EnterMedSchool

EDITION 2027 · FACTS AS OF 29 OCT 2026

IMAT 2027

Study Planner

58 days, day by day · **1,090** checkpoints · free

YOUR 58 DAYS, WEEK BY WEEK

W1	W2	W3	W4	W5	W6	W7	W8	Final
1	8	15	22	29		41	48	
2	9	16	23	30		42	49	
3	10	17	24	31	36	43	50	
4	11	18	25	32	37	44	51	55
5	12	19	26	33	38	45	52	56
6	13	20	27	34	39	46	53	57
7	14	21	28	35	40	47	54	58

Biology · Chemistry · Recall day · Final day · Rest day



by Ari Horesh EnterMedSchool

THIS PLANNER BELONGS TO _____

MY DAY 1 ____ / ____ / _____

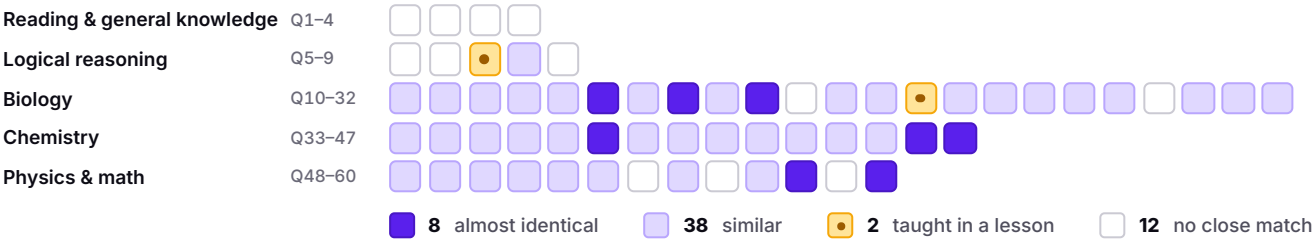
MY IMAT 2027 DATE ____ / ____ / 2027

Free to use and share

LAST YEAR'S EXAM · IMAT 2026

48 of the 60 IMAT 2026 questions were already in my course

I put the real exam questions next to mine, side by side, so you can see for yourself.





I'm Ari. This is my IMAT 2027 course.

The IMAT is the entrance exam to study medicine in Italy, in English. I have taught it for almost 7 years, to more than 1,000 students.

IMAT 2027 course: We start with the questions you get wrong.

Your wrong answers show your weak spots, and I review them too. You fix each one with proven study techniques, then practice it again in different forms.

What you get, from the day you join until IMAT 2027:

- 5,000+ practice questions and 250+ past-paper questions explained
- 200+ hours of lessons, from the basics
- 2,500+ math and physics videos from zero, being animated for IMAT 2027
- 600+ student questions, each with my answer
- 4 weeks live with me before the exam like in 2026
- Direct WhatsApp support from me

Bonus for med school: Lifetime EnterMedSchool+

Scan to see the course

entermedschool.com/imat-course

My students, on the official IMAT lists

★★★★★ 5.0 on Google from 51 reviews



Top 0.4%
Ujjwal



Top 0.7%
Darius



Top 1.5%
Stella

Year after year, my students are among the highest scorers of everyone who takes the IMAT

I'll see you in the first lesson.

Ari · Medical student at Pavia



Course details as of 29 Oct 2026. The current details are always on entermedschool.com/imat-course.

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Every line links to its page when you read this on a screen.

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4	The Four Macromolecules of Life	16
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Week 2 Days 8–14

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9	DNA Structure and Replication	24
10	Mitosis and the Cell Cycle	26
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How to use this planner

58 days: 44 study days and 14 rest days. Read this page, then start Day 1.

1 Write your dates

Put your Day 1 and your IMAT date on the cover, then map all 58 days on page 6. The IMAT 2027 date is not announced yet: write it in when it is.

2 One study day, one spread

A full study day is about 8 hours of work. Start with the reading, then tick a checkpoint when you can explain it without the book. A heavy day takes a second spread.

3 Mark every self-check

Got it, Shaky or Re-test. Copy each Shaky and Re-test into the week's review.

4 Try the real IMAT questions

Each study day lists past-paper questions on its topics. Open them in the free past papers (scan the QR), then mark Tried and Right.

5 Rest on rest days

They are part of the plan. Day 6 puts it like this:

> Step away from new material. What you learned this week sticks while you recover
>
> Day 6 · Rest and Recovery

6 Review every week

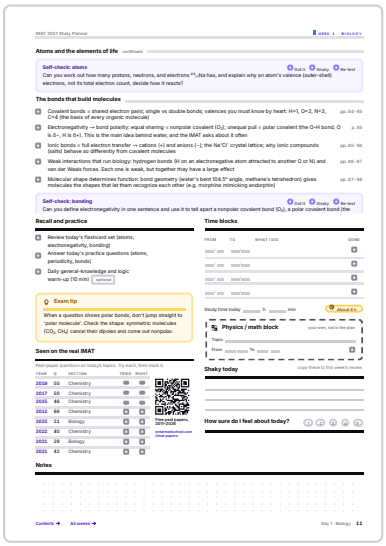
On your weekend, fill in the weekly review: how the days went, your weak spots, and your next dates.

7 After Day 58

Past papers and revision until your exam, from page 183.

Missed a day? Write its new date. Every later day moves with it.





Day 1, exactly as it looks in this book: the plan and the checklist on the left, your tools and notes on the right.

Physics and math are not taught in the 58 days

The days teach biology and chemistry. Physics and math appear only on Day 58, in its group "**Warm up physics and math (not covered on the content days)**". In IMAT 2026 they were 13 of the 60 questions (19.5 of 90 points).

So plan them yourself: every study day has an empty Physics / math block, and page 9 holds your plan and links to free EnterMedSchool pages.

What the marks mean

☐	Tick it when you can explain it
○ ○ ○	Your self-check mark
optional	You can skip it
pp. 51-52	The book's pages
About 8 h	The day's estimate

Before you start

This planner uses the previous exam syllabus and format as a preparation baseline. The official 2027 syllabus and exam format have not yet been confirmed.

The planner may contain errors. Please be sure to verify the content and use it at your own responsibility.

Free to use and share.

The exam at a glance

Confirm every line in the 2027 decree.

IMAT 2027: not announced yet

What I expect:

> IMAT 2027 is most likely in September 2027; the official date is announced in summer 2027

FILL IN FROM THE 2027 DECREE

Exam date	
Start time	
Registration opens	
Registration closes	
Decree number	

The latest official format: IMAT 2026

Held on Tue 29 Sep 2026, 13:30 Italy time



Taught day by day · Optional warm-up · Not taught: your own blocks

SECTION	QUESTIONS	HOW MANY	MAX POINTS
Reading & general knowledge	Q1–4	4	6
Logical reasoning	Q5–9	5	7.5
Biology	Q10–32	23	34.5
Chemistry	Q33–47	15	22.5
Physics & math	Q48–60	13	19.5
Total	**Q1–60**	**60**	**90**

100
minutes for the whole paper, no time limit per section

5
options per question, 1 correct

+1.5
per right answer · −0.4 per wrong · 0 for a blank

90
points at most

What the 58 days cover

Biology
Days 1–40

Chemistry
Days 41–57

Day 58
warm-up: physics, math, logic

After Day 58
past papers until your exam

40 of the 44 study days also have this optional task: **“Daily general-knowledge and logic warm-up (10 min)”**

Physics & math are not taught in the 58 days: plan your own blocks on page 9.

Notes

Plan my dates

Write a date under every day. Rest days come in pairs: start on a Monday and the first five pairs fall on weekends.

MY EXAM DATE

____ / ____ / 2027 **– 58 days =** MY LATEST DAY 1 ____ / ____ / ____

That latest Day 1 leaves no time for past papers. Start earlier:

> Aim to start working on past papers about 2-3 months before the exam. This is when you'll want to start simulating the real exam experience.

My Day 1 ____ / ____ / ____

My first past paper ____ / ____ / ____

Week 1 Days 1–7	1 Biology	2 Biology	3 Biology	4 Biology	5 Biology	6 Rest	7 Rest
Week 2 Days 8–14	8 Biology	9 Biology	10 Biology	11 Biology	12 Biology	13 Rest	14 Rest
Week 3 Days 15–21	15 Biology	16 Biology	17 Biology	18 Biology	19 Biology	20 Rest	21 Rest
Week 4 Days 22–28	22 Biology	23 Biology	24 Biology	25 Biology	26 Biology	27 Rest	28 Rest
Week 5 Days 29–35	29 Biology	30 Biology	31 Biology	32 Biology	33 Biology	34 Rest	35 Rest
Week 6 Days 36–40	36 Biology	37 Biology	38 recall	39 recall	40 recall		
Week 7 Days 41–47	41 Chemistry	42 Chemistry	43 Chemistry	44 Chemistry	45 Chemistry	46 Rest	47 Rest
Week 8 Days 48–54	48 Chemistry	49 Chemistry	50 Chemistry	51 Chemistry	52 Chemistry	53 Rest	54 Rest
Final days Days 55–58	55 recall	56 recall	57 recall	58 Final			

Study day · Recall day · Final day · Rest day

Phases and weeks

Every week on one page: the days, the chapters, and how much each week holds. Write your dates next to each week.



Biology Days 1–40 · **Chemistry** Days 41–57 · **Final day** Day 58 · **Past papers** until your exam

Study day · Recall day · Rest day · Final day

Page numbers follow these editions: Campbell Biology: A Global Approach (11th ed.) · Pearson Baccalaureate Higher Level Chemistry (2nd ed.)

Week 1 Days 1–7

MY DATES _____

- ○ 1 Biology Foundations & the Chemistry of Life — ch. 1-2
- ○ 2 Water and Carbon: The Molecules of Life — ch. 3-4
- ○ 3 A Tour of the Cell: Organelles and Their Jobs — ch. 7
- ○ 4 The Four Macromolecules of Life — ch. 5
- ○ 5 Energy, ATP and Enzymes — ch. 6
- ◌ 6 Rest and Recovery
- ◌ 7 Rest and Reset

110 checkpoints, **23** of them self-checks · **36** real IMAT questions

Week 2 Days 8–14

MY DATES _____

- ○ 8 Cell Membranes and Transport — ch. 8
- ○ 9 DNA Structure and Replication — ch. 16
- ○ 10 Mitosis and the Cell Cycle — ch. 12
- ○ 11 Meiosis and Sexual Life Cycles — ch. 13
- ○ 12 How Cells Talk and How Bodies Are Organized — ch. 9 + ch. 40
- ◌ 13 Rest and Recharge
- ◌ 14 Rest Day

104 checkpoints, **22** of them self-checks · **33** real IMAT questions

Week 3 Days 15–21

MY DATES _____

- ○ 15 The Circulatory System: Heart, Vessels and Blood — ch. 43
- ○ 16 Gas Exchange and Breathing — ch. 43 (pp. 1013-1023)
- ○ 17 The Digestive System: Nutrition, Digestion and Glucose Control — ch. 42
- ○ 18 Osmoregulation and Excretion: Water Balance, Nitrogenous Waste and the Kidney — ch. 44
- ○ 19 Nervous System: Organization and the Brain — ch. 49
- ◌ 20 Rest Day
- ◌ 21 Active Rest

130 checkpoints, **24** of them self-checks · **35** real IMAT questions

Week 4 Days 22–28

MY DATES _____

- ○ 22 Sensation and Movement in Animals — ch. 50
- ○ 23 Animal Defenses Against Infection — ch. 47
- ○ 24 Cellular Respiration: Harvesting Energy from Glucose — ch. 10
- ○ 25 Photosynthesis: How Plants Make Food from Light — ch. 11
- ○ 26 Neurons and the Nerve Impulse — ch. 48
- ◌ 27 Rest and Reset
- ◌ 28 Rest Day

135 checkpoints, **26** of them self-checks · **32** real IMAT questions

Week 5 Days 29–35

MY DATES _____

- ○ 29 Mendelian Genetics — ch. 14
- ○ 30 Animal Reproductive Systems — ch. 45
- ○ 31 How Evolution Works (Darwin, Natural Selection and the Evidence) — ch. 21
- ○ 32 Phylogeny and Microevolution: Reading the Tree of Life and How Populations Evolve — ch. 22-23
- ○ 33 How New Species Arise and the History of Life — ch. 24-25
- ◌ 34 Rest Day
- ◌ 35 Active Rest

131 checkpoints, **23** of them self-checks · **30** real IMAT questions

Week 6 Days 36–40

MY DATES _____

- ○ 36 DNA Technology: Cloning, PCR and Genetic Engineering — ch. 19
- ○ 37 Gene Expression: From Gene to Protein, and Controlling It — ch. 17-18, 26
- ○ 38 Biology Review Block recall
- ○ 39 Biology Recall: High-Yield Structures recall
- ○ 40 Biology Recall Practice recall

129 checkpoints, **46** of them self-checks · **37** real IMAT questions

Week 7 Days 41–47

MY DATES _____

- ○ 41 Stoichiometric Relationships: Chemistry's Bookkeeping — ch. 1
- ○ 42 Atomic Structure and How Electrons Are Arranged — ch. 2
- ○ 43 Periodicity: The Periodic Table and Its Trends — ch. 3
- ○ 44 Chemical Bonding and Structure: Ionic, Covalent and Metallic Bonds, and Molecular Shapes — ch. 4
- ○ 45 Energetics and Thermochemistry: Why Reactions Release or Absorb Heat — ch. 5
- ◌ 46 Rest and Recharge
- ◌ 47 Rest Day

134 checkpoints, **26** of them self-checks · **36** real IMAT questions

Week 8 Days 48–54

MY DATES _____

- ○ 48 Chemical Kinetics: How Fast Reactions Go (Collision Theory) — ch. 6
- ○ 49 Chemical Equilibrium: Reversible Reactions and Le Chatelier's Principle — ch. 7
- ○ 50 Acids and Bases: Proton Donors, the pH Scale, and Strong vs Weak — ch. 8
- ○ 51 Redox Processes: Electron Transfer, Oxidation Numbers and the Reactivity Series — ch. 9
- ○ 52 Organic Chemistry: Carbon Compounds, Families and Their Reactions — ch. 10
- ◌ 53 Rest Day
- ◌ 54 Rest and Plan

112 checkpoints, **21** of them self-checks · **33** real IMAT questions

Final days Days 55–58

MY DATES _____

- ○ 55 Chemistry Review Block recall
- ○ 56 Chemistry Memorization and Recall recall
- ○ 57 Chemistry Recall Practice recall
- ○ 58 Final Review Before the Exam Final day

105 checkpoints, **50** of them self-checks · **24** real IMAT questions

From Day 59 to your exam

Aim to start working on past papers about 2-3 months before the exam. This is when you'll want to start simulating the real exam experience.

Free past papers, 2011–2026
entermedschool.com/imat-papers

MY FIRST PAST PAPER _____

MY IMAT 2027 DATE _____

Books and free resources

The page numbers on every study day follow these two books, in these editions.

11th ed.

Campbell Biology: A Global Approach (11th ed.)
Biology · read on 27 days

2nd ed.

Pearson Baccalaureate Higher Level Chemistry (2nd ed.)
Chemistry · read on 10 days

Free on EnterMedSchool

Free past papers
16 papers, 2011–2026, free to download
entermedschool.com/imat-papers

The study planner guide
Study tips, books and free channels
entermedschool.com/imat-study-planner

The IMAT syllabus guide
Previous-cycle topics, until the 2027 syllabus is out
entermedschool.com/imat-2027-syllabus

The IMAT books guide
Which books to use, and how
entermedschool.com/imat-books

Free YouTube channels from the planner guide

Ninja Nerd Science · Armando Biology · Amoeba Sisters · Khan Academy · Organic Chemistry Tutor · AK lectures

Notes

Physics & math: my own blocks

The 58 days do not teach physics and math; only Day 58 warms them up. In IMAT 2026 they were 13 of the 60 questions, 19.5 of the 90 points, so give them your own blocks.



IMAT 2026, in exam order

Physics & math, Q48–60

Day 58 is the only day that warms them up:

Warm up physics and math (not covered on the content days) Day 58

- Self-check: kinematics and forces
- Self-check: electricity
- Self-check: energy, work and power
- Self-check: core algebra

Where to learn them on EnterMedSchool

THE PREVIOUS-CYCLE TOPIC LIST
Math and Physics (13 Questions)
entermedschool.com/imat-2027-syllabus

BOOKS AND HOW TO STUDY THEM
Books for IMAT Math and Physics
entermedschool.com/imat-books

PRACTICE ON REAL PAPERS
Physics & math are Q48–60 in the 2023–2026 papers
entermedschool.com/imat-papers

THE COURSE
2,500+ math and physics videos from zero, being animated for IMAT 2027
entermedschool.com/imat-course

My physics & math plan

Each study day has an empty Physics / math block for the day's session.

WEEK	TOPICS I WILL COVER	BLOCKS	DONE
Week 1 Days 1–7			☐
Week 2 Days 8–14			☐
Week 3 Days 15–21			☐
Week 4 Days 22–28			☐
Week 5 Days 29–35			☐
Week 6 Days 36–40			☐
Week 7 Days 41–47			☐
Week 8 Days 48–54			☐
Final days Days 55–58			☐

DAY

1

of 58

About 8 h

BIOLOGY

Biology Foundations & the Chemistry of Life

Start with what biology is and how science works. Then move on to the chemistry every living thing is made of: atoms, the elements of life, and the bonds that hold molecules together.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 1-2

- [ ] Read Ch 1: Biology and Its Themes (the unifying themes and how science works) — pp. 50-73
- [ ] Read Ch 2: Atoms and Molecules (elements, atomic structure, chemical bonds) — pp. 76-91

Do the end-of-section Concept Checks as you go. They are the book's own self-tests.

What is life? Its properties and the themes that unify biology

- [ ] The 7 properties of life: order; reproduction; growth and development; energy processing; response to the environment; regulation/homeostasis; evolutionary adaptation — pp. 51-52
- [ ] The hierarchy of biological organization: biosphere → ecosystem → community → population → organism → organ → tissue → cell → organelle → molecule (and what 'emergent property' means) — pp. 52-54
- [ ] Energy and matter: energy flows one way (in as light, out as heat), while chemicals are recycled. Also learn negative vs positive feedback regulation — pp. 57-58
- [ ] Evolution is the core theme: the 3 domains (Bacteria, Archaea, Eukarya) and life's unity in diversity — pp. 59-61
- [ ] Darwin and natural selection: 3 observations (variation, overproduction/competition, differential survival) → the inference that selection edits existing variation — pp. 62-63

Self-check: evolution ○ Got it ○ Shaky ○ Re-test

Can you state Darwin's three observations and explain why, together, they make natural selection unavoidable? And why does selection edit variation that already exists rather than create it on demand?

How biologists know what they know

- [ ] Hypothesis vs theory: a hypothesis is a testable, falsifiable explanation (deductive 'if...then'); a theory is broader and generates many hypotheses. You can never prove a hypothesis, only fail to falsify it — pp. 64-67
- [ ] Hoekstra's beach-mouse camouflage study, a real controlled experiment: independent variable (model coat color), dependent variable (predation rate), and what the control group is for — pp. 68-69

Self-check: experimental design ○ Got it ○ Shaky ○ Re-test

In the beach-mouse camouflage experiment, can you name the independent variable, the dependent variable, and the control group? And can you explain what a control does (it cancels out the effect of confounds; it doesn't eliminate them)?

Atoms and the elements of life

- [ ] The elements of life: only 4 elements (O, C, H, N) make up ~96% of body mass (Table 2.1: O 65%, C 18.5%, H 9.5%, N 3.3%). Learn the essential trace elements too (e.g. iron, iodine) — p. 77
- [ ] Atomic structure: protons (+), neutrons (0), electrons (−); atomic number = number of protons, mass number = protons + neutrons. Work through the sodium example $^{23}_{11}Na$ → 11 p, 11 e^-, 12 n — pp. 78-79
- [ ] Isotopes: same protons, different neutrons (^{12}C / ^{13}C / ^{14}C); why ^{14}C is radioactive and the others aren't, and what 'half-life' means — pp. 79-81
- [ ] Electron shells and valence: electrons sit in fixed energy levels; the outer (valence) electrons decide reactivity. A full valence shell (He, Ne, Ar) is inert; reactivity comes from unpaired valence electrons — pp. 80-83

Atoms and the elements of life continued

Self-check: atoms ◯ Got it ◯ Shaky ◯ Re-test

Can you work out how many protons, neutrons, and electrons $^{23}_{11}Na$ has, and explain why an atom's valence (outer-shell) electrons, not its total electron count, decide how it reacts?

The bonds that build molecules

- [ ] Covalent bonds = shared electron pairs; single vs double bonds; valences you must know by heart: H=1, O=2, N=3, C=4 (the basis of every organic molecule) pp. 84-85
- [ ] Electronegativity → bond polarity: equal sharing = nonpolar covalent (O_2); unequal pull = polar covalent (the O–H bond, O is δ−, H is δ+). This is the main idea behind water, and the IMAT asks about it often p. 85
- [ ] Ionic bonds = full electron transfer → cations (+) and anions (−); the Na^+Cl^- crystal lattice; why ionic compounds (salts) behave so differently from covalent molecules pp. 85-86
- [ ] Weak interactions that run biology: hydrogen bonds (H on an electronegative atom attracted to another O or N) and van der Waals forces. Each one is weak, but together they have a large effect pp. 86-87
- [ ] Molecular shape determines function: bond geometry (water's bent 104.5° angle, methane's tetrahedron) gives molecules the shapes that let them recognize each other (e.g. morphine mimicking endorphin) pp. 87-88

Self-check: bonding ◯ Got it ◯ Shaky ◯ Re-test

Can you define electronegativity in one sentence and use it to tell apart a nonpolar covalent bond (O_2), a polar covalent bond (the O–H bond in water), and an ionic bond (NaCl)?

Recall and practice

- [ ] Review today's flashcard set (atoms, electronegativity, bonding)
- [ ] Answer today's practice questions (atoms, periodicity, bonds)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Exam tip

When a question shows polar bonds, don't jump straight to 'polar molecule'. Check the shape: symmetric molecules (CO_2, CH_4) cancel their dipoles and come out nonpolar.

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2019	50	Chemistry	☐	☐
2017	50	Chemistry	☐	☐
2015	46	Chemistry	☐	☐
2012	66	Chemistry	☐	☐
2022	21	Biology	☐	☐
2022	40	Chemistry	☐	☐
2021	29	Biology	☐	☐
2021	42	Chemistry	☐	☐

Free past papers, 2011–2026
entermedschool.com/imat-papers

Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY
2
of 58

About 8 h

BIOLOGY

Water and Carbon: The Molecules of Life

Why water behaves like nothing else on Earth, and why carbon's four bonds make it the scaffold of every biological molecule. It all traces back to one idea from yesterday: electronegativity.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — W1 W2 W3 W4 W5 W6 W7 W8 Final — 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 3-4

- [ ] Read Ch 3: The Chemistry of Water (polarity, the emergent properties, acids and bases) — pp. 92-101
- [ ] Read Ch 4, Carbon: The Basis of Molecular Diversity (carbon skeletons, isomers, functional groups) — pp. 104-113

ⓘ Do the end-of-section Concept Checks. Almost every water property comes down to one word: hydrogen-bonding.

Why water is weird: polarity → hydrogen bonding

- [ ] Water is a polar molecule: the bent shape and oxygen's electronegativity give O a partial-negative (δ−) end and each H a partial-positive (δ+) end — p. 93
- [ ] Hydrogen bonding: each water molecule can H-bond to up to 4 neighbors; each bond is ~1/20 the strength of a covalent bond and forms and breaks constantly. This is the source of every property below — p. 93

Self-check: polarity ◯ Got it ◯ Shaky ◯ Re-test

Can you explain, starting from oxygen's electronegativity, why a water molecule is polar, and why that polarity lets one water molecule hydrogen-bond to four others?

Water's four special properties (all from hydrogen bonds)

- [ ] Cohesion and adhesion: water sticks to itself (cohesion) and to other surfaces (adhesion), pulling a column of sap > 100 m up a tree; high surface tension lets insects walk on water — pp. 93-94
- [ ] Water moderates temperature: high specific heat (1 cal/g·°C) and a huge heat of vaporization → evaporative cooling (sweat, leaf cooling) and stable coastal climates — pp. 94-95
- [ ] Ice floats: water is densest at 4 °C, and the solid lattice is ~10% less dense than the liquid, so ice insulates the water (and life) below it — pp. 95-96
- [ ] Water is the solvent of life: it surrounds ions/polar molecules with hydration shells; learn hydrophilic (water-loving) vs hydrophobic (water-fearing, nonpolar) — pp. 97-98

Self-check: emergent properties ◯ Got it ◯ Shaky ◯ Re-test

Can you take one fact (water makes hydrogen bonds) and use it to explain cohesion, high specific heat, evaporative cooling, and why ice floats?

Acids, bases and pH

- [ ] Water self-ionizes into H^+ and OH^-; the pH scale = $-\log[H^+]$ (each unit = 10×). Acids donate H^+ (lower pH); bases accept H^+ / donate OH^- (raise pH); pure water is neutral at pH 7 — pp. 99-100
- [ ] Buffers resist pH change by mopping up or releasing H^+. The carbonic-acid / bicarbonate ($H_2CO_3 \rightleftharpoons HCO_3^- + H^+$) buffer holds blood near pH 7.4 — pp. 100-101

Self-check: pH ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why a buffer keeps blood pH ~7.4 even when you add acid, and what the carbonic-acid/bicarbonate pair does with the extra H^+?

Carbon: the backbone of every biological molecule

- [ ] Why carbon? With 4 valence electrons it forms 4 covalent bonds (tetrahedral, 109.5°) and bonds to itself, building chains, branches and rings of almost unlimited variety — pp. 106-108

Carbon: the backbone of every biological molecule continued

- [ ] Hydrocarbons and carbon skeletons: skeletons vary in length, branching, double-bond position and rings; hydrocarbons (C + H only) are nonpolar and energy-rich (fats, fuels) p. 108
- [ ] Isomers (same formula, different molecule): structural (different skeleton), cis-trans (groups around a double bond), and enantiomers (mirror images). Chirality is why one drug enantiomer heals and the other harms (thalidomide, ibuprofen) pp. 109-110

Self-check: isomers ○ Got it ○ Shaky ○ Re-test

Can you tell apart structural isomers, cis-trans isomers, and enantiomers? And can you explain why two enantiomers of the same drug can have completely different effects in the body?

The functional groups that run biology

- [ ] The reactive 'business ends', part 1: hydroxyl (–OH, alcohols, polar), carbonyl (C=O, aldehydes and ketones), carboxyl (–COOH, acids, donates H^+) pp. 110-111
- [ ] Functional groups, part 2: amino (–NH_2, base, accepts H^+), sulfhydryl (–SH, forms cross-links in proteins), phosphate (–OPO_3^{2-}, charge and energy), methyl (–CH_3, switches genes on/off) p. 111
- [ ] ATP, the cell's energy currency: adenosine + 3 phosphates; it releases usable energy by reacting with water → ADP + P_i p. 112

Self-check: functional groups ○ Got it ○ Shaky ○ Re-test

Can you name what makes the carboxyl group acidic and the amino group basic? And can you recognize all seven functional groups on sight in a structural formula?

Recall and practice

- [ ] Review today's flashcard set (pH, acids, bases and buffers)
- [ ] Answer today's practice questions (water, pH, acids and bases)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Exam tip

When a question asks 'which property of water explains X?', trace it back to hydrogen bonding. Name the H-bond and you've almost always found the answer.

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2023	36	Chemistry	☐	☐
2021	44	Chemistry	☐	☐
2020	45	Chemistry	☐	☐
2015	46	Chemistry	☐	☐
2015	52	Chemistry	☐	☐
2022	40	Chemistry	☐	☐
2020	24	Biology	☐	☐
2023	26	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
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Study time today _____ h _____ min About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY

3

of 58

About 8 h

BIOLOGY

A Tour of the Cell: Organelles and Their Jobs

Open up a eukaryotic cell and meet every organelle: the nucleus that stores the plans, the ribosomes and endomembrane system that build and ship proteins, the mitochondria that make energy, and the cytoskeleton that holds it together.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — W1 W2 W3 W4 W5 W6 W7 W8 Final — 58

Today's reading — Campbell Biology: A Global Approach (11th ed.) · ch. 7

- [ ] Read Ch 7: Cell Structure and Function (the full tour of the cell and the summary table) — pp. 163-195

ⓘ Use the Chapter Review table (pp. 194-195). It lists every organelle's structure and function in one place.

Two kinds of cells

- [ ] How we study cells: light microscopes (LM) vs electron microscopes (EM = far higher resolution); cell fractionation spins cells apart to isolate organelles — pp. 164-167
- [ ] Prokaryotic vs eukaryotic cells: prokaryotes (bacteria) have no nucleus and no membrane-bound organelles (their DNA sits in a nucleoid); eukaryotes have a true nucleus and internal membrane-bound organelles — pp. 167-169
- [ ] Every cell is wrapped in a plasma membrane (a selective barrier). Why cells stay tiny: the surface-area-to-volume ratio. If a cell gets too big, the membrane can't service the inside fast enough — pp. 169-172

Self-check: cell types ○ Got it ○ Shaky ○ Re-test

Can you list what a prokaryotic cell lacks compared with a eukaryotic cell, and explain why a large surface-area-to-volume ratio forces cells to stay small?

Information central: nucleus and ribosomes

- [ ] The nucleus, the control center: a double membrane (nuclear envelope) studded with nuclear pores; holds the DNA as chromatin (DNA + proteins); the nucleolus inside makes ribosome subunits — pp. 172-174
- [ ] Ribosomes, the protein factories: built from rRNA and protein; free in the cytosol or bound to the rough ER; they are not membrane-bound (a classic trap) — pp. 173-174

Self-check: nucleus ○ Got it ○ Shaky ○ Re-test

Can you explain the job of the nucleolus, and why ribosomes are not considered part of the endomembrane system even when they're stuck to the rough ER?

Make it, ship it, recycle it: the endomembrane system

- [ ] Endoplasmic reticulum: rough ER (ribosome-studded → makes secretory proteins and new membrane) vs smooth ER (makes lipids, detoxifies drugs, stores Ca^{2+}) — pp. 174-176
- [ ] Golgi apparatus, the post office: stacks of sacs that modify, sort and ship proteins in vesicles (cis face receives from the ER, trans face sends out) — pp. 176-177
- [ ] Lysosomes and vacuoles: lysosomes = acidic bags of hydrolytic (digestive) enzymes that recycle worn-out parts and ingested material; vacuoles store water, food and waste — pp. 177-178

Self-check: endomembrane ○ Got it ○ Shaky ○ Re-test

Can you trace a secreted protein's path through the endomembrane system (rough ER → Golgi → vesicle → out), and say what each station does to it?

Power and scaffolding: mitochondria, chloroplasts and cytoskeleton

- [ ] Mitochondria, the powerhouse: a double membrane (the inner one folded into cristae) where cellular respiration makes ATP; they carry their own DNA — pp. 179-181
- [ ] Chloroplasts and peroxisomes: chloroplasts (plant cells only) run photosynthesis in their stroma and thylakoid stacks (grana); peroxisomes use catalase to break down H_2O_2 — pp. 179-182

Power and scaffolding: mitochondria, chloroplasts and cytoskeleton continued

- [ ] Endosymbiotic theory: mitochondria and chloroplasts were once free-living bacteria engulfed by an ancestral cell, which is why they have a double membrane, their own DNA and their own (bacterial-type) ribosomes p. 181
- [ ] The cytoskeleton: microtubules (hollow tubulin rods → shape, organelle and chromosome movement, cilia and flagella), microfilaments (actin → muscle, shape, cytoplasmic streaming), intermediate filaments (anchor organelles, resist tension) pp. 182–188

Self-check: energy and structure ○ Got it ○ Shaky ○ Re-test

Can you give two pieces of evidence for the endosymbiotic origin of mitochondria? And can you name which cytoskeletal fiber builds cilia, flagella and the mitotic spindle?

Recall and practice

- [ ] Review today's flashcard set (organelles and their jobs)
- [ ] Answer today's practice questions (cell structure)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Exam tip

Ribosomes are the classic trap: they are not membrane-bound, so they are not part of the endomembrane system, not even the ones bound to the rough ER.

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2023	16	Biology	☐	☐
2022	25	Biology	☐	☐
2021	27	Biology	☐	☐
2014	39	Biology	☐	☐
2012	56	Biology	☐	☐
2020	23	Biology	☐	☐
2016	23	Biology	☐	☐
2016	40	Biology	☐	☐

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Study time today _____ h _____ min About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY

4

of 58

About 8 h

BIOLOGY

The Four Macromolecules of Life

Carbohydrates, lipids, proteins and nucleic acids: the four big molecules every cell is built from. Learn how cells snap small monomers into giant polymers, and what each family does.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 5

- [ ] Read Ch 5: Biological Macromolecules and Lipids (carbohydrates, lipids, proteins, nucleic acids) pp. 114-139

ⓘ The Chapter Review table (pp. 138-139) lays out all four macromolecules side by side: components, examples and functions.

Big molecules from small parts

- [ ] Monomers and polymers: cells build huge molecules (polymers) by linking small repeating units (monomers). Carbohydrates, proteins and nucleic acids are polymers; lipids are not true polymers pp. 115-116
- [ ] Two reactions you'll see everywhere: dehydration synthesis joins monomers (removing one water per bond); hydrolysis breaks them apart (adding water back) pp. 115-116

Self-check: polymers ○ Got it ○ Shaky ○ Re-test

Can you explain the difference between dehydration synthesis and hydrolysis, and say which three of the four macromolecule families are true polymers (and which one isn't)?

Carbohydrates: fuel and structure

- [ ] Monosaccharides (glucose, fructose) are the monomers; two of them join by a glycosidic bond into a disaccharide (sucrose = glucose + fructose; lactose = glucose + galactose) pp. 116-118
- [ ] Polysaccharides (glucose chains): starch = plant energy store, glycogen = animal energy store (liver/muscle), cellulose = plant cell-wall structure (the indigestible fiber) pp. 118-120

Self-check: carbohydrates ○ Got it ○ Shaky ○ Re-test

Can you name the storage polysaccharide in plants vs animals, and explain why humans can digest starch but not cellulose even though both are glucose chains?

Lipids: the hydrophobic family

- [ ] Fats (triglycerides) = glycerol + 3 fatty acids. Saturated (no C=C double bonds → straight, solid, animal fats) vs unsaturated (C=C kinks → liquid plant oils) pp. 120-122
- [ ] Phospholipids (glycerol + phosphate + 2 fatty acids) are amphipathic → they build the membrane bilayer. Steroids (4 fused rings) include cholesterol and the steroid hormones pp. 122-123

Self-check: lipids ○ Got it ○ Shaky ○ Re-test

Can you explain why a phospholipid (not a triglyceride) is the molecule that forms membranes, and why unsaturated fats are liquid at room temperature?

Proteins: the workhorses

- [ ] Amino acids (20 kinds) link by peptide bonds (a dehydration reaction) into polypeptides. Proteins do almost every job: enzymes, transport, structure, defense, signaling, movement pp. 123-126
- [ ] Four levels of protein structure: primary (amino-acid sequence) → secondary (α-helix / β-sheet, held by H-bonds) → tertiary (3-D fold) → quaternary (several chains, e.g. hemoglobin). Heat/pH can denature (unfold) a protein pp. 126-131

Self-check: proteins ○ Got it ○ Shaky ○ Re-test

Can you walk up the four levels of protein structure, and explain why a single change in the primary sequence (the amino acids) can wreck the final 3-D shape and function?

Nucleic acids: the information molecules

- [ ] Nucleotides, the monomers of nucleic acids: each = a sugar + a phosphate group + a nitrogenous base; they link into long chains — pp. 132-133
- [ ] DNA vs RNA: DNA = deoxyribose sugar, bases A-T-C-G, usually double-stranded → stores the genes. RNA = ribose sugar, bases A-U-C-G, usually single-stranded → carries the instructions out — pp. 133-134

Self-check: nucleic acids ○ Got it ○ Shaky ○ Re-test

Can you list the three parts of a nucleotide, and give the three differences between DNA and RNA (sugar, bases, number of strands)?

Recall and practice

- [ ] Review today's flashcard set (the four macromolecules)
- [ ] Answer today's practice questions (carbs, lipids and proteins)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Exam tip

Lipids are the odd one out: they are not polymers (no repeating monomer). If a question calls a fat a 'polymer of fatty acids', it's wrong.

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2023	19	Biology	☐	☐
2017	30	Biology	☐	☐
2013	35	Biology	☐	☐
2011	43	Biology	☐	☐
2021	29	Biology	☐	☐
2020	24	Biology	☐	☐
2020	25	Biology	☐	☐
2017	27	Biology	☐	☐

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__:__	__:__		☐

Study time today _____ h _____ min — About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY

5

of 58

About 8 h

BIOLOGY

Energy, ATP and Enzymes

What makes a reaction happen, where cells keep their energy (ATP), and how enzymes make life's chemistry run fast enough to keep you alive. This is the engine room of the cell.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading — Campbell Biology: A Global Approach (11th ed.) · ch. 6

- [ ] Read Ch 6: Energy and Life (metabolism, free energy, ATP, enzymes) — pp. 141-161

ⓘ Don't get lost in the math. At this stage you only need the ideas: exergonic vs endergonic, ATP, and what an enzyme does.

Energy and metabolism

- [ ] Metabolism = all of a cell's reactions. Catabolic pathways break molecules down and release energy (e.g. respiration); anabolic pathways build molecules up and consume energy — pp. 142-143
- [ ] The two laws of thermodynamics: (1) energy is conserved (transformed, never created or destroyed); (2) every energy transfer increases entropy (disorder), so some energy is always lost as heat — pp. 143-145

Self-check: metabolism ◯ Got it ◯ Shaky ◯ Re-test

Can you classify respiration vs building a protein as catabolic or anabolic? And can you explain, using the 2nd law, why no energy transfer is ever 100% efficient?

Which reactions happen on their own?

- [ ] Free energy (ΔG) tells you if a reaction is spontaneous. Exergonic (ΔG < 0) releases energy → happens on its own (e.g. respiration). Endergonic (ΔG > 0) absorbs energy → needs an input (e.g. building molecules) — pp. 145-149

Self-check: free energy ◯ Got it ◯ Shaky ◯ Re-test

Can you say whether an exergonic or an endergonic reaction releases energy, and which one a cell has to pay for to make happen?

ATP: the cell's energy currency

- [ ] ATP (adenosine triphosphate) = adenosine + 3 phosphates. Snapping off the last phosphate (ATP → ADP + P_i) is exergonic: it releases the usable energy the cell spends — pp. 149-151
- [ ] Energy coupling: the cell uses the energy from exergonic ATP hydrolysis to drive endergonic work (building molecules, pumping ions across membranes, and movement) — pp. 150-152

Self-check: ATP ◯ Got it ◯ Shaky ◯ Re-test

Can you explain what ATP becomes when it releases energy, and what 'energy coupling' means (how an exergonic reaction pays for an endergonic one)?

Enzymes: lowering the energy barrier

- [ ] Every reaction must clear an energy barrier, the activation energy. Enzymes are biological catalysts: they lower the activation energy so reactions run fast at body temperature, and they are not used up (reusable) — pp. 152-153
- [ ] How enzymes work: the substrate fits the enzyme's active site (induced fit), so each enzyme is specific. Activity peaks at an optimum temperature and pH; too much heat or the wrong pH denatures the enzyme, and it stops working — pp. 153-156
- [ ] Inhibitors slow enzymes: a competitive inhibitor mimics the substrate and blocks the active site (more substrate can out-compete it); a noncompetitive inhibitor binds elsewhere and changes the enzyme's shape — pp. 156-157

Self-check: enzymes ◯ Got it ◯ Shaky ◯ Re-test

Can you explain how an enzyme speeds a reaction without being used up, and tell a competitive inhibitor from a noncompetitive one by where it binds?

Controlling enzymes

- [ ] Allosteric regulation: a molecule binds a site away from the active site and switches the enzyme on or off. Feedback inhibition: a pathway's end product shuts off an early enzyme, so the cell stops making what it already has enough of pp. 157-159

Self-check: regulation ◯ Got it ◯ Shaky ◯ Re-test

Can you explain feedback inhibition in one sentence, and why it's a smart way for a cell to avoid wasting energy making a product it already has?

Recall and practice

- [ ] Review today's flashcard set (enzymes, activation energy and inhibition)
- [ ] Answer today's practice questions (enzymes and inhibition)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Exam tip

An enzyme lowers activation energy and speeds both directions of a reaction. It does not change ΔG or make a non-spontaneous reaction spontaneous.

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2020	31	Biology	☐	☐
2017	26	Biology	☐	☐
2014	41	Biology	☐	☐
2023	29	Biology	☐	☐
2023	31	Biology	☐	☐
2022	22	Biology	☐	☐
2022	27	Biology	☐	☐
2022	39	Chemistry	☐	☐

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FROM	TO	WHAT I DID	DONE
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Study time today _____ h _____ min — About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY

6

Rest day

Rest and Recovery

No new material today. Memory consolidates while you rest, so let it. Sleep well, drink enough water, and move a little.



- [ ] Step away from new material. What you learned this week sticks while you recover optional
- [ ] Optional: a relaxed 10-minute skim of this week's flashcards (Days 1-5)

HOURS OF SLEEP

HOW I FEEL

1 2 3 4 5

WHAT I DID TODAY

DAY

7

Rest day

Rest and Reset

Recharge before the next cycle. You learn faster with a clear, rested mind than by cramming tired.

- [ ] Fully switch off from studying and do something you enjoy optional
- [ ] Optional: jot down any topic from Days 1-5 that still feels shaky, to revisit next week

HOURS OF SLEEP

HOW I FEEL

1 2 3 4 5

WHAT I DID TODAY

Weekly review

Week 1 · Days 1–7

REVIEW DATE _____



Leo's tip

Set aside a fixed hour each weekend to tidy your flashcards and log what still feels shaky. The planner moves quickly, and this weekly audit keeps the revision wheels turning while the content pile grows.



WEEK 1 DONE

Color it in

How the days went

DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
Biology Foundations & the Chemistry of Life	Water and Carbon: The Molecules of Life	A Tour of the Cell: Organelles and Their Jobs	The Four Macromolecules of Life	Energy, ATP and Enzymes	Rest and Recovery	Rest and Reset
○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Rested	○ Rested

Checkpoints ticked _____ / **87** Self-checks marked Got it _____ / **23** Physics / math blocks _____

Weak-spot tracker

Every Shaky or Re-test from this week, one row each.

TOPIC	DAY	WHY	RE-TEST ON	FIXED
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐

Score log

Real IMAT questions this week: tried _____ / **36**

right _____

DATE	PAPER / SECTION	RIGHT	WRONG	BLANK	SCORE
__ / __					
__ / __					
__ / __					
__ / __					
__ / __					

Score = 1.5 × right − 0.4 × wrong · blank = 0 · IMAT 2026 rule

Next week

Week 2 · Days 8–14

8	Cell Membranes and Transport
9	DNA Structure and Replication
10	Mitosis and the Cell Cycle
11	Meiosis and Sexual Life Cycles
12	How Cells Talk and How Bodies Are Organized
13	Rest and Recharge
14	Rest Day

from _____ to _____

My goal for next week

What I move into next week

DAY

8

of 58

About 8 h

BIOLOGY

Cell Membranes and Transport

The membrane is the cell's gatekeeper. Learn its fluid-mosaic structure, then the four ways things cross it: diffusion, osmosis, active transport, and bulk transport (endo/exocytosis).

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading — Campbell Biology: A Global Approach (11th ed.) · ch. 8

- [ ] Read Ch 8: Cell Membranes (structure and all the ways molecules cross) — pp. 196-212

ⓘ Get the tonicity words straight (hyper-, hypo-, isotonic). The IMAT tests them constantly.

The membrane: a fluid mosaic

- [ ] The membrane is a phospholipid bilayer: amphipathic phospholipids point their hydrophilic heads out toward water and hide their hydrophobic tails inside — pp. 197-198
- [ ] The fluid mosaic model: proteins drift in or on the fluid lipid bilayer like tiles in a mosaic. Fluidity rises with unsaturated tails; cholesterol buffers it. Surface glycoproteins act as cell-ID tags — pp. 198-201

Self-check: membrane structure ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why the phospholipids spontaneously form a bilayer (not a single layer) in water, and what 'fluid mosaic' means?

Passive transport: no energy needed

- [ ] Selective permeability: small nonpolar molecules (O_2, CO_2) slip straight through the lipid; ions and large polar molecules (glucose) need transport proteins; water crosses through aquaporins — pp. 201-202
- [ ] Diffusion: molecules spread down their concentration gradient (high → low) on their own. It is spontaneous and costs no energy — pp. 202-203
- [ ] Osmosis = diffusion of water across the membrane. Tonicity: a cell in a hypertonic solution shrinks (loses water), in a hypotonic one swells or bursts (gains water), and in an isotonic one stays the same — pp. 203-205
- [ ] Facilitated diffusion: still passive (down the gradient, no ATP) but through a channel or carrier protein. This is how ions and glucose get across — pp. 205-206

Self-check: passive transport ◯ Got it ◯ Shaky ◯ Re-test

Can you predict whether a red blood cell swells, shrinks or stays the same in hypertonic vs hypotonic vs isotonic solution, and explain why, using osmosis?

Active and bulk transport: spending energy

- [ ] Active transport: moves a solute against its gradient (low → high), so it costs energy (ATP). The classic pump is the Na^+/K^+-ATPase (3 Na^+ out, 2 K^+ in) — pp. 206-209
- [ ] Bulk transport for big things: endocytosis brings material in (phagocytosis = 'cell eating', pinocytosis = 'cell drinking', receptor-mediated = specific); exocytosis ships material out — pp. 209-211

Self-check: active transport ◯ Got it ◯ Shaky ◯ Re-test

Can you explain the one thing that makes active transport 'active' (vs passive), and why the Na^+/K^+ pump needs to burn ATP?

