / put something down
who / whom	he (subject) / him (object)

Irregular verbs

Base	Past	Past participle
go	went	gone
see	saw	seen
lie (recline)	lay	lain
lay (put)	laid	laid

MEMORY TRICK

Who = he, whom = him

Answer the question with he or him:
"(Who/Whom) called?" → **he** called → **who**.
"To (who/whom)?" → to **him** → **whom**.

18 ENGLISH: LANGUAGE USE & VOCABULARY

clear words, word parts

Word parts

Prefix	Means	Root	Means	Suffix	Means
a-, an-	without	cardi/o	heart	-itis	inflammation
brady-; tachy-	slow; fast	derm/o	skin	-ectomy	removal
dys-	bad, difficult	gastr/o	stomach	-ology	study of
hyper-; hypo-	above; below	hem/o, hemat/o	blood	-algia	pain
inter-; intra-	between; within	hepat/o	liver	-emia	blood condition
peri-	around	nephr/o, ren/o	kidney	-megaly	enlargement
post-; pre-	after; before	neur/o	nerve	-otomy	cutting into
sub-	under	oste/o	bone	-scopy	looking inside
poly-	many	pulmon/o	lung	-osis	abnormal condition

Combine them: **tachycardia** = fast heart; **hepatitis** = liver inflammation; **nephrectomy** = kidney removal.

Vocabulary to know (HESI)

Word	Meaning	Word	Meaning
acute	sudden, severe, short	chronic	lasting a long time
benign	mild; not cancer	malignant	dangerous; spreading
dilate	widen	constrict	narrow
exacerbate	make worse	alleviate	ease
intermittent	stopping and starting	impending	about to happen
lethargic	sluggish, drowsy	diaphoretic	sweating heavily
febrile	feverish	edema	swelling with fluid
supine; prone	face up; face down	lateral	to the side
ambulate	walk	void	empty the bladder
adverse	unwanted, damaging	compliance	following instructions

Transitions

Purpose	Transitions
Add	also, furthermore, in addition
Contrast	however, although, on the other hand
Cause / effect	because, therefore, as a result
Example	for example, such as
Sequence	first, next, finally
Conclude	in summary, overall

Knowledge of language

Formal vs informal — reports and essays: no slang or contractions

Concise — "due to the fact that" → "because"; cut repeated words

Active voice — "The nurse recorded the data" (clearer than passive "The data were recorded")

Parallelism — "reading, writing and **speaking**," not "and to speak"

Context clues

Clue type	Signal	Example
Definition	is, means, or	Edema, or swelling, …
Synonym	also, likewise	lethargic, sluggish
Antonym	but, unlike	not acute but chronic
Example	such as, including	analgesics such as aspirin

19 PRACTICE SET

original problems, answers checked

Sixteen practice problems (original; not from any exam)

#	Problem	Answer	#	Problem	Answer
1	(Math) $2\frac{1}{4} + 1\frac{2}{3}$	**$3\frac{11}{12}$**	9	(Science) mRNA from DNA template ACGTTA	**UGCAAU**
2	(Math) 24 is what percent of 160?	**15 %**	10	(Science) Chambers that pump to the lungs and to the body	**right ventricle; left ventricle**
3	(Math) Solve $4(x - 3) = 2x + 6$	**x = 9**	11	(Science) pH 4 vs pH 6: which is more acidic, and how many times?	**pH 4, 100 ×**
4	(Math) 1.5 L in mL; 98.6 °F in °C	**1,500 mL; 37 °C**	12	(Science) Balance: $_H_2 + _O_2 \rightarrow _H_2O$	**2, 1, 2**
5	(Math) Median of 3, 11, 6, 8, 2, 10	**7**	13	(English) Fix: "Me and her went to the lab."	**She and I went to the lab.**
6	(Math) 0845 in 12-hour time; XXIV	**8:45 a.m.; 24**	14	(English) "brady-" + "cardia" means	**slow heart rate**
7	(Math) Area of a circle with diameter 10 (to 0.1)	**78.5**	15	(English) Which is correct: "fewer/less patients"?	**fewer** (countable)
8	(Reading) "Night shifts are the best shifts." Fact or opinion?	**opinion** (a judgment)	16	(Science) Bone count of the adult axial skeleton	**80**