Recall and practice

- [ ] Review today's flashcard set (membrane structure and transport)
- [ ] Answer today's practice questions (transport and osmosis)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2012	52	Biology	☐	☐
2022	24	Biology	☐	☐
2017	31	Biology	☐	☐
2017	38	Biology	☐	☐
2022	33	Biology	☐	☐
2011	48	Biology	☐	☐

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FROM	TO	WHAT I DID	DONE
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__:__	__:__		☐
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__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY

9

of 58

About 8 h

BIOLOGY

DNA Structure and Replication

Today is about the molecule that runs your whole life. Start with the double helix, then see how the cell copies all 3 billion letters of it, fast and almost perfectly, every time a cell divides.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading — Campbell Biology: A Global Approach (11th ed.) · ch. 16

- [ ] Read Ch 16: Nucleic Acids and Inheritance (the double helix, replication, chromosome packing) — pp. 364-384

ⓘ The replication-fork diagram (Concept 16.2) is worth memorizing. The IMAT often asks how the leading and lagging strands differ.

The double helix

- [ ] DNA, not protein, is the genetic material (the Hershey-Chase phage experiments proved it). Watson and Crick then worked out its shape: the double helix — pp. 365-369
- [ ] The two strands are antiparallel (they run 5'→3' in opposite directions): sugar-phosphate backbones on the outside, bases paired on the inside — pp. 369-370
- [ ] Base pairing: A pairs with T (2 hydrogen bonds), G pairs with C (3 hydrogen bonds). So the two strands are complementary: each one is a template to rebuild the other — p. 369

Self-check: DNA structure ○ Got it ○ Shaky ○ Re-test

Given one strand 5'-ATGC-3', can you write its complementary strand (with the correct 5'/3' ends) and explain what 'antiparallel' means?

Copying DNA: semiconservative replication

- [ ] DNA replication is semiconservative (Meselson-Stahl): the helix unzips and each old strand templates a new partner, so every daughter DNA is one old and one new strand — pp. 370-372
- [ ] At the replication fork: helicase unwinds the helix; primase lays a short RNA primer to start; then DNA polymerase adds nucleotides, but only in the 5'→3' direction — pp. 372-375

Self-check: replication basics ○ Got it ○ Shaky ○ Re-test

Can you explain what 'semiconservative' means, and name the jobs of helicase, primase and DNA polymerase at the fork?

Leading vs lagging strand

- [ ] Because polymerase only builds 5'→3', the leading strand is made continuously toward the fork, but the lagging strand is built backwards in pieces (Okazaki fragments). Then DNA ligase glues the pieces together — pp. 375-377
- [ ] Accuracy and ends: DNA polymerases proofread and fix mistakes as they go; telomeres (repetitive end-caps) stop chromosome ends from eroding away with each round of copying — pp. 377-379

Self-check: leading/lagging ○ Got it ○ Shaky ○ Re-test

Can you explain why one strand is made continuously and the other in Okazaki fragments, tracing it back to the single rule that polymerase only works 5'→3'?

Packing DNA into chromosomes

- [ ] Two meters of DNA into a tiny nucleus: DNA winds around histone proteins into nucleosomes, which coil and fold (chromatin) until it condenses into a chromosome. Euchromatin = loose and active; heterochromatin = dense and silent — pp. 380-382

Self-check: chromatin ○ Got it ○ Shaky ○ Re-test

Can you explain how DNA and histones make a nucleosome, and why genes in tightly packed heterochromatin are usually switched off?

Recall and practice

- [ ] Review today's flashcard set (DNA structure and replication)
- [ ] Answer today's practice questions (replication)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2021	28	Biology	☐	☐
2020	25	Biology	☐	☐
2020	31	Biology	☐	☐
2019	26	Biology	☐	☐
2017	23	Biology	☐	☐
2017	27	Biology	☐	☐
2015	32	Biology	☐	☐
2013	31	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY

10

of 58

About 8 h

BIOLOGY

Mitosis and the Cell Cycle

Today you'll see how one cell becomes two identical cells. Learn the cell cycle, then the five stages of mitosis, and how checkpoints keep the cycle from going wrong (and what happens when they fail: cancer).

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 12

- [ ] Read Ch 12: Mitosis (the cell cycle, the five stages, cytokinesis, cell-cycle control) pp. 284-302

ⓘ Learn the stages by their defining event (e.g. anaphase = sister chromatids separate). That's how the IMAT tests them.

The cell cycle

- [ ] Cell division makes two genetically identical daughter cells. The cell cycle = interphase (G1 grow → S copy the DNA → G2 grow), then the M phase (mitosis + cytokinesis = the division itself) pp. 285-288
- [ ] After S phase, each chromosome is made of two identical sister chromatids joined at the centromere: copies waiting to be pulled apart. (Mitosis does not change the chromosome number) pp. 285-287

Self-check: the cell cycle ◯ Got it ◯ Shaky ◯ Re-test

Can you say what happens in each phase (G1, S, G2, M), and explain why the daughter cells of mitosis have the same chromosome number as the parent cell?

The five stages of mitosis

- [ ] Prophase → prometaphase: chromosomes condense, the spindle (microtubules) forms, the nuclear envelope breaks down, and spindle fibers grab each chromosome at its kinetochore pp. 288-290
- [ ] Metaphase: all the chromosomes line up single-file across the cell's middle, on the metaphase plate (this is also when they are most condensed → best for karyotyping) p. 290
- [ ] Anaphase: the sister chromatids are pulled apart to opposite poles (the defining event). Telophase: two new nuclear envelopes re-form around the two sets of chromosomes pp. 290-292
- [ ] Cytokinesis divides the cytoplasm into two cells: a cleavage furrow pinches an animal cell in two; a cell plate builds a new wall down the middle of a plant cell pp. 292-293

Self-check: the stages ◯ Got it ◯ Shaky ◯ Re-test

Can you name each mitosis stage by its defining event? Given a diagram (chromosomes lined up in the middle, sister chromatids pulling apart, or two nuclei re-forming), can you say which stage it is?

Controlling the cycle (and cancer)

- [ ] The cell cycle is controlled by checkpoints (driven by cyclins and Cdks) that pause division until everything is ready. Cells that escape these checkpoints divide uncontrollably → tumors/cancer pp. 294-300

Self-check: cell-cycle control ◯ Got it ◯ Shaky ◯ Re-test

Can you explain what a cell-cycle checkpoint is for, and how a cancer cell and a normal cell differ in how they obey (or ignore) these controls?

Recall and practice

- [ ] Review today's flashcard set (mitosis and the cell cycle)
- [ ] Answer today's practice questions (mitosis stages)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2022	28	Biology	☐	☐
2019	26	Biology	☐	☐
2015	34	Biology	☐	☐
2020	28	Biology	☐	☐
2017	23	Biology	☐	☐
2016	24	Biology	☐	☐
2016	39	Biology	☐	☐
2015	28	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
___ : ___	___ : ___		☐
___ : ___	___ : ___		☐
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___ : ___	___ : ___		☐

Study time today _____ h _____ min

About 8 h

Physics / math block your own, not in the plan

Topic _____

From ___ : ___ To ___ : ___ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY

11

of 58

About 8 h

BIOLOGY

Meiosis and Sexual Life Cycles

How sex shuffles the deck. Yesterday one cell made two identical copies (mitosis); today a diploid cell makes four different haploid gametes. Learn about meiosis, fertilization, and the three mechanisms that make every offspring unique.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 13

- [ ] Read Ch 13: Sexual Life Cycles and Meiosis (chromosomes, the life cycle, the two divisions, genetic variation) pp. 304-318

ⓘ Keep Figure 13.8 (Exploring Meiosis) and the mitosis-vs-meiosis table (Figure 13.10) open side by side. The IMAT often asks about the difference between them.

Heredity rides on chromosomes (Concept 13.1)

- [ ] Genes are what gets inherited: units of coded DNA, each at a fixed spot (locus) on a chromosome. Parents pass on genes, not traits directly; this is heredity, and along with it comes variation p. 305
- [ ] Asexual vs sexual reproduction: asexual = one parent → genetically identical offspring (a clone, via mitosis); sexual = two parents → offspring that vary from each other and from both parents pp. 305-306
- [ ] Somatic cells vs gametes: somatic (body) cells carry the full chromosome set and make more body cells by mitosis; gametes (sperm and egg) are the reproductive cells that carry genes to the next generation p. 305

Self-check: what is inherited ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why offspring of asexual reproduction are clones but offspring of sexual reproduction vary, and what a 'gene' and its 'locus' are?

Counting chromosomes: diploid, haploid and the karyotype (Concept 13.2)

- [ ] A karyotype is the ordered display of a cell's chromosomes (stained at metaphase, lined up in pairs by size and centromere position). It's how you screen for abnormal chromosome numbers (e.g. Down syndrome) p. 306
- [ ] Homologous chromosomes (homologs): the two members of each pair (same length, same centromere, same genes in the same order), one inherited from each parent. Humans: 23 pairs = 46 chromosomes p. 306
- [ ] Autosomes vs sex chromosomes: 22 pairs are autosomes; the 23rd pair is the sex chromosomes (XX = female, XY = male). The sex chromosomes are the one homologous pair that doesn't have to fully match pp. 306-307
- [ ] Diploid (2n) = two sets of chromosomes (somatic cells, 2n = 46 in humans); haploid (n) = one set (gametes, n = 23). 'n' is the number of chromosomes in one set; don't confuse it with the chromatid count p. 307

Self-check: chromosome sets ◯ Got it ◯ Shaky ◯ Re-test

For a human cell, can you state 2n, n, and how many pairs are autosomes vs sex chromosomes? And can you define 'homologous chromosomes' without confusing them with sister chromatids?

The sexual life cycle: meiosis and fertilization (Concept 13.2)

- [ ] The human life cycle alternates two events: fertilization (haploid sperm + haploid egg → diploid zygote, 2n = 46) and meiosis (which halves the set back to n), so the chromosome number stays constant generation after generation pp. 307-308
- [ ] Why meiosis is required: if gametes were made by mitosis they'd be diploid, and each generation's chromosome number would double at fertilization. Meiosis counterbalances the doubling p. 308
- [ ] Three variations on the theme: animals (gametes are the only haploid cells), plants/algae (alternation of generations: multicellular haploid and diploid stages, sporophyte alternating with gametophyte), and most fungi/protists (the zygote is the only diploid stage) pp. 308-309

The sexual life cycle: meiosis and fertilization (Concept 13.2) continued

Self-check: the life cycle ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why a sexual life cycle needs both meiosis and fertilization, and what would happen to the chromosome number over generations if gametes were made by mitosis instead?

Meiosis I and II: two divisions, one replication (Concept 13.3)

- [ ] The big picture: DNA is copied once (S phase), but the cell then divides twice (meiosis I and meiosis II), turning one diploid cell into four haploid daughter cells (vs the two identical cells of mitosis) p. 309
- [ ] Meiosis I = the reductional division (2n → n): in prophase I homologs pair up (synapsis) and cross over; at metaphase I the tetrads line up; at anaphase I the homologs separate (sister chromatids stay joined). Result: two haploid cells, chromosomes still duplicated pp. 310-311
- [ ] Meiosis II = just like mitosis (n → n): no new DNA copying; at anaphase II the sister chromatids finally separate. Result: four haploid cells, each with single (unduplicated) chromosomes p. 311
- [ ] Don't confuse sister chromatids with homologs: sister chromatids are identical copies of one chromosome (joined at the centromere); homologs are the maternal and paternal versions of a chromosome (different alleles). Meiosis I separates homologs; meiosis II separates sisters p. 309

Self-check: the two divisions ◯ Got it ◯ Shaky ◯ Re-test

Can you say which division separates homologs and which separates sister chromatids, and explain why meiosis I (not II) is the step that makes a cell haploid?

Crossing over and synapsis in prophase I (Concept 13.3)

- [ ] Synapsis: in prophase I each homolog pairs gene-for-gene with its partner, zipped together by the synaptonemal complex into a tetrad (4 chromatids). This close pairing is what makes crossing over possible p. 312
- [ ] Crossing over: nonsister chromatids of paired homologs swap matching segments → recombinant chromosomes carrying a mix of maternal and paternal alleles. The X-shaped points where this happened are the chiasmata p. 312
- [ ] Why chiasmata matter: together with sister-chromatid cohesion they physically hold each homologous pair together until anaphase I, so the homologs line up and separate correctly. At least one crossover per pair is needed pp. 312-313

Self-check: crossing over ◯ Got it ◯ Shaky ◯ Re-test

Can you explain what crossing over exchanges (and between which chromatids), what a chiasma is, and why crossing over and synapsis happen in meiosis but not in mitosis?

Three sources of genetic variation (Concept 13.4)

- [ ] Independent assortment: at metaphase I each homologous pair faces a pole at random, independently of the others → 2^n possible chromosome combinations in the gametes (for humans, n = 23 → $2^{23} \approx 8.4$ million) p. 315
- [ ] Crossing over and random fertilization: crossing over makes recombinant chromosomes (so a gamete's chromosomes aren't purely maternal or paternal); random fertilization then unites one of ~8.4 million eggs with one of ~8.4 million sperm pp. 315-316
- [ ] Why it matters for evolution: this reshuffling produces the genetic variation natural selection acts on, but the original source of new alleles is mutation; meiosis and fertilization only recombine existing variation pp. 316-317

Self-check: sources of variation ◯ Got it ◯ Shaky ◯ Re-test

Can you name the three mechanisms that generate genetic variation in a sexual life cycle (independent assortment, crossing over, random fertilization)? And why does none of them create new alleles (only mutation does)?

Notes

Recall and practice

- [ ] Review today's flashcard set (meiosis I vs II, homologs, crossing over, independent assortment)
- [ ] Answer today's practice questions (meiosis, chromosome counting and variation)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2021	31	Biology	☐	☐
2018	25	Biology	☐	☐
2018	26	Biology	☐	☐
2016	35	Biology	☐	☐
2016	39	Biology	☐	☐
2015	28	Biology	☐	☐
2021	30	Biology	☐	☐
2020	28	Biology	☐	☐

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FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

12

of 58

About 8 h

BIOLOGY

How Cells Talk and How Bodies Are Organized

Two halves of one idea: communication. First, how a single cell 'hears' a signal from outside and reacts (reception → transduction → response). Then zoom out to the whole animal: the four tissue types, how they build organs and organ systems, and how the body keeps itself stable with feedback. No heavy chemistry today, just the big picture.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 9 + ch. 40

- [ ] Read Ch 9: Cellular Signaling (pp. 214-232) and Ch 40: The Animal Body (pp. 925-934). Aim for the big picture, not every molecule — pp. 214-232 (+ pp. 925-934)

ⓘ Work from one figure for each half. For signaling, keep the 3-stage overview (Figure 9.6, p. 218) open: reception, transduction, response. For the body, use Table 40.1 (p. 928, the organ systems) plus the four-tissue panel (Figure 40.5, pp. 929-931). Don't get lost in the cAMP/Ca2+ chemistry on the later pages yet; for now it's enough to understand 'second messenger = relays the signal inside'.

Why cells need to 'talk'

- [ ] Cells communicate using signaling molecules (mostly chemicals). A 'talking' cell releases a signal; only a 'listening' cell with the matching receptor can detect and respond to it. The signal fits the receptor like a hand in a glove — p. 219
- [ ] Local vs long-distance signaling: paracrine signals (e.g. local regulators, growth factors) act on nearby cells; synaptic signals cross a tiny synapse between neurons; long-distance signals are hormones, released into the blood to reach far-off target cells (Fig 9.5) — pp. 217-218

Self-check: the idea of signaling ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why a hormone travels through the whole bloodstream yet only affects some cells? And what is the difference between local (paracrine/synaptic) and long-distance (hormonal) signaling?

The 3 stages: reception → transduction → response

- [ ] Earl Sutherland's big insight was that signaling at the receiving cell has three stages: (1) reception (the signal binds a receptor), (2) transduction (the message is relayed/converted inside), (3) response (the cell does something, e.g. switches on an enzyme or a gene) (Fig 9.6) — p. 218
- [ ] Reception: most signals are water-soluble and bind a cell-surface receptor. The biggest family is the G protein-coupled receptors (GPCRs), which have 7 membrane-spanning helices. Small/hydrophobic signals (e.g. steroid hormones) instead slip through the membrane to an intracellular receptor — pp. 219-222
- [ ] Transduction often runs as a multi-step relay (a cascade). A key payoff is amplification: one bound receptor activates many relay molecules, each of which activates many more, so a tiny signal becomes a large response — p. 223

Self-check: the three stages ◯ Got it ◯ Shaky ◯ Re-test

Can you name the three stages of cell signaling in order, and explain what 'amplification' means and why a relay cascade is useful (rather than the signal acting directly)?

Second messengers: relaying the signal inside

- [ ] The signal molecule outside is the 'first messenger'; it usually does not enter the cell. Instead, small molecules made inside (second messengers) spread the message through the cytosol by diffusion. The two most common are cyclic AMP (cAMP) and calcium ions (Ca^{2+}) — pp. 225-226
- [ ] The classic example (epinephrine/adrenaline): the hormone binds a GPCR → activates the enzyme adenylyl cyclase → which makes cAMP from ATP → cAMP activates protein kinase A → glycogen is broken down. One hormone, never entering the cell, triggers a whole cascade (Fig 9.11/9.12) — pp. 225-226

Self-check: first vs second messenger ◯ Got it ◯ Shaky ◯ Re-test

Can you explain the difference between a first messenger and a second messenger, name two common second messengers, and trace how adrenaline outside a cell ends up breaking down glycogen inside it, without the adrenaline ever entering?

Zooming out: how an animal body is built

- [ ] Levels of organization (small → big): cells → tissues → organs → organ systems → organism. Each level has emergent properties the parts alone don't have. Form follows function at every level — p. 928
- [ ] A tissue is a group of similar cells doing one job; an organ is several tissue types working together (e.g. the stomach = epithelium + muscle + connective + nervous); an organ system is organs cooperating on a bigger task (e.g. the digestive system) (Table 40.1) — p. 928

Self-check: levels of organization ○ Got it ○ Shaky ○ Re-test

Can you list the levels of organization from cell to organism in order, and clearly say the difference between a tissue and an organ (with one example of each)?

The four tissue types

- [ ] There are four primary animal tissue types. Epithelial tissue covers surfaces and lines cavities/organs (tightly packed cells, little matrix, avascular). Connective tissue supports and connects (few cells in lots of matrix) and includes bone, cartilage, blood and fat (Fig 40.5) — pp. 929-930
- [ ] Muscle tissue contracts to produce movement (three kinds: skeletal, cardiac, smooth; all packed with actin and myosin). Nervous tissue (neurons and supporting glia) senses, processes and transmits electrical signals for fast communication and control — p. 931

Self-check: the four tissues ○ Got it ○ Shaky ○ Re-test

Can you name the four tissue types, give the main job of each in one line, and explain the key structural contrast between epithelial tissue (cells vs matrix) and connective tissue?

Keeping it stable: homeostasis and feedback

- [ ] Animals coordinate the body with two systems: the nervous system (fast, electrical, signals to specific cells along axons) and the endocrine system (slower but longer-lasting; hormones broadcast through the blood to any cell with the right receptor) (Fig 40.6) — p. 932
- [ ] Homeostasis = keeping the internal environment in a stable range (not a fixed number), e.g. body temp ~37°C, blood pH ~7.4, blood glucose 70-110 mg/100 mL. It's a dynamic steady state actively maintained around a set point, not a static equilibrium — p. 933
- [ ] A control loop has a sensor (detects change from the set point = the stimulus), a control center, and an effector (produces the response). Negative feedback opposes the change to restore the set point (e.g. sweating when hot); it runs almost all homeostasis (Fig 40.8) — p. 934
- [ ] Positive feedback does the opposite: it amplifies the change to drive a process to completion (e.g. childbirth contractions, blood clotting). It is the exception, not the rule, in the body — p. 934

Self-check: homeostasis and feedback ○ Got it ○ Shaky ○ Re-test

Can you label the three parts of a feedback loop (sensor, control center, effector), explain why negative feedback maintains homeostasis, and give one real example each of negative and positive feedback?

Notes

Recall and practice

- [ ] Review today's flashcard set (tissues, organs, homeostasis and feedback)
- [ ] Answer today's practice questions (cell signaling basics and body organization)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2019	30	Biology	☐	☐
2015	23	Biology	☐	☐
2012	44	Biology	☐	☐
2011	58	Biology	☐	☐
2023	15	Biology	☐	☐
2021	26	Biology	☐	☐
2021	38	Biology	☐	☐
2020	39	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
13

Rest day

Rest and Recharge

- [ ] Step away from intense study.
- [ ] Do something restful and drink enough water.



HOURS OF SLEEP

HOW I FEEL

1 2 3 4 5

WHAT I DID TODAY

DAY
14

Rest day

Rest Day

- [ ] Catch up on sleep and light exercise.
- [ ] Optional journaling: note biology questions to revisit.

HOURS OF SLEEP

HOW I FEEL

1 2 3 4 5

WHAT I DID TODAY

Weekly review

Week 2 · Days 8–14

REVIEW DATE _____



Leo's tip

Set aside a fixed hour each weekend to tidy your flashcards and log what still feels shaky.



WEEK 2 DONE

Color it in

How the days went

DAY 8	DAY 9	DAY 10	DAY 11	DAY 12	DAY 13	DAY 14
Cell Membranes and Transport	DNA Structure and Replication	Mitosis and the Cell Cycle	Meiosis and Sexual Life Cycles	How Cells Talk and How Bodies Are Organized	Rest and Recharge	Rest Day
○ Done	○ Done	○ Done	○ Done	○ Done	○ Rested	○ Rested
○ Partly	○ Partly	○ Partly	○ Partly	○ Partly		
○ Moved to Day	○ Moved to Day	○ Moved to Day	○ Moved to Day	○ Moved to Day		
_____	_____	_____	_____	_____		

Checkpoints ticked _____ / 82 Self-checks marked Got it _____ / 22 Physics / math blocks _____

Weak-spot tracker

Every Shaky or Re-test from this week, one row each.

TOPIC	DAY	WHY	RE-TEST ON	FIXED
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐

Score log

Real IMAT questions this week: tried _____ / 33

right _____

DATE	PAPER / SECTION	RIGHT	WRONG	BLANK	SCORE
__ / __					
__ / __					
__ / __					
__ / __					
__ / __					

Score = 1.5 × right − 0.4 × wrong · blank = 0 · IMAT 2026 rule

Next week

Week 3 · Days 15–21

15	The Circulatory System: Heart, Vessels and Blood
16	Gas Exchange and Breathing
17	The Digestive System: Nutrition, Digestion and Glucose Control
18	Osmoregulation and Excretion: Water Balance, Nitrogenous Waste and the Kidney
19	Nervous System: Organization and the Brain
20	Rest Day
21	Active Rest

from _____ to _____

My goal for next week

What I move into next week

DAY
15
of 58

About 8 h

BIOLOGY

The Circulatory System: Heart, Vessels and Blood

A body has to move oxygen, food and waste over distances too big for diffusion. Learn about the pump (the heart), the pipes (arteries, veins, capillaries) and the fluid itself (blood), and how a four-chambered heart keeps oxygen-rich and oxygen-poor blood completely apart.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58
W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 43

- [ ] Read Ch 43 (Concepts 43.1-43.4): circulatory systems, the heart and cardiac cycle, blood vessels and pressure, and blood — pp. 995-1011

Today is the circulation half of ch. 43 (Concepts 43.1-43.4, pp. 995-1011). Stop at the end of cardiovascular disease (p. 1011); gas exchange comes on a later day.

Why animals need a circulatory system

- [ ] Diffusion is fast only over tiny distances. Small or flat animals (hydra, flatworms) get by with a gastrovascular cavity and a body plan that keeps every cell near the surface, so they need no circulatory system — p. 996
- [ ] Bigger animals need a circulatory system: a fluid, vessels and a muscular pump (the heart). Open system: blood (hemolymph) bathes organs directly (insects, most mollusks). Closed system: blood stays inside vessels, separate from the interstitial fluid (annelids, cephalopods, all vertebrates) — pp. 997-998

Self-check: open vs closed ○ Got it ○ Shaky ○ Re-test

Can you explain why a small flatworm can survive with no circulatory system, and state the one key difference between an open and a closed circulatory system?

Single vs double circulation in vertebrates

- [ ] Single circulation (fish): blood makes one loop (heart → gills → body → heart) through a 2-chambered heart (1 atrium and 1 ventricle). Pressure drops after the gills, so flow to the body is sluggish — pp. 998-999
- [ ] Double circulation (amphibians, reptiles, mammals): two loops driven by one heart, a pulmonary circuit (heart → lungs → heart) and a systemic circuit (heart → body → heart). Re-pressurizing the blood between circuits gives a vigorous flow to the organs — p. 999
- [ ] More chambers = better separation of O_2-rich and O_2-poor blood: fish 2, amphibians 3 (mixing), birds and mammals 4 (fully separated). Two atria and two completely divided ventricles let endotherms run their high-energy lifestyle. A 4-chambered heart evolved separately in birds and mammals (convergent evolution) — pp. 999-1000

Self-check: single vs double ○ Got it ○ Shaky ○ Re-test

Can you explain why double circulation delivers blood to the body more forcefully than single circulation, and why a 4-chambered heart is better than a 3-chambered one?

The mammalian heart and the cardiac cycle

- [ ] Trace the blood: the right side handles O_2-poor blood (body → right atrium → right ventricle → pulmonary artery → lungs); the left side handles O_2-rich blood (lungs → left atrium → left ventricle → aorta → body). Careful: the pulmonary artery carries deoxygenated blood; the pulmonary vein carries oxygenated blood — p. 1000
- [ ] Valves keep blood flowing one way: AV (atrioventricular) valves sit between each atrium and ventricle; semilunar valves guard the two exits (into the aorta and pulmonary artery). The 'lub-dup' heart sounds are these valves snapping shut. The left ventricle has the thickest wall (it pumps to the whole body) — pp. 1000-1001
- [ ] The cardiac cycle = one heartbeat: systole (contraction, pumping) + diastole (relaxation, filling). Cardiac output = heart rate × stroke volume (the blood one ventricle pumps per beat, ≈ 70 mL). At rest it is about 5 L/min — p. 1001
- [ ] The heartbeat is myogenic: it starts in the heart itself. The SA node (pacemaker, in the right atrium) fires → atria contract → the AV node delays the signal ~0.1 s (so atria empty first) → bundle branches and Purkinje fibers spread it through the ventricles. The autonomic nerves and adrenaline only speed it up or slow it down — p. 1002

The mammalian heart and the cardiac cycle continued

Self-check: the heart ◯ Got it ◯ Shaky ◯ Re-test

Can you trace a drop of blood from the body all the way back to the body, naming every chamber and valve? And what does the SA node do, and why does the AV node delay the signal?

Blood vessels and blood pressure

- [ ] Three vessel types: arteries carry blood away from the heart (thick, elastic, muscular walls for high pressure); capillaries are one-cell-thick tubes where exchange happens; veins carry blood back to the heart (thin walls, low pressure, one-way valves). 'Artery vs vein' is about direction, not O_2 content — pp. 1003-1004
- [ ] Blood slows in capillaries because their total cross-sectional area is huge, and that slow flow is what lets substances exchange. Blood pressure is highest in the aorta/arteries and drops most across the arterioles, the main resistance vessels — p. 1004
- [ ] Pressure is reported as systolic/diastolic (≈120/70 mm Hg): the peak during ventricular contraction over the resting value between beats. The body adjusts pressure by narrowing arterioles (vasoconstriction) or widening them (vasodilation) — pp. 1004-1005
- [ ] Capillaries leak fluid into the tissues (blood pressure pushes out; plasma-protein osmotic pressure pulls back). The leftover fluid is recovered by the lymphatic system: lymph drains back into veins near the neck; lymph nodes also filter pathogens — pp. 1006-1007

Self-check: vessels and pressure ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why blood flows slowest in capillaries (and why that's useful), where blood pressure drops the most, and what the lymphatic system recovers?

Blood: cells, plasma and what goes wrong

- [ ] Blood is a connective tissue: ~55% plasma (water, ions, and proteins such as albumin, antibodies and fibrinogen) and ~45% cells. These are erythrocytes (red cells: carry O_2 on hemoglobin; no nucleus in mammals), leukocytes (white cells: defense) and platelets (cell fragments: clotting) — pp. 1008-1009
- [ ] All blood cells come from stem cells in the red bone marrow; low O_2 makes the kidneys release erythropoietin (EPO) to increase red-cell production (too few = anemia). In sickle-cell disease, abnormal hemoglobin warps red cells, jamming capillaries — pp. 1009-1010
- [ ] Clotting seals a break: exposed vessel wall → platelets stick and form a plug → a cascade converts prothrombin → thrombin, which turns fibrinogen into fibrin threads (a positive-feedback loop). In cardiovascular disease, atherosclerosis (fatty plaques) narrows arteries; a clot there can cause a heart attack or stroke — pp. 1010-1011

Self-check: blood ◯ Got it ◯ Shaky ◯ Re-test

Can you name the three cellular components of blood and one job of each, and explain in one line how a blood clot forms and why atherosclerosis is dangerous?

Notes

Recall and practice

- [ ] Review today's flashcard set (heart, vessels and blood)
- [ ] Answer today's practice questions (cardiac cycle and blood vessels)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2020	33	Biology	☐	☐
2018	28	Biology	☐	☐
2015	33	Biology	☐	☐
2022	24	Biology	☐	☐
2022	32	Biology	☐	☐
2022	33	Biology	☐	☐
2021	26	Biology	☐	☐
2021	36	Biology	☐	☐

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Study time today _____ h _____ min About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

16

of 58

About 8 h

BIOLOGY

Gas Exchange and Breathing

How a body gets O_2 in and CO_2 out. Every cell needs oxygen, but it can only cross a thin, wet surface by diffusion, so animals evolved gills, tracheae and lungs to do it. Then learn about the molecule that carries the gas: hemoglobin.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 43 (pp. 1013-1023)

- [ ] Read Ch 43, Concepts 43.5-43.7: gas exchange across respiratory surfaces, breathing, and O_2/CO_2 transport by hemoglobin — pp. 1013-1023

ⓘ This is the second half of ch. 43: the respiration concepts only (43.5-43.7). Keep the fish-gill countercurrent diagram (Figure 43.22) and the hemoglobin dissociation curve (Figure 43.31) open; the IMAT tests both heavily.

What makes a good gas-exchange surface

- [ ] Gas exchange = taking up O_2 and giving off CO_2. Each gas always diffuses from where its partial pressure is higher to where it is lower; there is no active 'pumping' of the gas itself — p. 1013
- [ ] Air vs water: air holds ~30× more O_2 than water and is far less dense and viscous (Table 43.1), so breathing water (fish) costs much more energy than breathing air — pp. 1013-1014
- [ ] Because diffusion is fast only over short distances, every respiratory surface is thin, moist, and has a large surface area. The circulatory system bridges the gap to the body's cells — p. 1014

Self-check: respiratory surfaces ◯ Got it ◯ Shaky ◯ Re-test

Can you list the three features every gas-exchange surface needs (thin, moist, large area), and explain why O_2 is harder to extract from water than from air?

Three solutions: gills, tracheae, lungs

- [ ] Gills are outfoldings of the body surface used in water. Fish maximize uptake with countercurrent exchange: blood flows opposite to the water, so a partial-pressure gradient favors O_2 moving into the blood along the whole gill (>80% of the water's O_2 is extracted) — pp. 1014-1015
- [ ] Insect tracheal system: a branching network of air tubes (tracheae → tracheoles) pipes air directly to almost every cell, so gas exchange does not depend on the insect's blood/circulatory system — pp. 1015-1016
- [ ] Mammalian airway (the route of inhaled air): nostrils → nasal cavity → pharynx → larynx → trachea → two bronchi → bronchioles → alveoli (millions of tiny sacs, ~100 m², where gas exchange happens). Cilia and mucus (the 'mucus escalator') clean the airway — pp. 1016-1017
- [ ] Surfactant is a phospholipid mixture that coats the alveoli and lowers surface tension so they don't collapse. Premature babies who lack it get respiratory distress syndrome (RDS) — pp. 1017-1018

Self-check: gills, tracheae, lungs ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why countercurrent flow lets a fish gill extract far more O_2 than if blood and water flowed the same way? And can you name, in order, every structure air passes through from the nose to an alveolus?

Breathing: ventilating the lungs

- [ ] Mammals use negative-pressure breathing: the diaphragm contracts (flattens) and the rib muscles lift the ribs → the chest cavity enlarges → pressure inside drops → air is pulled in. Relaxing makes the cavity smaller and pushes air out (exhalation is usually passive). Frogs instead push air in (positive pressure); birds use air sacs for one-way flow — pp. 1018-1020
- [ ] Lung volumes: tidal volume = air moved per normal breath (~500 mL); vital capacity = the most you can move in one breath; residual volume = air that always stays behind, so the lungs never fully empty — p. 1019
- [ ] Breathing is controlled by the medulla oblongata, which mainly watches blood CO_2 (sensed as the pH of cerebrospinal fluid, not O_2): rising CO_2 → lower pH → breathe faster and deeper. O_2 sensors in the aorta and carotid arteries only kick in when O_2 falls very low — p. 1020

Breathing: ventilating the lungs continued

Self-check: breathing ◯ Got it ◯ Shaky ◯ Re-test

Can you trace how lowering the diaphragm pulls air in (negative pressure)? And why is a rise in blood CO_2, not a fall in O_2, the main everyday trigger to breathe harder?

Carrying the gas: hemoglobin

- [ ] O_2 barely dissolves in blood, so animals use respiratory pigments. In vertebrates that pigment is hemoglobin (in red blood cells): 4 subunits, each with a heme group holding an iron (Fe^{2+}) that binds one O_2. So one hemoglobin carries up to 4 O_2, reversibly (loads in lungs, unloads in tissues). (Many invertebrates use copper-based hemocyanin instead) pp. 1021-1022
- [ ] Cooperativity: when one subunit binds O_2, the others change shape and bind O_2 more easily. This gives the oxygen-dissociation curve its S-shape (sigmoid). The steep middle means a small drop in tissue pO_2 unloads a lot of O_2 right where it's needed p. 1022
- [ ] Bohr shift: more CO_2 / lower pH reduces hemoglobin's affinity for O_2 (curve shifts right) → it releases more O_2 in the busy, acidic tissues that need it most. In the lungs the opposite happens (loads O_2) p. 1022
- [ ] CO_2 transport: most CO_2 travels as bicarbonate (HCO_3^-). Carbonic anhydrase in red cells speeds up $CO_2 + H_2O \rightleftharpoons H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$; only ~7% is carried dissolved and ~5% bound to hemoglobin pp. 1022-1023
- [ ] Diving mammals (e.g. Weddell seals) store extra O_2 using lots of myoglobin (an O_2-storage pigment) in muscle and route blood to vital organs. This lets them stay under far longer than humans p. 1023

Self-check: hemoglobin ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why the hemoglobin curve is S-shaped (cooperativity)? And which way does it shift when CO_2 rises (Bohr shift), and why is that exactly what an exercising muscle needs?

Notes

Recall and practice

- [ ] Review today's flashcard set (gas exchange and hemoglobin)
- [ ] Answer today's practice questions (hemoglobin and O_2 transport)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2019	39	Biology	☐	☐
2021	37	Biology	☐	☐
2018	35	Biology	☐	☐
2017	28	Biology	☐	☐
2017	31	Biology	☐	☐
2017	37	Biology	☐	☐
2016	32	Biology	☐	☐
2012	46	Biology	☐	☐

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Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

17

of 58

About 8 h

BIOLOGY

The Digestive System: Nutrition, Digestion and Glucose Control

Your body turns a meal into usable molecules. Follow food through the four stages of processing and along the whole human gut (mouth, stomach, small and large intestine), learn the enzymes and hormones that run it, and finish with how insulin and glucagon keep blood sugar steady.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 42

- [ ] Read Ch 42: Animal Digestive Systems (diet and nutrients, the four stages, the human gut, dietary adaptations, and feedback control) — pp. 972-991

ⓘ The 'Chemical digestion in the human digestive system' chart (Figure 42.11, p. 982) is the one figure to memorize. It shows every enzyme, where it acts, and what it makes.

What a diet must supply (Concept 42.1)

- [ ] Every diet must meet three needs: chemical energy (to make ATP), organic building blocks (a carbon source and a nitrogen source for biosynthesis), and essential nutrients. Diet types: herbivore (plants), carnivore (animals), omnivore (both) — p. 973
- [ ] Essential nutrients = substances the body cannot make and must get from food. Four classes: essential amino acids (humans need 8, infants 9), essential fatty acids (e.g. linoleic acid), vitamins (organic) and minerals (inorganic). A 'complete' protein supplies all the essential amino acids — pp. 973-974
- [ ] Vitamins (13 in humans, needed in tiny amounts): water-soluble (B vitamins and C; excess is excreted in urine) vs fat-soluble (A, D, E, K; excess is stored in body fat and can build up to toxic levels). Minerals are inorganic (iron, calcium, iodine...); e.g. iodine deficiency → goiter — pp. 974-976

Self-check: diet and essential nutrients ◯ Got it ◯ Shaky ◯ Re-test

Can you name the three things every diet must supply, list the four classes of essential nutrient, and explain why an excess of a fat-soluble vitamin is more dangerous than an excess of a water-soluble one?

The four stages of food processing (Concept 42.2)

- [ ] Food processing has four stages: ingestion (eating) → digestion (breaking food into small absorbable molecules) → absorption (cells take up the small molecules) → elimination (undigested waste leaves). Feeding mechanisms: filter, substrate, fluid and bulk feeders (most animals, including humans, are bulk feeders) — pp. 976-977
- [ ] Digestion is mechanical (chewing and churning → smaller pieces, more surface area) and chemical (enzymes split big polymers). Chemical digestion is enzymatic hydrolysis: it adds water to break each bond (the reverse of dehydration synthesis). It's needed because food macromolecules are too big to cross membranes and aren't identical to the body's own — p. 978
- [ ] Where digestion happens, and why it doesn't digest the animal itself: intracellular digestion = inside food vacuoles fused with lysosomes (e.g. sponges). Extracellular digestion = in a compartment: a gastrovascular cavity (one opening, e.g. hydra) or a complete alimentary canal (mouth → anus, two openings; it allows specialized, one-way, stepwise processing) — pp. 978-979

Self-check: the four stages ◯ Got it ◯ Shaky ◯ Re-test

Can you list the four stages of food processing in order, explain why chemical digestion is necessary (and why it's a hydrolysis reaction), and give the key advantage of a complete alimentary canal over a gastrovascular cavity?

Mouth, esophagus and stomach (Concept 42.3)

- [ ] Oral cavity: teeth chew (mechanical); saliva adds mucus (lubricates), buffers, lysozyme, and salivary amylase, which starts the chemical digestion of starch. The tongue forms food into a bolus; swallowing routes it to the esophagus while the epiglottis covers the trachea. Peristalsis (waves of smooth-muscle contraction) pushes the bolus down to the stomach — pp. 979-980

Mouth, esophagus and stomach (Concept 42.3) continued

- [ ] The stomach stores food (~2 L) and starts protein digestion. Gastric juice = hydrochloric acid (HCl) at ~pH 2 + the enzyme pepsin. HCl kills microbes and denatures proteins; the mix of food and juice is called chyme. The pyloric sphincter releases chyme into the small intestine a squirt at a time pp. 980-981
- [ ] Gastric-gland cells: parietal cells pump out H^+ and Cl^- (which form HCl in the lumen); chief cells release pepsinogen, an inactive zymogen. HCl converts pepsinogen → active pepsin, and pepsin then activates more pepsinogen (positive feedback). The stomach avoids digesting itself by making the enzyme inactive and by having a mucus layer p. 981

Self-check: mouth and stomach ◯ Got it ◯ Shaky ◯ Re-test

Can you say which nutrient salivary amylase starts on, what the two components of gastric juice do, and explain why pepsin is secreted as inactive pepsinogen (and how it then gets switched on)?

Small intestine: digestion finished, nutrients absorbed (Concept 42.3)

- [ ] The small intestine (~6 m, the longest part) is where most digestion is completed and almost all absorption happens. Its first 25 cm is the duodenum, where chyme meets digestive juices from the pancreas, liver and gland cells of the gut wall pp. 982-983
- [ ] The pancreas secretes bicarbonate (neutralizes the acidic chyme) plus enzymes for every food type: pancreatic amylase (carbs), trypsin and chymotrypsin (proteins; both secreted as inactive zymogens), pancreatic lipase (fats) and nucleases (nucleic acids). Brush-border enzymes on the intestinal lining finish the job pp. 982-983
- [ ] Fats are a special case: they are insoluble, so they clump. Bile (made by the liver, stored and concentrated in the gallbladder) acts as an emulsifier: bile salts break big fat globules into tiny droplets (emulsification, a physical step, not chemical digestion) so lipase can reach them. Bile is not an enzyme p. 983
- [ ] Absorption across the lining: folds → villi → microvilli (the 'brush border') give a tennis-court-sized surface area. Amino acids and sugars enter the blood capillaries → hepatic portal vein → liver. Fats are repackaged as chylomicrons that enter lacteals (lymph) first, then the blood pp. 983-984

Self-check: the small intestine ◯ Got it ◯ Shaky ◯ Re-test

Can you name what the pancreas adds to the duodenum, explain how bile helps fat digestion without being an enzyme, and trace where absorbed sugars and amino acids go versus where absorbed fats go?

Large intestine and dietary adaptations (Concepts 42.3-42.4)

- [ ] The large intestine (colon, cecum, rectum) does almost no digestion. It recovers water and ions, and its bacteria ferment fiber and make some vitamins (e.g. vitamin K, B vitamins). Feces are stored in the rectum. Too little water reabsorbed → diarrhea; too much → constipation pp. 984-985
- [ ] Form fits diet: teeth (dentition) match the diet. Carnivores have big pointed canines for tearing; herbivores have broad ridged molars for grinding; omnivores (humans) have a mix. Herbivores also have longer alimentary canals and fermentation chambers (cecum/rumen) because plant cellulose is hard to digest pp. 985-986
- [ ] Mutualistic microbes: animals can't make cellulase, so herbivores host symbiotic bacteria/protists that digest cellulose in fermentation chambers. Ruminants (cattle, sheep, deer) have a four-chambered stomach and re-chew the 'cud' to extract nutrients from grass with microbial help pp. 986-988

Self-check: large intestine and adaptations ◯ Got it ◯ Shaky ◯ Re-test

Can you state the main job of the large intestine (it's not digestion), and explain why herbivores need both a longer gut and symbiotic microbes to live on plants?

Controlling digestion and blood sugar (Concept 42.5)

- [ ] Hormones coordinate digestion so juices appear only when needed: gastrin (from the stomach, triggered by food/stretch) → more gastric acid; secretin (from the duodenum, sensing acid) → pancreatic bicarbonate; cholecystokinin/CCK (from the duodenum, sensing fat and protein) → pancreatic enzymes and gallbladder contraction (bile release) pp. 988-989
- [ ] Energy storage and glucose homeostasis: excess energy is stored as glycogen (in liver and muscle) and then as fat. Blood glucose is held near 70-110 mg/100 mL by two antagonistic pancreatic hormones: insulin (β-cells; released when glucose is high → cells take up glucose, liver stores glycogen → lowers blood glucose) and glucagon (α-cells; released when glucose is low → liver breaks down glycogen → raises blood glucose) pp. 989-990
- [ ] Diabetes mellitus = chronically high blood glucose. Type 1: an autoimmune attack destroys β-cells → little or no insulin (needs injections). Type 2: target cells stop responding to insulin (insulin resistance), usually later in life. Appetite itself is hormone-controlled (a brain 'satiety center'): ghrelin stimulates hunger; leptin, insulin and PYY suppress it pp. 990-991

Controlling digestion and blood sugar (Concept 42.5) continued

Self-check: hormones and glucose ◯ Got it ◯ Shaky ◯ Re-test

Can you match gastrin, secretin and CCK to their triggers and effects? And how do insulin and glucagon push blood glucose in opposite directions, and what goes wrong in type 1 vs type 2 diabetes?

Recall and practice

- [ ] Review today's flashcard set (digestion, enzymes, GI hormones and glucose control)
- [ ] Answer today's practice questions (the gut, digestive enzymes and GI hormones)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2021	40	Biology	☐	☐
2018	34	Biology	☐	☐
2023	15	Biology	☐	☐
2021	29	Biology	☐	☐
2020	24	Biology	☐	☐
2020	31	Biology	☐	☐
2020	39	Biology	☐	☐
2019	36	Biology	☐	☐

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__:__	__:__		☐

Study time today _____ h _____ min About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

18

of 58

About 8 h

BIOLOGY

Osmoregulation and Excretion: Water Balance, Nitrogenous Waste and the Kidney

How animals keep their internal water and salt in balance, and get rid of toxic nitrogen waste. Learn about osmoregulation, the three nitrogenous wastes, and the main topic: the nephron, the kidney's filtering unit.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading — Campbell Biology: A Global Approach (11th ed.) · ch. 44

- [ ] Read Ch 44: Animal Excretory Systems (osmoregulation, nitrogenous waste, excretory systems, the nephron, hormonal control) — pp. 1027-1046

The nephron diagram (Concept 44.4, Figures 44.12-44.13) is the core of this chapter. Learn each segment by what it reabsorbs or secretes.

Osmoregulation: balancing water and salt

- [ ] Osmoregulation = controlling the body's solute concentrations (osmolarity) to balance water gain and loss. The driving force is always osmosis across a membrane: water moves toward the higher solute concentration — p. 1028
- [ ] Osmolarity (mOsm/L) compares two solutions: isoosmotic = equal (no net water flow); a hyperosmotic solution has more solutes (water flows in); a hypoosmotic one has fewer (water flows out). Human blood ≈ 300 mOsm/L, seawater ≈ 1,000 mOsm/L — p. 1028
- [ ] Two strategies: an osmoconformer matches its surroundings (always marine, isoosmotic to seawater); an osmoregulator controls its own internal osmolarity using energy (active transport), which is what lets animals live in fresh water and on land — pp. 1028-1031
- [ ] Opposite problems: a freshwater fish (hyperosmotic to its water) gains water and loses salt → excretes lots of dilute urine and pumps salt in at the gills; a marine bony fish (hypoosmotic) loses water → drinks seawater and pumps salt out. Land animals fight desiccation — pp. 1029-1030

Self-check: osmoregulation ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why a freshwater fish makes large amounts of dilute urine while a marine bony fish drinks seawater and makes very little urine, tracing both back to whether the animal is hyper- or hypoosmotic to its surroundings?

Nitrogenous waste: ammonia, urea and uric acid

- [ ] Breaking down proteins and nucleic acids strips off nitrogen as ammonia (NH_3). It is very toxic, so it must be diluted in lots of water. Aquatic animals (most fish) release ammonia straight across the gills or body surface — p. 1032
- [ ] The trade-off is toxicity vs energy cost: urea (mammals, adult amphibians, sharks) is far less toxic and needs little water, but costs energy to make in the liver. Uric acid (insects, land snails, birds and reptiles) is almost nontoxic and nearly water-free (a paste), but costs the most energy — pp. 1032-1033
- [ ] Evolution matches the waste to the habitat and the egg: uric acid lets a bird or reptile embryo store waste as a harmless solid inside a shelled egg. The amount of waste also tracks diet and metabolic rate (high-protein, endothermic animals make more) — p. 1033

Self-check: nitrogenous waste ◯ Got it ◯ Shaky ◯ Re-test

Can you rank ammonia, urea and uric acid by toxicity and by the water needed to excrete them, and explain why excreting uric acid is a selective advantage for a desert reptile laying shelled eggs?

Excretory systems: the same four steps, four ways

- [ ] Almost every excretory system runs four steps: filtration (pressure forces water and small solutes out of body fluid, holding back cells and proteins) → reabsorption (reclaim the useful stuff) → secretion (add extra wastes/ions in) → excretion (release the urine) — p. 1034
- [ ] Invertebrate tubular systems: protonephridia (flatworms: flame bulbs and cilia draw fluid in); metanephridia (earthworms: collect coelomic fluid, one pair per segment); Malpighian tubules (insects: secrete waste from the hemolymph, the key to conserving water on land) — pp. 1034-1036

Excretory systems: the same four steps, four ways continued

- [ ] Vertebrate excretion happens in the kidney: outer renal cortex and inner renal medulla, drained by the renal pelvis → ureter → urinary bladder → urethra. The functional unit is the nephron (≈1 million per human kidney), wrapped in capillaries pp. 1036-1037

Self-check: excretory systems ◯ Got it ◯ Shaky ◯ Re-test

Can you name the four steps every excretory system performs, and match protonephridia, metanephridia and Malpighian tubules to flatworms, earthworms and insects?

The nephron, step by step

- [ ] Filtration at the start: blood pressure forces fluid out of the glomerulus (a ball of capillaries); Bowman's capsule collects it. Water, salts, glucose, amino acids and urea pass freely; blood cells and big plasma proteins stay behind. (≈180 L of filtrate/day → only ≈1.5 L urine) pp. 1037-1038
- [ ] The proximal tubule does the bulk of reabsorption: it reclaims most NaCl, water, glucose, amino acids and ~90% of the bicarbonate (HCO_3^-) buffer, and secretes H^+ and ammonia to control pH. The filtrate's volume drops a lot, but its osmolarity stays about the same p. 1038
- [ ] Loop of Henle: the descending limb is permeable to water but not salt (water leaves, filtrate concentrates); the ascending limb is permeable to salt but not water (NaCl leaves, filtrate dilutes: the 'diluting segment'). This is how the salty medulla gradient is built pp. 1038-1039
- [ ] Distal tubule and collecting duct: the distal tubule fine-tunes K^+, NaCl and pH; the collecting duct carries filtrate back down through the salty medulla and decides how much water to reabsorb (hormone-controlled). This sets the final urine's concentration pp. 1038-1039
- [ ] The countercurrent multiplier: the loop of Henle and vasa recta keep the inner medulla very salty (up to ~1,200 mOsm/L) by spending ATP to pump NaCl out of the thick ascending limb. That gradient is what lets the collecting duct pull water out and make hyperosmotic (concentrated) urine pp. 1040-1041

Self-check: the nephron ◯ Got it ◯ Shaky ◯ Re-test

Can you walk the filtrate from Bowman's capsule to the collecting duct, saying what each segment reabsorbs or secretes? And can you explain why a salty medulla (built by the loop of Henle) is required to make concentrated urine?

Hormonal control: ADH, RAAS and ANP

- [ ] ADH (antidiuretic hormone, or vasopressin): when blood osmolarity rises (you're dehydrated), the posterior pituitary releases ADH, which inserts aquaporin water channels into the collecting duct → more water reabsorbed → small volume of concentrated urine. Alcohol blocks ADH (→ more urine) p. 1044
- [ ] The RAAS (renin-angiotensin-aldosterone system) responds to low blood pressure/volume: the juxtaglomerular apparatus releases renin → angiotensin II (a vasoconstrictor) → aldosterone, which makes the kidney reabsorb more Na^+ (and water follows). ANP (from a stretched heart) opposes RAAS, promoting salt and water loss pp. 1045-1046

Self-check: hormones ◯ Got it ◯ Shaky ◯ Re-test

Can you explain the difference between what triggers ADH (high osmolarity) and what triggers the RAAS (low blood volume/pressure), and why ADH alone would dilute your blood Na^+ but aldosterone keeps it balanced?

Notes

Recall and practice

- [ ] Review today's flashcard set (osmoregulation, the nephron and kidney hormones)
- [ ] Answer today's practice questions (nephron, filtration and ADH/RAAS)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2020	37	Biology	☐	☐
2022	34	Biology	☐	☐
2017	29	Biology	☐	☐
2022	33	Biology	☐	☐
2023	15	Biology	☐	☐
2012	44	Biology	☐	☐
2023	26	Biology	☐	☐
2022	24	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

19

of 58

About 8 h

BIOLOGY

Nervous System: Organization and the Brain

Zoom out from the single neuron to the whole nervous system: how it's wired (CNS vs PNS, the autonomic divisions), the regions of the vertebrate brain and what each one does, how the cortex runs movement and thought, and how memories are stored.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 49

- [ ] Read Ch 49: Neural Regulation in Animals (nervous-system organization, the brain, the cortex, memory, disorders) — pp. 1141-1160

ⓘ Use the brain-development figure (Figure 49.11) and the Chapter Review brain diagram (p. 1161). They map every region to its function in one place.

How the nervous system is wired (Concept 49.1)

- [ ] From nerve nets to brains: simple animals (hydra) have a diffuse nerve net; bilaterally symmetric animals show cephalization (sensory neurons and interneurons cluster at the front into a brain) — pp. 1142-1143
- [ ] The two halves of the system: the central nervous system (CNS = brain + spinal cord) does the integrating; the peripheral nervous system (PNS = nerves + ganglia) carries information in and out — pp. 1142-1145
- [ ] Glia are the support cells: astrocytes (support and the blood-brain barrier), oligodendrocytes (myelinate CNS axons) vs Schwann cells (myelinate PNS axons), microglia (immune cleanup), ependymal cells (line ventricles, circulate CSF) — pp. 1143-1144
- [ ] Gray vs white matter, and the reflex: gray matter = neuron cell bodies; white matter = myelinated axons. A reflex (e.g. the knee-jerk) is a fast, automatic response wired through the spinal cord (sensory neuron → interneuron → motor neuron), without waiting for the brain — pp. 1144-1145
- [ ] The PNS splits in two: the motor (somatic) system controls voluntary skeletal muscle; the autonomic system runs involuntary organs and divides into sympathetic ('fight-or-flight') and parasympathetic ('rest-and-digest'), which act antagonistically — pp. 1145-1146

Self-check: organization ◯ Got it ◯ Shaky ◯ Re-test

Can you place a neuron in the CNS or PNS, classify it as afferent (sensory, toward the CNS) or efferent (motor, away from it), and explain how the sympathetic and parasympathetic divisions act antagonistically on the same organ?

The vertebrate brain, region by region (Concept 49.2)

- [ ] Three embryonic regions → the adult brain: forebrain (→ cerebrum + diencephalon), midbrain, and hindbrain (→ pons, medulla and cerebellum). Bigger brains and a larger forebrain track higher cognition across vertebrates — pp. 1147-1148
- [ ] The brainstem (midbrain + pons + medulla oblongata): the medulla controls breathing, heart rate, swallowing and vomiting; the pons helps regulate breathing; most large-scale motor axons cross sides here, so each half of the brain controls the opposite half of the body — p. 1149
- [ ] The cerebellum coordinates movement and balance (error-checks motor commands); damage to it causes clumsy, uncoordinated movement (ataxia). The diencephalon holds the thalamus (sensory relay to the cortex) and the hypothalamus (homeostasis: temperature, hunger, thirst; it also controls the pituitary) — p. 1149
- [ ] The brain's clock and feelings: the SCN (suprachiasmatic nucleus) in the hypothalamus is the pacemaker for the ~24-hour circadian rhythm; the limbic system (amygdala, hippocampus and parts of the thalamus) generates emotion, and the amygdala is central to fear — pp. 1150-1152

Self-check: brain regions ◯ Got it ◯ Shaky ◯ Re-test

Given a function (breathing, sensory relay to the cortex, body-temperature set point, coordinating balance, fear), can you name the brain region? And can you explain why the thalamus and hypothalamus, despite their similar names, do completely different jobs?

The cerebral cortex: movement and cognition (Concept 49.3)

- [ ] The cerebrum is split into left and right hemispheres joined by the corpus callosum (a thick band of white-matter axons). Each hemisphere mostly controls and senses the opposite side of the body (contralateral). The outer gray-matter layer is the cerebral cortex — pp. 1149-1153
- [ ] The four lobes: frontal (motor cortex, planning and decisions), parietal (somatosensory cortex: touch), temporal (hearing and memory), occipital (vision). In the motor and somatosensory cortex, body parts map by how much control or sensation they need (the homunculus) — pp. 1152-1153
- [ ] Lateralization: language is usually in the left hemisphere. Broca's area (frontal lobe) forms speech; Wernicke's area (temporal lobe) understands it. The right hemisphere leads on faces, patterns and spatial tasks. The Phineas Gage case revealed the frontal lobe's role in personality and decision-making — pp. 1154-1155

Self-check: the cortex ◯ Got it ◯ Shaky ◯ Re-test

Can you match each lobe to its primary job and predict the deficit from a lesion? For example, why does damage to the left motor cortex weaken the right side, and how do Broca's and Wernicke's aphasia differ (can't speak vs can't understand)?

Memory, learning and when the brain fails (Concepts 49.4-49.5)

- [ ] Neuronal plasticity: the connections between neurons are remodeled by experience. Synapses on active circuits are strengthened; unused ones are pruned. This synapse-level change is how learning physically happens — pp. 1155-1156
- [ ] Storing memories: short-term memory uses temporary links via the hippocampus; making memories long-term transfers them to lasting connections in the cerebral cortex. That is why hippocampal damage stops new long-term memories from forming. Long-term potentiation (LTP), a lasting strengthening of a synapse, is a leading cellular model for this — pp. 1156-1157
- [ ] Disorders in molecular terms: schizophrenia is linked to disrupted dopamine pathways; Parkinson's = death of dopamine-releasing midbrain neurons (a movement disorder); Alzheimer's = a dementia marked by amyloid plaques, tau neurofibrillary tangles and neuron loss — pp. 1158-1160

Self-check: memory and disorders ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why someone with hippocampal damage can still recall old memories but cannot form new ones, and name the neurotransmitter (dopamine) tied to both schizophrenia and Parkinson's disease?

Notes

Recall and practice

- [ ] Review today's flashcard set (nervous-system organization and brain anatomy)
- [ ] Answer today's practice questions (brain regions and the autonomic system)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2022	35	Biology	☐	☐
2017	32	Biology	☐	☐
2016	32	Biology	☐	☐
2023	21	Biology	☐	☐
2014	34	Biology	☐	☐
2012	42	Biology	☐	☐
2012	57	Biology	☐	☐
2023	15	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min — About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
20
Rest day

Rest Day

- [ ] Take a full break from structured study.
- [ ] Do some light stretching or mindfulness to keep your energy steady.



HOURS OF SLEEP

HOW I FEEL
1 2 3 4 5

WHAT I DID TODAY

DAY
21
Rest day

Active Rest

- [ ] Enjoy downtime and prepare for the upcoming week.
- [ ] Review planner notes for anything to catch up on.

HOURS OF SLEEP

HOW I FEEL
1 2 3 4 5

WHAT I DID TODAY

Weekly review

Week 3 · Days 15–21

REVIEW DATE _____



WEEK 3 DONE

Color it in



Leo's tip

Set aside a fixed hour each weekend to tidy your flashcards and log what still feels shaky.

How the days went

DAY 15	DAY 16	DAY 17	DAY 18	DAY 19	DAY 20	DAY 21
The Circulatory System: Heart, Vessels and Blood	Gas Exchange and Breathing	The Digestive System: Nutrition, Digestion and Glucose Control	Osmoregulation and Excretion: Water Balance, Nitrogenous Waste and the Kidney	Nervous System: Organization and the Brain	Rest Day	Active Rest
○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Rested	○ Rested

Checkpoints ticked _____ / **106** Self-checks marked Got it _____ / **24** Physics / math blocks _____

Weak-spot tracker

Every Shaky or Re-test from this week, one row each.

TOPIC	DAY	WHY	RE-TEST ON	FIXED
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐

Score log

Real IMAT questions this week: tried _____ / **35**

right _____

DATE	PAPER / SECTION	RIGHT	WRONG	BLANK	SCORE
__ / __					
__ / __					
__ / __					
__ / __					
__ / __					

Score = 1.5 × right − 0.4 × wrong · blank = 0 · IMAT 2026 rule

Next week

Week 4 · Days 22–28

22	Sensation and Movement in Animals
23	Animal Defenses Against Infection
24	Cellular Respiration: Harvesting Energy from Glucose
25	Photosynthesis: How Plants Make Food from Light
26	Neurons and the Nerve Impulse
27	Rest and Reset
28	Rest Day

from _____ to _____

My goal for next week

What I move into next week

DAY
22
of 58

About 8 h

BIOLOGY

Sensation and Movement in Animals

How an animal feels its world and then moves through it. Learn the five sensory receptor types, how the ear and eye work, then the sliding-filament machine that powers every muscle, and the skeletons that turn that pull into movement.

DATE ___ / ___ / ___ (M T W T F S S) START ___ : ___ END ___ : ___

Day 1 — W1 W2 W3 W4 W5 W6 W7 W8 Final — 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 50

- [ ] Read Ch 50: Sensation and Movement in Animals (sensory receptors, ear and eye, taste and smell, muscle, skeletons) — pp. 1163-1192

ⓘ The sliding-filament and Ca^{2+}/troponin story (Concept 50.5) is the most exam-tested part of this chapter. Read it twice.

How a stimulus becomes a signal: the 5 receptor types

- [ ] Every sense follows 4 steps: reception (detect the stimulus) → transduction (convert it to a change in membrane potential = the receptor potential) → transmission (to the CNS) → perception (the brain interprets it) — pp. 1164-1165
- [ ] Stimulus strength is coded two ways: a bigger receptor potential → a higher frequency of action potentials (a graded receptor potential, but an all-or-none AP). Amplification strengthens a tiny signal; adaptation = receptors stop responding to a constant stimulus — pp. 1165-1166
- [ ] The 5 receptor categories: mechanoreceptors (touch, pressure, stretch, sound), chemoreceptors (solutes/specific molecules), electromagnetic receptors (light, electricity, magnetism), thermoreceptors (heat/cold), and nociceptors (pain) — pp. 1166-1167

Self-check: receptors ◯ Got it ◯ Shaky ◯ Re-test

Can you name the four steps every sensory pathway shares, and match each of the five receptor types to the kind of energy it detects (e.g. which type transduces sound)?

Hearing and balance: the ear

- [ ] Hair cells are the mechanoreceptors of hearing and balance: bending their 'hairs' one way depolarizes them (more neurotransmitter, more APs), the other way hyperpolarizes them. Invertebrates use statocysts (settling statoliths) to sense gravity — pp. 1168-1170
- [ ] Sound path through the mammalian ear: tympanic membrane (eardrum) → 3 middle-ear bones (malleus, incus, stapes) → oval window → fluid in the coiled cochlea → the basilar membrane vibrates → hair cells in the organ of Corti fire. The basilar membrane's stiffness gradient codes pitch; amplitude codes volume — pp. 1169-1171
- [ ] Balance lives in the inner ear too: the utricle and saccule (with otoliths) sense head position and linear acceleration; the three semicircular canals, set in 3 planes, sense rotational (angular) movement — pp. 1171-1172

Self-check: the ear ◯ Got it ◯ Shaky ◯ Re-test

Can you trace a sound wave from the eardrum to a hair cell in order, and explain why the utricle/saccule and the semicircular canals detect different kinds of movement?

Vision: photoreceptors, rods and cones

- [ ] Eyes range from simple eyespots → compound eyes (many ommatidia, great for motion) → single-lens eyes (camera-like, as in us). All rely on photoreceptors containing a light-absorbing pigment — pp. 1173-1174
- [ ] The vertebrate retina has two photoreceptors: rods (very light-sensitive → night vision, no color) and cones (color and sharp detail, concentrated at the fovea). Signal flows photoreceptor → bipolar cell → ganglion cell → optic nerve; the optic disc is the blind spot (no photoreceptors) — pp. 1174-1178
- [ ] The visual pigment rhodopsin = the protein opsin + retinal (a vitamin-A derivative). Light flips retinal from cis to trans, which (via a signal cascade) hyperpolarizes the photoreceptor. Note that light turns the cell off rather than firing it — pp. 1175-1177

Vision: photoreceptors, rods and cones continued

Self-check: the eye ◯ Got it ◯ Shaky ◯ Re-test

Can you contrast rods and cones (sensitivity, color, where they sit), name the cell chain from photoreceptor to optic nerve, and say what rhodopsin is made of?

Chemical senses: taste and smell

- [ ] Both taste (gustation) and smell (olfaction) use chemoreceptors. The 5 basic tastes are sweet, sour, salty, bitter and umami; taste receptor cells sit in taste buds, and each cell detects only one taste type — pp. 1179-1180
- [ ] In smell, the receptor cells are neurons: olfactory receptor cells in the upper nasal cavity bind airborne odorants (via GPCRs) and send axons to the olfactory bulb. Each cell expresses only one odorant-receptor gene — pp. 1180-1181

Self-check: taste and smell ◯ Got it ◯ Shaky ◯ Re-test

Can you list the five basic tastes and explain the key difference between a taste receptor cell and an olfactory receptor cell (which one is a neuron)?

Muscle: the sliding-filament machine

- [ ] Skeletal (striated) muscle is built in nested units: muscle → fiber (one multinucleate cell) → myofibril → sarcomere (Z line to Z line) = the basic contractile unit. Thin filaments = actin (+ tropomyosin + troponin); thick filaments = myosin — p. 1182
- [ ] Sliding-filament model: the filaments themselves do not shorten. Myosin heads grab actin and ratchet the thin filaments toward the sarcomere's center, so the sarcomere shortens. Each cross-bridge cycle (bind → power stroke → release) is powered by ATP — pp. 1182-1184
- [ ] The Ca^{2+} switch: at rest, tropomyosin blocks myosin's binding sites on actin. A motor neuron's signal floods the cytosol with Ca^{2+} (released from the sarcoplasmic reticulum via the T-tubules); Ca^{2+} binds troponin, which pulls tropomyosin aside → contraction. Remove Ca^{2+} and the muscle relaxes — pp. 1184-1185
- [ ] Grading force: a motor unit = one motor neuron + all the fibers it controls; recruiting more units and stimulating faster (summation → tetanus) raises tension. Fiber types: slow-oxidative vs fast-glycolytic. Cardiac muscle (striated, intercalated discs, no tetanus) and smooth muscle (no striations, involuntary) differ from skeletal — pp. 1186-1188

Self-check: muscle contraction ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why a sarcomere shortens even though the filaments stay the same length, and trace exactly what Ca^{2+} does (what it binds, what moves, why that lets myosin grab actin)?

Skeletons and locomotion

- [ ] Because muscles only pull (force only on contraction), bones are moved by antagonistic muscle pairs (e.g. biceps flexes, triceps extends the same joint). Skeletons also support the body and protect organs — p. 1188
- [ ] Three skeleton types: hydrostatic (fluid under pressure → worms move by peristalsis), exoskeleton (a hard external case, e.g. the chitin cuticle of arthropods, which must be molted to grow), and endoskeleton (internal bone/cartilage, as in vertebrates) — pp. 1188-1190
- [ ] Locomotion = overcoming friction and gravity. On land, gravity dominates (strong supporting muscles needed); in water, gravity is largely offset but drag dominates (a sleek, fusiform shape helps); flight needs wings shaped as airfoils to generate lift — pp. 1191-1192

Self-check: skeletons ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why moving a limb back and forth needs two muscles (not one), and name the three skeleton types with one example animal each?

Notes

Recall and practice

- [ ] Review today's flashcard set (senses and muscle contraction)
- [ ] Answer today's practice questions (muscle and vision)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2023	23	Biology	☐	☐
2021	38	Biology	☐	☐
2015	29	Biology	☐	☐
2020	35	Biology	☐	☐
2015	24	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
23
of 58

About 8 h

BIOLOGY

Animal Defenses Against Infection

Your body fights off everything that tries to invade it. It has two layers of defense: the fast, general innate system (barriers, phagocytes, inflammation) and the slow but very precise adaptive system (B cells, T cells, antibodies, and the memory that makes vaccines work).

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 58
W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 47

- [ ] Read Ch 47: Animal Defenses Against Infection (innate immunity, adaptive immunity, B and T cells, antibodies, immune disorders) — pp. 1098-1120

ⓘ Keep the big two-column split (innate vs adaptive, then humoral vs cell-mediated) clear in your head: the IMAT tests those distinctions again and again. Figure 47.22 sums up the adaptive immune response.

Innate immunity: the fast, general defense

- [ ] Two layers of defense: innate immunity (in all animals) is fast and recognizes traits shared by whole groups of pathogens; adaptive immunity (vertebrates only) is slower but targets a specific pathogen. The first line is barrier defenses: skin, mucous membranes, and secretions — pp. 1099-1101
- [ ] Barrier chemistry: lysozyme (in tears, saliva, mucus) digests bacterial cell walls; stomach acid (pH 2) and acidic skin secretions kill most microbes before they get in. In the airway, mucus and ciliated cells sweep trapped pathogens upward — p. 1101
- [ ] If a pathogen breaks through, phagocytic cells eat it (phagocytosis): engulf → enclose in a vacuole → fuse with a lysosome → digest. The two main mammalian phagocytes are neutrophils (circulate in blood) and macrophages ('big eaters'); dendritic cells patrol tissues and stimulate adaptive immunity — p. 1101
- [ ] Innate cells recognize pathogens with Toll-like receptors (TLRs), each tuned to a molecular pattern common to a class of microbes (e.g. lipopolysaccharide of bacteria, double-stranded viral RNA). Natural killer (NK) cells, also innate, destroy virus-infected and cancerous cells without engulfing them — pp. 1101-1102
- [ ] Antimicrobial proteins: interferons are released by virus-infected cells to warn neighboring cells and limit viral spread; the complement system (~30 plasma proteins) is activated on pathogen surfaces, triggering a cascade that can punch holes in the invader and lyse it — p. 1102
- [ ] The inflammatory response: injured or infected tissue releases signals. Mast cells release histamine, which makes nearby blood vessels dilate and become more permeable, while macrophages release cytokines that recruit more phagocytes. The result: redness, heat, swelling, and pus. A whole-body version can cause fever — p. 1103

Self-check: innate immunity ○ Got it ○ Shaky ○ Re-test

Can you list the barrier defenses, walk through the 5 steps of phagocytosis, and explain what histamine does during inflammation (and which cell releases it)?

Adaptive immunity: antigens, receptors and specificity

- [ ] Adaptive immunity runs on two types of lymphocytes (white blood cells from bone marrow): B cells and T cells. An antigen is any molecule that triggers a response; the small piece an antigen receptor binds is the epitope. Each lymphocyte makes only one receptor specificity — p. 1104
- [ ] A B cell receptor is a Y-shaped protein of 2 heavy and 2 light chains, with a variable region (the antigen-binding site, which differs between cells) and a constant region. Its secreted form is an antibody (immunoglobulin, Ig). B cell receptors bind intact antigens free in blood or lymph — pp. 1104-1105
- [ ] T cells are different: their receptor binds only a fragment of an antigen displayed on a host cell by an MHC (major histocompatibility complex) molecule. This 'antigen presentation' is how T cells survey what is inside cells. Receptor diversity comes from randomly shuffling gene segments (V/J recombination) — pp. 1105-1107
- [ ] Self-tolerance: lymphocytes that react to the body's own molecules are destroyed or silenced as they mature, so the system normally attacks only nonself. When a matching antigen finally appears, clonal selection makes that one lymphocyte divide into a clone of short-lived effector cells and long-lived memory cells — pp. 1107-1108

Adaptive immunity: antigens, receptors and specificity continued

- [ ] Immunological memory explains why you usually get a disease only once. The primary response (first exposure) is slow, peaking in ~10-17 days; thanks to memory cells, the secondary response (re-exposure) is faster (peaks ~2-7 days), bigger, and longer-lasting pp. 1108-1109

Self-check: adaptive recognition ◯ Got it ◯ Shaky ◯ Re-test

Can you contrast what a B cell receptor binds vs what a T cell receptor binds, explain clonal selection in one sentence, and say why the secondary immune response is so much faster than the primary?

Humoral immunity: B cells and antibodies

- [ ] The humoral immune response defends body fluids (blood and lymph) against extracellular pathogens. Helper T cells (with the CD4 co-receptor) sit at the center: an antigen-presenting cell displays a fragment on a class II MHC molecule, the helper T cell binds it, and then secretes cytokines that activate B cells pp. 1109-1110
- [ ] Once activated (by antigen and helper-T cytokines), a B cell proliferates into a clone of memory B cells and plasma cells. Plasma cells are antibody factories: each secretes ~2,000 antibodies per second. The antibodies are specific for the epitope that started the response p. 1110
- [ ] Antibodies do not kill directly. They tag and disable: neutralization (coat a virus or toxin so it cannot bind host cells), opsonization (coat bacteria so phagocytes grab them more easily), and activating complement to lyse the pathogen. The 5 antibody classes are IgA, IgD, IgE, IgG, IgM pp. 1111-1112

Self-check: humoral immunity ◯ Got it ◯ Shaky ◯ Re-test

Can you trace the path from antigen-presenting cell → helper T cell → activated B cell → plasma cell → antibody, and explain the difference between neutralization and opsonization?

Cell-mediated immunity and active vs passive

- [ ] The cell-mediated response kills the body's own infected cells. Cytotoxic T cells (with the CD8 co-receptor) recognize a fragment of a pathogen protein on a class I MHC molecule (present on nearly all cells), then release perforin (pokes pores) and granzymes (trigger apoptosis) to kill the infected cell pp. 1112-1113
- [ ] MHC rule to memorize: class I MHC = on all nucleated cells, displays to cytotoxic (CD8) T cells; class II MHC = only on antigen-presenting cells, displays to helper (CD4) T cells. Memory helper-T, memory B, and memory cytotoxic-T cells together power every secondary response (Figure 47.22) p. 1113
- [ ] Active immunity = your own cells make the response and memory (from infection or from a vaccine, which exposes you to a harmless form of a pathogen). Passive immunity = ready-made antibodies are transferred (mother → fetus across the placenta, or in breast milk; or an antivenin injection). It is immediate but short-lived, with no memory p. 1114

Self-check: cell-mediated and immunization ◯ Got it ◯ Shaky ◯ Re-test

Can you explain how a cytotoxic T cell kills an infected cell (which MHC class, which two proteins it releases), and clearly distinguish active from passive immunity with one example of each?

When immunity goes wrong (47.4)

- [ ] ABO blood groups show self-tolerance in action: you make antibodies against the A/B carbohydrate antigens you do not carry, so a mismatched transfusion is attacked. MHC differences are also why transplanted tissue can be rejected (surgeons match MHC as closely as possible) pp. 1115-1116
- [ ] Allergies are exaggerated responses to harmless allergens: IgE antibodies on mast cells trigger histamine release (sneezing, runny nose; a severe case is anaphylactic shock). Autoimmune disease = loss of self-tolerance: the immune system attacks the body (e.g. lupus, type 1 diabetes, multiple sclerosis, rheumatoid arthritis) pp. 1116-1117
- [ ] Immunodeficiency = the immune response is missing or weak (e.g. inborn SCID, or acquired). AIDS is caused by HIV, which infects and destroys helper T cells, knocking out the coordinator of both humoral and cell-mediated immunity. Pathogens also evade us via antigenic variation (e.g. flu) and latency (e.g. herpes) pp. 1117-1120

Self-check: immune disorders ◯ Got it ◯ Shaky ◯ Re-test

Can you say what goes wrong in an allergy vs an autoimmune disease vs an immunodeficiency? And can you explain why HIV is so devastating, given which immune cell it destroys?

Notes

Recall and practice

- [ ] Review today's flashcard set (innate vs adaptive immunity, B/T cells, antibodies)
- [ ] Answer today's practice questions (the immune system)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2013	38	Biology	☐	☐
2018	37	Biology	☐	☐
2021	39	Biology	☐	☐
2019	24	Biology	☐	☐
2014	33	Biology	☐	☐
2021	37	Biology	☐	☐
2013	33	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

24

of 58

About 8 h

BIOLOGY

Cellular Respiration: Harvesting Energy from Glucose

How a cell turns the food you eat into usable energy (ATP). Follow one glucose molecule through all four stages (glycolysis, the link reaction, the citric acid cycle and the electron transport chain) and see what happens when the oxygen runs out.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 10

- [ ] Read Ch 10: Cell Respiration (redox, glycolysis, the citric acid cycle, oxidative phosphorylation, fermentation) pp. 236-255

ⓘ Use the road-map figure (Figure 10.6, p. 241). The IMAT tests this chapter on exactly these points: where each stage happens and what goes in and out.

The big picture: respiration is a controlled 'burn'

- [ ] Cellular respiration unpacks the energy in food into ATP. The summary equation: $C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O +$ energy (ATP). It is exergonic ($\Delta G = -686$ kcal/mol), the slow, stepwise opposite of burning pp. 237-238
- [ ] It's all redox: glucose is oxidized (loses electrons → gets broken down) and oxygen is reduced (gains electrons → becomes water). 'Oxidation = lose electrons, reduction = gain electrons' (OIL RIG) pp. 237-239
- [ ] Electrons are not dumped straight onto O_2; they are carried in stages by NAD^+/NADH (and FAD/$FADH_2$). NAD^+ is the empty carrier; NADH is the loaded one, holding high-energy electrons for later pp. 239-240
- [ ] The four stages and where they happen: (1) glycolysis in the cytosol → (2) pyruvate oxidation and (3) the citric acid cycle in the mitochondrial matrix → (4) oxidative phosphorylation on the inner mitochondrial membrane pp. 240-241

Self-check: the overview ◯ Got it ◯ Shaky ◯ Re-test

Can you name the four stages of respiration in order, say where each one happens in the cell, and explain why the whole thing counts as a redox reaction (what is oxidized, what is reduced)?

Stage 1: Glycolysis (splitting sugar)

- [ ] Glycolysis ('sugar-splitting') happens in the cytosol and needs no oxygen, so every cell can do it. One 6-carbon glucose is split into two 3-carbon pyruvate molecules p. 242
- [ ] Two phases: the energy investment phase first spends 2 ATP to 'prime' glucose, then the energy payoff phase makes 4 ATP and 2 NADH. So the net yield is 2 ATP and 2 NADH per glucose pp. 242-243
- [ ] The ATP here is made by substrate-level phosphorylation: an enzyme transfers a phosphate straight from a substrate onto ADP (no membrane, no oxygen needed). Note that glycolysis releases no CO_2 pp. 242-243

Self-check: glycolysis ◯ Got it ◯ Shaky ◯ Re-test

Glycolysis 'makes 4 ATP', but the net yield is 2. Can you explain why, and state the full net output of glycolysis per glucose (ATP, NADH, pyruvate)?

Stages 2 and 3: The link reaction and the citric acid cycle

- [ ] Pyruvate oxidation (the 'link reaction') in the matrix: each 3-carbon pyruvate loses a carbon as CO_2 and is converted to 2-carbon acetyl-CoA, making 1 NADH. This step links glycolysis to the citric acid cycle p. 243
- [ ] The citric acid (Krebs/TCA) cycle in the matrix: acetyl-CoA joins oxaloacetate to make citrate, then 8 steps regenerate oxaloacetate (that's why it's a cycle) while stripping off electrons and releasing CO_2 pp. 243-245
- [ ] What one turn of the cycle yields per acetyl-CoA: 3 NADH, 1 $FADH_2$, 1 ATP (via GTP) and 2 CO_2. Per glucose (two turns): 6 NADH, 2 $FADH_2$, 2 ATP, 4 CO_2. The cycle itself uses no O_2 directly pp. 244-245

Self-check: link reaction and Krebs ◯ Got it ◯ Shaky ◯ Re-test

Can you trace pyruvate (3C) → acetyl-CoA (2C) → fully oxidized, and account for where all six carbons of one glucose leave as CO_2 (which stages), without any oxygen being used directly?

Stage 4: Oxidative phosphorylation, the big ATP payoff

- [ ] The electron transport chain (inner mitochondrial membrane): NADH and $FADH_2$ drop their electrons in, and the electrons fall down a series of carriers (Complexes I–IV, plus mobile ubiquinone/Q and cytochrome c), releasing energy at each step — pp. 246-247
- [ ] Oxygen is the final electron acceptor at the end of the chain: it grabs the spent electrons and H^+ to form water. Without O_2, the chain backs up and the whole thing stalls (this is why you must breathe) — pp. 246-247
- [ ] Chemiosmosis: the chain pumps H^+ from the matrix into the intermembrane space, building a proton gradient (proton-motive force). H^+ then flows back through ATP synthase (a molecular turbine), which phosphorylates ADP → ATP — pp. 247-248
- [ ] The tally: oxidative phosphorylation makes ~26-28 ATP, the bulk of the ~30-32 ATP total per glucose. NADH yields more ATP than $FADH_2$ because its electrons enter earlier in the chain (so more H^+ get pumped) — pp. 249-250

Self-check: oxidative phosphorylation ◯ Got it ◯ Shaky ◯ Re-test

Can you explain how the electron transport chain and ATP synthase are linked by a proton gradient (chemiosmosis)? And why does oxidative phosphorylation stop as soon as oxygen runs out?

No oxygen? Fermentation keeps glycolysis alive

- [ ] Without O_2 the chain stops, NADH piles up and NAD^+ runs out, so glycolysis (which needs NAD^+) would halt. Fermentation's whole job is to regenerate NAD^+ by passing electrons from NADH onto pyruvate, which keeps glycolysis (and its 2 ATP) going — pp. 251-252
- [ ] Two types: lactic acid fermentation (pyruvate → lactate; in your muscles during hard exercise, no CO_2) and alcohol fermentation (pyruvate → ethanol + CO_2; in yeast, used for bread and beer). Aerobic respiration yields ~16× more ATP than fermentation — pp. 252-253

Self-check: fermentation ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why the point of fermentation is to regenerate NAD^+ (not to make ATP)? And can you name the end product in human muscle vs in yeast, and which one releases CO_2?

Notes

Recall and practice

- [ ] Review today's flashcard set (the four stages, locations and ATP yields)
- [ ] Answer today's practice questions (glycolysis, Krebs, the ETC and fermentation)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2022	26	Biology	☐	☐
2014	42	Biology	☐	☐
2023	31	Biology	☐	☐
2020	31	Biology	☐	☐
2018	35	Biology	☐	☐
2017	36	Biology	☐	☐
2013	43	Biology	☐	☐
2023	19	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min — About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

25

of 58

About 8 h

BIOLOGY

Photosynthesis: How Plants Make Food from Light

Yesterday a cell burned sugar for energy (respiration). Today you'll see how plants build that sugar in the first place: capturing sunlight in chloroplasts, splitting water, and fixing CO_2 into food. This is the process that feeds (and oxygenates) almost the entire planet.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 11

- [ ] Read Ch 11: Photosynthetic Processes (the chloroplast, the light reactions, the Calvin cycle, C4 and CAM plants) — pp. 259-278

ⓘ Keep the two-stage overview (Figure 11.6, p. 263) open as your map: the light reactions in the thylakoid make ATP and NADPH; the Calvin cycle in the stroma spends them to fix CO_2. Almost every IMAT photosynthesis question comes down to 'which stage, which location, what goes in and out?'

The big picture and the chloroplast (Concept 11.1)

- [ ] Autotrophs ("self-feeders") build their own organic food from CO_2; they are the producers of the biosphere. Heterotrophs (consumers, like us) must eat organic molecules made by others. Photosynthesis ultimately feeds almost all life — pp. 259-260
- [ ] The overall reaction: $6\ CO_2 + 6\ H_2O + \text{light} \rightarrow C_6H_{12}O_6 + 6\ O_2$. It's a redox process: CO_2 is reduced to sugar and water is oxidized. (It's not just respiration run backwards, but it is the energetic opposite: this one stores energy, powered by light) — pp. 262-263
- [ ] Tracking the atoms (van Niel and the 18-O experiment): the O_2 released comes from splitting water, not from CO_2. This is a classic IMAT trap. The carbon in the sugar comes from CO_2 — pp. 262-263
- [ ] Inside the chloroplast: a double membrane encloses the fluid stroma; suspended in it are thylakoids (flat membrane sacs), stacked into columns called grana. CO_2 enters the leaf through pores called stomata — p. 261
- [ ] The two stages and where they sit: the light reactions run in the thylakoid membrane (they capture light → make ATP and NADPH, releasing O_2); the Calvin cycle runs in the stroma (it spends that ATP and NADPH to fix CO_2 into sugar). The light reactions make no sugar; the Calvin cycle uses no light directly — pp. 263-264

Self-check: overview and locations ○ Got it ○ Shaky ○ Re-test

Can you write the overall equation, say where the released O_2 comes from, and place the two stages in the right part of the chloroplast (thylakoid vs stroma) with what each one makes and uses?

Capturing light: pigments and photosystems (Concept 11.2)

- [ ] Only certain wavelengths of visible light drive photosynthesis. Chlorophyll a is the main pigment; it absorbs red and blue light best and reflects green, which is why leaves look green — pp. 264-266
- [ ] Accessory pigments (chlorophyll b, carotenoids) absorb extra wavelengths and pass the energy to chlorophyll a, broadening the usable spectrum (this is why the action spectrum is wider than chlorophyll a's absorption spectrum). Carotenoids also give photoprotection against excess light — pp. 266-267
- [ ] A photosystem = a reaction-center complex (a special pair of chlorophyll a molecules and a primary electron acceptor) surrounded by light-harvesting complexes that funnel energy inward. The two types: photosystem II (P680) and photosystem I (P700). They are named in order of discovery, but PS II acts first — pp. 267-269

Self-check: pigments and photosystems ○ Got it ○ Shaky ○ Re-test

Can you explain why leaves are green, what accessory pigments add, and what a photosystem is made of? And which photosystem (II or I) fires first in linear electron flow?

The light reactions: electron flow and chemiosmosis (Concept 11.2)

- [ ] Linear (non-cyclic) electron flow follows this path: light hits PS II → excited electrons leave → PS II refills them by splitting water (photolysis: $H_2O \rightarrow 2\ e^- + 2\ H^+ + \frac{1}{2}\ O_2$, the source of atmospheric O_2) → electrons fall down an electron transport chain to PS I → light re-energizes them → they reduce $NADP^+$ to NADPH — pp. 269-270

The light reactions: electron flow and chemiosmosis (Concept 11.2) continued

- [ ] Chemiosmosis makes the ATP: as electrons fall down the chain, protons (H^+) are pumped into the thylakoid lumen, building a gradient. They flow back out to the stroma through ATP synthase, which phosphorylates ADP → ATP (this is photophosphorylation). It is the same machinery as in mitochondria, but here the electrons start from water and the energy comes from light — pp. 271-273
- [ ] Cyclic electron flow: a short-circuit using only PS I. Electrons cycle back from ferredoxin to the cytochrome complex, pumping extra H^+. It makes extra ATP but no NADPH and no O2, and is used to top up ATP when the Calvin cycle needs more ATP than NADPH — pp. 270-271

Self-check: the light reactions ○ Got it ○ Shaky ○ Re-test

Can you trace one electron from water all the way to NADPH (naming PS II, the chain, PS I), explain how the H^+ gradient makes ATP, and say what cyclic flow changes (ATP yes, NADPH/O2 no)?

The Calvin cycle: fixing CO2 into sugar (Concept 11.3)

- [ ] The Calvin cycle runs in the stroma and uses the ATP and NADPH from the light reactions to build sugar from CO2. Its three phases: (1) carbon fixation, (2) reduction, (3) regeneration of the CO2 acceptor. It is 'light-independent' only in the sense that light is not used directly; it still needs the products of the light reactions — p. 273
- [ ] Carbon fixation step: the enzyme rubisco (the most abundant protein on Earth) attaches CO2 to the 5-carbon sugar RuBP. Then ATP and NADPH reduce the product to G3P, a 3-carbon sugar. The direct output is G3P, not glucose (glucose and other organics are built from G3P afterwards) — pp. 273-274
- [ ] The bookkeeping: it takes three turns (3 CO2 fixed) to net one G3P; making one glucose needs two G3P (so 6 CO2). The cycle consumes ATP and NADPH but produces no oxygen and no ATP itself (a common trap) — p. 274

Self-check: the Calvin cycle ○ Got it ○ Shaky ○ Re-test

Can you name the three phases, say what RuBisCO does and what the direct product is (G3P, not glucose), and explain why blocking the Calvin cycle would soon stall the light reactions too?

Hot, dry climates: C4 and CAM plants (Concept 11.4)

- [ ] The problem is photorespiration: on hot, dry days plants close their stomata to save water, so CO2 drops and O2 builds up inside the leaf. RuBisCO then grabs O2 instead of CO2, wasting energy and fixing no sugar. C3 plants (the most common type; the first fixed product is a 3-carbon acid) suffer most — p. 275
- [ ] C4 plants (e.g. corn, sugarcane) fix CO2 first with PEP carboxylase (no affinity for O2) into a 4-carbon compound in mesophyll cells, then move it to bundle-sheath cells, where it releases CO2 right next to RuBisCO. This concentrates CO2 to suppress photorespiration. They separate the steps by space (two cell types) — pp. 275-277
- [ ] CAM plants (e.g. cacti, pineapple) open stomata at night to take in CO2 (stored as organic acids), then close them by day and release that CO2 to the Calvin cycle. They separate the steps by time. In short: C4 = separation in space, CAM = separation in time; both keep CO2 high around RuBisCO — pp. 277-278

Self-check: C4 and CAM ○ Got it ○ Shaky ○ Re-test

Can you explain why closing stomata triggers photorespiration, and contrast how C4 (space, two cell types, PEP carboxylase) and CAM (time, night vs day) plants get around it?

Notes

Recall and practice

- [ ] Review today's flashcard set (chloroplast, light reactions, Calvin cycle, C4/CAM)
- [ ] Answer today's practice questions (photosynthesis: locations, products, RuBisCO, CAM)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2017	39	Biology	☐	☐
2022	27	Biology	☐	☐
2021	34	Biology	☐	☐
2015	27	Biology	☐	☐
2023	22	Biology	☐	☐
2019	40	Biology	☐	☐
2013	43	Biology	☐	☐
2018	35	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min — About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

26

of 58

About 8 h

BIOLOGY

Neurons and the Nerve Impulse

Your body sends messages at up to 100 m/s. Start with the neuron, see why it rests at −70 mV, then follow a single spark (the action potential) as it races down the axon and jumps the gap to the next cell.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 48

- [ ] Read Ch 48: Electrical Signals in Animals (neuron structure, resting potential, the action potential, synapses) pp. 1123-1136

ⓘ Figure 48.11 (the five stages of an action potential, channel by channel) is the one to memorize: almost every IMAT neuron question goes back to it.

The neuron and how the nervous system is wired

- [ ] A neuron is built for one job: carrying signals. The dendrites and cell body receive input; the single axon (from the axon hillock) transmits the signal and ends at a synapse onto the next cell p. 1124
- [ ] Neurons do not work alone: glial cells (glia) outnumber them ~10-50× and support them. They nourish neurons, insulate axons, and regulate the fluid around them pp. 1124-1125
- [ ] Information flows in three steps (sensory input → integration → motor output), handled by sensory neurons, interneurons and motor neurons. The CNS (brain and spinal cord) integrates; the PNS carries signals in and out; bundled axons = nerves pp. 1125-1126

Self-check: neuron parts ○ Got it ○ Shaky ○ Re-test

Can you trace a signal through a neuron in order (dendrites → cell body → axon hillock → axon → synapse) and say which end receives and which end transmits?

The resting potential: a neuron at −70 mV

- [ ] A resting neuron is polarized: the inside is about −60 to −80 mV (typically −70 mV) relative to the outside. This voltage across the membrane is the membrane potential, stored electrical energy ready to be used p. 1126
- [ ] The sodium-potassium pump uses ATP to push 3 Na^+ out and 2 K^+ in, building the gradients (K^+ high inside, Na^+ high outside). The pump only sets up the gradients; it does not directly make the spike pp. 1126-1127
- [ ] Why is the inside negative? At rest, many K^+ leak channels are open but very few Na^+ ones, so K^+ trickles out down its gradient and leaves the inside net-negative (close to the K^+ equilibrium potential, ~−90 mV) pp. 1127-1128

Self-check: resting potential ○ Got it ○ Shaky ○ Re-test

Can you explain why the inside of a resting neuron is negative, and the difference between what the Na^+/K^+ pump does and what the open K^+ channels do?

The action potential: the all-or-none spike

- [ ] Graded potentials vary with stimulus strength and fade with distance. An action potential is different: once threshold (~−55 mV) is crossed, voltage-gated Na^+ channels fly open and positive feedback fires a full spike. It is all-or-none pp. 1129-1130
- [ ] The spike, phase by phase: rising = Na^+ rushes in (depolarization); falling = Na^+ channels inactivate and K^+ channels open, so K^+ flows out (repolarization); undershoot = a brief hyperpolarization before resetting pp. 1130-1131
- [ ] The refractory period (Na^+ channels still inactivated) means a region cannot fire again immediately, so the impulse only travels forward, away from the cell body, and never backwards pp. 1131-1132

Self-check: the spike ○ Got it ○ Shaky ○ Re-test

Can you name the ion and channel behind each phase (rising, falling, undershoot), and explain why the refractory period forces the impulse to travel in only one direction?

Sending it fast: myelin and saltatory conduction

- [ ] The impulse propagates because Na^+ flowing in at one spot depolarizes the next region to threshold, regenerating the spike. So the action potential keeps the same size all the way down the axon (it does not weaken) — pp. 1131-1132
- [ ] For speed: a wider axon conducts faster, and myelin (Schwann cells in the PNS, oligodendrocytes in the CNS) insulates the axon so the spike jumps from node to node at the nodes of Ranvier. This is saltatory conduction — pp. 1132-1133

Self-check: conduction ◯ Got it ◯ Shaky ◯ Re-test

Can you explain how myelin and the nodes of Ranvier make a signal travel faster (saltatory conduction)? And why does an action potential never get smaller as it travels?

Crossing the gap: synapses

- [ ] At a chemical synapse: the action potential reaches the terminal → voltage-gated Ca^{2+} channels open → Ca^{2+} entry makes vesicles fuse and release neurotransmitter → it crosses the synaptic cleft and binds receptors on the next cell. (Electrical synapses use gap junctions instead) — pp. 1133-1134
- [ ] The receptor decides the effect: open Na^+/K^+ channels → depolarizing EPSP (excitatory, fires the cell); open K^+/Cl^- channels → hyperpolarizing IPSP (inhibitory). The axon hillock sums all EPSPs and IPSPs (temporal and spatial summation) to decide whether to fire — pp. 1134-1135
- [ ] The signal must be stopped: neurotransmitter is cleared by enzymes (e.g. acetylcholine broken down by acetylcholinesterase) or by reuptake into the presynaptic neuron. Otherwise it would keep firing the next cell — p. 1136

Self-check: synapses ◯ Got it ◯ Shaky ◯ Re-test

Can you walk through a chemical synapse step by step (Ca^{2+} in → vesicles → cleft → receptor) and explain how the same neurotransmitter can be excitatory at one synapse but inhibitory at another?

Recall and practice

- [ ] Review today's flashcard set (neurons, the action potential and synapses)
- [ ] Answer today's practice questions (the nerve impulse)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2017	38	Biology	☐	☐
2016	36	Biology	☐	☐
2015	36	Biology	☐	☐
2014	34	Biology	☐	☐
2023	23	Biology	☐	☐
2023	28	Biology	☐	☐
2021	29	Biology	☐	☐
2019	40	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min — About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY
27
Rest day

Rest and Reset

- [ ] Unwind and do something other than study.
- [ ] Optional: light reading or stretching.



HOURS OF SLEEP

HOW I FEEL
1 2 3 4 5

WHAT I DID TODAY

DAY
28
Rest day

Rest Day

- [ ] Focus on well-being and sleep.
- [ ] Plan meals and study blocks for the coming week.

HOURS OF SLEEP

HOW I FEEL
1 2 3 4 5

WHAT I DID TODAY

Weekly review

Week 4 · Days 22–28

REVIEW DATE _____



WEEK 4 DONE

Color it in



Leo's tip

Set aside a fixed hour each weekend to tidy your flashcards and log what still feels shaky.

How the days went

DAY 22	DAY 23	DAY 24	DAY 25	DAY 26	DAY 27	DAY 28
Sensation and Movement in Animals	Animal Defenses Against Infection	Cellular Respiration: Harvesting Energy from Glucose	Photosynthesis: How Plants Make Food from Light	Neurons and the Nerve Impulse	Rest and Reset	Rest Day
○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Rested	○ Rested

Checkpoints ticked _____ / **109** Self-checks marked Got it _____ / **26** Physics / math blocks _____

Weak-spot tracker

Every Shaky or Re-test from this week, one row each.

TOPIC	DAY	WHY	RE-TEST ON	FIXED
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐

Score log

Real IMAT questions this week: tried _____ / **32**

right _____

DATE	PAPER / SECTION	RIGHT	WRONG	BLANK	SCORE
__ / __					
__ / __					
__ / __					
__ / __					
__ / __					

Score = 1.5 × right − 0.4 × wrong · blank = 0 · IMAT 2026 rule

Next week

Week 5 · Days 29–35

29	Mendelian Genetics
30	Animal Reproductive Systems
31	How Evolution Works (Darwin, Natural Selection and the Evidence)
32	Phylogeny and Microevolution: Reading the Tree of Life and How Populations Evolve
33	How New Species Arise and the History of Life
34	Rest Day
35	Active Rest

from _____ to _____

My goal for next week

What I move into next week

DAY

29

of 58

About 8 h

BIOLOGY

Mendelian Genetics

How traits are passed from parents to offspring. A monk counting pea plants worked out the rules of heredity before anyone had seen a gene: dominant vs recessive, the 3:1 ratio, and the two laws that let you predict a cross. Then come the exceptions (codominance, blood groups) and the diseases that follow these same rules in humans.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — W1 W2 W3 W4 W5 W6 W7 W8 Final — 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 14

- [ ] Read Ch 14: Mendelian Genetics (Mendel's two laws, probability, complex inheritance, human disorders) pp. 319-338

ⓘ Learn to build a Punnett square (Figure 14.5) and read it both ways: the genotype ratio and the phenotype ratio. The 3:1 and 9:3:3:1 ratios and the dominant/recessive trap come up often on the IMAT.

Mendel's two laws and the vocabulary (Concept 14.1)

- [ ] The particulate idea: parents pass on discrete heritable units (genes), not a blended 'fluid'. Mendel proved this by crossing true-breeding pea plants: varieties that, left to self-pollinate, only ever give the same trait pp. 319-321
- [ ] Key words to learn first: a character is a heritable feature (e.g. flower color); a trait is one variant of it (purple vs white). Crossing the P generation gives the F1 (first filial), and F1 × F1 gives the F2 pp. 320-321
- [ ] Mendel's monohybrid result: true-breeding purple × white → F1 all purple (the white trait vanishes), then white reappears in the F2, ≈ 3 purple : 1 white. Purple is the dominant trait, white the recessive one: it was hidden, not destroyed pp. 321-322
- [ ] Alleles are alternative versions of a gene at one locus. Each organism carries two (one per parent). Two identical = homozygous (PP or pp); two different = heterozygous (Pp). Genotype = the alleles you carry; phenotype = the trait you see pp. 322-324
- [ ] Law of segregation: the two alleles of a gene separate during gamete formation, so each gamete carries only one (this goes back to homologs separating in meiosis I). This is what gives the 1:2:1 genotype → 3:1 phenotype ratio in F2 pp. 322-324
- [ ] The testcross: cross a dominant-phenotype individual of unknown genotype with a homozygous recessive (aa). All dominant offspring → it was homozygous; a 1:1 split → it was heterozygous. This is how you read a hidden genotype pp. 324-325
- [ ] Law of independent assortment: each gene pair segregates independently of the others (a dihybrid YyRr makes YR, Yr, yR, yr in equal numbers) → the 9:3:3:1 F2 ratio. Caution: this only holds for genes on different (or far-apart) chromosomes pp. 324-326

Self-check: the two laws ○ Got it ○ Shaky ○ Re-test

Can you state the law of segregation and the law of independent assortment, and explain why a Pp × Pp cross gives a 1:2:1 genotype ratio but a 3:1 phenotype ratio? And what is a testcross for?

Probability: Punnett squares and the two rules (Concept 14.2)

- [ ] A Punnett square lists every gamete from each parent down the side and across the top, then fills in the offspring genotypes. A capital letter = dominant allele, lowercase = recessive (e.g. P vs p). Build one for a Pp × Pp cross and read off 3:1 pp. 323-324
- [ ] Segregation is like a coin toss, so genetics follows the rules of probability. Multiplication rule: P(two independent events both happen) = multiply (e.g. P of aa = ½ × ½ = ¼). It lets you solve dihybrid and trihybrid crosses without a giant square pp. 326-327
- [ ] Addition rule: P(an event that can happen in two mutually exclusive ways) = add the two probabilities (e.g. a heterozygote Rr can arise as R from the egg and r from the sperm, or the reverse → ¼ + ¼ = ½) pp. 327-328

Self-check: probability rules ○ Got it ○ Shaky ○ Re-test

For AaBb × AaBb, can you use the multiplication rule (not a 16-box square) to get the chance of an aabb offspring, and explain when you multiply and when you add probabilities?

When one gene breaks the simple rules (Concept 14.3)

- [ ] Incomplete dominance: the heterozygote is an intermediate 'blend' (red × white snapdragons → pink F1). Because the heterozygote looks different, the F2 phenotype ratio becomes 1:2:1, the same as the genotype ratio — pp. 328-329
- [ ] Codominance: both alleles are fully and separately expressed in the heterozygote (not a blend), e.g. the human MN blood group shows both M and N molecules. Codominance = both show; incomplete dominance = blend — pp. 329-330
- [ ] Multiple alleles and the ABO blood groups: a gene can have >2 alleles in the population (here I^A, I^B, i). I^A and I^B are codominant and i is recessive → blood types A, B, AB, O. (Any one person still carries only two alleles) — p. 330
- [ ] Pleiotropy: one gene affects many phenotypic traits (e.g. the single sickle-cell or cystic-fibrosis allele causes a whole cluster of symptoms). 'Dominant' never means stronger or better; it only means it shows in the heterozygote — pp. 330-331

Self-check: beyond simple dominance ◯ Got it ◯ Shaky ◯ Re-test

Can you tell incomplete dominance from codominance in one line, give the genotypes of all four ABO blood types, and explain what pleiotropy means with one example?

When many genes act together (Concept 14.3)

- [ ] Epistasis: one gene's product masks or alters the expression of a different gene (e.g. in Labradors the pigment-deposition gene E/e hides the black/brown B/b gene → a 9:3:4 F2 ratio, a modified 9:3:3:1). Epistasis = one gene over another — p. 331
- [ ] Polygenic inheritance: many genes add up to shape one quantitative trait (skin color, height) → a smooth continuous range, not discrete categories. It is the opposite of pleiotropy (many genes → one trait, vs one gene → many traits) — pp. 331-332
- [ ] Nature vs nurture: a genotype sets a range of possibilities; the environment decides where in that range the phenotype lands (hydrangea flower color shifts with soil pH). Traits shaped by genes and environment are called multifactorial — pp. 332-333

Self-check: two or more genes ◯ Got it ◯ Shaky ◯ Re-test

Can you explain how epistasis differs from polygenic inheritance, and why polygenic (quantitative) traits like height show a smooth continuous range instead of neat 3:1-style categories?

Mendelian inheritance in humans (Concept 14.4)

- [ ] Pedigree analysis: a family tree used to track a trait (□ = male, ○ = female, a filled symbol = affected). It lets you deduce whether an allele is dominant or recessive, and predict a future child's risk with the probability rules — pp. 334-335
- [ ] Recessively inherited disorders: only the homozygote (aa) is affected; heterozygotes (Aa) are healthy carriers who can still pass the allele on. Two carriers (Aa × Aa) → ¼ affected. Examples: albinism, Tay-Sachs, cystic fibrosis — pp. 335-336
- [ ] Cystic fibrosis and sickle-cell: CF is the most common lethal genetic disease in people of European descent (a faulty chloride channel → thick mucus). Sickle-cell shows heterozygote advantage: one copy protects against malaria, which keeps the allele common — pp. 336-337
- [ ] Dominantly inherited disorders: a single dominant allele causes the trait, so an affected Aa parent has a 50% chance of passing it on. Most lethal dominants are rare (carriers die young), but late-onset ones persist (e.g. Huntington's) — pp. 337-338

Self-check: human disorders ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why two healthy parents can have a child with a recessive disorder (and the ¼ risk), and why a lethal dominant like Huntington's isn't eliminated? And what does 'heterozygote advantage' mean for the sickle-cell allele?

Notes

Recall and practice

- [ ] Review today's flashcard set (Mendel's laws, Punnett ratios, dominance variations, ABO, pedigrees)
- [ ] Answer today's practice questions (monohybrid and dihybrid crosses, probability, blood groups, pedigrees)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2023	32	Biology	☐	☐
2021	33	Biology	☐	☐
2018	31	Biology	☐	☐
2022	29	Biology	☐	☐
2022	30	Biology	☐	☐
2015	25	Biology	☐	☐
2013	37	Biology	☐	☐
2012	48	Biology	☐	☐

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Study time today _____ h _____ min

About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
30
of 58

About 8 h

BIOLOGY

Animal Reproductive Systems

How animals make the next generation. Start with the two big modes (asexual vs sexual) and how fertilization brings sperm and egg together. Then focus on humans: the male and female plumbing, how sperm and eggs are made (and why one egg ≠ four sperm), the hormone loops that run the menstrual cycle, and what happens from fertilization to birth.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58
W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 45

- [ ] Read Ch 45: Animal Reproductive Systems (reproduction modes, fertilization, human anatomy, gametogenesis, the cycles, pregnancy and birth) — pp. 1049-1069

ⓘ The female reproductive-cycle figure (Figure 45.14) is the one to learn thoroughly: the IMAT often asks which hormone peaks when and which event the LH surge triggers. Trace FSH, LH, estrogen and progesterone through the follicular and luteal phases.

Two ways to reproduce, and fertilization (Concepts 45.1-45.2)

- [ ] Sexual reproduction: two haploid gametes (a large immotile egg and a small motile sperm) fuse into a diploid zygote → genetic variety. Asexual reproduction: new individuals from one parent by mitosis (budding, fission, fragmentation with regeneration) → clones — pp. 1050-1051
- [ ] Variations to know: parthenogenesis = an egg develops without fertilization (e.g. bee drones); hermaphroditism = one individual has both male and female systems (useful for sessile animals that rarely meet a mate) — pp. 1050-1051
- [ ] Fertilization can be external (eggs and sperm released into water; it needs a moist habitat and synchronized timing, e.g. spawning fish or frogs) or internal (sperm deposited in the female tract; fewer gametes but better-protected offspring, the land adaptation) — pp. 1052-1053

Self-check: reproduction modes ○ Got it ○ Shaky ○ Re-test

Can you explain the 'twofold cost of sex' (why an asexual female out-reproduces a sexual one)? And why is internal fertilization, not external, the one that frees animals from needing water to reproduce?

Human reproductive anatomy (Concept 45.3)

- [ ] Male plumbing. Trace the sperm: seminiferous tubules of the testis (made here) → epididymis (matured and stored) → vas deferens → ejaculatory duct → urethra → out. The scrotum holds the testes ~2 °C below core temperature because sperm need it cooler — pp. 1055-1056
- [ ] Three accessory glands make most of the semen volume (sperm are a tiny fraction): seminal vesicles (~60%, alkaline, with fructose to fuel sperm), prostate (thin enzyme-rich fluid), bulbourethral glands (pre-ejaculate mucus that neutralizes the urethra) — p. 1056
- [ ] Female plumbing: ovaries (hold follicles, each an oocyte with support cells; make eggs and hormones) → oviduct or Fallopian tube (where fertilization usually happens) → uterus (its lining = the endometrium, where the embryo implants; neck = cervix) → vagina — pp. 1056-1057

Self-check: anatomy ○ Got it ○ Shaky ○ Re-test

Can you name the male duct pathway in order, say which gland contributes most of the semen volume, and state where in the female tract fertilization and implantation each occur?

Making the gametes: gametogenesis (Concept 45.3)

- [ ] Spermatogenesis: in the seminiferous tubules a diploid spermatogonium (2n) → primary spermatocyte (2n) → after meiosis, four functional haploid (n) sperm. It is continuous and prolific from puberty on; Sertoli cells nurse the developing sperm — pp. 1057-1058
- [ ] Oogenesis is unequal: cytokinesis puts almost all the cytoplasm into one big egg, and the spare sets leave as tiny polar bodies that degenerate → only one functional egg per meiosis (vs four sperm). Females are born with all their primary oocytes — pp. 1058-1059

Making the gametes: gametogenesis (Concept 45.3) continued

- [ ] Two meiotic arrests to memorize: the primary oocyte sits arrested in prophase I (from before birth); a primary oocyte finishes meiosis I just before ovulation, and the secondary oocyte released at ovulation is arrested at metaphase II. It only completes meiosis II if a sperm fertilizes it — pp. 1058-1059

Self-check: gametogenesis ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why one primary spermatocyte gives four sperm but one primary oocyte gives only one egg? And at which exact meiotic stage are the primary oocyte and the ovulated secondary oocyte each arrested?

The hormones and the menstrual cycle (Concept 45.4)

- [ ] The control axis (same wiring in both sexes): hypothalamus → GnRH → anterior pituitary → the gonadotropins FSH and LH → the gonads. In males, LH drives Leydig cells to make testosterone; FSH and testosterone drive Sertoli cells and spermatogenesis (with negative feedback from testosterone and inhibin) — pp. 1060-1061
- [ ] Ovarian cycle. Follicular phase: FSH and LH grow follicles, which secrete estradiol → high sustained estrogen flips to positive feedback → the LH surge → ovulation (a secondary oocyte released). Luteal phase: the ruptured follicle becomes the corpus luteum, secreting progesterone (and estradiol) — pp. 1062-1063
- [ ] The uterine (menstrual) cycle runs in step: menstrual phase (lining shed) → proliferative phase (estrogen rebuilds the endometrium; parallels the follicular phase) → secretory phase (progesterone from the corpus luteum readies it for implantation; parallels the luteal phase). No pregnancy → corpus luteum dies → estrogen and progesterone crash → menstruation — p. 1063

Self-check: the cycle ◯ Got it ◯ Shaky ◯ Re-test

Can you trace one full cycle, naming which hormone is high at each step? And can you explain the twist: estrogen normally gives negative feedback but, when high and sustained before ovulation, switches to positive feedback to trigger the LH surge?

From fertilization to birth (Concept 45.5)

- [ ] Conception → development: a sperm fertilizes the egg in the oviduct → zygote → cleavage → a blastocyst that implants in the endometrium ~7 days later. Its outer layer (the trophoblast) helps build the placenta, which exchanges nutrients, gases and wastes between mother and fetus via the umbilical cord — pp. 1064-1065
- [ ] The pregnancy hormone: the early embryo secretes hCG (human chorionic gonadotropin), which acts like LH to keep the corpus luteum alive → progesterone stays high → no menstruation. hCG in the urine is what a pregnancy test detects. Later the placenta itself takes over progesterone production — pp. 1065-1066
- [ ] Birth (labor) has three stages: dilation of the cervix → expulsion of the baby → delivery of the placenta. It is driven by a positive-feedback loop: stretch → oxytocin → stronger contractions → more stretch (a classic positive-feedback example that examiners reuse) — pp. 1066-1067

Self-check: pregnancy ◯ Got it ◯ Shaky ◯ Re-test

Can you explain what hCG does and why a pregnancy test looks for it, and describe the positive-feedback loop (oxytocin) that drives labor to completion?

Notes

Recall and practice

- [ ] Review today's flashcard set (reproductive anatomy, gametogenesis and the cycle)
- [ ] Answer today's practice questions (male/female reproduction)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2017	25	Biology	☐	☐
2015	23	Biology	☐	☐
2017	29	Biology	☐	☐
2018	25	Biology	☐	☐
2014	29	Biology	☐	☐
2017	23	Biology	☐	☐
2016	35	Biology	☐	☐

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Study time today _____ h _____ min About 8 h

Physics / math block — your own, not in the plan

Topic _____

From ___ : ___ To ___ : ___ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
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About 8 h

BIOLOGY

How Evolution Works (Darwin, Natural Selection and the Evidence)

The single idea that ties all of biology together. Start with Darwin and the thinkers who set the stage, then his big idea (descent with modification by natural selection) and exactly why it works. Finish with the four lines of evidence (direct observation, homology, fossils, biogeography) that turn 'just a theory' into the best-supported explanation in biology.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58
W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 21

- [ ] Read Ch 21: How Evolution Works (the road to Darwin, descent with modification by natural selection, and the evidence for evolution) — pp. 500-515

ⓘ Learn Darwin's logic as 2 observations → 2 inferences (Figure 21.10/21.11): the IMAT tests the reasoning, not only the vocabulary. And keep the homologous-vs-analogous distinction clear in your head; examiners ask about it often.

The road to Darwin: a young, fixed Earth gives way (Concept 21.1)

- [ ] Evolution is descent with modification: today's species are the modified descendants of earlier, different ancestors. Read it two ways: as a pattern (the observed fact that life has changed over time) and as a process (the mechanisms, e.g. natural selection, that cause the change) — p. 501
- [ ] The old view Darwin overturned: species were thought to be fixed (unchanging) and the Earth only a few thousand years old. Aristotle's scala naturae ranked life on a fixed ladder; Linnaeus built the nested naming system (still used), but as a record of creation, not kinship — p. 502
- [ ] Geology and fossils made the Earth old: fossils in layered rock strata (older = deeper) showed species appear and go extinct; Hutton and Lyell argued that slow, present-day processes shaped the Earth over vast time, so it must be ancient, which gives evolution time to work — pp. 502-503
- [ ] Lamarck got the mechanism wrong: he saw that life changes, but proposed 'use and disuse' and the inheritance of acquired characteristics (e.g. a giraffe stretching its neck and passing on the longer neck). Genetics refutes this: traits gained in your lifetime aren't inherited (the trained-bonsai trap) — p. 503

Self-check: the road to Darwin ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why the age of the Earth mattered so much for Darwin's idea, and pinpoint exactly what Lamarck got right vs the mechanism he got wrong?

Darwin's big idea: descent with modification by natural selection (Concept 21.2)

- [ ] On the Beagle, Darwin saw adaptations: inherited traits that fit organisms to their environment (the Galápagos finch beaks, each shaped to its food). He came to see adaptation and the origin of new species as the same gradual process, and (prompted by Wallace) published On the Origin of Species in 1859 — pp. 503-505
- [ ] Artificial selection is the warm-up argument: by breeding only the individuals with desired traits, humans turned one wild mustard into cabbage, kale, broccoli, Brussels sprouts and more, in a few generations. If humans can reshape a species this fast, nature can do far more over deep time — pp. 506-507
- [ ] Natural selection as 2 observations → 2 inferences. Observations: (1) individuals vary in heritable traits; (2) populations overproduce offspring, so many die. Inferences: (1) individuals with favorable traits survive and reproduce more; (2) over generations those favorable traits accumulate in the population — p. 507
- [ ] Descent with modification explains unity and diversity at once: all life shares a common ancestor (unity), and as descendants spread into different habitats they accumulated different adaptations (diversity). Darwin pictured this as a branching tree of life — pp. 505-506

Self-check: natural selection logic ◯ Got it ◯ Shaky ◯ Re-test

Can you state Darwin's two observations and two inferences in order? And how does the very same process of descent with modification account for both the unity and the diversity of life?

How natural selection really works (the examiner's traps) (Concept 21.2)

- [ ] The key subtlety: individuals do not evolve; populations do. Selection acts on the phenotypes of individuals (who survive and reproduce), but what changes over generations is the makeup of the population. An individual's body can't evolve in its lifetime p. 508
- [ ] Selection edits existing heritable variation. It does not create traits on demand and isn't goal-directed: it can only amplify or reduce variants already present, and only heritable ones (if every individual is identical for a trait, selection can't act). 'Fittest' = best suited to this environment now, not strongest p. 508
- [ ] Selection depends on time and place: a trait that helps in one environment may be useless or harmful in another, and as environments change, the favored traits change too. Camouflage (the leaf-mimicking mantises and dead-leaf moth) is a textbook adaptation produced this way p. 508

Self-check: what selection can and can't do ◯ Got it ◯ Shaky ◯ Re-test

Why is it wrong to say 'an organism evolved a trait because it needed it'? Can you correct the sentence using 'heritable variation', 'population', and 'edits what already exists'?

The evidence: four ways we know evolution happens (Concept 21.3)

- [ ] 1) Direct observation (evolution caught in the act): soapberry-bug beak length shifts within decades to match a new host plant, and antibiotic resistance spreads in bacteria (e.g. MRSA) because the drug kills susceptible cells and the resistant survivors reproduce. (Note: the drug selects for resistance; it doesn't create it) pp. 509-510
- [ ] 2) Homology (similarity from shared ancestry): homologous structures share an ancestor but may do different jobs (the same arm bones in human, cat, whale, bat). This includes vestigial structures (leftover snake pelvis), embryonic similarities, and molecular homologies (a shared genetic code). Key contrast: analogous structures look alike because of convergent evolution (similar environments), not common ancestry pp. 511-513
- [ ] Reading the relationships: an evolutionary (phylogenetic) tree shows descent. Each branch point is the most recent common ancestor of the lineages above it; 'closest relatives' share the most recent common ancestor (not the most similar appearance) p. 512
- [ ] 3) Fossil record and 4) biogeography: transitional fossils document change over time (the whale/cetacean series losing hind limbs; DNA ties whales to hippos). Biogeography, the geographic spread of species, fits descent and continental drift: island species resemble the nearest mainland, not far-off lands with similar climates pp. 513-516
- [ ] 'Just a theory?' No. In science a theory is a broad, well-tested explanation (far stronger than an everyday 'guess'). The pattern of evolution is observed fact; natural selection is the process that explains a huge range of data, which is exactly why evolution is so strongly supported pp. 515-516

Self-check: the evidence ◯ Got it ◯ Shaky ◯ Re-test

Can you name the four lines of evidence for evolution and give one example of each? And what is the difference between homologous and analogous structures (which one signals common ancestry)?

Notes

Recall and practice

- [ ] Review today's flashcard set (Darwin, natural selection and the evidence)
- [ ] Answer today's practice questions (natural selection and evidence for evolution)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2012	55	Biology	☐	☐
2016	27	Biology	☐	☐
2023	18	Biology	☐	☐
2023	32	Biology	☐	☐
2018	38	Biology	☐	☐
2015	40	Biology	☐	☐
2021	35	Biology	☐	☐
2016	28	Biology	☐	☐

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Study time today _____ h _____ min About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
32
of 58

About 8 h

BIOLOGY

Phylogeny and Microevolution: Reading the Tree of Life and How Populations Evolve

Two halves of one idea. First, how biologists reconstruct evolutionary history: naming species, reading phylogenetic trees, and telling true relatedness (homology) from look-alikes (analogy). Then the mechanism: how a population's gene pool changes over generations through the Hardy-Weinberg test, mutation, gene flow, genetic drift and natural selection.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58
W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 22-23

- [ ] Read Ch 22 (phylogeny: taxonomy, trees, homology vs analogy, cladistics) and Ch 23 (microevolution: genetic variation, Hardy-Weinberg, drift, gene flow, selection) — pp. 519-555

ⓘ Two figures matter most here: the Hardy-Weinberg worked example (Figure 23.8, p. 545: trace p=0.8/q=0.2 to the p^2:2pq:q^2 genotype ratios) and the three modes of selection (Figure 23.13, p. 552: directional vs disruptive vs stabilizing). Learn those two well and most IMAT evolution questions become free marks.

Reading the tree of life: trees, taxonomy and relatedness

- [ ] Phylogeny is the evolutionary history of a species or group. The Linnaean system names each species with a two-part binomial (genus and specific epithet, e.g. Homo sapiens) and nests species in ever-broader taxa: domain → kingdom → phylum → class → order → family → genus → species — pp. 520-521
- [ ] A phylogenetic tree is a hypothesis about relationships. Each branch point is the common ancestor of the lineages diverging from it; sister taxa share an immediate common ancestor. Trees show patterns of descent. They do not show how 'advanced' a species is, or (unless stated) timing or degree of change — pp. 521-523
- [ ] Similarity can mislead: homology is likeness from shared ancestry (true relatedness), while analogy is likeness from convergent evolution, in which unrelated lineages adapt to similar environments (e.g. the Australian 'mole' vs the African golden mole). Only homology reveals phylogeny — pp. 524-525
- [ ] Cladistics groups species into clades. A clade (= monophyletic group) is an ancestor plus all its descendants. Trees are built from shared derived characters (novelties unique to a clade), using an outgroup to tell derived from ancestral, and choosing the most parsimonious tree (fewest changes; Occam's razor) — pp. 525-528

Self-check: phylogeny ◯ Got it ◯ Shaky ◯ Re-test

Two animals look almost identical. Can you explain how a biologist decides whether that resemblance is homology (shared ancestry) or analogy (convergent evolution)? And why should only one of them be used to build a phylogenetic tree?

Microevolution starts here: genetic variation

- [ ] Microevolution is defined as a change in allele frequencies in a population over generations. A key IMAT trap: individuals do not evolve; populations do. Evolution needs raw material, and that raw material is heritable genetic variation among individuals — pp. 540-541
- [ ] Where variation comes from: mutation is the ultimate source of new alleles (a point mutation can matter, but most new mutations are neutral or slightly harmful). Sexual reproduction reshuffles existing alleles each generation via crossing over, independent assortment and random fertilization — pp. 542-543

Self-check: genetic variation ◯ Got it ◯ Shaky ◯ Re-test

Mutation and sexual reproduction both increase genetic variation, but only one of them creates new alleles. Can you say which, and explain what the other one does instead?

The Hardy-Weinberg test: is this population evolving?

- [ ] A population is a group of interbreeding individuals of one species; its gene pool is all the alleles at all loci in all its members. For a locus with two alleles, p + q = 1 (p = frequency of one allele, q = the other). An allele at 100% frequency is 'fixed' — pp. 543-544
- [ ] Hardy-Weinberg equilibrium: if a population is not evolving, allele and genotype frequencies stay constant. Genotypes follow $p^2 + 2pq + q^2 = 1$ (p^2 and q^2 = the two homozygotes, 2pq = heterozygotes). Worked example: p=0.8, q=0.2 → 0.64 : 0.32 : 0.04 — pp. 544-546

The Hardy-Weinberg test: is this population evolving? continued

- [ ] HW holds only under five conditions (Table 23.1): (1) no mutation, (2) random mating, (3) no natural selection, (4) very large population (no drift), (5) no gene flow. Break any one and allele frequencies can change, so HW is the null model you compare a real population against to detect evolution p. 546

Self-check: Hardy-Weinberg ◯ Got it ◯ Shaky ◯ Re-test

If q^2 (the recessive homozygote) = 0.01 in a Hardy-Weinberg population, can you work out q, p, and the carrier frequency 2pq? And can you list the five conditions that must hold for that calculation to be valid?

Two non-adaptive forces: genetic drift and gene flow

- [ ] Genetic drift is random change in allele frequencies from chance events (sampling error), not because a trait is better. It is strongest in small populations, tends to reduce genetic variation, and can fix or lose alleles by luck alone (even harmful ones). Think 'survival of the luckiest' p. 548
- [ ] Two dramatic forms of drift: the founder effect (a few individuals start a new, isolated population whose gene pool differs from the source, e.g. high retinitis pigmentosa on Tristan da Cunha) and the bottleneck effect (a crash slashes population size by chance, e.g. the greater prairie chicken) p. 549
- [ ] Gene flow is the transfer of alleles into or out of a population by migrating individuals or gametes (e.g. wind-blown pollen). It tends to make separate populations more genetically similar (the opposite of drift) and can spread alleles (like insecticide resistance) between populations pp. 550-551

Self-check: drift and gene flow ◯ Got it ◯ Shaky ◯ Re-test

A storm randomly kills most of a small island lizard population regardless of their traits, and the survivors' allele frequencies shift. Which force is this? Can you also contrast the founder vs bottleneck effect, and say why gene flow does the opposite (makes populations more alike)?

Natural selection: the only adaptive force

- [ ] Natural selection is differential reproductive success: it needs variation, heritability, and differential reproduction. Relative fitness = an individual's contribution to the next generation's gene pool relative to others (fittest ≠ strongest; it means most surviving offspring). Selection acts on phenotype but changes allele frequencies pp. 551-552
- [ ] Three modes of selection (Figure 23.13): directional favors one extreme and shifts the mean (e.g. deeper finch beaks in drought); disruptive favors both extremes over the middle (black-bellied seedcracker beak sizes); stabilizing favors the intermediate and removes extremes (human birth weight ~3-4 kg) p. 552
- [ ] Only natural selection consistently causes adaptive evolution. Drift and gene flow change allele frequencies too, but not consistently toward 'good fit'. Sexual selection (→ sexual dimorphism) favors traits that win mates. Balancing selection preserves variation, e.g. heterozygote advantage (the sickle-cell allele protects heterozygotes from malaria) pp. 552-555

Self-check: natural selection ◯ Got it ◯ Shaky ◯ Re-test

Can you tell the three modes of selection apart from a one-line scenario (which extreme(s) win?), explain why 'fittest' means most offspring rather than strongest, and say why natural selection, but not drift or gene flow, reliably produces adaptation?

Notes

Recall and practice

- [ ] Review today's flashcard set (variation, Hardy-Weinberg, drift, gene flow, the modes of selection, homology vs analogy)
- [ ] Answer today's practice questions (gene pool, drift and the founder/bottleneck effects, gene flow, Hardy-Weinberg, selection modes)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2016	27	Biology	☐	☐
2012	55	Biology	☐	☐
2023	18	Biology	☐	☐
2023	20	Biology	☐	☐
2021	35	Biology	☐	☐
2021	33	Biology	☐	☐
2019	31	Biology	☐	☐
2015	39	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

33

of 58

About 8 h

BIOLOGY

How New Species Arise and the History of Life

Two chapters that join Darwin's small changes to the whole history of life. First, what makes two groups separate species, and the ways one species splits into two. Then zoom all the way out: from the first cells in the primordial soup, through the oxygen revolution and the first complex cells, to the Cambrian explosion and the 'big five' mass extinctions.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 24-25

- [ ] Read Ch 24: Species and Speciation (pp. 560-578) and Ch 25: Macroevolution (pp. 579-602) — pp. 560-602

ⓘ Two figures are the core of today's reading. Figure 24.3 (pp. 562-563) sorts every reproductive barrier into prezygotic vs postzygotic; memorize that table and most speciation MCQs become free marks. Then Table 25.1 'The Geologic Record' (p. 587) is your timeline cheat sheet: prokaryotes ~3.5 bya, eukaryotes ~1.8 bya, Cambrian explosion 541 mya.

What exactly is a species?

- [ ] The biological species concept: a species is a group of populations whose members can interbreed in nature and produce viable, fertile offspring, but cannot do so with other groups. It is about reproductive compatibility, not how similar they look — pp. 561-562
- [ ] What keeps a species' gene pool distinct is reproductive isolation: biological barriers that block gene flow with other species. Note its limits: the concept cannot be applied to asexual organisms (most prokaryotes) or to fossils — pp. 561-564
- [ ] Prezygotic barriers act before a zygote forms (they impede mating or fertilization): habitat, temporal (different breeding times), behavioral (courtship), mechanical (body/flower mismatch), and gametic (sperm cannot fertilize the egg) isolation — p. 562
- [ ] Postzygotic barriers act after a hybrid zygote forms: reduced hybrid viability (the hybrid dies or is frail), reduced hybrid fertility (e.g. the sterile mule from horse × donkey), and hybrid breakdown (F1 fine, but later generations are feeble or sterile) — p. 563

Self-check: defining a species ◯ Got it ◯ Shaky ◯ Re-test

Can you state the biological species concept in one sentence, and sort these into prezygotic vs postzygotic: two frogs breed in different seasons; a mule is sterile; sperm cannot bind the other species' egg; the F2 hybrids are feeble?

How one species splits into two

- [ ] Allopatric ('other country') speciation: a geographic barrier (a new river, a rising mountain, colonizing an island) physically splits a population, cutting gene flow. The separated gene pools then diverge by natural selection, drift and mutation until reproductive barriers exist — pp. 565-567
- [ ] Sympatric ('same country') speciation: a new species arises without geographic separation, while still living among the parent population. It is rarer than allopatric (gene flow is harder to block) and needs polyploidy, sexual selection, or a switch to a new habitat or food source — pp. 567-569
- [ ] Polyploidy (extra chromosome sets) is the classic case of instant sympatric speciation, common in plants (>80% of plant species). An autopolyploid doubles its own set; an allopolyploid combines two species' sets via a hybrid. The polyploid cannot breed with the 2n parent → new species in one generation — pp. 568-569
- [ ] When incompletely isolated species meet, they form a hybrid zone, a region where they mate and produce hybrids. Over time it has three fates: reinforcement (selection strengthens prezygotic barriers if hybrids are unfit), fusion (barriers weaken and the species merge), or stability (hybrids keep forming) — pp. 570-573
- [ ] Tempo: speciation can be fast or slow. Punctuated equilibria = long stasis, then sudden change in the fossil record; other lineages change gradually. Once divergence begins it can finish quickly (a few thousand years), but the gap between speciation events averages millions of years — pp. 574-576

Self-check: modes of speciation ◯ Got it ◯ Shaky ◯ Re-test

Can you explain the difference between allopatric and sympatric speciation, why sympatric speciation is rarer, and how polyploidy can make a new plant species in a single generation?

From the primordial soup to the first cells

- [ ] Earth formed ~4.6 billion years ago; the first cells appear in the fossil record ~3.5 bya. The leading scenario for the origin of life runs in four stages: abiotic synthesis of small organic monomers → polymers → protocells (membrane-bound droplets) → self-replicating molecules that made inheritance possible pp. 580-582
- [ ] The Miller-Urey experiment showed that amino acids form abiotically under a simulated early-Earth atmosphere plus energy. The first genetic material was likely RNA, not DNA: ribozymes (RNA enzymes) can catalyze their own replication (the 'RNA world' hypothesis, before DNA took over as the stable store) pp. 581-582
- [ ] The fossil record (mostly in sedimentary strata) is dated by radiometric dating: a radioactive parent isotope decays to a daughter at a fixed half-life. Carbon-14 (half-life 5,730 yr) dates young fossils; older fossils are bracketed using long-lived isotopes (e.g. uranium-238) in surrounding volcanic rock pp. 583-584

Self-check: origin of life and dating ◯ Got it ◯ Shaky ◯ Re-test

Can you list the four stages from organic molecules to the first cells, explain why an 'RNA world' is proposed before DNA, and say how a half-life is used to date a fossil?

The timeline of life: oxygen, eukaryotes and the big radiations

- [ ] The geologic record splits Earth's history into eons (Hadean → Archaean → Proterozoic → Phanerozoic) and the Phanerozoic into the Paleozoic, Mesozoic and Cenozoic eras (Table 25.1). The earliest cells were prokaryotes (~3.5 bya); for ~2 billion years Earth was an exclusively microbial, prokaryotic world pp. 586-588
- [ ] The oxygen revolution: cyanobacteria's oxygenic photosynthesis slowly raised atmospheric O_2 from ~2.7 bya. It was first soaked up by iron (banded iron formations), then began 'gassing out' into the air. The rising O_2 doomed many anaerobes but set the stage for aerobic respiration and complex life p. 588
- [ ] The first eukaryotes (~1.8 bya) arose by endosymbiosis: a host cell engulfed a small aerobic prokaryote that became the mitochondrion, and later a photosynthetic prokaryote became the plastid (serial endosymbiosis). Evidence: both organelles have their own circular DNA, 70S-like ribosomes and double membranes, and divide like bacteria pp. 588-589
- [ ] The Cambrian explosion (~541-525 mya): most present-day animal phyla appear suddenly in the fossil record, including the first large predators with hard parts. Earlier, the soft-bodied Ediacaran biota (635-541 mya) were the first large multicellular eukaryotes. Then life colonized land (~500 mya: plants, fungi, arthropods, later tetrapods) pp. 590-591
- [ ] The rise and fall of groups is shaped by plate tectonics (continental drift; the supercontinent Pangaea ~250 mya), the 'big five' mass extinctions (the Permian wiped out ~96% of marine species; the Cretaceous, 66 mya, ended the non-bird dinosaurs when the Chicxulub asteroid hit), and the adaptive radiations that refill empty niches afterward (e.g. mammals after the dinosaurs) pp. 591-596

Self-check: the history of life ◯ Got it ◯ Shaky ◯ Re-test

Can you put these in order with rough dates: first prokaryotes, oxygen revolution, first eukaryotes, Cambrian explosion, colonization of land? And can you explain how endosymbiosis gave eukaryotes their mitochondria and plastids?

Notes

Recall and practice

- [ ] Review today's flashcard set (species concept, reproductive barriers, speciation modes, hybrid zones, history of life)
- [ ] Answer today's practice questions (allopatric vs sympatric, barrier types, polyploidy, adaptive radiation, endosymbiosis)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2015	40	Biology	☐	☐
2023	16	Biology	☐	☐
2023	18	Biology	☐	☐
2023	25	Biology	☐	☐
2023	32	Biology	☐	☐
2021	24	Biology	☐	☐
2021	34	Biology	☐	☐
2020	23	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
34
Rest day

Rest Day

- [ ] Let yourself recover fully.
- [ ] Enjoy time away from study materials.



HOURS OF SLEEP

HOW I FEEL
1 2 3 4 5

WHAT I DID TODAY

DAY
35
Rest day

Active Rest

- [ ] Keep stress levels low.
- [ ] Optional: light journaling or stretching.

HOURS OF SLEEP

HOW I FEEL
1 2 3 4 5

WHAT I DID TODAY

Weekly review

Week 5 · Days 29–35

REVIEW DATE _____



WEEK 5 DONE

Color it in



Leo's tip

Set aside a fixed hour each weekend to tidy your flashcards and log what still feels shaky.

How the days went

DAY 29	DAY 30	DAY 31	DAY 32	DAY 33	DAY 34	DAY 35
Mendelian Genetics	Animal Reproductive Systems	How Evolution Works (Darwin, Natural Selection and the Evidence)	Phylogeny and Microevolution: Reading the Tree of Life and How Populations Evolve	How New Species Arise and the History of Life	Rest Day	Active Rest
○ Done	○ Done	○ Done	○ Done	○ Done	○ Rested	○ Rested
○ Partly	○ Partly	○ Partly	○ Partly	○ Partly		
○ Moved to Day _____	○ Moved to Day _____	○ Moved to Day _____	○ Moved to Day _____	○ Moved to Day _____		

Checkpoints ticked _____ / **108** Self-checks marked Got it _____ / **23** Physics / math blocks _____

Weak-spot tracker

Every Shaky or Re-test from this week, one row each.

TOPIC	DAY	WHY	RE-TEST ON	FIXED
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐

Score log

Real IMAT questions this week: tried _____ / **30**

right _____

DATE	PAPER / SECTION	RIGHT	WRONG	BLANK	SCORE
__ / __					
__ / __					
__ / __					
__ / __					
__ / __					

Score = 1.5 × right − 0.4 × wrong · blank = 0 · IMAT 2026 rule

Next week

Week 6 · Days 36–40

36	DNA Technology: Cloning, PCR and Genetic Engineering
37	Gene Expression: From Gene to Protein, and Controlling It
38	Biology Review Block
39	Biology Recall: High-Yield Structures
40	Biology Recall Practice

from _____ to _____

My goal for next week

What I move into next week

DAY
36
of 58

About 8 h

BIOLOGY

DNA Technology: Cloning, PCR and Genetic Engineering

The molecular-biology toolbox: how scientists copy, cut, paste and read DNA. That means cloning a gene into a bacterial plasmid, photocopying it with PCR, sorting fragments by gel electrophoresis, editing genomes with CRISPR-Cas9, and putting these tools to work in medicine, forensics and GM crops.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 19

- [ ] Read Ch 19: DNA Technology (DNA sequencing and cloning; restriction enzymes; PCR; studying gene expression; CRISPR; cloning organisms and stem cells; applications) — pp. 448-470

ⓘ Keep the gene-cloning road map (Figure 19.4, p. 450) and the restriction-enzyme/ligase figure (Figure 19.5, p. 451) side by side. Almost every IMAT biotech question comes down to 'which enzyme does what, in what order?' Trace one gene: cut with a restriction enzyme → ligate into a plasmid → transform bacteria.

Gene cloning: cut, paste and copy a gene

- [ ] DNA cloning means making many identical copies of a gene (or DNA segment). The classic method: insert the gene into a plasmid (a small, circular, self-replicating bacterial DNA molecule). The plasmid is used as a cloning vector to carry foreign DNA into a host cell (usually E. coli) — p. 450
- [ ] Restriction enzymes (restriction endonucleases) are 'molecular scissors'. They recognize a specific short DNA sequence (a restriction site, often a 4-8 bp palindrome, e.g. EcoRI cuts GAATTC) and cut both strands there. A bacterium's own DNA is protected by methylation — pp. 451-452
- [ ] Many restriction enzymes cut in a staggered way, leaving short single-stranded overhangs called sticky ends. Any two fragments cut by the same enzyme have complementary sticky ends, so they base-pair. DNA ligase then seals the sugar-phosphate backbone to give a recombinant DNA molecule — pp. 451-452

Self-check: cloning a gene ◯ Got it ◯ Shaky ◯ Re-test

Can you list, in order, the steps to clone a gene into a bacterial plasmid? And can you say exactly which enzyme cuts the DNA, why 'sticky ends' matter, and which enzyme seals the recombinant molecule back together?

Photocopying and sorting DNA: PCR and gel electrophoresis

- [ ] PCR (polymerase chain reaction) amplifies a target DNA stretch in vitro into billions of copies. It uses a repeating 3-step cycle: denature (~95 °C, strands separate) → anneal (~50-65 °C, two primers bind opposite strands, bracketing the target) → extend (~72 °C, polymerase builds new strands). Copies = 2^n after n cycles — pp. 452-453
- [ ] PCR needs a heat-stable polymerase that survives the 95 °C denaturation step every cycle: Taq polymerase, from the hot-spring bacterium Thermus aquaticus. The two primers give PCR its specificity, because only DNA between the primer sites is copied — pp. 452-453
- [ ] Gel electrophoresis sorts DNA fragments by size. DNA is negatively charged (phosphate backbone), so it migrates toward the positive electrode (anode). The gel acts as a sieve, so smaller fragments travel farther. Gel electrophoresis is used to check restriction digests, PCR products and DNA profiles — p. 452

Self-check: PCR and gels ◯ Got it ◯ Shaky ◯ Re-test

Can you name the three temperature steps of one PCR cycle and what happens at each, and explain why Taq polymerase (not a human polymerase) is used? And on a gel, can you predict whether a 200 bp or a 2000 bp fragment ends up nearer the wells?

Studying and editing genes: cDNA, CRISPR-Cas9

- [ ] To express a eukaryotic gene in bacteria, you clone its cDNA, not the genomic gene, because bacteria cannot splice out introns. cDNA (complementary DNA) is made from mature mRNA by the enzyme reverse transcriptase, so it contains only exons (the coding sequence) and is ready for bacterial expression — pp. 454-456
- [ ] Where and when is a gene expressed? Its mRNA is detected by base pairing with a labeled nucleic acid probe: in situ hybridization shows mRNA inside intact tissue; RT-PCR, DNA microarrays and RNA-seq compare expression of many genes or samples at once. All these methods rely on complementary base pairing — pp. 455-458

Studying and editing genes: cDNA, CRISPR-Cas9 continued

- [ ] CRISPR-Cas9 edits genomes precisely: a guide RNA steers the Cas9 nuclease to a matching DNA sequence, where Cas9 cuts both strands. The cell's repair then either disrupts ('knocks out') the gene or, given a template, corrects it. The method was adapted from a bacterial defense against phages (Doudna and Charpentier) pp. 458-459

Self-check: cDNA and CRISPR ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why a eukaryotic gene will not work in bacteria unless you use cDNA? (What is the problem with introns?) And can you describe how a guide RNA and Cas9 together let CRISPR cut one specific spot in a whole genome?

Cloning organisms, stem cells and real-world uses

- [ ] Whole-organism cloning by somatic cell nuclear transfer (SCNT): the nucleus of a body (somatic) cell is put into an enucleated egg. This is how Dolly the sheep was made (1997). The clone's nuclear DNA matches the nucleus donor's, but its mitochondria (and mtDNA) come from the egg cytoplasm pp. 461-462
- [ ] Stem cells both self-renew and differentiate. Embryonic stem (ES) cells are pluripotent (can form any body cell type) but ethically and technically tricky. Induced pluripotent stem (iPS) cells are ordinary adult cells reprogrammed back to an ES-like state. They show great promise for regenerative medicine pp. 463-465
- [ ] Applications: bacteria and transgenic 'pharm' animals mass-produce protein drugs (human insulin, growth hormone, clotting factors); gene therapy supplies a working gene to treat disease; forensics matches people via STR (short tandem repeat) genetic profiles; GM crops gain pest or herbicide resistance pp. 465-470

Self-check: clones, stem cells and uses ◯ Got it ◯ Shaky ◯ Re-test

In SCNT, why is a clone like Dolly not 100% genetically identical to the nucleus donor (think mitochondria)? And can you explain the difference between pluripotent ES cells and iPS cells, and name two medical products made by transgenic organisms?

Recall and practice

- [ ] Answer today's practice questions (cloning; restriction enzymes and ligase; PCR; gel electrophoresis; cDNA; CRISPR; SCNT; STR profiles)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2017	40	Biology	☐	☐
2016	28	Biology	☐	☐
2016	31	Biology	☐	☐
2023	25	Biology	☐	☐
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2020	23	Biology	☐	☐
2019	24	Biology	☐	☐
2017	24	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

DAY

37

of 58

About 8 h

BIOLOGY

Gene Expression: From Gene to Protein, and Controlling It

The final piece of the genetics block. Follow one gene the whole way: DNA transcribed into RNA, the RNA processed and spliced, then translated codon by codon into a protein. Then see how cells switch genes on and off (operons, chromatin) and meet viruses, the famous exception that runs the dogma in reverse.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Campbell Biology: A Global Approach (11th ed.) · ch. 17-18, 26

- [ ] Read Ch 17 (transcription, RNA processing, translation, the genetic code, point mutations), Ch 18.1-18.2 (operons and eukaryotic gene regulation) and Ch 26.1-26.2 (viruses: lytic and lysogenic, retroviruses) — pp. 385-422 (+ 608-616)

ⓘ Learn the codon table (Figure 17.6, p. 391): AUG = start/Met, and UAA/UAG/UGA = stop. Then read mutations using Figure 17.27 (p. 408): silent vs missense vs nonsense vs frameshift is one of the most-tested ideas on the IMAT.

The big picture: the central dogma

- [ ] The central dogma (Crick, 1957): genetic information flows DNA → RNA → protein. Transcription copies a gene's DNA into RNA; translation reads that RNA to build a protein. DNA stores the instructions, RNA is the working copy, and protein does the job — pp. 388-389
- [ ] Location matters: in eukaryotes, transcription happens in the nucleus and translation at ribosomes in the cytoplasm (the two are separated). In prokaryotes there is no nucleus, so transcription and translation are coupled: ribosomes start translating an mRNA while it is still being made — p. 389
- [ ] Not every gene makes a protein: some genes are transcribed into functional RNAs (rRNA, tRNA, regulatory RNAs) that are never translated. 'Gene expression' is the broad term for using a gene to make any functional product — p. 388

Self-check: the overview ◯ Got it ◯ Shaky ◯ Re-test

Can you state the central dogma in one line, say which step is transcription and which is translation, and explain why prokaryotes can couple the two but eukaryotes cannot?

The genetic code: reading DNA in triplets

- [ ] The code is a triplet code: each codon is 3 mRNA bases coding for one amino acid. There are $4^3 = 64$ possible codons: 61 specify amino acids and 3 are stop codons (UAA, UAG, UGA). AUG is the start codon and codes for methionine, and it sets the reading frame — pp. 390-391
- [ ] The code is degenerate (redundant) but not ambiguous: several codons can specify the same amino acid (synonyms usually differ in the 3rd base), yet each codon means exactly one amino acid (or stop). It is also nearly universal: almost all organisms share it — p. 391
- [ ] Which strand is which: the mRNA is complementary to the template (antisense) strand and matches the coding (sense) strand, with U in place of T. So coding DNA 5'-ATG-3' → mRNA 5'-AUG-3'; template DNA 3'-TAC-5' → mRNA 5'-AUG-3'. Codon tables are written for mRNA (U, not T) — pp. 390-391

Self-check: the code ◯ Got it ◯ Shaky ◯ Re-test

Given the coding DNA strand 5'-ATG GAA TTT-3', can you write the mRNA, name the start codon, and explain what 'degenerate but not ambiguous' means in terms of how many codons hit each amino acid?

Step 1: Transcription (making the RNA copy)

- [ ] RNA polymerase makes RNA from the DNA template, building 5'→3' (so it reads the template 3'→5'), and unlike DNA polymerase it needs no primer. It starts at the promoter (a DNA sequence; in eukaryotes often a TATA box) and stops at a terminator — pp. 392-394
- [ ] Three stages: initiation (polymerase and promoter; in eukaryotes, transcription factors must bind first to form the initiation complex), elongation (RNA built 5'→3', DNA rewinds behind), termination (transcript released). In eukaryotes, the first transcript is pre-mRNA (the primary transcript) — pp. 393-394

Step 1: Transcription (making the RNA copy) continued

Self-check: transcription ◯ Got it ◯ Shaky ◯ Re-test
Can you name the three stages of transcription, say what a promoter is and which enzyme binds it, and explain the one big way RNA polymerase differs from DNA polymerase (hint: primer)?

Step 1.5: RNA processing (editing the transcript)

- [ ] Eukaryotic pre-mRNA gets three edits before it leaves the nucleus: a 5' cap (a modified guanine that protects the mRNA and helps the ribosome bind), a poly-A tail (50-250 adenines added to the 3' end, for stability and export), and splicing — p. 395
- [ ] Splicing removes the introns (non-coding 'intervening' sequences) and joins the exons (the parts EXpressed in mature mRNA). A spliceosome does this. Alternative splicing lets one gene make several different proteins. Note: prokaryotes generally do not splice — pp. 395-397
- [ ] Introns vs exons trap: only exons end up in mature mRNA; introns are cut out and degraded (they are not translated). The mature mRNA also keeps untranslated regions (5' UTR and 3' UTR) flanking the coding segment — p. 396

Self-check: RNA processing ◯ Got it ◯ Shaky ◯ Re-test
Can you name the three modifications that turn pre-mRNA into mature mRNA, explain which sequences (introns or exons) survive splicing, and say how alternative splicing lets one gene encode several proteins?

Step 2: Translation (building the protein)

- [ ] The players: mRNA (the message), tRNA (the adaptor: it carries an amino acid and has an anticodon that base-pairs with the mRNA codon), and the ribosome (rRNA and protein; the small subunit binds mRNA, the large subunit forms peptide bonds). Aminoacyl-tRNA synthetases 'charge' each tRNA with the correct amino acid (using ATP) — pp. 398-399
- [ ] The ribosome's three tRNA sites: A site (Aminoacyl: incoming charged tRNA), P site (Peptidyl: holds the growing chain), E site (Exit: spent tRNA leaves). The peptide bond is catalyzed by rRNA (peptidyl transferase), so the ribosome is a ribozyme — pp. 400-403
- [ ] Three stages: initiation (the small subunit and initiator tRNA find AUG; the tRNA sits in the P site), elongation (codon recognition → peptide-bond formation → translocation, GTP-driven), termination (a release factor reads the stop codon and frees the polypeptide). The ribosome reads mRNA 5'→3'; the protein grows N-terminus → C-terminus — pp. 402-403

Self-check: translation ◯ Got it ◯ Shaky ◯ Re-test
Can you walk through one elongation cycle (A site → peptide bond → translocation), say which molecule recognizes a stop codon (not a tRNA), and explain why aminoacyl-tRNA synthetases, not the ribosome, guarantee the right amino acid is used?

When it goes wrong: point mutations

- [ ] A point mutation is a single base-pair change (substitution). Three kinds: silent (the codon still codes for the same amino acid, thanks to degeneracy), missense (one amino acid changes), nonsense (a codon becomes a stop → premature, shortened protein) — p. 408
- [ ] Insertions or deletions that are not a multiple of 3 cause a frameshift: every codon downstream is regrouped and garbled (often ending in a premature stop), so frameshifts are usually far more damaging than a missense change. Adding or removing 3 (or 6, 9…) bases stays in-frame — pp. 409-410

Self-check: mutations ◯ Got it ◯ Shaky ◯ Re-test
Can you classify a substitution as silent, missense or nonsense, and explain why a single-base insertion usually wrecks a protein far more than a single-base substitution (think reading frame)?

Control: switching genes on and off

- [ ] Prokaryotes group related genes into an operon: one promoter and operator controlling a cluster (one mRNA, polycistronic). The trp operon is repressible (normally on; tryptophan acts as a corepressor to shut it off). The lac operon is inducible (normally off; allolactose is the inducer that turns it on) — pp. 414-417
- [ ] Eukaryotes regulate genes mostly via chromatin structure and transcription factors. Histone acetylation loosens chromatin → more transcription; DNA methylation generally silences genes. Specific transcription factors (activators) bind distant enhancers to turn transcription up. Heritable changes that do not alter the DNA sequence are epigenetic — pp. 418-422

Self-check: gene regulation ◯ Got it ◯ Shaky ◯ Re-test
Can you contrast the trp operon (repressible) with the lac operon (inducible): which is normally on, and what small molecule flips each? And can you say whether histone acetylation and DNA methylation each turn transcription up or down?

The final exception: viruses and reverse transcription

- [ ] A virus is just nucleic acid (DNA or RNA) in a protein coat called a capsid (some also have a membranous envelope). Viruses are obligate intracellular parasites: they have no ribosomes or metabolism, so they hijack a host cell's machinery to express their genes and replicate pp. 608-610
- [ ] Phages replicate in two ways: the lytic cycle (a virulent phage like T4 makes copies and bursts the cell) or the lysogenic cycle (a temperate phage like λ integrates its DNA as a prophage that is copied silently with the host until it is induced to go lytic) pp. 612-613
- [ ] Retroviruses (e.g. HIV) are the best-known exception to the central dogma: their enzyme reverse transcriptase copies their RNA genome back into DNA (RNA → DNA), which integrates as a provirus. So information can flow RNA → DNA, but never protein → nucleic acid pp. 615-616

Self-check: viruses ○ Got it ○ Shaky ○ Re-test

Can you explain why a virus cannot reproduce on its own, contrast the lytic and lysogenic cycles (what is a prophage?), and say exactly which step of HIV's life cycle breaks the simple DNA → RNA → protein flow?

Recall and practice

- [ ] Review today's flashcard set (central dogma, the genetic code, transcription, RNA processing, translation, mutations, gene regulation and reverse transcription)
- [ ] Answer today's practice questions (codons and strands, translation and ribosome sites, mutations, plus cDNA, CRISPR and reverse transcription bridges)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2018	39	Biology	☐	☐
2015	39	Biology	☐	☐
2020	25	Biology	☐	☐
2017	34	Biology	☐	☐
2023	24	Biology	☐	☐
2018	37	Biology	☐	☐
2013	31	Biology	☐	☐
2013	36	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

38

of 58

About 8 h

BIOLOGY recall

Biology Review Block

No new pages today. Use the day to prove to yourself that the biology block has sunk in. Go back through every big idea, say it out loud or sketch it from memory, and let the parts that feel shaky show you exactly what to test again.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Recall: cells, organelles and the membrane

- [ ] Prokaryotes (bacteria) have no nucleus and no membrane-bound organelles; eukaryotes (you, plants, fungi) keep their DNA in a nucleus and compartmentalize work into organelles

Self-check: the organelle tour ◯ Got it ◯ Shaky ◯ Re-test

Without notes, can you name each major organelle (nucleus, mitochondrion, rough and smooth ER, Golgi, ribosome, lysosome, chloroplast), give its one-line job, and say which ones are not membrane-bound?

- [ ] The membrane is a fluid-mosaic phospholipid bilayer: hydrophilic heads face the water, hydrophobic tails face inward, and proteins drift within it. This makes it selectively permeable

Self-check: getting across the membrane ◯ Got it ◯ Shaky ◯ Re-test

Can you sort osmosis, simple diffusion, facilitated diffusion, the Na^+/K^+ pump, endocytosis and exocytosis into passive vs active, and state which ones need a transport protein and which ones cost ATP?

Recall: cellular respiration and photosynthesis

- [ ] Respiration runs in four stages: glycolysis (cytosol) → pyruvate oxidation and Krebs cycle (matrix) → electron transport chain and chemiosmosis (inner membrane). It nets ~30-32 ATP per glucose, with O_2 as the final electron acceptor

Self-check: follow one glucose ◯ Got it ◯ Shaky ◯ Re-test

Can you trace a single glucose through all four stages of respiration from memory, naming where each happens and the ATP, NADH and $FADH_2$ tally? And what does fermentation rescue when oxygen runs out?

- [ ] Photosynthesis is the mirror image: the light reactions in the thylakoid split water and make ATP and NADPH; the Calvin cycle in the stroma uses them to fix CO_2 into sugar ($6\ CO_2 + 6\ H_2O \rightarrow$ glucose $+ 6\ O_2$)

Self-check: respiration vs photosynthesis ◯ Got it ◯ Shaky ◯ Re-test

Can you draw both equations side by side and explain how respiration and photosynthesis are reverse processes: which one consumes O_2, which one releases it, and where each set of reactions happens?

Recall: DNA, cell division and gene expression

- [ ] DNA is an antiparallel double helix; A pairs with T (2 H-bonds) and G with C (3 H-bonds). Replication is semi-conservative: each new helix keeps one parental strand

Self-check: mitosis vs meiosis ◯ Got it ◯ Shaky ◯ Re-test

Can you contrast mitosis (one division → 2 identical diploid cells) with meiosis (two divisions → 4 genetically unique haploid gametes), and pinpoint where crossing-over and independent assortment create variation?

- [ ] The central dogma: DNA → (transcription) → mRNA → (translation at the ribosome) → protein. The genetic code is read in 3-base codons, and gene regulation decides which genes are switched on

Self-check: from gene to protein ◯ Got it ◯ Shaky ◯ Re-test

Given a short DNA template strand, can you transcribe it to mRNA, read the codons, and explain the roles of mRNA, tRNA and the ribosome in translation, without peeking at a codon table for the mechanism?

Recall: Mendelian genetics and inheritance

- [ ] Mendel's law of segregation: the two alleles for a gene separate during gamete formation, so each gamete carries only one. This is the basis of the 3:1 ratio in a monohybrid cross

Self-check: run the crosses ○ Got it ○ Shaky ○ Re-test

Can you set up a Punnett square for a monohybrid and a dihybrid cross from memory, predict the genotype and phenotype ratios (3:1 and 9:3:3:1), and explain how the law of independent assortment gives the dihybrid result?

- [ ] Know the vocabulary cold: genotype vs phenotype, homozygous vs heterozygous, dominant vs recessive, plus exceptions like incomplete dominance, codominance and sex-linked inheritance

Self-check: beyond simple dominance ○ Got it ○ Shaky ○ Re-test

Can you explain how incomplete dominance and codominance differ from a clean dominant/recessive pattern, and why an X-linked recessive trait shows up far more often in males?

Recall: evolution and the human body systems

- [ ] Natural selection needs variation, heritability and differential survival; combined with mutation, genetic drift and gene flow, it shifts allele frequencies, and reproductive isolation drives speciation

Self-check: mechanisms of evolution ○ Got it ○ Shaky ○ Re-test

Can you distinguish natural selection from genetic drift and gene flow, and explain what reproductive isolation has to do with one species splitting into two?

- [ ] The body systems trade materials with the environment: the circulatory system carries O_2 and nutrients, gas exchange loads O_2 at the alveoli, digestion breaks food down with enzymes, and the nephron filters blood to make urine

Self-check: the systems working together ○ Got it ○ Shaky ○ Re-test

Can you trace a glucose molecule and an O_2 molecule from the outside world to a body cell, naming the digestive, respiratory and circulatory steps? And can you then explain how the nervous and endocrine systems coordinate the whole organism?

- [ ] Fast vs slow control: the nervous system fires electrical action potentials across synapses for split-second responses, while the endocrine system releases hormones into the blood for slower, longer-lasting effects

Notes

Recall and practice, targeted by the SRS

- [ ] Review today's due flashcards. The spaced-repetition system has already brought back the biology cards you are closest to forgetting
- [ ] Redo the practice questions you got wrong earlier in the biology block. The ones you struggled with will keep coming back until you know them
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2018	35	Biology	☐	☐
2023	32	Biology	☐	☐
2019	36	Biology	☐	☐
2015	27	Biology	☐	☐
2013	43	Biology	☐	☐
2023	18	Biology	☐	☐
2023	19	Biology	☐	☐
2023	22	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
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__:__	__:__		☐
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__:__	__:__		☐

Study time today _____ h _____ min — About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
39
of 58

About 8 h

BIOLOGY recall

Biology Recall: High-Yield Structures

No new chapters today. This is a recall day: re-test the diagrams, sequences and pathways the IMAT asks about often, drawing them from memory before you peek. Your spaced-repetition deck will bring back the cards you have been forgetting, so rely on it and start there.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58
W1 W2 W3 W4 W5 W6 W7 W8 Final

How today works: recall, don't re-read

- [ ] Today is active recall, not re-reading. Pull each diagram out of your head onto blank paper first, then check it. Struggling to remember is what builds the memory. Your due flashcards already point you to whatever you have been forgetting.

Self-check: set the bar ◯ Got it ◯ Shaky ◯ Re-test
Before you start: of all the biology you have covered so far, which 3 diagrams or pathways do you trust least from memory? Note them now. Those are the ones to draw twice today.

Molecular structures: draw the three classics

Self-check: glucose ◯ Got it ◯ Shaky ◯ Re-test
Can you draw the ring structure of glucose ($C_6H_{12}O_6$) from memory, numbering all six carbons, placing the −OH groups, and showing what differs between α-glucose and β-glucose at carbon 1?

- [ ] A phospholipid is amphipathic: a phosphate-containing polar 'head' (hydrophilic) and two fatty-acid 'tails' (hydrophobic). This two-sided structure is exactly why it self-assembles into a bilayer in water.

Self-check: phospholipid and water ◯ Got it ◯ Shaky ◯ Re-test
Can you draw a phospholipid (label the polar head and the two hydrophobic tails) and draw a water molecule showing its bent ~104.5° shape, the partial charges (δ−/δ+) and a hydrogen bond to a neighbor? And why does water's polarity make it the universal solvent?

Heart, blood flow and the blood buffer

Self-check: blood-flow pathway ◯ Got it ◯ Shaky ◯ Re-test
Can you trace one drop of blood all the way around, from the vena cava back to the aorta, naming every chamber, valve and the two great circuits (pulmonary then systemic) in the correct order, without looking?

- [ ] The double-pump path: vena cava → right atrium → tricuspid valve → right ventricle → pulmonary valve → pulmonary artery → lungs → pulmonary vein → left atrium → bicuspid (mitral) valve → left ventricle → aortic valve → aorta → body.

Self-check: pressure graphs ◯ Got it ◯ Shaky ◯ Re-test
Can you sketch the cardiac-cycle pressure graph (aorta, left ventricle and left atrium on one set of axes), mark where each valve opens and closes, and explain what makes the 'lub' (S1) and 'dub' (S2) sounds?

- [ ] The carbonic-acid blood buffer: $CO_2 + H_2O \rightleftharpoons H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$ (carbonic anhydrase speeds the first step). Add acid → equilibrium shifts left to mop up H^+; lose acid → shifts right. This is how the blood holds pH near 7.4.

Self-check: the buffer equation ◯ Got it ◯ Shaky ◯ Re-test
Can you write the full carbonic-acid buffer equilibrium from memory and, using Le Chatelier, explain which way it shifts when blood becomes too acidic? And why does hyperventilating (blowing off CO_2) raise blood pH?

HIV structure, neurons and the reflex arc

Self-check: HIV/AIDS virus ◯ Got it ◯ Shaky ◯ Re-test
Can you draw the structure of HIV from memory: the lipid envelope with its gp120/gp41 spikes, the protein capsid, the two RNA strands and the reverse transcriptase enzyme? And can you say why being a retrovirus (RNA → DNA) is its defining feature?

HIV structure, neurons and the reflex arc continued

- [ ] HIV is an enveloped retrovirus: its RNA genome is copied into DNA by reverse transcriptase, and the copy is then integrated into the host genome. It destroys $CD4^+$ helper T-cells, and once their count collapses, the clinical stage is AIDS.
- [ ] The three functional neuron types: sensory (afferent: receptor → CNS), motor (efferent: CNS → effector), and interneuron (a relay that sits between the two inside the CNS). Know which is which in any pathway.

Self-check: the reflex arc ◯ Got it ◯ Shaky ◯ Re-test

Can you list the five steps of a reflex arc in order (receptor → sensory neuron → integration center/interneuron in the spinal cord → motor neuron → effector) and explain why a reflex can act before the brain is even 'aware' of the stimulus?

Sarcomere, gametogenesis and PCR

Self-check: sarcomere structure ◯ Got it ◯ Shaky ◯ Re-test

Can you draw a relaxed sarcomere and label the Z lines, the I band, the A band, the H zone and the M line? Can you then show which of those get shorter (and which stay the same width) when the muscle contracts?

- [ ] The sliding-filament cycle: Ca^{2+} frees the actin binding sites → myosin heads bind (cross-bridge) → the power stroke pulls actin inward → ATP detaches the head → ATP hydrolysis re-cocks it. The filaments slide past each other; they do not shorten.

Self-check: spermatogenesis vs oogenesis ◯ Got it ◯ Shaky ◯ Re-test

Can you sketch both gametogenesis pathways side by side: spermatogonium → primary spermatocyte → secondary spermatocyte → spermatid → sperm (4 equal gametes) vs oogonium → primary oocyte → secondary oocyte and polar bodies (1 large egg)? And can you state the two key differences (4 vs 1 functional gamete, equal vs unequal cytoplasm)?

- [ ] Oogenesis is asymmetric: unequal cytoplasmic division concentrates resources into one secondary oocyte/egg, while the leftovers form tiny polar bodies. Spermatogenesis is symmetric: one primary spermatocyte yields four functional sperm.

Self-check: the steps of PCR ◯ Got it ◯ Shaky ◯ Re-test

Can you recite the three repeating steps of PCR and their approximate temperatures from memory: denaturation (~95 °C, strands separate) → annealing (~55 °C, primers bind) → extension (~72 °C, Taq polymerase builds the new strand)? Why does the copy number roughly double every cycle?

Review what the SRS has due

- [ ] Review today's due flashcards. The spaced-repetition deck brings back exactly the cards you have been getting wrong, so the ones you struggled with will keep coming back until you know them.
- [ ] Redo the practice questions you missed earlier on these topics. Getting them right from memory today is the real test of whether you have learned them.
- [ ] Blank-paper brain-dump (15 min): pick the one diagram you fumbled most today and redraw it from scratch with no notes, then check it once. optional

Notes

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2023	23	Biology	☐	☐
2023	28	Biology	☐	☐
2022	31	Biology	☐	☐
2021	23	Biology	☐	☐
2020	33	Biology	☐	☐
2020	35	Biology	☐	☐
2018	23	Biology	☐	☐
2018	25	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

40

of 58

About 8 h

BIOLOGY recall

Biology Recall Practice

No new chapters today, only your memory and the trickiest biology you have met so far. Go through each focus area, try to explain it out loud or on paper before you peek, and let the spaced-repetition system bring back the cards you have started to forget.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Proteins: bonds and the four levels of structure

- [ ] A peptide bond is the covalent amide link between the carboxyl group of one amino acid and the amino group of the next, formed by a condensation (dehydration) reaction that releases one water molecule

Self-check: peptide bonds ○ Got it ○ Shaky ○ Re-test

Can you draw two amino acids joining into a dipeptide, showing exactly which two groups react, the bond that forms and the small molecule that is lost?

- [ ] The four levels in one line: primary = the amino-acid sequence (peptide bonds) → secondary = local α-helices and β-pleated sheets (hydrogen bonds along the backbone) → tertiary = the whole chain's 3-D fold (R-group interactions) → quaternary = two or more folded chains assembled together

Self-check: protein structure levels ○ Got it ○ Shaky ○ Re-test

Can you name all four levels of protein structure in order, state the main type of bond or interaction that holds each one together, and give hemoglobin as an example of a protein with quaternary structure?

Human transport: the Bohr shift and the oxygen curve

- [ ] The Bohr shift: rising CO_2 and falling pH (more H^+) lower hemoglobin's affinity for oxygen, shifting the oxyhemoglobin dissociation curve to the right, so actively respiring tissues (acidic, CO_2-rich) automatically get more O_2 unloaded to them

Self-check: the Bohr shift ○ Got it ○ Shaky ○ Re-test

Can you sketch the S-shaped oxyhemoglobin dissociation curve, then show which way it moves during exercise? In one sentence, why is that rightward shift useful to a working muscle?

Self-check: human transport overview ○ Got it ○ Shaky ○ Re-test

Can you trace a red blood cell on a full circuit of the double circulation (heart → lungs → heart → body → heart), naming where blood becomes oxygenated and where it becomes deoxygenated?

Cardiac control and ECG basics

- [ ] The heart is myogenic: it beats on its own. The SA node (sinoatrial node) in the right atrium is the natural pacemaker; the impulse spreads across the atria, pauses at the AV node, then races down the bundle of His and Purkinje fibers to make the ventricles contract
- [ ] On an ECG: the P wave = atrial depolarization, the QRS complex = ventricular depolarization (it hides atrial repolarization), and the T wave = ventricular repolarization. Heart rate is tuned by the autonomic nervous system: sympathetic speeds it up, parasympathetic (vagus) slows it down

Self-check: conduction and ECG ○ Got it ○ Shaky ○ Re-test

Can you label a normal ECG trace (P, QRS, T) and say which part of the cardiac cycle each one corresponds to? And which structure sets the heart's rhythm without any nerve input?

Epithelial tissue and digestive hormones

- [ ] Epithelial tissue is classified by cell shape (squamous/flat, cuboidal, columnar) and layers (simple = one layer, stratified = many). Match form to job: thin simple squamous for fast diffusion (alveoli), columnar with microvilli for absorption (gut), stratified for protection (skin)

Epithelial tissue and digestive hormones continued

Self-check: epithelial types ◯ Got it ◯ Shaky ◯ Re-test
Can you match each epithelium (simple squamous, simple cuboidal, simple columnar, stratified squamous) to a location in the body and explain why its shape suits the function there?

- [ ] Three digestive hormones to keep straight: gastrin (from the stomach) → stimulates gastric acid; secretin (from the duodenum) → triggers bicarbonate from the pancreas to neutralize acid; cholecystokinin/CCK (from the duodenum) → releases bile from the gallbladder and digestive enzymes from the pancreas

Self-check: digestive hormones ◯ Got it ◯ Shaky ◯ Re-test
Can you state, for gastrin, secretin and CCK, where each is released and the one main job it does? And which two are triggered by chyme arriving in the duodenum?

CNS structure and how penicillin works

- [ ] The central nervous system = brain and spinal cord (everything else is the peripheral nervous system). Big brain regions: the cerebrum (thought, voluntary movement), cerebellum (balance and coordination), and brainstem/medulla (vital reflexes like breathing and heart rate)
- [ ] Penicillin blocks the enzyme that cross-links the bacterial cell wall (peptidoglycan), so a growing, dividing bacterium cannot build a strong wall and bursts under osmotic pressure. That is why it hits bacteria but not human cells (your cells have no cell wall), and why it only works on actively dividing cells

Self-check: CNS and penicillin ◯ Got it ◯ Shaky ◯ Re-test
Can you state what penicillin targets and why it is harmless to your own cells? Separately, can you name the two organs of the CNS and one job of the cerebrum vs the cerebellum?

Genetics, the lac operon and mechanisms of evolution

- [ ] Mendel's two laws: the law of segregation (the two alleles of a gene separate, so each gamete carries only one) and the law of independent assortment (alleles of different genes are inherited independently, which is the basis of the dihybrid 9:3:3:1 ratio)

Self-check: monohybrid and dihybrid crosses ◯ Got it ◯ Shaky ◯ Re-test
Can you set up a Punnett square for a monohybrid cross (Aa × Aa) and predict the 3:1 phenotype ratio? Then, from memory, can you state the phenotype ratio of a dihybrid cross (AaBb × AaBb)?

Self-check: genotype frequencies ◯ Got it ◯ Shaky ◯ Re-test
If an allele has frequency p and its partner q ($p + q = 1$), can you write the Hardy-Weinberg expansion and say which term (p^2, $2pq$, q^2) gives the heterozygotes? Can you then use it to find the carrier frequency from a given q^2?

- [ ] The lac operon is an inducible operon: when lactose is absent, the repressor binds the operator and the genes are off; when lactose is present, it inactivates the repressor, so RNA polymerase transcribes the enzymes that digest lactose. This is a classic example of gene regulation in bacteria

Self-check: the lac operon ◯ Got it ◯ Shaky ◯ Re-test
Can you explain, step by step, what happens at the lac operon with lactose vs without lactose, naming the role of the repressor and the operator in each case?

- [ ] Four mechanisms that change allele frequencies (i.e. drive evolution): mutation (the raw source of new alleles), natural selection (differential survival/reproduction), genetic drift (random change, strongest in small populations) and gene flow (migration moving alleles between populations)

Self-check: mechanisms of evolution ◯ Got it ◯ Shaky ◯ Re-test
Can you name the four mechanisms that change a population's allele frequencies and give a one-line description of each? Which one is the ultimate origin of all genetic variation?

Genetic engineering: CRISPR, restriction enzymes and gels

- [ ] Restriction enzymes are molecular scissors that cut DNA at specific palindromic recognition sequences, often leaving overhanging 'sticky ends' that let fragments from different sources be joined by DNA ligase. This is the basis of recombinant DNA

Genetic engineering: CRISPR, restriction enzymes and gels continued

- [ ] Gel electrophoresis separates DNA fragments by size: DNA is negative, so it migrates toward the positive electrode, and smaller fragments travel further through the gel. The result is the banding pattern used in fingerprinting and to check a cut or PCR product
- [ ] CRISPR-Cas9 is a precise gene-editing tool: a short guide RNA directs the Cas9 nuclease to a matching DNA sequence, where it makes a targeted double-strand cut so a gene can be knocked out or edited. This is modern genetic engineering at single-base precision

Self-check: biotechnology toolkit ○ Got it ○ Shaky ○ Re-test

Can you explain how restriction enzymes, DNA ligase and gel electrophoresis work together to make and check recombinant DNA? Separately, what role does the guide RNA play in CRISPR-Cas9?

Review your due cards and practice

- [ ] Review today's due flashcards. The spaced-repetition system brings back the cards you are starting to forget, and the ones you struggled with keep coming back until you know them
- [ ] Redo your due practice questions across these focus areas. Anything you miss today is scheduled to come back sooner
- [ ] Optional: redo the 2-3 questions that beat you last time, slowly, explaining each step out loud (10 min)

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2023	32	Biology	☐	☐
2023	18	Biology	☐	☐
2023	21	Biology	☐	☐
2022	35	Biology	☐	☐
2021	29	Biology	☐	☐
2021	35	Biology	☐	☐
2021	37	Biology	☐	☐
2021	46	Chemistry	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

Weekly review

Week 6 · Days 36–40

REVIEW DATE _____



Leo's tip
Set aside a fixed hour each weekend to tidy your flashcards and log what still feels shaky.



WEEK 6 DONE
Color it in

How the days went

DAY 36	DAY 37	DAY 38	DAY 39	DAY 40
DNA Technology: Cloning, PCR and Genetic Engineering	Gene Expression: From Gene to Protein, and Controlling It	Biology Review Block	Biology Recall: High-Yield Structures	Biology Recall Practice
○ Done ○ Partly ○ Moved to Day	○ Done ○ Partly ○ Moved to Day	○ Done ○ Partly ○ Moved to Day	○ Done ○ Partly ○ Moved to Day	○ Done ○ Partly ○ Moved to Day

Checkpoints ticked _____ / **83** Self-checks marked Got it _____ / **46** Physics / math blocks _____

Weak-spot tracker

Every Shaky or Re-test from this week, one row each.

TOPIC	DAY	WHY	RE-TEST ON	FIXED
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐

Score log

Real IMAT questions this week: tried _____ / **37**

right _____

DATE	PAPER / SECTION	RIGHT	WRONG	BLANK	SCORE
__ / __					
__ / __					
__ / __					
__ / __					
__ / __					

Score = 1.5 × right − 0.4 × wrong · blank = 0 · IMAT 2026 rule

Next week

Week 7 · Days 41–47

41	Stoichiometric Relationships: Chemistry's Bookkeeping
42	Atomic Structure and How Electrons Are Arranged
43	Periodicity: The Periodic Table and Its Trends
44	Chemical Bonding and Structure: Ionic, Covalent and Metallic Bonds, and Molecular Shapes
45	Energetics and Thermochemistry: Why Reactions Release or Absorb Heat
46	Rest and Recharge
47	Rest Day

from _____ to _____

My goal for next week

What I move into next week



Biology: done

Next: chemistry, Days 41–57.

W1 W2 W3 W4 W5 W6 W7 W8 Final

Biology weak spots I keep re-testing

Copy them from your weekly reviews, Weeks 1–6.

TOPIC	DAY	RE-TEST 1	RE-TEST 2	FIXED
		__ / __	__ / __	☐
		__ / __	__ / __	☐
		__ / __	__ / __	☐
		__ / __	__ / __	☐
		__ / __	__ / __	☐
		__ / __	__ / __	☐
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		__ / __	__ / __	☐
		__ / __	__ / __	☐
		__ / __	__ / __	☐
		__ / __	__ / __	☐
		__ / __	__ / __	☐

Chemistry, day by day

Days 41–57

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DAY

41

of 58

About 8 h

CHEMISTRY

Stoichiometric Relationships: Chemistry's Bookkeeping

Your first chemistry day covers the basics the whole subject is built on. Learn what matter is made of, then meet the mole, the chemist's 'dozen'. It links the number of particles you can't see to the mass you can weigh, so you can balance equations and calculate exactly how much reacts.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 1

- [ ] Read Ch 1: Stoichiometric relationships (states of matter, elements/compounds/mixtures, the mole, molar mass, empirical and molecular formulas, balancing equations, reacting masses, limiting reagent, yield, concentration and molar gas volume) — pp. 3-57

ⓘ Lean on the summary diagram (Figure 1.7, p. 21): particles ⇄ moles ⇄ mass. Almost every IMAT stoichiometry question is a trip around that triangle using $n = N/N_a$ and $n = m/M$. If you can move around it easily in both directions, you understand the chapter.

What matter is made of (and how it changes)

- [ ] An element is a pure substance made of only one type of atom (e.g. carbon, C). A compound is two or more elements chemically bonded in a fixed ratio (e.g. H_2O), with properties totally different from its elements. A mixture is substances physically combined (not bonded) that keep their own properties, and it is either homogeneous (uniform, e.g. air) or heterogeneous (non-uniform, e.g. oil and water) — pp. 4-9
- [ ] The three states of matter (kinetic theory): solid = particles close-packed, strong forces, fixed shape and volume; liquid = particles touching but mobile, fixed volume but no fixed shape; gas = particles far apart, negligible forces, no fixed shape or volume. Heating raises the particles' average kinetic energy (∝ temperature in kelvin) — pp. 9-10
- [ ] Changes of state are physical changes (no new substance, reversible): melting/freezing (solid⇄liquid), vaporizing/condensing (liquid⇄gas), and sublimation/deposition (solid⇄gas directly, e.g. CO_2). On a heating curve the temperature plateaus at the melting and boiling points: the energy goes into breaking inter-particle forces, not into raising the temperature — pp. 11-13
- [ ] A chemical change makes a new substance and is shown by a chemical equation: reactants → products. State symbols (s), (l), (g), (aq) show the physical state of each species, e.g. $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$ — pp. 6-10

Self-check: matter and change ◯ Got it ◯ Shaky ◯ Re-test

Can you sort element vs compound vs mixture (and homogeneous vs heterogeneous), describe the particle picture of solid/liquid/gas, and explain why a heating curve goes flat at the melting and boiling points even though you keep adding heat?

The mole: chemistry's counting unit

- [ ] Atoms are far too small and too numerous to count, so chemists count in moles. A mole is a fixed number (like 'a dozen' = 12): the amount of substance, symbol n, unit mol — pp. 15-16
- [ ] Avogadro's number is the number of particles in one mole: $N_a \approx 6.02 \times 10^{23}$. So the number of particles $N = n \times N_a$ (and $n = N \div N_a$). This converts between 'amount in moles' and the actual count of atoms, molecules or ions — pp. 16-17
- [ ] Relative atomic mass (A_r) is the weighted-average mass of an element's atoms relative to 1/12 of a carbon-12 atom (so it has no units), e.g. H = 1.01, C = 12.01, O = 16.00, Cl = 35.45. Adding the A_r of every atom in a formula gives the relative formula mass (M_r) — pp. 17-18
- [ ] Molar mass (M) is the mass of one mole of a substance = its A_r or M_r expressed in grams, units g mol^{-1} (e.g. $M(H_2O)$ = 18.02 g mol^{-1}). This is the key bridge: moles ⇄ mass via $n = m / M$ (and $m = n \times M$) — pp. 19-21

Self-check: the mole triangle ◯ Got it ◯ Shaky ◯ Re-test

Without notes, can you go both ways around the particles ⇄ moles ⇄ mass triangle? Try it: how many moles are in 9.0 g of water (M = 18), and how many molecules is that? (Use $n = m/M$, then $N = n \times N_a$.)

Formulas from data: empirical vs molecular

- [ ] The empirical formula is the simplest whole-number ratio of atoms in a compound (e.g. burning Mg gives MgO). You find it from experimental masses: divide each element's mass by its molar mass to get moles, then divide by the smallest to get the ratio pp. 21-23
- [ ] The molecular formula shows the actual number of atoms in a molecule and is a whole-number multiple of the empirical formula. Find the multiplier x from x × (empirical formula mass) = molar mass. For example, empirical CH_2O (30 g mol^{-1}) with M = 180 gives x = 6, so glucose is $C_6H_{12}O_6$ pp. 25-26
- [ ] Composition data often comes as percentage by mass. Treat the percentages as the mass (in grams) in a 100 g sample, then run the same moles-and-ratio steps to get the empirical formula. (Ionic compounds like MgO are always written as empirical formulas.) pp. 24-25

Self-check: empirical and molecular formulas ○ Got it ○ Shaky ○ Re-test

Can you explain the difference between empirical and molecular formula, and outline the steps to get an empirical formula from percentage-by-mass data (what do you divide by, and why divide by the smallest)?

Reacting amounts: balancing, limiting reagent and yield

- [ ] Balancing an equation: atoms are neither created nor destroyed, so each element must have the same number of atoms on both sides. Adjust the big numbers in front (stoichiometric coefficients) only; never change a subscript inside a formula. Coefficient 1 is not written pp. 6-7
- [ ] The coefficients give the mole ratio in which substances react (e.g. in $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$, 1 mol CH_4 needs 2 mol O_2). Reacting-mass method: convert the known mass to moles (n = m/M), apply the mole ratio, then convert back to mass. This is stoichiometry pp. 28-29
- [ ] When reactants aren't in the exact ratio, the limiting reagent is the one that runs out first. It determines how much product forms; the others are 'in excess'. To find it, convert each reactant to moles and compare against the equation's ratio (never compare grams directly) pp. 30-31
- [ ] Theoretical yield = the maximum product if 100% of the limiting reagent converted. The real (experimental/actual) yield is usually less, so percentage yield = (actual yield ÷ theoretical yield) × 100%. A value over 100% means an error (e.g. impure or wet product), not a great reaction pp. 31-32

Self-check: reacting amounts ○ Got it ○ Shaky ○ Re-test

Can you balance C_xH_y combustion by inspection, explain why you must convert grams to moles before deciding the limiting reagent, and write the percentage-yield formula from memory, including why a result above 100% flags a mistake?

Amounts in solutions and gases

- [ ] Concentration (molarity) of a solution = moles of solute ÷ volume of solution, c = n / V, units mol dm^{-3} (so n = c × V). Watch the units: 1 dm^3 = 1000 cm^3, so divide a cm^3 volume by 1000 first. A solution of known concentration is a 'standard solution' pp. 46-47
- [ ] Diluting a solution adds solvent but keeps the moles of solute constant, so concentration falls: $c_1V_1 = c_2V_2$ (any matching volume units cancel). This is the quick way to work out how much stock solution to dilute to a target concentration pp. 48-49
- [ ] Avogadro's law: equal volumes of any gases at the same temperature and pressure contain equal numbers of particles, so for gases volume is proportional to moles ($V \propto n$). That means gas-reaction volumes are in the same ratio as the equation's coefficients pp. 33-34
- [ ] Because of Avogadro's law, one mole of any gas occupies the same molar volume at fixed conditions: ≈ 22.7 dm^3 mol^{-1} at STP (0 °C / 273 K and 100 kPa) in this book (you'll often see ≈ 22.4 dm^3 at the older 1 atm STP). So moles of gas n = volume ÷ molar volume pp. 34-35

Self-check: solutions and gases ○ Got it ○ Shaky ○ Re-test

Can you calculate moles from a concentration and a volume in cm^3 (remembering the ÷1000), use $c_1V_1 = c_2V_2$ for a dilution, and find moles of a gas at STP from its volume using the molar volume? Why does the gas type not matter for the volume?

Notes

Recall and practice

- [ ] Review today's flashcard set (the mole, molar mass, formulas, limiting reagent, yield, molarity and molar volume)
- [ ] Answer today's practice questions (mole conversions, balancing, reacting masses, limiting reagent, % yield, molarity and gas volume)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2021	52	Chemistry	☐	☐
2011	63	Chemistry	☐	☐
2020	52	Chemistry	☐	☐
2019	44	Chemistry	☐	☐
2017	45	Chemistry	☐	☐
2017	46	Chemistry	☐	☐
2015	41	Chemistry	☐	☐
2015	42	Chemistry	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

42

of 58

About 8 h

CHEMISTRY

Atomic Structure and How Electrons Are Arranged

Look inside the atom: the three sub-atomic particles, what atomic number and mass number count, and why the periodic table's masses are decimals (isotopes). Then see how electrons fill shells and sub-shells, the arrangement that decides how every element bonds.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 2

- [ ] Read Ch 2: Atomic structure (sub-atomic particles, atomic and mass number, isotopes, ions, electron configuration; skim the HL ionization-energy math in 12.1) — pp. 58-97

ⓘ Work through the chlorine isotope calculation on p. 64 (77.5 × ^{35}Cl + 22.5 × ^{37}Cl → 35.45) and copy the electron-configuration table on p. 81 for the first 20 elements. Those two are the highest-yield things on these pages. Treat 12.1 (pp. 85-97) lightly: get the idea of ionization energy from the first-ionization-energy graph (Fig 2.28) and the aluminum successive-ionization-energy graph (Fig 2.25), and skip the Lyman-series convergence math.

Inside the atom: the three particles

- [ ] An atom is a tiny, dense nucleus (protons and neutrons, called nucleons) surrounded by a cloud of electrons. The nuclear radius is ~10^{-15} m and the atomic radius ~10^{-10} m, so the atom is almost entirely empty space (Rutherford's gold-foil experiment, Fig 2.3) — pp. 60-62
- [ ] Relative mass and charge to memorize (Table p. 61): proton mass 1, charge +1; neutron mass 1, charge 0; electron mass ~0.0005 (negligible), charge −1. Protons and neutrons carry essentially all the mass; the electron's mass is ignored in mass calculations — p. 61
- [ ] Atomic number (Z) = number of protons. It defines the element (like a fingerprint) and never changes in a chemical reaction. In a neutral atom, protons = electrons, so Z also gives the electron count — p. 62
- [ ] Mass number (A) = protons + neutrons (total nucleons). The notation is ^{A}ZX (mass number top-left, atomic number bottom-left). So neutrons = A − Z. Example: $^{27}_{13}$Al has 13 p, 13 e, and 27 − 13 = 14 n — pp. 62-63

Self-check: particle counting ◯ Got it ◯ Shaky ◯ Re-test

Given $^{40}_{20}$Ca, can you state the number of protons, neutrons and electrons? And for the species with 19 protons, 20 neutrons and 18 electrons, can you name the element and its charge (answer: $^{39}K^{+}$)?

Isotopes and relative atomic mass

- [ ] Isotopes are atoms of the same element (same Z, same number of protons) with different numbers of neutrons → different mass numbers. They sit in the same place on the periodic table and have the same chemical properties (chemistry depends on electrons, not neutrons) — pp. 63-64
- [ ] Relative atomic mass (A_r) is the abundance-weighted average mass of an element's atoms (relative to ^{12}C = 12). That's why the periodic-table value is a decimal, not a whole number. For example, chlorine is 35.45 because it is a mix of ^{35}Cl and ^{37}Cl — pp. 66-67
- [ ] How to calculate A_r from abundances: take a sample of 100 atoms, multiply each isotope's mass by its % abundance, add them, and divide by 100. Chlorine (p. 64): (77.5 × 35 + 22.5 × 37) ÷ 100 = 3545 ÷ 100 = 35.45. A mass spectrum (Fig 2.6) gives you exactly this abundance data — pp. 64-67

Self-check: isotope math ◯ Got it ◯ Shaky ◯ Re-test

A mass spectrum shows an element is 60% mass-69 and 40% mass-71. Can you compute its relative atomic mass (answer 69.8)? And can you explain in one sentence why two isotopes of chlorine react identically?

How ions form

- [ ] Ions form when an atom gains or loses electrons (never protons, since protons fix the element). Lose electrons → fewer negatives → positive ion = cation (e.g. Na^{+}, Al^{3+}). Gain electrons → negative ion = anion (e.g. Cl^{-}, O^{2-}). Atomic and mass numbers are unchanged — pp. 64-65

How ions form continued

- [ ] Charge = protons − electrons. Worked example (p. 65): $^{40}Ca^{2+}$ has 20 p and 20 − 2 = 18 e. $^{16}O^{2-}$ has 8 p and 8 + 2 = 10 e. To count the electrons in an ion, start from Z, then subtract the + charge or add the − charge pp. 64-66

Self-check: ions ◯ Got it ◯ Shaky ◯ Re-test

Why does a cation end up smaller than its parent atom while an anion ends up larger? (Hint: a cation often loses a whole outer shell and the remaining electrons feel a stronger pull; an anion gains electrons so repulsion spreads the cloud out.)

Electron shells, sub-shells and configuration

- [ ] Electrons occupy shells (main energy levels) numbered n = 1, 2, 3... Each shell holds a maximum of $2n^2$ electrons: shell 1 → 2, shell 2 → 8, shell 3 → 18. The simple arrangement of the first 20 elements fills 2, then 8, then 8 (e.g. calcium = 2,8,8,2) p. 79
- [ ] Each shell is split into sub-shells labeled s, p, d, f. Capacities: s holds 2, p holds 6, d holds 10, f holds 14. An orbital is a region holding at most 2 electrons (Pauli: a full orbital has 2 electrons of opposite spin). s has 1 orbital, p has 3, d has 5 pp. 76-79
- [ ] Build configurations with the Aufbau principle (fill lowest energy first), writing electrons as superscripts. First five elements: H $1s^1$, He $1s^2$, Li $1s^2 2s^1$, Be $1s^2 2s^2$, B $1s^2 2s^2 2p^1$ (Fig 2.17). Hund's rule: within a sub-shell, electrons occupy separate orbitals singly (parallel spins) before pairing up pp. 79-81
- [ ] One surprise in the order: 4s fills before 3d (it is lower in energy for K and Ca). So potassium is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ and calcium ends $...4s^2$. The outer-shell electrons are the valence electrons. They drive bonding and follow the repeating periodic pattern pp. 81-82

Self-check: configuration ◯ Got it ◯ Shaky ◯ Re-test

Can you write the full electron configuration of the first 20 elements (H → Ca) from memory, remembering that 4s fills before 3d? Sanity check: potassium should come out as $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$.

First ionization energy (the qualitative idea)

- [ ] First ionization energy = the energy needed to remove one mole of electrons from one mole of gaseous atoms in their ground state: $X(g) \rightarrow X^+(g) + e^-$. It measures how tightly the outermost electron is held: a bigger pull from the nucleus means a higher ionization energy pp. 85-88
- [ ] Successive ionization energies rise, then jump each time a shell closer to the nucleus starts to empty. For aluminum (electron arrangement 2,8,3) the big jumps fall after the 3rd and 11th electrons, tracing the 3 → 8 → 2 shell pattern (Al graph, Fig 2.25). Each jump marks an electron pulled from a shell nearer the nucleus, which is direct evidence that electrons sit in distinct energy levels pp. 88-90

Self-check: ionization energy ◯ Got it ◯ Shaky ◯ Re-test

In words, why does it take more energy to remove the second electron than the first, and why is there a huge jump once you start removing electrons from a full inner shell? (No numbers needed, only the shell idea.)

Notes

Recall and practice

- [ ] Review today's flashcard set (sub-atomic particles, isotopes, shells and blocks, ion size)
- [ ] Answer today's practice questions (mass number, ions, electron shells and the octet rule)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2022	37	Chemistry	☐	☐
2017	52	Chemistry	☐	☐
2021	42	Chemistry	☐	☐
2017	42	Chemistry	☐	☐
2016	44	Chemistry	☐	☐
2011	59	Chemistry	☐	☐
2021	41	Chemistry	☐	☐
2019	40	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min — About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

43

of 58

About 8 h

CHEMISTRY

Periodicity: The Periodic Table and Its Trends

Yesterday's electron configurations now pay off: the periodic table is electron arrangement turned into a map. Learn how it is organized (periods, groups, s/p/d blocks, metals vs nonmetals) and the trends that run across and down it: atomic radius, ionization energy, electronegativity and reactivity. All of them are driven by one tug-of-war between nuclear pull and shielding.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 3

- [ ] Read Ch 3: Periodicity (3.1 the periodic table: periods, groups, s/p/d/f blocks, metals and nonmetals; 3.2 periodic trends, plus Group 1 and Group 17 reactivity; skim the HL transition-metal detail in 13.1) — pp. 98-118

ⓘ Two tables do most of the work here: copy the Period 3 atomic-radius row on p. 104 (Na 186 → Cl 99 pm; chlorine is about half the size of sodium) and the ionic-radius row just below it, then study the Group 1 vs Group 17 melting-point and reactivity table on pp. 108/112-113. Treat the d-block (13.1, pp. 119+) lightly. You only need 'transition metals form colored ions and show variable oxidation states'; skip the complex-ion detail.

How the table is built: periods, groups and blocks

- [ ] Elements are arranged by increasing atomic number (Z = proton count). Vertical columns are groups (numbered 1–18, IUPAC); horizontal rows are periods. The position is set by the highest-energy electron, so the table is really electron configuration drawn as a map — pp. 98-99
- [ ] Same group = same number of valence (outer) electrons → similar chemistry and similar ion charges (Group 1 → 1 outer e^- → +1; Group 17 → 7 outer e^- → −1). The period number tells you how many occupied principal energy levels (shells) the atom has — pp. 98-99
- [ ] The table splits into four blocks named after the sub-shell the outer electrons fill: s block (Groups 1–2 and He), p block (Groups 13–18), d block (the central transition metals), f block (the detached lanthanides and actinides). So you can read an element's configuration straight off its position (Fig 3.1) — pp. 98-99
- [ ] Metals sit on the left and center (they lose electrons → cations); nonmetals are top-right (they gain/share electrons); metalloids (B, Si, Ge, As, Sb, Te) form a diagonal 'staircase' between them and behave in between (many are semiconductors) — p. 100

Self-check: reading the table ◯ Got it ◯ Shaky ◯ Re-test

Given an element's period and group, can you state how many valence electrons and how many occupied shells it has, name its block, and say whether it's a metal or nonmetal? Try it for phosphorus (Period 3, Group 15) and for potassium (Period 4, Group 1).

What drives every trend: nuclear pull vs shielding

- [ ] Effective nuclear charge (Z_{eff}) = the net pull the outer electrons actually feel. Inner electrons 'shield' (screen) the outer ones from the full nuclear charge, so $Z_{eff} \approx$ (protons) − (inner electrons). For sodium: 11 protons shielded by 10 inner electrons → $Z_{eff} \approx +1$ (Fig 3.2) — pp. 102-103
- [ ] Across a period Z_{eff} rises (one more proton each step, same inner shell), so the nucleus grips the outer electrons harder. Down a group Z_{eff} stays roughly constant (≈ the group number) because each added proton is offset by an added inner shell, but the outer electrons sit a whole shell further out. Almost every trend below comes down to this tug-of-war — pp. 102-103

Self-check: the 'why' ◯ Got it ◯ Shaky ◯ Re-test

Can you briefly explain why the effective nuclear charge felt by the outer electrons increases across a period but stays about the same down a group? (Hint: count protons added vs inner electrons added in each direction.)

Size trends: atomic radius and ionic radius

- [ ] Atomic radius (half the distance between neighboring nuclei, Fig 3.3) decreases across a period (rising Z_{eff} pulls electrons in) and increases down a group (each step adds a shell). The change across is big: in Period 3 a chlorine atom (99 pm) is about half the size of a sodium atom (186 pm) — pp. 103-104

Size trends: atomic radius and ionic radius continued

- [ ] Ionic radius: a cation is smaller than its parent atom (it loses the whole outer shell, e.g. Na^+ is 98 pm vs Na 186 pm), and an anion is larger (added electrons increase repulsion and spread the cloud out: Cl^- 181 pm vs Cl 99 pm). Positive ions are always smaller than negative ions across the same period p. 104

Self-check: radii ◯ Got it ◯ Shaky ◯ Re-test

For the isoelectronic set O^{2-}, F^-, Ne, Na^+, Mg^{2+} (all 10 electrons), can you rank them by size and say why they differ (answer: more protons → tighter pull → smaller, so Mg^{2+} is smallest and O^{2-} is largest)?

Energy trends: ionization energy and electronegativity

- [ ] First ionization energy (energy to pull the outermost electron off a gaseous atom, $X(g) \rightarrow X^+(g) + e^-$) increases across a period (higher Z_eff holds electrons tighter) and decreases down a group (the outer electron is further out and more shielded, so easier to remove). It is the mirror image of atomic radius (Fig 3.4) p. 105
- [ ] Electronegativity = an atom's pulling power for the shared electrons in a covalent bond (Pauling scale). It increases across a period and decreases down a group, for the same Z_eff reasons. Fluorine (top-right, 4.0) is the most electronegative element; cesium (bottom-left, 0.7) the least p. 107
- [ ] Metallic vs nonmetallic character follows from these: metals have low ionization energy and electronegativity (they give electrons up easily), so metallic character increases down a group and decreases across a period (left = most metallic, top-right = most nonmetallic) p. 107

Self-check: the trend table ◯ Got it ◯ Shaky ◯ Re-test

Can you fill in the whole grid from memory? Across a period (left→right): atomic radius ↓, ionization energy ↑, electronegativity ↑, metallic character ↓. Down a group: radius ↑, ionization energy ↓, electronegativity ↓, metallic character ↑. Why are 'across' and 'down' driven by different causes (Z_eff vs added shells)?

Two families to know: alkali metals and halogens

- [ ] Group 1 alkali metals (Li, Na, K…) have one outer electron and low ionization energy, so they are very reactive metals that form +1 ions. Reactivity increases down the group (the outer electron gets easier to lose). With water they give a hydroxide and hydrogen, e.g. $2Na + 2H_2O \rightarrow 2NaOH + H_2$, and the reaction gets more violent Li → Na → K pp. 111-112
- [ ] Group 17 halogens (F, Cl, Br, I) exist as diatomic molecules X_2, have seven outer electrons, and form −1 halide ions. Reactivity decreases down the group (bigger atom → weaker pull on the incoming electron), so fluorine is the most reactive nonmetal. Note the opposite trend to Group 1: the two families sit on opposite sides of the table p. 113
- [ ] Displacement proves the reactivity order: a more reactive halogen pushes a less reactive one out of its salt. Bubble chlorine through potassium bromide and the solution turns orange as bromine appears: $Cl_2 + 2Br^- \rightarrow 2Cl^- + Br_2$ (chlorine is smaller, so it grabs the electron harder). Iodide is displaced by both Cl_2 and Br_2 p. 114
- [ ] Group 18 noble gases are almost unreactive because their valence shell is already full (octet; He has 2). They have the highest ionization energies and don't easily gain or lose electrons. Over in the d block, transition metals form colored ions and show variable oxidation states (e.g. Fe^{2+}/Fe^{3+}). This is the main point at IMAT level; the detailed complex-ion chemistry is HL extra pp. 111-119

Self-check: families ◯ Got it ◯ Shaky ◯ Re-test

Why does reactivity increase down Group 1 but decrease down Group 17? And which single pair of elements gives the most vigorous reaction of all (hint: the most reactive metal meets the most reactive nonmetal, in opposite corners of the s and p blocks)?

Notes

Recall and practice

- [ ] Review today's flashcard set (groups and blocks, the families, and the across/down trends)
- [ ] Answer today's practice questions (periodic-table organization, periodic trends and reactivity)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2011	64	Chemistry	☐	☐
2021	41	Chemistry	☐	☐
2018	52	Chemistry	☐	☐
2021	45	Chemistry	☐	☐
2018	45	Chemistry	☐	☐
2017	50	Chemistry	☐	☐
2023	43	Chemistry	☐	☐
2022	50	Chemistry	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
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__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min — About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

44

of 58

About 8 h

CHEMISTRY

Chemical Bonding and Structure: Ionic, Covalent and Metallic Bonds, and Molecular Shapes

How atoms stick together. Learn the three main bond types (ionic, covalent, metallic), draw molecules with Lewis dots, then predict their 3D shapes with VSEPR (linear, bent, pyramidal, tetrahedral). Finish with the weak forces between molecules that decide melting points and solubility.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 4

- [ ] Read Ch 4: Chemical bonding and structure (ionic, covalent and metallic bonds, Lewis structures, VSEPR shapes, intermolecular forces; learn the basic VSEPR shapes in 14.1 but skip hybridization and σ/π) — pp. 140-184

ⓘ Copy the VSEPR summary table on p. 162 (CH_4, NH_3, H_2O → 109.5°, 107°, 105°). It is the single highest-yield thing in this chapter. Then study the bonding-continuum diagram on p. 154 (ionic → polar covalent → pure covalent) and Figure 4.16 (p. 176), the boiling-point graph that shows the hydrogen-bonding spikes for NH_3, H_2O and HF. Treat 14.1-14.2 (pp. 185+) lightly: learn the 2/3/4 electron-domain shapes and skip hybridization, sigma/pi and the 5/6-domain shapes.

Three ways atoms bond

- [ ] The octet rule drives bonding: atoms gain, lose or share electrons to reach a full outer shell of 8 (like a noble gas; H/He aim for 2). It's a guideline, not a law: there are exceptions (B and Be settle for fewer) — pp. 140-150
- [ ] Ionic bonding (metal + nonmetal): the metal loses electrons → cation (e.g. Na^+, Mg^{2+}), and the nonmetal gains them → anion (e.g. Cl^-, O^{2-}). The bond is the electrostatic attraction between the oppositely charged ions, locked into a giant 3D lattice — pp. 143-144
- [ ] Ionic compounds have high melting points (strong lattice forces, stronger when ions are smaller or more highly charged: MgO 2800 °C beats Na_2O 1132 °C), are brittle, and conduct electricity only when molten or dissolved (ions freed to move), not as a solid — pp. 145-146
- [ ] Covalent bonding (nonmetal + nonmetal): atoms share a pair of electrons; the bond is the attraction between that shared pair and both positive nuclei. A group of covalently bonded atoms is a molecule (H_2 forms at the lowest-energy separation, 75 pm, releasing 435 kJ/mol; Fig 4.6) — pp. 148-150
- [ ] Metallic bonding (metal + metal): a lattice of cations sitting in a shared 'sea' of delocalized electrons; the bond is the attraction between them. The mobile electrons explain why metals conduct electricity and heat, are malleable (ions slide, the bond stays intact) and are shiny — pp. 181-183

Self-check: the three bond types ○ Got it ○ Shaky ○ Re-test

For each pair, can you say which bond type forms and what holds it together? (a) Na + Cl, (b) two O atoms, (c) a block of copper. And can you explain why a block of copper conducts electricity but solid NaCl does not?

Drawing molecules: Lewis structures

- [ ] A Lewis (electron-dot) structure shows all valence electrons: bonding pairs (a shared pair = one bond line) plus the lone pairs that aren't bonding. Method: count total valence electrons, draw the skeleton, add a pair in each bond, then fill octets (CCl_4 = 32 electrons, p. 156) — pp. 155-157
- [ ] Atoms can share more than one pair: a double bond = 2 shared pairs (O=O), a triple bond = 3 shared pairs (N≡N). More shared electrons → a shorter and stronger bond (for C–C: single 154 pm/346 kJ, double 134 pm/614 kJ, triple 120 pm/839 kJ; p. 151) — pp. 150-151
- [ ] A coordinate (dative) bond is a covalent bond where both shared electrons come from one atom (shown with an arrow). Examples: H_3O^+, NH_4^+ (the lone pair on N accepts H^+). Once formed, it's identical to any other covalent bond — pp. 157-158
- [ ] Resonance: when a double bond could sit in more than one position, the real molecule is a blend (resonance hybrid) of all the structures, not flipping between them. Ozone O_3 has two equal bonds (127 pm, between single 148 and double 121); other examples: CO_3^{2-} and benzene (bond order 1.5) — pp. 164-167

Drawing molecules: Lewis structures continued

Self-check: Lewis and multiple bonds ◯ Got it ◯ Shaky ◯ Re-test

Can you draw the Lewis structures of CH_4, NH_3, H_2O and CO_2 from memory, showing every lone pair (counts: 8, 8, 8, 16 valence electrons)? Why are the two O–O bonds in ozone identical, even though one Lewis structure shows one single and one double bond?

Molecular shapes: VSEPR

- [ ] VSEPR (Valence Shell Electron Pair Repulsion): electron domains around the central atom all repel, so they spread out as far apart as possible. A domain = any region of electron density: a single, double or triple bond (each counts as one) or a lone pair — pp. 158-159
- [ ] Electron-domain geometry from the count: 2 domains → linear (180°, e.g. CO_2, $BeCl_2$); 3 → trigonal planar (120°, e.g. BF_3, HCHO, NO_3^-); 4 → tetrahedral (109.5°, e.g. CH_4, NH_4^+). This is the backbone of the whole topic: memorize it — pp. 160-161
- [ ] Lone pairs aren't 'seen' in the shape (only bonded atoms are), and they repel harder than bonding pairs (lone–lone > lone–bond > bond–bond), squeezing the angles. So 4 domains give: 0 lone pairs → tetrahedral, 1 → trigonal pyramidal (NH_3), 2 → bent (H_2O) — pp. 161-162
- [ ] The key comparison (p. 162 table): all three have tetrahedral electron geometry, but extra lone pairs shrink the angle. CH_4 109.5° (0 LP) → NH_3 ~107° (1 LP, pyramidal) → H_2O ~105° (2 LP, bent). Memorize this ladder — p. 162

Self-check: VSEPR shapes ◯ Got it ◯ Shaky ◯ Re-test

Steps: Lewis → count domains → electron geometry → remove lone pairs → molecular shape. Can you do it for CO_2, BF_3, CH_4, NH_3 and H_2O and give each shape and bond angle? And why is the H_2O angle smaller than the NH_3 angle even though both are 'tetrahedral-based'?

Bond and molecular polarity

- [ ] A bond is polar when the two atoms differ in electronegativity: the more electronegative atom pulls the shared pair, gaining a partial negative charge (δ−) and leaving δ+ on the other (a dipole). Same atoms (Cl_2, O_2) = pure (nonpolar) covalent; a very large difference (>1.8) tips into ionic — pp. 152-154
- [ ] A molecule with polar bonds can still be nonpolar if its shape is symmetric so that the bond dipoles cancel: CO_2 (linear), BF_3 (trigonal planar) and CCl_4 (tetrahedral) are all nonpolar. If the dipoles don't cancel, there is a net dipole → polar: H_2O (bent), NH_3 (pyramidal), CH_3Cl — p. 163

Self-check: polarity ◯ Got it ◯ Shaky ◯ Re-test

CO_2 and H_2O both contain polar bonds, yet only one is a polar molecule. Can you explain why, using shape (which dipoles cancel)? And can you state the two things you need to check to decide if any molecule is polar?

Forces between molecules (and giant structures)

- [ ] Intermolecular forces are the (weak) attractions between molecules, much weaker than the covalent bonds within them. When a molecular substance melts or boils, these are what break (boiling water gives H_2O vapor, not loose H and O atoms). Their strength sets melting/boiling point, volatility and solubility — p. 173
- [ ] London (dispersion) forces: momentary uneven electron clouds make instantaneous dipoles that induce dipoles in neighbors. They act between all molecules (the only force between nonpolar ones) and strengthen with more electrons/bigger size, e.g. halogen boiling points rise $F_2 < Cl_2 < Br_2 < I_2$ — pp. 174-175
- [ ] Dipole–dipole forces act between polar molecules (permanent δ+ and δ− charges attract, e.g. HCl) and are stronger than London forces for molecules of similar size. London and dipole–dipole forces together are called van der Waals forces — pp. 175-176
- [ ] Hydrogen bonding: the strongest intermolecular force, which occurs only when H is bonded directly to N, O or F. It's why H_2O, NH_3 and HF have anomalously high boiling points for their mass (Fig 4.16), why ice floats (open H-bonded lattice, less dense than water), and why DNA strands pair up — pp. 176-177
- [ ] 'Like dissolves like': polar or H-bonding solutes (HCl, glucose, ethanol) dissolve in polar water; nonpolar solutes (Br_2, grease, wax) dissolve in nonpolar solvents. Overall: ionic and giant covalent (diamond, SiO_2) substances melt very high; simple molecular substances melt low, and many are gases or liquids at room temperature — pp. 178-180

Self-check: intermolecular forces ◯ Got it ◯ Shaky ◯ Re-test

Can you name the three intermolecular forces from weakest to strongest, and say which molecules show each? Why does H_2O (mass 18) boil at 100 °C while CH_4 (mass 16) boils at −164 °C? Which force is responsible?

Recall and practice

- [ ] Review today's flashcard set (VSEPR shapes, electron vs molecular geometry, bond angles and lone-pair effects)
- [ ] Answer today's practice questions (electron domains, the common molecular shapes, polarity by symmetry)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2022	41	Chemistry	☐	☐
2020	44	Chemistry	☐	☐
2023	44	Chemistry	☐	☐
2022	48	Chemistry	☐	☐
2021	48	Chemistry	☐	☐
2020	45	Chemistry	☐	☐
2019	48	Chemistry	☐	☐
2016	46	Chemistry	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

45

of 58

About 8 h

CHEMISTRY

Energetics and Thermochemistry: Why Reactions Release or Absorb Heat

Every reaction either gives out heat or takes it in. Today you'll learn the sign rule for enthalpy change (ΔH), read energy-level diagrams, see Hess's law as nothing more than 'energy is conserved', and add up bond enthalpies to predict whether a reaction warms or cools its surroundings.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 5

- [ ] Read Ch 5: Energetics and thermochemistry (5.1 measuring energy changes, 5.2 Hess's law, 5.3 bond enthalpies; only skim the qualitative idea of entropy and skip the HL Born-Haber and Gibbs math in 15.1-15.2) pp. 211-235

ⓘ Keep the two energy-level diagrams in Figure 5.4 (p. 213) side by side: (a) exothermic, products lower, ΔH negative; (b) endothermic, products higher, ΔH positive. Then copy the bond-enthalpy table on p. 232 and follow the methane-combustion worked example on p. 234 (ΣE bonds broken − ΣE bonds formed = +2652 − 3460 = −808 kJ/mol). Treat 15.1-15.2 (pp. 237-271, Born-Haber and Gibbs) as 'go deeper' only: for the IMAT, all you need is the qualitative idea of entropy as disorder.

Energy, heat and enthalpy: the vocabulary

- [ ] Key terms: the system is the reaction you care about (the chemicals); the surroundings are everything else (the solution, beaker, air). Energy can move between them, but the total energy is conserved: any energy the system loses, the surroundings gain (Figure 5.1, p. 212) p. 212
- [ ] Heat and temperature are not the same. Heat is a form of energy that flows from hot to cold. Temperature measures the average kinetic energy of the particles. A swimming pool at 30 °C holds far more heat energy than a kettle at 100 °C, because it has many more particles (p. 215) p. 215
- [ ] Enthalpy (H) is the heat content of a substance: energy stored in its chemical bonds as potential energy. You can't measure H directly, but you can measure the enthalpy change, $\Delta H = H(\text{products}) - H(\text{reactants})$, at constant pressure. ΔH is quoted in kJ mol^{-1} (p. 212) pp. 212-213
- [ ] Heat change from a temperature change: $q = m \times c \times \Delta T$, where c is the specific heat capacity (heat to raise 1 g by 1 K). For water c = 4.18 J g^{-1} K^{-1} (given in the data booklet). This is how calorimetry turns a thermometer reading into an enthalpy value. See the ethanol worked example on p. 220 pp. 215-216

Self-check: heat vs temperature ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why a bath of warm water can hold more heat energy than a tiny drop of boiling water, even though the drop is hotter? And can you state, in words, what $q = m \times c \times \Delta T$ lets you calculate in a calorimetry experiment?

Exothermic vs endothermic and the sign of ΔH

- [ ] Exothermic reactions release heat to the surroundings (which warm up). The products end up with less stored energy than the reactants, so ΔH is negative (ΔH < 0). Most reactions, including all combustion and all neutralization, are exothermic (p. 213) p. 213
- [ ] Endothermic reactions absorb heat from the surroundings (which cool down). The products end up with more stored energy than the reactants, so ΔH is positive (ΔH > 0). Example: photosynthesis, ΔH = +2802.5 kJ mol^{-1}. The classic demo: mixing solids that freeze the beaker to the table (p. 213) pp. 213-214
- [ ] Read an energy-level (enthalpy) diagram (Figure 5.4, p. 213): the y-axis is enthalpy H, reactants on the left, products on the right. Exothermic → products drawn lower (arrow down, ΔH negative). Endothermic → products drawn higher (arrow up, ΔH positive). The vertical gap is the size of ΔH p. 213
- [ ] Because ΔH depends on conditions, values are quoted as the standard enthalpy change ΔH°: measured at 100 kPa pressure, 1 mol dm^{-3} for solutions, with every substance in its standard state (298 K is the usual temperature). A thermochemical equation pairs the equation with its ΔH°, e.g. $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$, ΔH° = −890 kJ mol^{-1} (p. 214) p. 214

Self-check: the sign of ΔH ◯ Got it ◯ Shaky ◯ Re-test

A beaker gets colder as a reaction proceeds. Is the reaction exothermic or endothermic, and is ΔH positive or negative? Now sketch its energy-level diagram from memory: which is higher, the reactants or the products?

Hess's law: energy is conserved

- [ ] Hess's law: the enthalpy change for a reaction is the same whatever route you take, as long as the start and end points are the same. In other words, the ΔH of an overall reaction = the sum of the ΔH of the steps it can be broken into (p. 225) pp. 225-226
- [ ] Why it works: Hess's law comes down to conservation of energy (the first law of thermodynamics). Go around a complete energy cycle back to the start and the total ΔH must be zero; otherwise you'd create or destroy energy (Figures 5.11-5.12, p. 225). One useful rule follows: reverse a reaction and you reverse the sign of its ΔH pp. 225-226
- [ ] The standard enthalpy change of formation (ΔH°f) is the enthalpy change when one mole of a substance forms from its elements in their standard states. ΔH°f of an element in its most stable form is zero. Hess's law shortcut: ΔH°reaction = Σ ΔH°f(products) − Σ ΔH°f(reactants) (pp. 228-229) pp. 228-229

Self-check: Hess's law ○ Got it ○ Shaky ○ Re-test

In one sentence, why is the enthalpy change the same no matter which route a reaction takes? And if A → B has ΔH = −120 kJ mol^{-1}, what is ΔH for B → A, and why does the sign flip?

Bond enthalpies: counting energy in bonds

- [ ] Breaking bonds is endothermic: it always needs energy (you pull apart atoms held by attraction). The bond enthalpy is the energy to break one mole of a bond in gaseous molecules, e.g. $Cl_2(g) \rightarrow 2Cl(g)$, ΔH = +242 kJ mol^{-1}. Bond-breaking ΔH values are always positive (p. 231) pp. 230-231
- [ ] Making bonds is exothermic: it always releases energy, and exactly as much as breaking that same bond absorbs, e.g. $H(g) + H(g) \rightarrow H_2(g)$, ΔH = −436 kJ mol^{-1}. Bond-making ΔH values are always negative (Figure 5.16, p. 232) p. 232
- [ ] Mean (average) bond enthalpies are tabulated because the same bond differs slightly between molecules, so an average is taken over similar compounds (data booklet table, p. 232). Note the trend: multiple bonds are stronger and shorter, e.g. C–C +347, C=C +614 kJ mol^{-1}; C=O +804 kJ mol^{-1} (p. 232) pp. 231-232
- [ ] Estimate a reaction's enthalpy from bonds: ΔH = Σ E(bonds broken) − Σ E(bonds formed). If the bonds formed are stronger than the bonds broken, more energy is released than used → exothermic (ΔH negative). Methane combustion works out as +2652 − 3460 = −808 kJ mol^{-1} (p. 234) pp. 233-234

Self-check: bond enthalpies ○ Got it ○ Shaky ○ Re-test

Which step costs energy and which releases it: breaking bonds or making bonds? Using ΔH = Σ(bonds broken) − Σ(bonds formed), can you explain in words why a reaction is exothermic when the bonds in the products are stronger than the bonds in the reactants?

A first look at entropy (qualitative only)

- [ ] Entropy (S) is a measure of disorder: how spread out the particles and their energy are. Gases (particles flying everywhere) have far higher entropy than liquids, which have more than solids. A change that creates more disorder, especially one that produces a gas, increases entropy (Essential ideas, p. 211; p. 218) p. 211
- [ ] The natural direction of change is toward lower stored energy and greater overall disorder. This is why a few endothermic reactions still happen: the big increase in entropy (e.g. releasing a gas) drives them, even though they absorb heat (p. 218). [The full Born-Haber cycles and Gibbs-energy math in 15.1-15.2, pp. 237-271, are HL 'go deeper' material, not needed for the IMAT.] p. 218

Self-check: entropy idea ○ Got it ○ Shaky ○ Re-test

Can you rank solid, liquid and gas from lowest to highest entropy? Then, in one sentence, can you explain why a reaction that releases a gas leads to a big increase in disorder, and why that can let an endothermic reaction happen anyway?

Notes

Recall and practice

Active recall: the whole chapter (no deck today) ◯ Got it ◯ Shaky ◯ Re-test

Without looking, can you run the full chain: (1) define exothermic vs endothermic and give the sign of ΔH for each; (2) say which way the products sit on an energy-level diagram in each case; (3) state Hess's law and why it is true; (4) write the bond formula ΔH = Σ(bonds broken) − Σ(bonds formed) and explain when a reaction comes out exothermic? There is no flashcard or practice deck for energetics, so this recall is today's quiz.

☐ Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2020	47	Chemistry	☐	☐
2023	40	Chemistry	☐	☐
2016	45	Chemistry	☐	☐
2015	43	Chemistry	☐	☐
2014	49	Chemistry	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
46
Rest day

Rest and Recharge

- [ ] Reset and recharge before the next block of chemistry.
- [ ] Light catch-up or reflection if you need it; otherwise switch off.



HOURS OF SLEEP

HOW I FEEL

1 2 3 4 5

WHAT I DID TODAY

DAY
47
Rest day

Rest Day

- [ ] Take care of your well-being.
- [ ] Optional: organize notes and plan for upcoming topics.

HOURS OF SLEEP

HOW I FEEL

1 2 3 4 5

WHAT I DID TODAY

Weekly review

Week 7 · Days 41–47

REVIEW DATE _____



Leo's tip

Set aside a fixed hour each weekend to tidy your flashcards and log what still feels shaky.



WEEK 7 DONE

Color it in

How the days went

DAY 41	DAY 42	DAY 43	DAY 44	DAY 45	DAY 46	DAY 47
Stoichiometric Relationships: Chemistry's Bookkeeping	Atomic Structure and How Electrons Are Arranged	Periodicity: The Periodic Table and Its Trends	Chemical Bonding and Structure: Ionic, Covalent and Metallic Bonds, and Molecular Shapes	Energetics and Thermochemistry: Why Reactions Release or Absorb Heat	Rest and Recharge	Rest Day
○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Rested	○ Rested

Checkpoints ticked _____ / **108** Self-checks marked Got it _____ / **26** Physics / math blocks _____

Weak-spot tracker

Every Shaky or Re-test from this week, one row each.

TOPIC	DAY	WHY	RE-TEST ON	FIXED
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐

Score log

Real IMAT questions this week: tried _____ / **36**

right _____

DATE	PAPER / SECTION	RIGHT	WRONG	BLANK	SCORE
__ / __					
__ / __					
__ / __					
__ / __					
__ / __					

Score = 1.5 × right − 0.4 × wrong · blank = 0 · IMAT 2026 rule

Next week

Week 8 · Days 48–54

48	Chemical Kinetics: How Fast Reactions Go (Collision Theory)
49	Chemical Equilibrium: Reversible Reactions and Le Chatelier's Principle
50	Acids and Bases: Proton Donors, the pH Scale, and Strong vs Weak
51	Redox Processes: Electron Transfer, Oxidation Numbers and the Reactivity Series
52	Organic Chemistry: Carbon Compounds, Families and Their Reactions
53	Rest Day
54	Rest and Plan

from _____ to _____

My goal for next week

What I move into next week

DAY

48

of 58

About 8 h

CHEMISTRY

Chemical Kinetics: How Fast Reactions Go (Collision Theory)

Why does a sparkler burn in seconds but iron rust over years? Today is about reaction rate (how fast a reaction goes). Collision theory explains all of it: particles must hit each other hard enough and the right way around. Then you'll see how temperature, concentration, surface area and a catalyst each change the speed.

DATE ____ / ____ / _____ M T W T F S S START ____ : ____ END ____ : ____

Day 1 — W1 W2 W3 W4 W5 W6 W7 W8 Final — 58

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 6

- [ ] Read Ch 6: Chemical kinetics, sub-topic 6.1 (rate of reaction, collision theory, activation energy, the Maxwell–Boltzmann curve, and the factors that change rate; skim the HL rate-law and Arrhenius math in 16.1-16.2) — pp. 271-285

ⓘ Focus on the two Maxwell–Boltzmann figures. Fig 6.16/6.17 (p. 282) shows why heating from 300 K to 310 K speeds things up: the curve shifts right, so a bigger shaded area lies past E_a. Fig 6.20 (p. 284) shows a catalyst doing the same job by moving E_a left instead. Pair those with the catalyst energy profile in Fig 6.19 (p. 284, lower peak, same ΔH). Treat 16.1-16.2 (pp. 286-310) as 'go deeper' only: skip the rate-law/order tables and the Arrhenius ($k = Ae^{(-E_a/RT)}$) math. For the IMAT you only need the qualitative idea of E_a and how a catalyst lowers it.

What 'rate' means: how fast, not how far

- [ ] Rate of reaction = how fast a reaction goes = the change in concentration of a reactant or product per unit time. Typical units: mol dm^{-3} s^{-1} (i.e. mol L^{-1} per second). Rate is the reciprocal of time: a faster reaction takes less time (the 'race winner' has the shortest time, p. 272) — pp. 272-273
- [ ] On a concentration-vs-time graph the rate is the slope: reactant curves fall and product curves rise (Figs 6.1 and 6.2, p. 272). The rate is fastest at the start (steepest slope) and slows as reactants get used up. A straight, flat curve means the reaction has finished — pp. 272-273
- [ ] You can follow a reaction by measuring anything that changes: mass (gas escaping), gas volume collected, color (colorimetry, p. 276), or by stopping samples and titrating. A 'clock reaction' times how long it takes to reach one visible end point (e.g. a cross disappearing under cloudy sulfur, p. 278) — pp. 276-278

Self-check: what rate is ◯ Got it ◯ Shaky ◯ Re-test

Can you define reaction rate in words and give its usual units, explain why a concentration-vs-time graph is steepest at the start, and name three different things you could measure to follow a reaction's progress?

Collision theory: energy and the right angle

- [ ] Collision theory: particles must collide to react, but not every collision works. A collision is only 'successful' if it has (1) enough energy and (2) the correct orientation/geometry (Fig 6.15, p. 281). Rate depends on the frequency of successful collisions — pp. 280-281
- [ ] Activation energy (E_a) = the minimum energy colliding particles must have to react (the 'energy barrier'). Think of it as a pass mark in an exam: only particles with kinetic energy above E_a have successful collisions. At the top of the barrier the particles form a short-lived, unstable transition state (p. 280) — p. 280
- [ ] An energy profile plots energy along the reaction path (Fig 6.13, p. 280): reactants → up over the E_a hump (transition state, marked *) → down to products. E_a controls the speed (kinetics); the start-to-end drop is ΔH and controls the heat (thermodynamics). They are different things, so 'exothermic' does not mean 'fast' — pp. 280-281

Self-check: collision theory ◯ Got it ◯ Shaky ◯ Re-test

Can you state the two conditions for a successful collision, define activation energy in your own words, and explain on an energy-profile sketch why a reaction can be very exothermic yet still extremely slow?

The Maxwell–Boltzmann curve: who has enough energy?

- [ ] In any sample, particles move randomly with a range of kinetic energies, not all the same. The average kinetic energy is directly proportional to the absolute temperature (in Kelvin): heat something up and its particles, on average, move faster (kinetic-molecular theory, p. 278-279) — pp. 278-279

The Maxwell–Boltzmann curve: who has enough energy? continued

- [ ] The Maxwell–Boltzmann distribution curve (Fig 6.11, p. 279) plots the number of particles against kinetic energy. The total area under the curve = the total number of particles. Mark E_a on the energy axis: only the shaded area to the right of E_a represents particles with enough energy to react (Fig 6.14, p. 280) pp. 279-280

Self-check: the energy distribution ◯ Got it ◯ Shaky ◯ Re-test

Can you sketch a Maxwell–Boltzmann curve, mark E_a on it, and shade the region representing particles that can react? And can you say what the total area under the whole curve represents?

The five factors that change the rate

- [ ] Temperature ↑ → rate ↑ (often roughly doubles per +10 °C). The curve shifts right (Figs 6.16/6.17, p. 282): a much bigger fraction of particles now exceed E_a. The main reason is the larger fraction of successful collisions, not just slightly more frequent collisions pp. 282-283
- [ ] Concentration ↑ → rate ↑ (Fig 6.18, p. 283): more particles packed into the same volume means they collide more often, so successful collisions happen more frequently. For gases, increasing pressure does the same thing: squeezing the gas raises its concentration (p. 283) p. 283
- [ ] Surface area ↑ → rate ↑ for solids: grinding a lump into powder exposes far more surface, so more particles can collide (p. 283). Marble chips in acid fizz gently, but marble powder reacts vigorously. This is also why fine flour or coal dust can cause dust explosions p. 283
- [ ] A catalyst speeds up a reaction without being used up, by providing an alternative pathway with lower activation energy (Fig 6.19, p. 284). On a Maxwell–Boltzmann curve this moves E_a to the left, so a bigger fraction of particles can now react (Fig 6.20). A catalyst does not change ΔH or the equilibrium yield, only the speed. Enzymes are biological catalysts (p. 285) pp. 284-285

Self-check: the factors ◯ Got it ◯ Shaky ◯ Re-test

For each of temperature, concentration, pressure, surface area and catalyst, can you say what happens to the rate and explain it with collision theory? Bonus: which factor changes E_a, and which ones do not?

Notes

Recall and practice

- [ ] Review today's flashcard set (rate, collision theory, activation energy and the five factors)
- [ ] Answer today's practice questions (rate basics, collision theory, Maxwell–Boltzmann and catalysts)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2014	47	Chemistry	☐	☐
2018	51	Chemistry	☐	☐
2016	45	Chemistry	☐	☐
2023	40	Chemistry	☐	☐
2017	26	Biology	☐	☐
2023	37	Chemistry	☐	☐
2022	22	Biology	☐	☐
2021	28	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
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__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

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of 58

About 8 h

CHEMISTRY

Chemical Equilibrium: Reversible Reactions and Le Chatelier's Principle

Some reactions never finish. They reach a balance point where forward and reverse run at the same speed and the amounts stop changing. Today you'll learn what 'dynamic equilibrium' means, what the equilibrium constant tells you about a reaction, and Le Chatelier's principle (the topic the IMAT asks about most): how to predict which way the balance shifts when you change concentration, pressure or temperature.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 7

- [ ] Read Ch 7: Equilibrium, sub-topic 7.1 (reversible reactions, dynamic equilibrium, the features of the equilibrium state, the equilibrium constant Kc qualitatively, and Le Chatelier's principle for concentration, pressure, temperature and catalyst; skim the HL Kc math in 17.1) pp. 311-329

ⓘ Focus on two things. First, the HI flask photo and the two graphs in Fig 7.3 (p. 313): note that starting from pure HI (a) or from H_2+I_2 (b) reaches the same equilibrium mixture. This shows that equilibrium is a balance point, not a finish line. Second, the Le Chatelier summary table on p. 325: in four rows it tells you what concentration, pressure, temperature and a catalyst each do to both the position of equilibrium and the value of Kc (only temperature changes Kc; a catalyst changes neither). The $N_2O_4 \rightleftharpoons 2NO_2$ color photo (p. 324, brown gets browner on heating) is the classic exam picture for the temperature effect. Treat 17.1 (pp. 330-345) as 'go deeper' only: you need the idea of Kc and what its size means, but skip the Kc/ICE-table calculations and the $\Delta G = -RT \ln K$ math.

Reversible reactions and dynamic equilibrium

- [ ] A reversible reaction can go both ways: reactants → products (forward) and products → reactants (backward/reverse). You write it with the ⇌ symbol instead of →. Example: $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$. Start with colorless HI in a sealed flask and the purple I_2 color builds up, then stops changing (p. 313) p. 313
- [ ] Dynamic equilibrium is reached when the rate of the forward reaction equals the rate of the backward reaction. 'Dynamic' means both reactions are still happening: the reaction has not stopped. Products form exactly as fast as they break down, so there is no net change (p. 313) pp. 313-314
- [ ] Because forward and reverse rates are equal, the concentrations of all reactants and products stay constant, and so do macroscopic properties like color. Constant does not mean equal: there is usually much more of one side than the other (Fig 7.3, p. 314). Equilibrium is only reached in a closed system (nothing can enter or leave) p. 314
- [ ] The same equilibrium mixture is reached from either direction: starting from pure HI, or from a mix of H_2 + I_2, gives the identical final composition (Fig 7.3a vs 7.3b, p. 313-314). The proportion of reactants to products is the equilibrium position: a mixture rich in products 'lies to the right', and one rich in reactants 'lies to the left' p. 314

Self-check: what equilibrium means ◯ Got it ◯ Shaky ◯ Re-test

Can you explain why 'dynamic equilibrium' does not mean the reaction has stopped, state the one condition that must be true about the forward and reverse rates, and explain why 'concentrations are constant' is not the same as 'concentrations are equal'?

The equilibrium constant Kc: how far does it go?

- [ ] The equilibrium constant Kc is a single number that captures the equilibrium position. For $aA + bB \rightleftharpoons cC + dD$ it's the equilibrium concentrations of products over reactants, each raised to its balancing coefficient: $K_c = [C]^c[D]^d / [A]^a[B]^b$ (products on top). It has a fixed value for a given reaction at a given temperature (pp. 316-317) pp. 316-317
- [ ] The size of Kc tells you how far the reaction goes. Large Kc (≫1) → mostly products, equilibrium lies to the right, reaction goes almost to completion. Small Kc (≪1) → mostly reactants, lies to the left, reaction barely happens. Kc ≈ 1 → a real mix of both (Fig 7.4, p. 317) p. 317
- [ ] Kc says nothing about speed. A reaction can have a huge Kc (very product-favored) but still be extremely slow. How far a reaction goes (equilibrium, thermodynamics) and how fast it gets there (rate, kinetics) are two completely separate ideas (p. 317) p. 317

Self-check: the equilibrium constant ◯ Got it ◯ Shaky ◯ Re-test

If reaction A has Kc = 10^{10} and reaction B has Kc = 10^{-8} at the same temperature, which one lies further to the products side? And does a big Kc tell you that reaction is fast? Why or why not?

Le Chatelier's principle: concentration and pressure

- [ ] Le Chatelier's principle: if a system at equilibrium is disturbed by a change, the equilibrium shifts in the direction that opposes (minimizes) that change. It's the main rule for predicting which way the balance moves, and it's the equilibrium topic the IMAT asks about most (p. 322) p. 322
- [ ] Concentration: add more of something and the system shifts away from it to use it up; remove something and the system shifts toward it to replace it. So adding a reactant (or removing a product) shifts right (more product); adding a product (or removing a reactant) shifts left. Kc is unchanged (p. 322, Fig 7.5) p. 322
- [ ] Pressure (gas reactions only): increasing pressure shifts the equilibrium to the side with fewer moles of gas (to reduce the pressure). For example, $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (4 gas molecules → 2) shifts right under high pressure. If both sides have the same number of gas molecules (e.g. $H_2 + I_2 \rightleftharpoons 2HI$), pressure has no effect. Kc is unchanged (p. 323) p. 323

Self-check: concentration and pressure ◯ Got it ◯ Shaky ◯ Re-test

For $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$: which way does the equilibrium shift if you (a) add more N_2, (b) remove NH_3 as it forms, (c) increase the pressure? And why would increasing the pressure do nothing to $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$?

Le Chatelier's principle: temperature and catalysts

- [ ] Temperature: treat heat as a reactant (endothermic) or a product (exothermic). Raising the temperature shifts equilibrium in the endothermic direction; lowering it favors the exothermic direction. Classic picture: $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ ($\Delta H = +57$ kJ, forward endothermic). Heating makes it browner (more NO_2); cooling makes it paler (Fig p. 324) pp. 323-324
- [ ] Temperature is the only change that alters the value of Kc. Concentration and pressure changes shift the position but leave Kc fixed; only temperature gives a new Kc (e.g. for the exothermic N_2O_4 formation, Kc falls from 1300 at 273 K to 170 at 298 K). For an exothermic forward reaction, heating decreases Kc; for an endothermic one, heating increases Kc (pp. 324-325) pp. 324-325
- [ ] A catalyst has no effect on the position of equilibrium or on Kc. It lowers the activation energy by the same amount for both the forward and backward reactions, so it speeds them up equally: the system reaches the same equilibrium, only faster (Fig 7.6, p. 325). This is the catalyst trap the IMAT sets most often p. 325
- [ ] Putting it together (the Haber process, $N_2 + 3H_2 \rightleftharpoons 2NH_3$, exothermic): for a high yield you want high pressure (fewer gas molecules on the right) and low temperature (favors the exothermic forward reaction). But low temperature is too slow, so industry compromises with a moderate temperature (~450 °C) and an iron catalyst to regain the rate (pp. 327-328) pp. 327-328

Self-check: temperature and catalysts ◯ Got it ◯ Shaky ◯ Re-test

For an exothermic forward reaction, which way does heating shift the equilibrium, and what happens to Kc? And can you explain why adding a catalyst does not increase the yield of product but changes only how fast equilibrium is reached?

Notes

Recall and practice

- [ ] Review today's flashcard set (dynamic equilibrium, the size of K, and Le Chatelier for concentration, pressure, temperature and catalyst)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2023	40	Chemistry	☐	☐
2019	43	Chemistry	☐	☐
2018	51	Chemistry	☐	☐
2020	47	Chemistry	☐	☐
2016	45	Chemistry	☐	☐
2022	43	Chemistry	☐	☐
2015	43	Chemistry	☐	☐
2018	50	Chemistry	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
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__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min — About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
50
of 58

About 8 h

CHEMISTRY

Acids and Bases: Proton Donors, the pH Scale, and Strong vs Weak

What makes something an acid or a base? Today you'll meet the modern proton-transfer (Brønsted-Lowry) picture, spot conjugate acid-base pairs, read the pH scale, and learn the single most-tested trap on this topic: strong vs weak is not the same as concentrated vs dilute.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 W1 W2 W3 W4 W5 W6 W7 W8 Final 58

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 8

- [ ] Read Ch 8: Acids and bases (Brønsted-Lowry theory, conjugate pairs, properties and neutralization, the pH scale, strong vs weak, acid rain) — pp. 346-405

ⓘ Lean on Figure 8.5 (p. 356): the vertical pH scale lining up $[H^+]$ from 1.0 to 10^{-14} against pH 0-14, with real substances (stomach acid, blood, oven cleaner). It makes 'low pH = high $[H^+]$' clear at a glance. Then study the two-pair worked example on p. 349 (CH_3COOH/CH_3COO^- and H_2O/H_3O^+). Labeling conjugate pairs is exactly how the IMAT tests this. Skip the 18.x HL math (buffers, pKa, titration curves) for now.

What is an acid? The proton-transfer picture

- [ ] The modern definition (Brønsted-Lowry): an acid is a proton (H^+) donor and a base is a proton (H^+) acceptor. Since a hydrogen atom is only one proton and one electron, losing the electron leaves a bare proton, so 'H^+' and 'proton' mean the same thing here — p. 347
- [ ] An older, narrower idea (Arrhenius): an acid releases H^+ in water and a base releases OH^-. It works for many cases but fails for bases with no OH^- (e.g. ammonia, NH_3), which is why the proton-transfer definition is broader and preferred — p. 347
- [ ] In water a free proton never floats alone: it attaches to a water molecule to form the hydronium ion, H_3O^+ ($H^+(aq) + H_2O \rightarrow H_3O^+$). You'll see '$H^+(aq)$' and '$H_3O^+(aq)$' used interchangeably for the acidic species in solution — p. 348

Self-check: defining acids and bases ◯ Got it ◯ Shaky ◯ Re-test

In the reaction $HCl + NH_3 \rightarrow NH_4^+ + Cl^-$, which species donates a proton and which accepts it? So which is the Brønsted-Lowry acid and which is the base? Why can NH_3 be a base even though it has no OH^-?

Conjugate pairs and amphiprotic species

- [ ] When an acid donates its proton it becomes a base (its conjugate base); when a base accepts a proton it becomes an acid (its conjugate acid). A conjugate acid-base pair differs by exactly one proton (H^+), e.g. CH_3COOH / CH_3COO^- and H_2O / H_3O^+ — pp. 348-349
- [ ] To build the pair: remove one H^+ from an acid to get its conjugate base; add one H^+ to a base to get its conjugate acid (adjust the charge by 1 each time). So the conjugate base of H_2CO_3 is HCO_3^-, and the conjugate acid of NO_2^- is HNO_2 — p. 349
- [ ] Some species can act as both an acid and a base, depending on what they react with. These are called amphiprotic. Water is the classic example (a base toward CH_3COOH, an acid toward NH_3); HCO_3^- also qualifies, needing both a lone pair and a donatable H^+ — pp. 349-350

Self-check: conjugate pairs ◯ Got it ◯ Shaky ◯ Re-test

Write the conjugate base of each: H_3O^+, NH_3, H_2CO_3. Now write the conjugate acid of each: OH^-, CO_3^{2-}. What single rule (add/remove H^+, adjust charge) gets you every answer?

How acids behave: reactions and neutralization

- [ ] The three classic reactions of acids: (1) acid + reactive metal → salt + hydrogen gas; (2) acid + base → salt + water; (3) acid + carbonate → salt + water + carbon dioxide. Reactions (1) and (3) fizz (effervescence) because a gas is released — pp. 351-353
- [ ] Neutralization is acid + base → salt + water. The net ionic reaction common to all of them is $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$, and it is exothermic (releases heat). A salt is the ionic compound left when the acid's H^+ is replaced by a metal (or other positive) ion — p. 352
- [ ] Indicators are dyes that change color reversibly with the H^+ concentration, letting you detect pH. Know three: litmus (red in acid → blue in alkali), methyl orange (red → yellow), phenolphthalein (colorless → pink in alkali) — pp. 353-354

How acids behave: reactions and neutralization continued

Self-check: acid reactions ◯ Got it ◯ Shaky ◯ Re-test

Predict the products: (a) HCl + Mg, (b) H_2SO_4 + NaOH, (c) HCl + $CaCO_3$. Which two fizz, and what gas comes off each? What single net ionic equation describes every acid + base neutralization?

The pH scale and the strong-vs-weak trap

- ☐ pH measures how acidic a solution is: pH = $-\log_{10}[H^+]$. The usual scale runs 0-14. Below 7 is acidic, 7 is neutral, above 7 is alkaline (basic). Lower pH means higher $[H^+]$: a solution with $[H^+] = 10^{-2}$ has pH 2; one with $[H^+] = 10^{-11}$ has pH 11 — pp. 355-357
- ☐ It's a logarithmic scale, so each 1 pH unit = a 10-fold change in $[H^+]$. Going from pH 5 to pH 3 means $[H^+]$ rises 100× (10^2). In water $[H^+]$ and $[OH^-]$ are inversely linked: $[H^+][OH^-] = Kw = 10^{-14}$ at 25 °C, so pure water has $[H^+] = 10^{-7}$ → pH 7 — pp. 357-359
- ☐ Strong vs weak is about the extent of ionization: a strong acid/base ionizes almost completely in water (HCl, HNO_3, H_2SO_4; NaOH, KOH), while a weak one ionizes only partially and sits at equilibrium (CH_3COOH and most organic acids; NH_3). A strong acid has a weak conjugate base, and vice versa — pp. 360-362
- ☐ The classic IMAT trap: strong/weak (extent of ionization) is not the same as concentrated/dilute (moles of solute per volume). A weak acid can be concentrated and a strong acid can be dilute; these are two independent ideas. Tell them apart by conductivity, reaction rate, or pH at equal concentration — pp. 361-362

Self-check: pH and strength ◯ Got it ◯ Shaky ◯ Re-test

A solution has $[H^+] = 1 \times 10^{-4}$ mol dm^{-3}. What is its pH, and is it acidic or basic? Then: why does 0.1 M HCl have a lower pH than 0.1 M CH_3COOH even though the concentrations are identical? Explain using 'extent of ionization'.

Acid deposition (acid rain): the environmental angle

- ☐ Normal rain is already slightly acidic (pH ≈ 5.6) because dissolved CO_2 forms weak carbonic acid, H_2CO_3. Acid rain means rain with pH below 5.6, caused by extra acids from the oxides of sulfur and nitrogen (the primary pollutants) — pp. 393-394
- ☐ Where the acids come from: SO_2 (mainly from burning coal) dissolves/oxidizes to sulfurous (H_2SO_3) and sulfuric (H_2SO_4) acid; nitrogen oxides NOx (mainly from vehicle engines) form nitrous (HNO_2) and nitric (HNO_3) acid. Effects: eroding limestone/marble buildings, leaching nutrients from soil, and killing fish in acidified lakes — pp. 394-397

Self-check: acid rain ◯ Got it ◯ Shaky ◯ Re-test

Why is even clean rain naturally acidic (which gas, which acid)? Name the two pollutant gases responsible for acid rain, the everyday source of each, and one way acid rain damages the environment.

Notes

Recall and practice

- [ ] Answer today's practice questions (Brønsted-Lowry definitions, conjugate pairs, the pH scale, strong vs weak, neutralization)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

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2023	37	Chemistry	☐	☐
2022	43	Chemistry	☐	☐
2016	45	Chemistry	☐	☐
2022	36	Chemistry	☐	☐
2022	47	Chemistry	☐	☐
2021	47	Chemistry	☐	☐

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FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
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Study time today _____ h _____ min — About 8 h

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

51

of 58

About 8 h

CHEMISTRY

Redox Processes: Electron Transfer, Oxidation Numbers and the Reactivity Series

Every reaction where electrons change hands is redox. Learn the two ways to spot it: OIL RIG (who loses or gains electrons) and oxidation numbers (which atom's number goes up or down). Then use the reactivity series to predict which metal or halogen wins the tug-of-war for electrons, and compare voltaic and electrolytic cells.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 — W1 W2 W3 W4 W5 W6 W7 W8 Final — 58

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 9

- [ ] Read Ch 9: Redox processes (electron transfer and OIL RIG, oxidation numbers and their rules, oxidizing and reducing agents, half-equations, the reactivity series and displacement; skim the qualitative voltaic-vs-electrolytic cells in 9.2 and skip the HL electrode-potential math) — pp. 406-431

ⓘ Copy the oxidation-state summary table on p. 409 (O = −2, H = +1, Group 1 = +1, F = −1, plus the exceptions). You will use it for every oxidation-number question. Then work through the two worked examples on p. 410 (Ca + Sn^{2+}, and $4NH_3 + 5O_2$) to see how a change in oxidation number tells you what is oxidized and what is reduced. Treat 9.2/19.1 'Electrochemical cells' (from p. 425) lightly: get the voltaic-vs-electrolytic split from the diagram on p. 426 and the labeled cell in Fig 9.7 (p. 429), and skip the standard-electrode-potential and Nernst calculations.

What redox really is: electrons change hands

- [ ] Redox is two opposite processes that always happen together. Oxidation = loss of electrons; reduction = gain of electrons. Learn the mnemonic OIL RIG: Oxidation Is Loss, Reduction Is Gain (of electrons). The old 'gain of oxygen / loss of hydrogen' definitions still work, but electron transfer is the more general one — pp. 406-407
- [ ] Because electrons can't vanish, one species' loss is another's gain, so oxidation and reduction happen at the same time in a redox reaction. Example: when Mg burns, $2Mg \rightarrow 2Mg^{2+} + 4e^-$ (Mg oxidized) while $O_2 + 4e^- \rightarrow 2O^{2-}$ (O reduced). The electrons lost by one are exactly the electrons gained by the other — p. 407
- [ ] Oxidation = electron loss (e.g. $Zn \rightarrow Zn^{2+} + 2e^-$); reduction = electron gain (e.g. $Cu^{2+} + 2e^- \rightarrow Cu$). It all comes down to spotting which way the electrons move: the species that gives electrons away is oxidized, and the species that takes them is reduced — pp. 406-407

Self-check: OIL RIG ◯ Got it ◯ Shaky ◯ Re-test

In $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$, can you say which species loses electrons (oxidized) and which gains electrons (reduced), and recite what OIL RIG stands for? (Answer: Zn is oxidized, Cu^{2+} is reduced.)

Oxidation numbers: a bookkeeping trick for electrons

- [ ] When electrons are shared in covalent bonds (not fully transferred), 'who lost electrons?' is fuzzy, so you use the oxidation number (oxidation state): the apparent charge an atom would have if every bond were fully ionic. Write the sign first, then the number, e.g. +2 or −3 (note: ion charge is written number-then-sign, e.g. 2+) — p. 408
- [ ] The assignment rules (summary table, p. 409): a free element = 0 (e.g. Mg, O_2, N_2); a simple ion = its charge; in compounds, Group 1 = +1, Group 2 = +2, F = −1, O = −2 (but −1 in peroxides like H_2O_2), H = +1 (but −1 in metal hydrides like NaH). The numbers must add up to 0 in a neutral compound, or to the ion's charge in a polyatomic ion — pp. 408-409
- [ ] Use the sum rule to find the unknown. In H_2SO_4: 2(+1) + S + 4(−2) = 0 → S = +6. In SO_3^{2-}: S + 3(−2) = −2 → S = +4. The same trick names compounds with Roman numerals: FeO is iron(II) oxide, Fe_2O_3 is iron(III) oxide, $KMnO_4$ has Mn at +7 (manganate(VII)) — pp. 409-411
- [ ] The key link: a redox reaction is one where oxidation numbers change. An increase in oxidation number = oxidation; a decrease = reduction. So you don't even need to see electrons move; tracking the numbers is enough (e.g. $2H_2 + O_2 \rightarrow 2H_2O$: H goes 0 → +1, oxidized; O goes 0 → −2, reduced) — p. 410

Self-check: oxidation numbers ◯ Got it ◯ Shaky ◯ Re-test

Can you assign the oxidation state of nitrogen in NO_3^- (answer +5) and of chromium in $K_2Cr_2O_7$ (answer +6) using the rules? And in $Ca + Sn^{2+} \rightarrow Ca^{2+} + Sn$, which element's number increases (is oxidized)? (Answer: Ca, 0 → +2.)

Agents and half-equations

- [ ] The oxidizing agent (oxidant) is the species that gets reduced: it accepts electrons and causes the other species to be oxidized. The reducing agent (reductant) is the species that gets oxidized: it donates electrons. Watch out for the trap: each agent itself undergoes the opposite of what its name says. Common oxidants: O_2, Cl_2, conc. HNO_3, H^+/MnO_4^-; common reductants: H_2, C, CO, reactive metals pp. 414-416
- [ ] In $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$, carbon is the reducing agent (it reduces Fe from +3 → 0, and is itself oxidized 0 → +2), while Fe_2O_3 is the oxidizing agent. A quick check: the reduced substance is the oxidizing agent; the oxidized substance is the reducing agent pp. 415-416
- [ ] A half-equation shows only the oxidation or only the reduction, with electrons added to balance the charge. For $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$: oxidation $Zn \rightarrow Zn^{2+} + 2e^-$ (electrons lost, on the right); reduction $Cu^{2+} + 2e^- \rightarrow Cu$ (electrons gained, on the left). The two half-equations must carry the same number of electrons so they cancel when added pp. 412-413
- [ ] To balance a half-equation in acidic solution: (1) balance the main atoms, (2) balance O by adding H_2O, (3) balance H by adding H^+, (4) balance charge by adding electrons, then scale both halves to the same number of electrons and add them. This is how IMAT-style redox equations are built from scratch pp. 413-414

Self-check: agents and halves ○ Got it ○ Shaky ○ Re-test

In $2Mg + O_2 \rightarrow 2MgO$, which substance is the reducing agent and which is the oxidizing agent? Can you also write the two half-equations? (Answer: Mg is the reducing agent, $Mg \rightarrow Mg^{2+} + 2e^-$; O_2 is the oxidizing agent, $O_2 + 4e^- \rightarrow 2O^{2-}$.)

The reactivity series and two kinds of cell

- [ ] A displacement reaction is redox: a more reactive metal pushes a less reactive metal out of its compound by reducing its ions. Dip zinc in blue $CuSO_4$ and the color fades while brown copper appears: $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ (Fig 9.1). Zn is the stronger reducing agent, so it 'forces' Cu^{2+} to accept electrons. The reverse (Cu in $ZnSO_4$) does not happen pp. 416-417
- [ ] The reactivity (activity) series ranks metals by how readily they are oxidized (lose electrons). Top → bottom: Mg > Al > Zn > Fe > Pb > Cu > Ag. A metal higher in the series is the stronger reducing agent and will displace any metal below it from solution, which lets you predict whether a given redox reaction will happen (you don't need to memorize the list, only to read it) pp. 417-418
- [ ] Halogens do the same, acting as oxidizing agents: a more reactive halogen displaces a less reactive halide. Reactivity falls down the group (F > Cl > Br > I), so $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$ works (Cl_2 oxidizes Br^-), but I_2 + KBr does not. Think of it as a competition for electrons: the stronger oxidizing agent always wins pp. 418-419
- [ ] Two kinds of electrochemical cell (p. 426). Voltaic (galvanic) cells let a spontaneous redox reaction generate electricity (chemical → electrical), as in a battery. Electrolytic cells do the opposite: electricity drives a non-spontaneous reaction (electrical → chemical), e.g. extracting reactive metals like aluminum. In both, oxidation happens at the anode and reduction at the cathode pp. 425-429

Self-check: reactivity and cells ○ Got it ○ Shaky ○ Re-test

Using Mg > Zn > Fe > Cu: will Mg displace Fe^{2+} from solution? Will Cu displace Zn^{2+}? And in one sentence each, what is the difference between a voltaic and an electrolytic cell? (Answers: yes; no; voltaic makes electricity from a spontaneous reaction, electrolytic uses electricity to force a reaction.)

Notes

Recall and practice

- [ ] Answer today's practice questions (reactivity series, metal and halogen displacement, extraction and simple cells: all genuine redox)
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2022	42	Chemistry	☐	☐
2023	45	Chemistry	☐	☐
2023	19	Biology	☐	☐
2023	37	Chemistry	☐	☐
2020	50	Chemistry	☐	☐
2016	42	Chemistry	☐	☐
2023	46	Chemistry	☐	☐
2021	29	Biology	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

52

of 58

About 8 h

CHEMISTRY

Organic Chemistry: Carbon Compounds, Families and Their Reactions

Carbon's ability to bond to itself gives millions of compounds, so chemists sort them into families (homologous series) that share a general formula and reactions. Today you'll learn to recognize the key families and functional groups, name simple molecules the IUPAC way, spot structural isomers, and predict the three reactions the IMAT often asks about: combustion, substitution and addition.

DATE ____ / ____ / ____ M T W T F S S START ____ : ____ END ____ : ____

Day 1 — W1 W2 W3 W4 W5 W6 W7 W8 Final — 58

Today's reading

Pearson Baccalaureate Higher Level Chemistry (2nd ed.) · ch. 10

- [ ] Read Ch 10: Organic chemistry (homologous series and general formulas, IUPAC naming, structural isomers, functional groups, then combustion, substitution and addition reactions; skim the HL mechanism math in 20.1-20.3) — pp. 464-495

ⓘ Copy two tables and one figure. At IMAT level, they are the whole chapter: the alkane boiling-point table (p. 466, why bp rises down a series), the functional-group / suffix table (p. 470, class → group → -suffix → general formula), and the alkene-reaction wheel (Figure 10.8, p. 490, the four addition products). Bookmark the bromine-water test (Figure 10.6, p. 485): an alkene decolorizes it instantly, an alkane only in UV light. Treat 20.1-20.3 (pp. 496-529) as 'go deeper': learn the reaction names (substitution, addition) but skip the SN1/SN2 and stereochemistry math.

What organic chemistry is: carbon and the homologous series

- [ ] Organic chemistry is the chemistry of carbon compounds. There are millions of them because one carbon atom forms four strong covalent bonds and can bond to other carbons, building long chains, branches and rings (a backbone). Hydrocarbons are the simplest: molecules of carbon and hydrogen only — p. 464
- [ ] A homologous series is a 'family' of compounds with the same general formula and the same functional group, where each member differs from the next by a $-CH_2-$ unit. The first four alkanes are methane CH_4, ethane C_2H_6, propane C_3H_8 and butane C_4H_{10}, adding one CH_2 each time — pp. 464-465
- [ ] Each series has a general formula you can memorize: alkanes C_nH_{2n+2} (saturated), alkenes C_nH_{2n} (one C=C), alkynes C_nH_{2n-2} (one C≡C), alcohols $C_nH_{2n+1}OH$, carboxylic acids $C_nH_{2n+1}COOH$. Plug in n to get any member (e.g. n = 3 alkane → C_3H_8) — pp. 465-466
- [ ] Members of a series show a gradual trend in physical properties: as the chain lengthens, boiling point rises (alkanes table p. 466: CH_4 −164 °C → C_8H_{18} 125 °C). Reason: bigger molecules have more electrons → stronger London (dispersion) forces → more energy to separate them. But they share similar chemical reactions (same functional group) — p. 466

Self-check: families and formulas ◯ Got it ◯ Shaky ◯ Re-test

Can you write the general formula for alkanes, alkenes and alcohols from memory, give the molecular formula of the 5-carbon alkane (answer C_5H_{12}), and explain in one sentence why boiling point rises as you go up a homologous series?

Drawing and naming: structural formulas, IUPAC names, isomers

- [ ] Three ways to write a molecule (table p. 468): empirical formula = simplest ratio (ethane CH_3), molecular formula = actual atom count (C_2H_6), structural formula = shows how atoms are bonded. A full structural formula draws every bond; a condensed one groups atoms, e.g. ethanoic acid = CH_3COOH — pp. 467-468
- [ ] IUPAC names have three parts written as one word: prefix (substituents) + stem (longest carbon chain) + suffix (functional group). Stems by carbon count: meth-(1), eth-(2), prop-(3), but-(4), pent-(5), hex-(6). A number locates a group; choose the chain end that gives the smallest number (e.g. propan-2-ol, but-1-ene) — pp. 469-472
- [ ] The suffix flags the functional group: -ane (alkane), -ene (alkene, C=C), -yne (alkyne), -ol (alcohol), -al (aldehyde), -one (ketone), -oic acid (carboxylic acid). Substituent prefixes: methyl, ethyl... for side-chains and fluoro/chloro/bromo/iodo for halogens (e.g. 2-bromopropane, 1,2-dichloropropane) — pp. 470-471
- [ ] Structural isomers = molecules with the same molecular formula but a different arrangement of atoms (so different properties). C_4H_{10} has two: straight-chain butane (bp −0.5 °C) and branched 2-methylpropane (bp −11.7 °C). The number of isomers grows fast with size (C_5H_{12} → 3, C_6H_{14} → 5), which is a big reason carbon makes so many compounds — pp. 473-474

Drawing and naming: structural formulas, IUPAC names, isomers continued

Self-check: naming and isomers ◯ Got it ◯ Shaky ◯ Re-test

Can you break the name 'propan-2-ol' into prefix/stem/suffix and say what each part tells you? And can you draw the two structural isomers of C_4H_{10} and name them (butane and 2-methylpropane)?

The main families and their functional groups

- [ ] A functional group is the reactive part of a molecule: it gives the whole family its characteristic reactions, so the carbon backbone is only the 'scaffold'. Saturated means all single C–C bonds (alkanes); unsaturated means it contains a C=C double (alkenes) or C≡C triple bond — pp. 464-470
- [ ] Alkanes (C_nH_{2n+2}) are saturated hydrocarbons with only strong, nonpolar C–C and C–H bonds, so they are unreactive (good fuels). Alkenes (C_nH_{2n}) are unsaturated: the reactive C=C double bond is the site of their chemistry and makes them much more reactive than alkanes — pp. 483-486
- [ ] Alcohols carry the hydroxyl –OH group (suffix -ol; e.g. ethanol C_2H_5OH). The –OH is polar, so small alcohols dissolve in water. Halogenoalkanes have a halogen (F, Cl, Br, I) on the chain (e.g. chloroethane C_2H_5Cl); the C–halogen bond is polar, which makes them more reactive than alkanes — pp. 491-494
- [ ] Carboxylic acids have the –COOH (carboxyl) group (suffix -oic acid; e.g. ethanoic acid CH_3COOH) and are weakly acidic. Benzene (C_6H_6) is an aromatic, unsaturated ring, but its six electrons are delocalized. This makes the ring unusually stable, so it prefers substitution over the addition reactions a normal C=C would do — pp. 477-480

Self-check: spot the family ◯ Got it ◯ Shaky ◯ Re-test

Given CH_3CH_2OH, $CH_2{=}CHCH_3$, CH_3COOH and C_2H_5Cl, can you name the family and functional group of each (alcohol/–OH, alkene/C=C, carboxylic acid/–COOH, halogenoalkane/C–Cl) and say which one is unsaturated?

The three key reactions: combustion, substitution, addition

- [ ] Combustion (burning in O_2, exothermic): with plenty of oxygen it is complete → $CO_2 + H_2O$, e.g. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$. With limited oxygen it is incomplete → toxic carbon monoxide CO (and/or soot C) + H_2O. This is why poor ventilation makes a flame dangerous — pp. 483-484
- [ ] Substitution (the alkane reaction): because alkanes are saturated, the only group reaction is to swap one atom for another. In UV light, methane + chlorine → chloromethane + HCl: $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$. Halogenoalkanes also substitute; for example, with NaOH(aq) the halogen is replaced by –OH to give an alcohol ($CH_3Cl + NaOH \rightarrow CH_3OH + NaCl$) — p. 484
- [ ] Addition (the alkene reaction): the C=C double bond opens up and atoms add across it, giving one saturated product (no atoms lost). Alkene + H_2 (Ni cat.) → alkane; + Br_2 → dibromoalkane; + HBr → halogenoalkane; + H_2O (H_2SO_4 cat.) → alcohol. Figure 10.8 (p. 490) is the summary wheel of all four — pp. 486-490
- [ ] Bromine-water test (distinguishes alkene from alkane): orange/brown bromine water is decolorized instantly by an alkene (it adds across the C=C). An alkane leaves it orange (it only reacts slowly, and only in UV light). Decolorization = unsaturation = C=C present (Figure 10.6, p. 485) — pp. 485-487

Self-check: predict the reaction ◯ Got it ◯ Shaky ◯ Re-test

Can you write the complete combustion equation for propane and say what product changes if oxygen is limited (CO instead of CO_2)? And can you explain how bromine water tells an alkene apart from an alkane, including which reaction type each undergoes (addition vs substitution)?

Notes

Recall and practice

- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2023	36	Chemistry	☐	☐
2021	44	Chemistry	☐	☐
2018	46	Chemistry	☐	☐
2023	41	Chemistry	☐	☐
2021	46	Chemistry	☐	☐
2015	46	Chemistry	☐	☐
2022	38	Chemistry	☐	☐
2022	39	Chemistry	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min About 8 h

Physics / math block your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY
53
Rest day

Rest Day

- [ ] Allow yourself to recharge.
- [ ] Try some gentle movement or relaxation.



HOURS OF SLEEP

HOW I FEEL
1 2 3 4 5

WHAT I DID TODAY

DAY
54
Rest day

Rest and Plan

- [ ] Enjoy downtime and prepare for the final review week.
- [ ] Review planner tasks for anything to catch up on.

HOURS OF SLEEP

HOW I FEEL
1 2 3 4 5

WHAT I DID TODAY

Weekly review

Week 8 · Days 48–54

REVIEW DATE _____



Leo's tip

Set aside a fixed hour each weekend to tidy your flashcards and log what still feels shaky.



WEEK 8 DONE

Color it in

How the days went

DAY 48	DAY 49	DAY 50	DAY 51	DAY 52	DAY 53	DAY 54
Chemical Kinetics: How Fast Reactions Go (Collision Theory)	Chemical Equilibrium: Reversible Reactions and Le Chatelier's Principle	Acids and Bases: Proton Donors, the pH Scale, and Strong vs Weak	Redox Processes: Electron Transfer, Oxidation Numbers and the Reactivity Series	Organic Chemistry: Carbon Compounds, Families and Their Reactions	Rest Day	Rest and Plan
○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Done ○ Partly ○ Moved to Day _____	○ Rested	○ Rested

Checkpoints ticked _____ / **91** Self-checks marked Got it _____ / **21** Physics / math blocks _____

Weak-spot tracker

Every Shaky or Re-test from this week, one row each.

TOPIC	DAY	WHY	RE-TEST ON	FIXED
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐
		○ content ○ careless reading ○ timing	__ / __	☐

Score log

Real IMAT questions this week: tried _____ / **33**

right _____

DATE	PAPER / SECTION	RIGHT	WRONG	BLANK	SCORE
__ / __					
__ / __					
__ / __					
__ / __					
__ / __					

Score = 1.5 × right − 0.4 × wrong · blank = 0 · IMAT 2026 rule

Next week

Final days · Days 55–58

55	Chemistry Review Block
56	Chemistry Memorization and Recall
57	Chemistry Recall Practice
58	Final Review Before the Exam

from _____ to _____

My goal for next week

What I move into next week

DAY

55

of 58

About 8 h

CHEMISTRY recall

Chemistry Review Block

No new chapters today. The whole day is about what you have already learned. Recall each big chemistry idea from memory, spot the gaps, and let your due flashcards take care of the rest. Be honest with yourself: the parts you can't quite explain out loud are exactly the ones worth re-testing.

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 58
W1 W2 W3 W4 W5 W6 W7 W8 Final

Foundations: the mole, the atom and the periodic table

- [ ] The mole is just a counting word: 1 mol = 6.022 × 10^{23} particles, and moles = mass ÷ molar mass. Every stoichiometry problem is 'grams → moles → (use the equation's ratio) → moles → grams'.

Self-check: mole map ○ Got it ○ Shaky ○ Re-test
Without notes, can you draw the triangle that links mass, moles, particles and gas volume, and say which number you multiply or divide by at each arrow (molar mass, Avogadro's number, molar volume ≈ 22.7 dm^3 at STP)?

Self-check: balancing and limiting reagent ○ Got it ○ Shaky ○ Re-test
Can you balance a reaction by inspection, then use the coefficient (mole) ratio to find the limiting reagent and the theoretical yield? Pick any equation from memory and run it end to end.

- [ ] An atom = protons + neutrons in the nucleus, electrons outside. Atomic number Z = number of protons (it defines the element); isotopes share Z but differ in neutrons (hence different mass numbers).

Self-check: electron configuration ○ Got it ○ Shaky ○ Re-test
Can you write the full electron configuration of, say, sulfur or iron from scratch (applying the Aufbau filling order, Hund's rule and the Pauli exclusion principle) and read its valence electrons straight off?

- [ ] The trends all trace back to nuclear charge vs. distance/shielding: across a period atomic radius shrinks while ionization energy and electronegativity rise; down a group radius grows and those two fall.

Self-check: explain the trends ○ Got it ○ Shaky ○ Re-test
Can you explain, rather than recite, why atomic radius decreases across a period but increases down a group, using effective nuclear charge and shielding? And can you predict which of two given atoms is more electronegative?

Self-check: group behavior ○ Got it ○ Shaky ○ Re-test
Can you recall the main behavior of the alkali metals, the halogens and the noble gases, and link each one to its valence-electron count (1, 7, and a full shell)?

Bonding and molecular shape (VSEPR)

- [ ] Bonding type follows the electronegativity difference: large ΔEN → electron transfer → ionic; small ΔEN → electron sharing → covalent (polar if uneven, nonpolar if even). Metals pool electrons → metallic.

Self-check: draw the shape ○ Got it ○ Shaky ○ Re-test
Pick a molecule like CO_2, H_2O, NH_3 or CH_4. Can you draw its Lewis structure, count bonding and lone pairs, and use VSEPR to give the electron geometry, the molecular shape and the bond angle from memory?

Self-check: polar molecule or not? ○ Got it ○ Shaky ○ Re-test
Can you explain how a molecule can contain polar bonds yet be nonpolar overall (e.g. CO_2 vs H_2O), and link the answer to molecular symmetry and the vector sum of bond dipoles?

Energetics and kinetics: how far and how fast

- [ ] Energetics keeps track of heat: ΔH < 0 is exothermic (releases heat, products lower in energy), ΔH > 0 is endothermic. ΔH = bonds broken − bonds formed, and Hess's law lets you add steps to reach a target.

Energetics and kinetics: how far and how fast continued

Self-check: bond enthalpies and Hess's law ◯ Got it ◯ Shaky ◯ Re-test
Can you estimate a reaction's ΔH from mean bond enthalpies (broken minus formed), and separately use Hess's law to combine given equations into a target reaction, getting the signs right?

- [ ] Kinetics is about rate, not yield: reactions go faster when particles collide more often and harder (higher concentration, pressure, temperature, surface area) or over a lower activation-energy path (catalyst).

Self-check: speed it up ◯ Got it ◯ Shaky ◯ Re-test
Using collision theory, can you explain why raising temperature speeds up a reaction (two effects), and how a catalyst increases rate without being used up or shifting the final equilibrium position?

Equilibrium, Le Châtelier, acids and bases

- [ ] Dynamic equilibrium = forward and reverse rates equal, concentrations constant (not equal). Le Châtelier: stress the system (concentration, pressure/volume, temperature) and it shifts to oppose the change.

Self-check: predict the shift ◯ Got it ◯ Shaky ◯ Re-test
For a reversible reaction of your choice, can you predict which way it shifts (and what happens to K) when you add a reactant, increase the pressure, or raise the temperature? And can you say why a catalyst does none of this?

- [ ] Brønsted–Lowry: acids donate H^+, bases accept H^+, and every acid has a conjugate base. pH = −log[H^+]; in water pH + pOH = 14, with pH 7 neutral, lower acidic, higher basic.

Self-check: pH on demand ◯ Got it ◯ Shaky ◯ Re-test
Can you calculate the pH of a strong acid or base from its concentration, identify the conjugate base of a given acid, and explain in one line what a buffer does and why?

Redox and organic chemistry

- [ ] Redox = electron transfer. OIL RIG: Oxidation Is Loss, Reduction Is Gain of electrons. The reducing agent is itself oxidized; the oxidizing agent is itself reduced. Track it with oxidation numbers.

Self-check: assign and identify ◯ Got it ◯ Shaky ◯ Re-test
Can you assign oxidation numbers across a given reaction, spot which species is oxidized and which is reduced, and name the oxidizing and reducing agents? Can you then balance the half-reactions?

- [ ] Organic chemistry is carbon making four bonds. Alkanes are C_nH_{2n+2} (saturated); a double bond gives alkenes (C_nH_{2n}); functional groups (–OH alcohol, –COOH carboxylic acid) set the family and reactivity.

Self-check: name and draw ◯ Got it ◯ Shaky ◯ Re-test
Can you name a simple straight-chain molecule with IUPAC rules, recognize its functional group, and draw two structural isomers of a given formula (e.g. C_4H_{10}) to show you understand isomerism?

Let the SRS do most of the work

- [ ] Review today's due chemistry flashcards. The spaced-repetition system has already brought back the cards you are closest to forgetting. The ones you get wrong will come back sooner, on their own.
- [ ] Work through your due practice questions across the chemistry block. Mark anything you struggled with; it comes back on its own, so rely on the schedule rather than cramming.
- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Notes

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2016	45	Chemistry	☐	☐
2023	19	Biology	☐	☐
2023	43	Chemistry	☐	☐
2021	29	Biology	☐	☐
2020	47	Chemistry	☐	☐
2018	51	Chemistry	☐	☐
2017	50	Chemistry	☐	☐
2016	42	Chemistry	☐	☐

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Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

56

of 58

About 8 h

CHEMISTRY recall

Chemistry Memorization and Recall

No new chapters today, only what you have already learned. This is a pure recall day: close the book, try to rebuild each idea from memory first, then check yourself. Whatever feels shaky here is exactly what your due flashcards will bring back.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 58

W1 W2 W3 W4 W5 W6 W7 W8 Final

Recall: metals vs nonmetals and the bond types

Self-check: metals vs nonmetals ○ Got it ○ Shaky ○ Re-test

Without looking, can you list the typical physical properties of metals vs nonmetals (conductivity, luster, malleability, melting point) and point to roughly where the dividing line sits on the periodic table, including where hydrogen breaks the pattern?

- [ ] The three bonds, by the elements involved: metal + nonmetal → ionic (electrons transferred); nonmetal + nonmetal → covalent (electrons shared); metal + metal → metallic ('sea' of delocalized electrons)

Self-check: predicting the bond ○ Got it ○ Shaky ○ Re-test

Given any two elements, can you decide which bond forms and justify it from the electronegativity difference (large ΔEN → ionic, small/zero → covalent) rather than just memorizing? And can you explain why metals end up bonding metallically?

- [ ] Electronegativity is the recall hook for bond character: ΔEN ≈ 0 → nonpolar covalent, intermediate → polar covalent, large → ionic. It rises across a period and falls down a group

Recall: the reactivity series

Self-check: order the metals ○ Got it ○ Shaky ○ Re-test

Can you write out the reactivity series from memory (K, Na, Ca, Mg, Al, Zn, Fe, Pb, (H), Cu, Ag, Au) and use it to predict whether a given displacement reaction will happen (a more reactive metal displacing a less reactive one from its compound)?

- [ ] The reactivity (activity) series ranks metals by how readily they lose electrons (are oxidized). Higher up = more reactive = stronger reducing agent = displaces those below it

Self-check: reactions with water and acid ○ Got it ○ Shaky ○ Re-test

From the series alone, can you predict how the top metals react with water vs dilute acid (e.g. K/Na react violently with cold water; Mg/Zn/Fe need acid; Cu/Ag/Au essentially don't) and explain the trend in terms of ease of oxidation?

Recall: groups 1, 2, 7 and the noble gases

Self-check: how each group behaves ○ Got it ○ Shaky ○ Re-test

Can you give the typical behavior of each group from memory: Group 1 (alkali metals, +1, very reactive, reactivity increases down the group); Group 2 (alkaline earth, +2); Group 7 (halogens, −1, reactivity decreases down the group); Group 18 (noble gases, full shell, inert)?

- [ ] Group 1 = alkali metals: one outer electron, always +1, soft, react vigorously with water → metal hydroxide + H_2. Reactivity grows down the group (the outer electron is easier to lose)
- [ ] Group 7 = halogens: seven outer electrons, gain one → −1 ions, exist as diatomic molecules. Reactivity falls down the group, so a higher halogen displaces a lower one (e.g. $Cl_2 + 2Br^- \rightarrow 2Cl^- + Br_2$)
- [ ] Group 18 = noble gases: full outer shell → very stable and essentially unreactive. This 'full-shell stability' is the reason every other group tries to reach a noble-gas configuration

Self-check: opposite trends ○ Got it ○ Shaky ○ Re-test

Can you explain why Group 1 reactivity increases down the group but Group 7 reactivity decreases, in both cases using shielding and the distance of the outer shell from the nucleus (ease of losing vs gaining an electron)?

Recall: electron configurations of the first 20 elements

- [ ] Fill orbitals lowest-energy first (Aufbau): 1s → 2s → 2p → 3s → 3p → 4s → 3d. Max electrons: s holds 2, p holds 6. Note that 4s fills before 3d, which matters at K (19) and Ca (20)

Self-check: write them out ○ Got it ○ Shaky ○ Re-test

Can you write the full electron configuration of any element from H (1) to Ca (20) from memory (e.g. Na = $1s^2 2s^2 2p^6 3s^1$, Cl = $1s^2 2s^2 2p^6 3s^2 3p^5$, Ca = $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$) and remember that 4s comes before 3d?

- [ ] The valence electrons (outermost shell) determine an element's group and its chemistry. The group number tells you the count: Group 1 → 1 valence e^-, Group 2 → 2, Group 7 → 7, Group 18 → 8 (full)

Self-check: configuration and position ○ Got it ○ Shaky ○ Re-test

Given only an element's electron configuration, can you read off its period (highest shell number) and group (valence electrons) and predict the ion it forms? Can you also go the other way, from a periodic-table position back to the configuration?

Recall: core organic reactions, conditions and tests

- [ ] Complete combustion (plenty of O_2): hydrocarbon → CO_2 + H_2O. Incomplete combustion (limited O_2): → CO (toxic) + C (soot) + H_2O. Same fuel; the oxygen supply decides the products
- [ ] Saturated alkanes (single bonds) undergo substitution with halogens, but only in UV light (free-radical mechanism), e.g. CH_4 + Cl_2 →(UV) CH_3Cl + HCl
- [ ] Unsaturated alkenes (C=C double bond) undergo addition: the double bond opens and atoms add across it (with H_2/Ni, with Br_2, with H_2O/acid). No UV needed; it happens readily at room temperature
- [ ] The bromine water test for unsaturation: orange/brown bromine water is decolorized by an alkene (addition across C=C) but stays orange with an alkane (no reaction). This is the classic 'saturated vs unsaturated' test

Self-check: match reaction to conditions ○ Got it ○ Shaky ○ Re-test

Can you state for each: complete vs incomplete combustion (and their products), substitution (which compound, what condition: UV), and addition (which compound, why no UV)? And can you describe exactly what you would see in the bromine water test for an alkene vs an alkane?

Self-check: why the difference ○ Got it ○ Shaky ○ Re-test

Can you explain why alkanes need substitution while alkenes do addition, i.e. that the reactive C=C double bond is what lets alkenes add atoms without breaking apart, whereas saturated alkanes can only swap a hydrogen for a halogen?

Now let the SRS do its job

- [ ] Review today's due flashcards. The spaced-repetition system has already brought back the chemistry cards you are closest to forgetting. The ones you struggled with above will keep coming back until you know them
- [ ] Re-attempt the practice questions you previously got wrong on these topics (bonding, reactivity series, group trends, electron configurations, organic reactions). Redoing your own mistakes is the most useful review you can do
- [ ] Optional: from memory, sketch a one-page 'cheat sheet' of today's five areas, then check it against your notes and fill only the gaps

Notes

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2017	50	Chemistry	☐	☐
2011	64	Chemistry	☐	☐
2021	41	Chemistry	☐	☐
2021	42	Chemistry	☐	☐
2018	52	Chemistry	☐	☐
2012	66	Chemistry	☐	☐
2023	36	Chemistry	☐	☐
2023	43	Chemistry	☐	☐

Free past papers, 2011–2026

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Time blocks

FROM	TO	WHAT I DID	DONE
__ : __	__ : __		☐
__ : __	__ : __		☐
__ : __	__ : __		☐
__ : __	__ : __		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __ : __ To __ : __ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

DAY

57

of 58

About 8 h

CHEMISTRY recall

Chemistry Recall Practice

No new chapters today. You work only with what you already know. This is a consolidation day: pull each big chemistry idea out of memory, re-test the calculations with a timer, and let the spaced-repetition system bring back whatever you have started to forget.

DATE ___ / ___ / ___ M T W T F S S START ___ : ___ END ___ : ___

Day 1 58
W1 W2 W3 W4 W5 W6 W7 W8 Final

How to use a recall day (read this first)

- [ ] Review ≠ re-reading. The point of today is retrieval: close the book, try to reproduce each idea from memory first, then check. The struggle to recall is what makes it stick. A blank you fill in beats a paragraph you skim.

Self-check: the exam mindset ◯ Got it ◯ Shaky ◯ Re-test
Without notes, can you list the chemistry topics the IMAT asks about often (bonding, naming, the mole, thermochemistry, equilibrium, rates, periodic trends) and say which two feel shakiest? Those are where you will spend most of today.

Recall: bonding, mechanisms and naming

- [ ] The three big bond types: ionic (metal + nonmetal, electrons transferred), covalent (nonmetals, electrons shared) and metallic (a lattice of cations in a 'sea' of delocalized electrons).

Self-check: bond types ◯ Got it ◯ Shaky ◯ Re-test
Can you still classify a bond as ionic, covalent or metallic from the elements alone, and use the electronegativity difference to call a covalent bond polar vs nonpolar?

- [ ] Mechanism basics: alkanes do substitution (one atom swapped for another, e.g. radical halogenation); compounds with C=C double bonds do addition (the bond opens and atoms add across it).

Self-check: reaction mechanisms ◯ Got it ◯ Shaky ◯ Re-test
Can you draw, from memory, a simple substitution on an alkane and an addition across a C=C double bond, and say in one line why a saturated molecule substitutes while an unsaturated one adds?

- [ ] IUPAC naming depends on the stem (meth/eth/prop/but... = 1/2/3/4 carbons) and the suffix for the functional group (-ane, -ene, -ol, -al, -one, -oic acid). Number the chain to give the group the lowest locant.

Self-check: IUPAC naming ◯ Got it ◯ Shaky ◯ Re-test
Given a small drawn structure, can you name it correctly (pick the longest chain, number it for the lowest locants, and attach the right prefix/suffix)? And can you reverse it (name → structure)?

Recall and timed drill: the mole and amount of substance

- [ ] The mole is just a counting word: 1 mol = 6.022×10^{23} particles (Avogadro's number). The bridge to the lab is n = m / M (moles = mass ÷ molar mass), and for gases n = V ÷ molar volume (≈ 22.7 $dm^3\ mol^{-1}$ at STP, the value this book uses).

Self-check: the mole toolkit ◯ Got it ◯ Shaky ◯ Re-test
Can you recall, without looking, the three conversions that link moles with mass (÷/× M), with particles (÷/× Avogadro) and with gas volume (÷/× the molar volume, ≈ 22.7 dm^3 at STP)?

- [ ] Stoichiometry: the coefficients in a balanced equation are a mole ratio. Convert what you are given to moles, multiply by the ratio, then convert back to the units the question wants.
- [ ] Timed drill (8 min): do 3-4 amount-of-substance problems against the clock (grams to and from moles, a particle count, one balanced-equation mole-ratio question). Work on speed and accuracy, not only the method.

Self-check: under time pressure ◯ Got it ◯ Shaky ◯ Re-test
After the timed set: did the arithmetic slow you down, or the setup? If you hesitated on which conversion to use, that is the gap to drill again before the exam.

Recall: energy, equilibrium and reaction rates

- [ ] Thermochemistry sign rule: exothermic releases heat, ΔH < 0 (negative); endothermic absorbs heat, ΔH > 0 (positive). ΔH is per mole, so scale it by the moles reacting.

Self-check: energy changes ○ Got it ○ Shaky ○ Re-test
Can you recall the sign of ΔH for exothermic vs endothermic, sketch the energy profile for each (reactants vs products height), and estimate ΔH from bond energies (bonds broken − bonds made)?

- [ ] Equilibrium is dynamic: forward and reverse rates are equal, so concentrations stay constant (not zero motion). Le Châtelier: a system shifts to oppose any change in concentration, pressure or temperature you impose.

Self-check: Le Châtelier ○ Got it ○ Shaky ○ Re-test
For a given reversible reaction, can you predict the direction of shift when you add a reactant, raise the pressure, or heat it, and justify each with 'the system opposes the change'?

- [ ] Reaction rate depends on successful collisions (collision theory). Raising temperature, concentration or surface area speeds it up; a catalyst speeds it up by lowering the activation energy, without being consumed.

Self-check: rates and catalysts ○ Got it ○ Shaky ○ Re-test
Can you explain what a catalyst does to the activation energy (and what it does not change: ΔH and the equilibrium position), and list the factors that increase the rate of a reaction?

- [ ] Timed drill (6 min): do 2-3 energy-change calculations against the clock (an exothermic/endothermic sign call, a bond-energy ΔH estimate, and scaling ΔH by the moles reacting).

Recall: periodic trends and property types

- [ ] Across a period (left → right): atomic radius decreases, while ionization energy and electronegativity increase. Down a group it is the reverse: radius grows and the others fall.

Self-check: periodic trends ○ Got it ○ Shaky ○ Re-test
Can you reproduce the period and group trends for atomic radius, ionization energy and electronegativity from memory, and explain them in terms of nuclear charge and shielding?

- [ ] Property check: a physical property is observed without changing the substance's identity (mass, density, melting point, color); a chemical property describes how it reacts or transforms (flammability, reactivity with acid).

Self-check: physical vs chemical ○ Got it ○ Shaky ○ Re-test
Given a mixed list (boiling point, rusting, density, flammability, melting), can you sort each as a physical or chemical property and state the one-line rule you used to decide?

Review what the SRS has due

- [ ] Review today's due chemistry flashcards. The system schedules them for you: the cards you struggled with on earlier days will come back here automatically, so don't skip them.
- [ ] Answer the due chemistry practice questions across all your earlier topics. Star anything you get wrong: it will come back at shorter intervals before the exam.

Self-check: weakest topic ○ Got it ○ Shaky ○ Re-test
Of everything you re-tested today, which single chemistry topic is still weakest? Make a one-line note now so tomorrow's review (and the SRS) can target it.

- [ ] Daily general-knowledge and logic warm-up (10 min) optional

Notes

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2016	45	Chemistry	☐	☐
2023	40	Chemistry	☐	☐
2021	52	Chemistry	☐	☐
2020	47	Chemistry	☐	☐
2020	52	Chemistry	☐	☐
2019	52	Chemistry	☐	☐
2018	51	Chemistry	☐	☐
2017	50	Chemistry	☐	☐

Free past papers, 2011–2026

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Time blocks

FROM	TO	WHAT I DID	DONE
__ : __	__ : __		☐
__ : __	__ : __		☐
__ : __	__ : __		☐
__ : __	__ : __		☐

Study time today _____ h _____ min

About 8 h

Physics / math block

your own, not in the plan

Topic _____

From __ : __ To __ : __ ☐

Shaky today

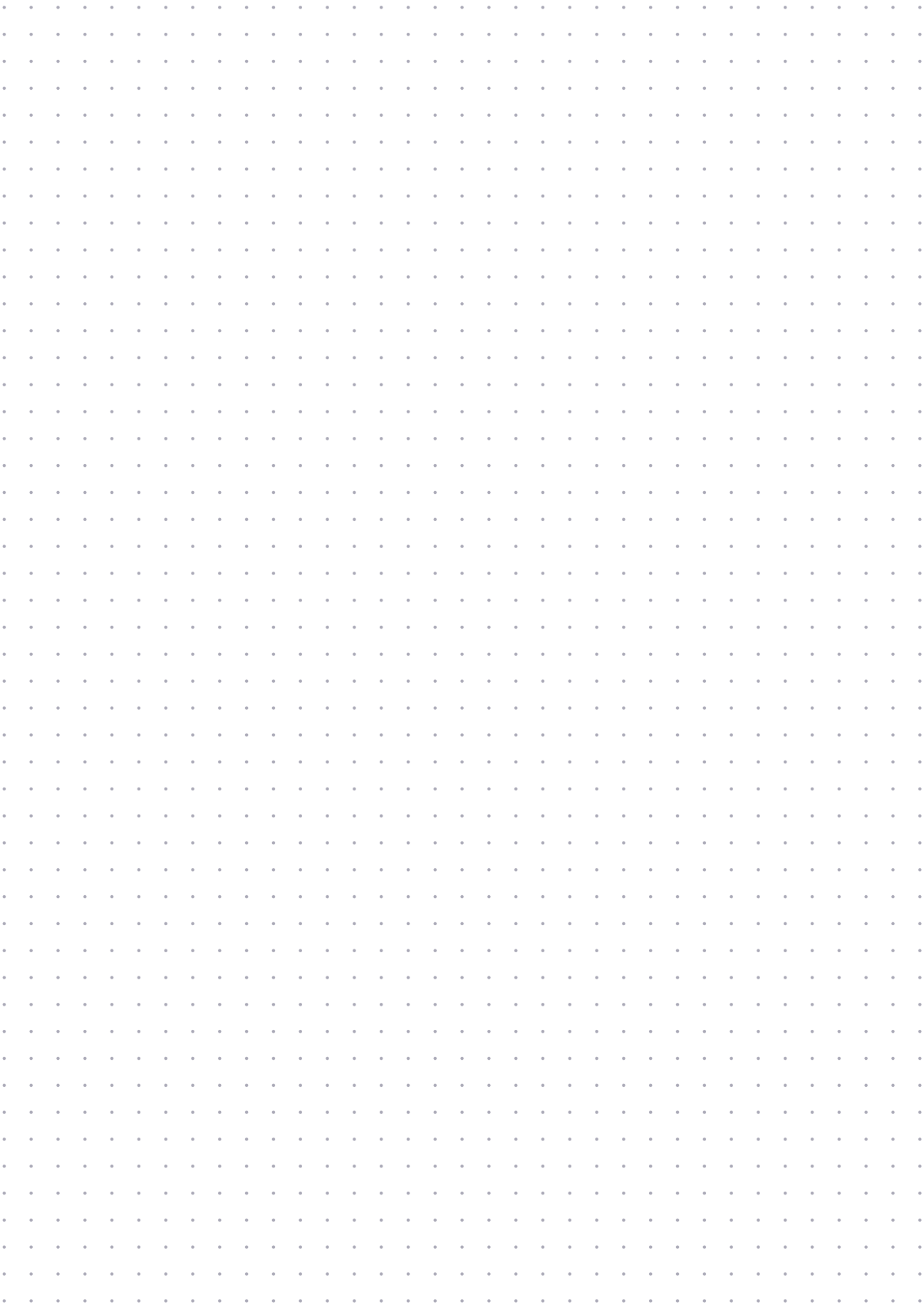
copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes



DAY

58

of 58

Ends early

ALL SUBJECTS

Final Review Before the Exam

No new chapters today. Go back over everything you have covered in the last 57 days: find the few weak spots that remain, redo real past-paper questions, and warm up the physics, math and logic you did not practice on the content days, so tomorrow feels familiar instead of scary.

"...then stop early and rest."

DATE ___ / ___ / _____ M T W T F S S START ___ : ___ END ___ : ___

Day 1 ... 58
W1 W2 W3 W4 W5 W6 W7 W8 Final

Biology weak spots: recall, don't re-read

Self-check: cells and transport ○ Got it ○ Shaky ○ Re-test

From memory only: can you still explain the difference between diffusion, facilitated diffusion, osmosis and active transport? And can you predict which way water moves when a cell is dropped into a hypertonic or a hypotonic solution?

- [ ] Osmosis is the net movement of water across a semipermeable membrane from high water potential (dilute) to low water potential (concentrated). No ATP is needed.

Self-check: cell division ○ Got it ○ Shaky ○ Re-test

Can you still draw the stages of mitosis and meiosis side by side, and say exactly where crossing-over and independent assortment happen? And why does meiosis produce 4 genetically different haploid cells while mitosis makes 2 identical diploid ones?

- [ ] Meiosis = one round of DNA replication + two divisions → 4 haploid, genetically unique gametes. The genetic shuffling comes from crossing-over (prophase I) and independent assortment (metaphase I).

Self-check: molecular genetics ○ Got it ○ Shaky ○ Re-test

Without notes: can you walk through DNA → mRNA → protein (replication, transcription, translation) and say where each step happens in a eukaryotic cell? And why is DNA replication called 'semi-conservative'?

- [ ] DNA replication is semi-conservative: each new double helix keeps one original (template) strand and one newly made strand.

Self-check: genetics problems ○ Got it ○ Shaky ○ Re-test

Can you still set up a Punnett square for a dihybrid cross and get the classic 9:3:3:1 ratio? And can you handle a question on dominant vs recessive, codominance and sex-linked inheritance?

- [ ] Enzymes are biological catalysts: they lower a reaction's activation energy and are reused. Their activity peaks at an optimum pH and temperature, and the lock-and-key / induced-fit model describes how they work.

Chemistry weak spots: close the gaps

Self-check: the mole and stoichiometry ○ Got it ○ Shaky ○ Re-test

Can you still convert between grams, moles and the number of particles (using molar mass and Avogadro's number)? And can you balance an equation, then use the mole ratio to find a limiting reactant?

- [ ] Moles = mass ÷ molar mass, and 1 mole = 6.022×10^{23} particles (Avogadro's number). You need these two conversions for almost every IMAT stoichiometry question.

Self-check: periodic trends and bonding ○ Got it ○ Shaky ○ Re-test

Across a period and down a group, can you predict the trend in atomic radius, ionization energy and electronegativity, and explain why each one moves the way it does? Can you then decide if a bond is ionic, polar covalent or nonpolar covalent?

- [ ] Across a period, electronegativity and ionization energy rise while atomic radius falls; down a group, the reverse. The trends are driven by nuclear charge vs shielding and distance.

Self-check: acids, bases and equilibrium ○ Got it ○ Shaky ○ Re-test

Can you still calculate pH from $[H^+]$ (and back), tell a strong acid from a weak one, and predict which way an equilibrium shifts when you change concentration, pressure or temperature (Le Chatelier)?

Chemistry weak spots: close the gaps continued

- [ ] pH = −log[H^+]; a change of 1 pH unit is a 10× change in [H^+]. At equilibrium the forward and reverse rates are equal, and Le Chatelier predicts the shift when you disturb it.

Drill real past papers and study the solutions

Redo a section of a recent IMAT paper ○ Got it ○ Shaky ○ Re-test

Pick a biology or chemistry section from a recent IMAT (or BMAT) past paper and time yourself. For every question you got wrong or guessed: can you explain, out loud, the one idea that would have made it obvious?

Turn mistakes into a checklist ○ Got it ○ Shaky ○ Re-test

Look back over your past-paper errors this week. Can you name your top 3 recurring traps (a topic, a careless-reading habit, a timing problem) and the exact fix you will use tomorrow for each?

Warm up physics and math (not covered on the content days)

Self-check: kinematics and forces ○ Got it ○ Shaky ○ Re-test

Can you derive and use the SUVAT equations for constant acceleration (including free-fall with g)? And can you apply Newton's second law F = ma, including resolving forces and spotting when acceleration is zero (equilibrium)?

Self-check: energy, work and power ○ Got it ○ Shaky ○ Re-test

Can you write kinetic energy as ½mv^2, gravitational potential energy as mgh, use conservation of energy to link them, and define work (W = Fd) and power (P = W/t) with the right units?

- [ ] In a frictionless system, mechanical energy is conserved: kinetic energy (½mv^2) and gravitational potential energy (mgh) change into each other, but their sum stays constant.

Self-check: electricity ○ Got it ○ Shaky ○ Re-test

Can you apply Ohm's law (V = IR), find power (P = VI), and work out total resistance for resistors in series (add them) vs in parallel (add the reciprocals)?

Self-check: core algebra ○ Got it ○ Shaky ○ Re-test

Can you rearrange a formula for any variable, solve a quadratic, handle indices and logarithms, and work in scientific notation, all quickly and without a calculator?

Warm up logical reasoning and general knowledge

Self-check: logical reasoning ○ Got it ○ Shaky ○ Re-test

On a logic question, can you reliably separate the conclusion from the supporting premises, spot an unstated assumption, and tell a 'strengthen' task from a 'weaken' or 'flaw' one before you read the options?

Self-check: general knowledge and reading speed ○ Got it ○ Shaky ○ Re-test

Have you skimmed the kinds of general-knowledge and current-affairs topics the IMAT often asks about, and practiced reading a dense passage once and answering from it quickly, without re-reading the whole thing?

Notes

Let the SRS bring back what you struggled with

- [ ] Review today's due flashcards. Cards you found hard earlier come back automatically, so rely on the deck and clear the queue.
- [ ] Redo your due practice questions, focusing on the ones you missed earlier. Getting them right now is the best way to feel confident before the exam.
- [ ] Final logic and general-knowledge warm-up (10 min), then stop early and rest. optional

Seen on the real IMAT

Past-paper questions on today's topics. Try each, then mark it.

YEAR	Q	SECTION	TRIED	RIGHT
2021	28	Biology	☐	☐
2020	31	Biology	☐	☐
2017	23	Biology	☐	☐
2016	42	Chemistry	☐	☐
2023	25	Biology	☐	☐
2023	29	Biology	☐	☐
2023	35	Chemistry	☐	☐
2023	43	Chemistry	☐	☐

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entermedschool.com/imat-papers

Time blocks

FROM	TO	WHAT I DID	DONE
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐
__:__	__:__		☐

Study time today _____ h _____ min

Physics / math block — your own, not in the plan

Topic _____

From __:__ To __:__ ☐

Shaky today

copy these to this week's review

How sure do I feel about today?

1 2 3 4 5

Notes

Notes

58 days done

REVIEW DATE _____



58 DAYS DONE

Color it in

How the days went

DAY **55**
Chemistry Review Block
- ◯ Done
- ◯ Partly
- ◯ Moved to Day

_____

DAY **56**
Chemistry Memorization and Recall
- ◯ Done
- ◯ Partly
- ◯ Moved to Day

_____

DAY **57**
Chemistry Recall Practice
- ◯ Done
- ◯ Partly
- ◯ Moved to Day

_____

DAY **58**
Final Review Before the Exam
- ◯ Done
- ◯ Partly
- ◯ Moved to Day

_____

Checkpoints ticked _____ / **55** Self-checks marked Got it _____ / **50** Physics / math blocks _____

Weak-spot tracker

Every Shaky or Re-test from this week, one row each.

TOPIC	DAY	WHY	RE-TEST ON	FIXED
		◯ content ◯ careless reading ◯ timing	__ / __	☐
		◯ content ◯ careless reading ◯ timing	__ / __	☐
		◯ content ◯ careless reading ◯ timing	__ / __	☐
		◯ content ◯ careless reading ◯ timing	__ / __	☐
		◯ content ◯ careless reading ◯ timing	__ / __	☐
		◯ content ◯ careless reading ◯ timing	__ / __	☐
		◯ content ◯ careless reading ◯ timing	__ / __	☐
		◯ content ◯ careless reading ◯ timing	__ / __	☐

Score log

Real IMAT questions this week: tried _____ / **24**

right _____

DATE	PAPER / SECTION	RIGHT	WRONG	BLANK	SCORE
__ / __					
__ / __					
__ / __					
__ / __					
__ / __					

Score = 1.5 × right − 0.4 × wrong · blank = 0 · IMAT 2026 rule

What's next

From Day 59 to your exam	183
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My first past paper _____



From Day 59 to your exam

Past-paper method

1. Aim to start working on past papers about 2-3 months before the exam. This is when you'll want to start simulating the real exam experience.
2. Print out the past papers, set a timer for 100 minutes, and try to recreate exam conditions as closely as possible. Find a quiet spot without any distractions, and work through the paper just like you would on the exam day.
3. Once you've finished, don't just check the answers you got wrong-go over every single question, even the ones you got right. Look for patterns, traps, or tricky wording that tends to repeat from year to year.
4. When you encounter mistakes, revise on those topics. Also, watch for any recurring themes in the questions you got wrong-recognizing these patterns will help you be more prepared when similar ones appear on exam day.
5. So, while older papers are helpful, I highly recommend focusing on the most recent available exams, as they reflect the newer style and structure.

Which papers

The 2023–2026 papers share the current layout: **Reading & GK Q1–4 · Logic Q5–9 · Biology Q10–32 · Chemistry Q33–47 · Physics & math Q48–60**

The daily pages used real questions from 2011–2023 only. The 2024, 2025 and 2026 papers are still new to you, and the next pages have a mock spread for each.

2011 · 2012 · 2013 · 2014 · 2015 · 2016 · 2017 · 2018 · 2019

2020 · 2021 · 2022 · 2023 · **2024** · **2025** · **2026**

Free past papers, 2011–2026

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My past-paper plan

One row per paper. The mock spreads are on the next pages.

WEEK OF	PAPER	SPREAD	SCORE	DONE
__ / __		p. ___	/ 90	☐
__ / __		p. ___	/ 90	☐
__ / __		p. ___	/ 90	☐
__ / __		p. ___	/ 90	☐
__ / __		p. ___	/ 90	☐
__ / __		p. ___	/ 90	☐
__ / __		p. ___	/ 90	☐
__ / __		p. ___	/ 90	☐

MY FIRST PAST PAPER

___ / ___ / _____

MY IMAT 2027 DATE

___ / ___ / 2027

DAYS LEFT

Mock exam · IMAT 2024

Date ____ / ____ Start ____ : ____ Place _____



100 minutes
one tick every 10 minutes

> Print out the past papers, set a timer for 100 minutes, and try to recreate exam conditions as closely as possible. Find a quiet spot without any distractions, and work through the paper just like you would on the exam day.

Answers

Fill in one letter, then mark Right, Wrong or Blank as you check.

Reading & GK Q1–4

1	A	B	C	D	E	R	W	B
2	A	B	C	D	E	R	W	B
3	A	B	C	D	E	R	W	B
4	A	B	C	D	E	R	W	B

Logic Q5–9

5	A	B	C	D	E	R	W	B
6	A	B	C	D	E	R	W	B
7	A	B	C	D	E	R	W	B
8	A	B	C	D	E	R	W	B
9	A	B	C	D	E	R	W	B

Biology Q10–32

10	A	B	C	D	E	R	W	B
11	A	B	C	D	E	R	W	B
12	A	B	C	D	E	R	W	B
13	A	B	C	D	E	R	W	B
14	A	B	C	D	E	R	W	B
15	A	B	C	D	E	R	W	B
16	A	B	C	D	E	R	W	B
17	A	B	C	D	E	R	W	B
18	A	B	C	D	E	R	W	B
19	A	B	C	D	E	R	W	B
20	A	B	C	D	E	R	W	B

Biology Q10–32 cont.

21	A	B	C	D	E	R	W	B
22	A	B	C	D	E	R	W	B
23	A	B	C	D	E	R	W	B
24	A	B	C	D	E	R	W	B
25	A	B	C	D	E	R	W	B
26	A	B	C	D	E	R	W	B
27	A	B	C	D	E	R	W	B
28	A	B	C	D	E	R	W	B
29	A	B	C	D	E	R	W	B
30	A	B	C	D	E	R	W	B
31	A	B	C	D	E	R	W	B
32	A	B	C	D	E	R	W	B

Chemistry Q33–47

33	A	B	C	D	E	R	W	B
34	A	B	C	D	E	R	W	B
35	A	B	C	D	E	R	W	B
36	A	B	C	D	E	R	W	B
37	A	B	C	D	E	R	W	B
38	A	B	C	D	E	R	W	B
39	A	B	C	D	E	R	W	B
40	A	B	C	D	E	R	W	B

Chemistry Q33–47 cont.

41	A	B	C	D	E	R	W	B
42	A	B	C	D	E	R	W	B
43	A	B	C	D	E	R	W	B
44	A	B	C	D	E	R	W	B
45	A	B	C	D	E	R	W	B
46	A	B	C	D	E	R	W	B
47	A	B	C	D	E	R	W	B

Physics & math Q48–60

48	A	B	C	D	E	R	W	B
49	A	B	C	D	E	R	W	B
50	A	B	C	D	E	R	W	B
51	A	B	C	D	E	R	W	B
52	A	B	C	D	E	R	W	B
53	A	B	C	D	E	R	W	B
54	A	B	C	D	E	R	W	B
55	A	B	C	D	E	R	W	B
56	A	B	C	D	E	R	W	B
57	A	B	C	D	E	R	W	B
58	A	B	C	D	E	R	W	B
59	A	B	C	D	E	R	W	B
60	A	B	C	D	E	R	W	B

Notes

MY SCORE

right × 1.5 − wrong × 0.4 = _____ / 90

BY SECTION

Reading & GK	Logic	Biology	Chemistry	Physics & math
/ 6	/ 7.5	/ 34.5	/ 22.5	/ 19.5
_____	_____	_____	_____	_____

Review everything

> Once you've finished, don't just check the answers you got wrong-go over every single question, even the ones you got right. Look for patterns, traps, or tricky wording that tends to repeat from year to year.

Error analysis

Q	TOPIC	WHY	MY FIX	RE-TEST ON
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __

My top 3 traps

1 _____

2 _____

3 _____

Minutes left at the end

_____ min

Notes

Mock exam · IMAT 2025

Date ____ / ____ Start ____ : ____ Place _____



100 minutes
one tick every 10 minutes

> Print out the past papers, set a timer for 100 minutes, and try to recreate exam conditions as closely as possible. Find a quiet spot without any distractions, and work through the paper just like you would on the exam day.

Answers

Fill in one letter, then mark Right, Wrong or Blank as you check.

Reading & GK Q1–4

1	A	B	C	D	E	R	W	B
2	A	B	C	D	E	R	W	B
3	A	B	C	D	E	R	W	B
4	A	B	C	D	E	R	W	B

Logic Q5–9

5	A	B	C	D	E	R	W	B
6	A	B	C	D	E	R	W	B
7	A	B	C	D	E	R	W	B
8	A	B	C	D	E	R	W	B
9	A	B	C	D	E	R	W	B

Biology Q10–32

10	A	B	C	D	E	R	W	B
11	A	B	C	D	E	R	W	B
12	A	B	C	D	E	R	W	B
13	A	B	C	D	E	R	W	B
14	A	B	C	D	E	R	W	B
15	A	B	C	D	E	R	W	B
16	A	B	C	D	E	R	W	B
17	A	B	C	D	E	R	W	B
18	A	B	C	D	E	R	W	B
19	A	B	C	D	E	R	W	B
20	A	B	C	D	E	R	W	B

Biology Q10–32 cont.

21	A	B	C	D	E	R	W	B
22	A	B	C	D	E	R	W	B
23	A	B	C	D	E	R	W	B
24	A	B	C	D	E	R	W	B
25	A	B	C	D	E	R	W	B
26	A	B	C	D	E	R	W	B
27	A	B	C	D	E	R	W	B
28	A	B	C	D	E	R	W	B
29	A	B	C	D	E	R	W	B
30	A	B	C	D	E	R	W	B
31	A	B	C	D	E	R	W	B
32	A	B	C	D	E	R	W	B

Chemistry Q33–47

33	A	B	C	D	E	R	W	B
34	A	B	C	D	E	R	W	B
35	A	B	C	D	E	R	W	B
36	A	B	C	D	E	R	W	B
37	A	B	C	D	E	R	W	B
38	A	B	C	D	E	R	W	B
39	A	B	C	D	E	R	W	B
40	A	B	C	D	E	R	W	B

Chemistry Q33–47 cont.

41	A	B	C	D	E	R	W	B
42	A	B	C	D	E	R	W	B
43	A	B	C	D	E	R	W	B
44	A	B	C	D	E	R	W	B
45	A	B	C	D	E	R	W	B
46	A	B	C	D	E	R	W	B
47	A	B	C	D	E	R	W	B

Physics & math Q48–60

48	A	B	C	D	E	R	W	B
49	A	B	C	D	E	R	W	B
50	A	B	C	D	E	R	W	B
51	A	B	C	D	E	R	W	B
52	A	B	C	D	E	R	W	B
53	A	B	C	D	E	R	W	B
54	A	B	C	D	E	R	W	B
55	A	B	C	D	E	R	W	B
56	A	B	C	D	E	R	W	B
57	A	B	C	D	E	R	W	B
58	A	B	C	D	E	R	W	B
59	A	B	C	D	E	R	W	B
60	A	B	C	D	E	R	W	B

Notes

MY SCORE

right × 1.5 − wrong × 0.4 = _____ / 90

BY SECTION

Reading & GK	Logic	Biology	Chemistry	Physics & math
/ 6	/ 7.5	/ 34.5	/ 22.5	/ 19.5
_____	_____	_____	_____	_____

Review everything

> Once you've finished, don't just check the answers you got wrong-go over every single question, even the ones you got right. Look for patterns, traps, or tricky wording that tends to repeat from year to year.

Error analysis

Q	TOPIC	WHY	MY FIX	RE-TEST ON
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __

My top 3 traps

1

2

3

Minutes left at the end

_____ min

Notes

Mock exam · IMAT 2026

Date ____ / ____ Start ____ : ____ Place _____



100 minutes
one tick every 10 minutes

> Print out the past papers, set a timer for 100 minutes, and try to recreate exam conditions as closely as possible. Find a quiet spot without any distractions, and work through the paper just like you would on the exam day.

Answers

Fill in one letter, then mark Right, Wrong or Blank as you check.

Reading & GK Q1–4

1	A	B	C	D	E	R	W	B
2	A	B	C	D	E	R	W	B
3	A	B	C	D	E	R	W	B
4	A	B	C	D	E	R	W	B

Logic Q5–9

5	A	B	C	D	E	R	W	B
6	A	B	C	D	E	R	W	B
7	A	B	C	D	E	R	W	B
8	A	B	C	D	E	R	W	B
9	A	B	C	D	E	R	W	B

Biology Q10–32

10	A	B	C	D	E	R	W	B
11	A	B	C	D	E	R	W	B
12	A	B	C	D	E	R	W	B
13	A	B	C	D	E	R	W	B
14	A	B	C	D	E	R	W	B
15	A	B	C	D	E	R	W	B
16	A	B	C	D	E	R	W	B
17	A	B	C	D	E	R	W	B
18	A	B	C	D	E	R	W	B
19	A	B	C	D	E	R	W	B
20	A	B	C	D	E	R	W	B

Biology Q10–32 cont.

21	A	B	C	D	E	R	W	B
22	A	B	C	D	E	R	W	B
23	A	B	C	D	E	R	W	B
24	A	B	C	D	E	R	W	B
25	A	B	C	D	E	R	W	B
26	A	B	C	D	E	R	W	B
27	A	B	C	D	E	R	W	B
28	A	B	C	D	E	R	W	B
29	A	B	C	D	E	R	W	B
30	A	B	C	D	E	R	W	B
31	A	B	C	D	E	R	W	B
32	A	B	C	D	E	R	W	B

Chemistry Q33–47

33	A	B	C	D	E	R	W	B
34	A	B	C	D	E	R	W	B
35	A	B	C	D	E	R	W	B
36	A	B	C	D	E	R	W	B
37	A	B	C	D	E	R	W	B
38	A	B	C	D	E	R	W	B
39	A	B	C	D	E	R	W	B
40	A	B	C	D	E	R	W	B

Chemistry Q33–47 cont.

41	A	B	C	D	E	R	W	B
42	A	B	C	D	E	R	W	B
43	A	B	C	D	E	R	W	B
44	A	B	C	D	E	R	W	B
45	A	B	C	D	E	R	W	B
46	A	B	C	D	E	R	W	B
47	A	B	C	D	E	R	W	B

Physics & math Q48–60

48	A	B	C	D	E	R	W	B
49	A	B	C	D	E	R	W	B
50	A	B	C	D	E	R	W	B
51	A	B	C	D	E	R	W	B
52	A	B	C	D	E	R	W	B
53	A	B	C	D	E	R	W	B
54	A	B	C	D	E	R	W	B
55	A	B	C	D	E	R	W	B
56	A	B	C	D	E	R	W	B
57	A	B	C	D	E	R	W	B
58	A	B	C	D	E	R	W	B
59	A	B	C	D	E	R	W	B
60	A	B	C	D	E	R	W	B

Notes

MY SCORE

right × 1.5 − wrong × 0.4 = _____ / 90

BY SECTION

Reading & GK	Logic	Biology	Chemistry	Physics & math
/ 6	/ 7.5	/ 34.5	/ 22.5	/ 19.5

Review everything

> Once you've finished, don't just check the answers you got wrong-go over every single question, even the ones you got right. Look for patterns, traps, or tricky wording that tends to repeat from year to year.

Error analysis

Q	TOPIC	WHY	MY FIX	RE-TEST ON
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __

My top 3 traps

1

2

3

Minutes left at the end

_____ min

Notes

Mock exam · any paper

Date ____ / ____ Start ____ : ____ Paper _____



___ minutes
write in its time limit

For any other paper. The 2011–2022 papers had different section splits and lengths (questions: 80 in 2011–2012; 60 from 2013). Their time and scoring are not verified here, so write in the paper's own rules and maximum.

Answers

Fill in one letter, then mark Right, Wrong or Blank as you check.

1	A B C D E	R W B	21	A B C D E	R W B	41	A B C D E	R W B	61	A B C D E	R W B
2	A B C D E	R W B	22	A B C D E	R W B	42	A B C D E	R W B	62	A B C D E	R W B
3	A B C D E	R W B	23	A B C D E	R W B	43	A B C D E	R W B	63	A B C D E	R W B
4	A B C D E	R W B	24	A B C D E	R W B	44	A B C D E	R W B	64	A B C D E	R W B
5	A B C D E	R W B	25	A B C D E	R W B	45	A B C D E	R W B	65	A B C D E	R W B
6	A B C D E	R W B	26	A B C D E	R W B	46	A B C D E	R W B	66	A B C D E	R W B
7	A B C D E	R W B	27	A B C D E	R W B	47	A B C D E	R W B	67	A B C D E	R W B
8	A B C D E	R W B	28	A B C D E	R W B	48	A B C D E	R W B	68	A B C D E	R W B
9	A B C D E	R W B	29	A B C D E	R W B	49	A B C D E	R W B	69	A B C D E	R W B
10	A B C D E	R W B	30	A B C D E	R W B	50	A B C D E	R W B	70	A B C D E	R W B
11	A B C D E	R W B	31	A B C D E	R W B	51	A B C D E	R W B	71	A B C D E	R W B
12	A B C D E	R W B	32	A B C D E	R W B	52	A B C D E	R W B	72	A B C D E	R W B
13	A B C D E	R W B	33	A B C D E	R W B	53	A B C D E	R W B	73	A B C D E	R W B
14	A B C D E	R W B	34	A B C D E	R W B	54	A B C D E	R W B	74	A B C D E	R W B
15	A B C D E	R W B	35	A B C D E	R W B	55	A B C D E	R W B	75	A B C D E	R W B
16	A B C D E	R W B	36	A B C D E	R W B	56	A B C D E	R W B	76	A B C D E	R W B
17	A B C D E	R W B	37	A B C D E	R W B	57	A B C D E	R W B	77	A B C D E	R W B
18	A B C D E	R W B	38	A B C D E	R W B	58	A B C D E	R W B	78	A B C D E	R W B
19	A B C D E	R W B	39	A B C D E	R W B	59	A B C D E	R W B	79	A B C D E	R W B
20	A B C D E	R W B	40	A B C D E	R W B	60	A B C D E	R W B	80	A B C D E	R W B

Notes

MY SCORE

right × ___ − wrong × ___ = _____ / ____

BY SECTION

/ _____ | / _____ | / _____ | / _____ | / _____

Review everything

> Once you've finished, don't just check the answers you got wrong-go over every single question, even the ones you got right. Look for patterns, traps, or tricky wording that tends to repeat from year to year.

Error analysis

Q	TOPIC	WHY	MY FIX	RE-TEST ON
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __
		○ content ○ careless reading ○ timing		__ / __

My top 3 traps

1

2

3

Minutes left at the end

_____ min

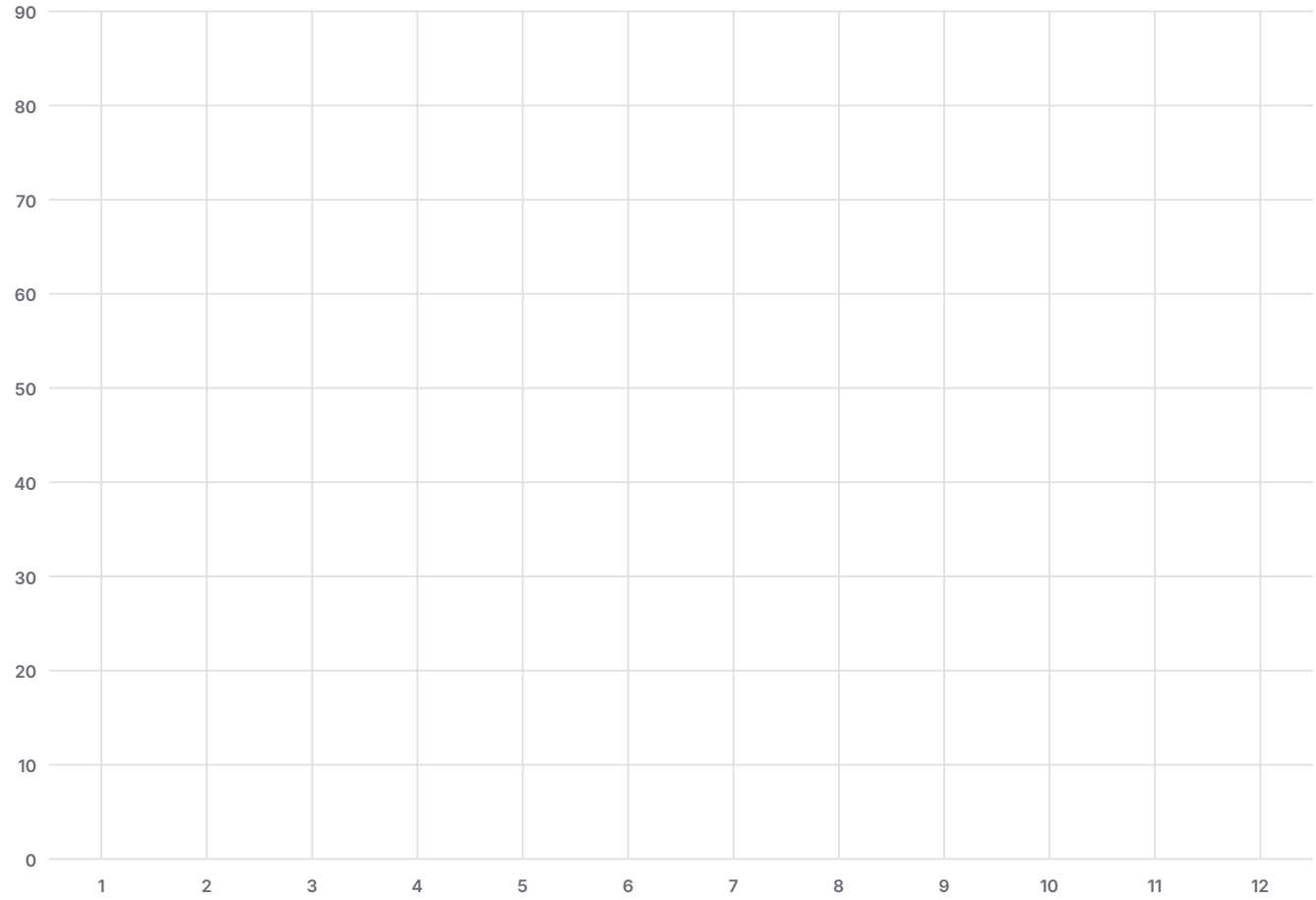
Notes

Mock score log

One row per mock, then plot the score on the chart.

#	DATE	PAPER	RIGHT	WRONG	BLANK	SCORE	READING & GK	LOGIC	BIOLOGY	CHEMISTRY	PHYSICS & MATH	MIN LEFT	TOP TRAP
1	__ / __					__ / __							
2	__ / __					__ / __							
3	__ / __					__ / __							
4	__ / __					__ / __							
5	__ / __					__ / __							
6	__ / __					__ / __							
7	__ / __					__ / __							
8	__ / __					__ / __							
9	__ / __					__ / __							
10	__ / __					__ / __							
11	__ / __					__ / __							
12	__ / __					__ / __							

My scores out of 90 (the 2023–2026 papers)



Weak-spot master list

Every weak spot from your weekly reviews and mocks, until it is fixed.

TOPIC	FIRST FLAGGED	RE-TEST 1	RE-TEST 2	RE-TEST 3	FIXED
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
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	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐
	Day ___	__ / __	__ / __	__ / __	☐

Revision week

Week _____ from ____ / ____ to ____ / ____

Verify and reexamine what you've learned. Study your Anki flashcards and summarise what you've accomplished. Review the syllabus to ensure you've covered all the topics.

M T W T F S S

____ / ____

WHAT I REVISE

- [ ] Flashcards
- [ ] Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

- [ ] Flashcards
- [ ] Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

- [ ] Flashcards
- [ ] Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

- [ ] Flashcards
- [ ] Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

- [ ] Flashcards
- [ ] Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

- [ ] Flashcards
- [ ] Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

- [ ] Flashcards
- [ ] Past-paper questions

Still shaky

Revision week

Week _____ from ____ / ____ to ____ / ____

Verify and reexamine what you've learned. Study your Anki flashcards and summarise what you've accomplished. Review the syllabus to ensure you've covered all the topics.

M T W T F S S

____ / ____

WHAT I REVISE

Flashcards

Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

Flashcards

Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

Flashcards

Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

Flashcards

Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

Flashcards

Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

Flashcards

Past-paper questions

Still shaky

M T W T F S S

____ / ____

WHAT I REVISE

Flashcards

Past-paper questions

Still shaky

Print this page again for every revision week.

Final week

The last seven days: write the date and your plan in each box.

Days to go

7	6	5	4	3	2	1
___ / ___	___ / ___	___ / ___	___ / ___	___ / ___	___ / ___	___ / ___

From my 2027 call

EXAM DATE

___ / ___ / 2027

START TIME

___ : ___

TEST CENTER ADDRESS

DOCUMENTS THE CALL ASKS FOR

1 _____ 2 _____ 3 _____

The plan's last line, for your exam eve:

"Final logic and general-knowledge warm-up (10 min), then stop early and rest."

Notes

Exam-day checklist

Fill in each line from your 2027 call and your own plan, then tick it.

Paperwork, as written in my 2027 call

- [ ] **Document 1** _____
- [ ] **Document 2** _____
- [ ] **Document 3** _____
- [ ] **Test center address**

_____

- [ ] **Arrival time** _____
- [ ] **My registration confirmation** _____

My plan

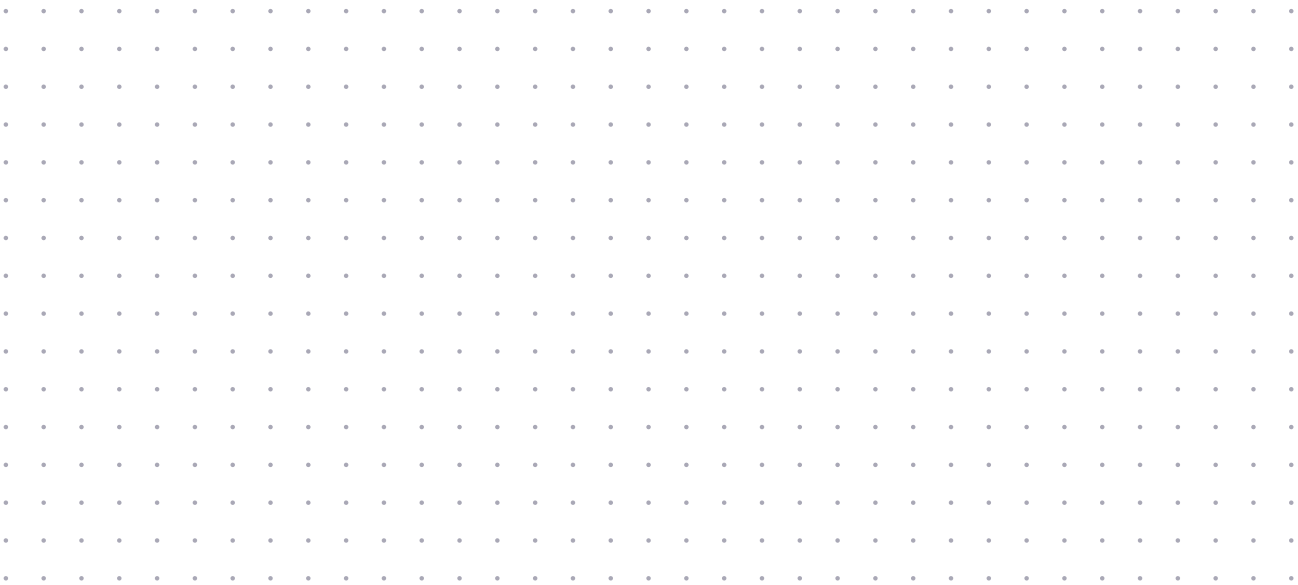
- [ ] **Wake-up time** _____
- [ ] **Leave home** _____
- [ ] **Route planned** _____
- [ ] **Food and water, if the call allows** _____

In the room

IMAT 2026 rules; confirm them in the 2027 call

60	100	+1.5 · −0.4 · 0
questions	minutes for the whole paper	right · wrong · blank · 90 at most

Notes for the day



After the exam

The IMAT 2026 calendar, from the official sources, next to your own 2027 dates.

STEP	IMAT 2026 (ITALY TIME)	MY IMAT 2027
Registration opened	26 Aug 2026	___ / ___ / 2027
Registration closed	9 Sep 2026, 15:00	___ / ___ / 2027
Exam day	29 Sep 2026, 13:30	___ / ___ / 2027
Anonymous scores	8 Oct 2026	___ / ___ / 2027
Your paper and score	19 Oct 2026	___ / ___ / 2027
First EU allocation	26 Oct 2026	___ / ___ / 2027
Next EU round	3 Nov 2026 scheduled	___ / ___ / 2027

My score _____ **/ 90**

What I want to remember

Notes

Notes

Notes

EnterMedSchool

Free to use and share.

The planner may contain errors. Please be sure to verify the content and use it at your own responsibility.

Facts as of 29 Oct 2026.

KEEP GOING ON ENTERMEDSCHOOL.COM

The study planner guide **entermedschool.com/imat-study-planner**

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My IMAT 2027 course **entermedschool.com/imat-course**

