IB DP PHYSICS · EXAM SPECIAL · SL & HL · NEW SYLLABUS (FIRST EXAMS MAY 2025) · ~9 MIN READ

IB Physics Paper 1A: Multiple-Choice Strategies and Traps

How to attack IB Physics Paper 1A multiple choice: timing with Paper 1B, the shortcuts examiners recommend, worked examples and a bank of the misconceptions flagged in the 2024–25 subject reports.

Paper 1 format & timing | Elimination | Proportion & ratio | Units & dimensions | Limiting cases | Graph meaning | Cause vs description | Misconception bank

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No tag = **SL and HL** HL ONLY HL students only DATA BOOKLET given in the exam
M1 A1 how marks are awarded highlight = comes up again and again HANDY worth memorising
Test yourself at the end

IN 30 SECONDS

- **Paper 1A is the multiple-choice half of Paper 1:** 40 questions at HL and 25 at SL, sat in the same session as Paper 1B (the data-based questions). One clock covers both parts.
- **There is no negative marking.** A blank answer is a guaranteed zero, so never leave a question empty. The May 2025 reports saw more blanks towards the end of Paper 1A.
- **About half the items test application (AO3),** not recall. Most are designed to be answered without a calculator, even though one is now allowed.

BY THE END YOU CAN

- Plan your time between Paper 1A and Paper 1B.
- Use elimination, proportion, units and limiting cases to answer quickly.
- Recognise the misconceptions that examiners say catch most students.

1 Format and timing

Level	Paper 1A	Paper 1B	Shared time	Weighting of Paper 1
HL	40 MCQ (40 marks)	Data questions (20 marks)	2 hours	36%
SL	25 MCQ (25 marks)	Data questions (20 marks)	1 hour 30 minutes	36%

- **A sensible split:** about **1 minute per MCQ**, so roughly 40 min at HL or 25 min at SL, then the rest for Paper 1B, which needs more reading and writing.
- **Two passes.** First pass: answer everything you can in under a minute and mark the rest. Second pass: return to the marked ones. Last two minutes: fill every blank.
- **Shade carefully.** Check that the question number on the answer sheet matches the question you're on, especially after skipping one.

EXAM TIP

Don't let one tricky MCQ eat five minutes. It is worth the same 1 mark as the easiest question in the paper.

2 Six techniques examiners recommend

1 · Eliminate

- Cross out options that are **impossible**: wrong units, the wrong direction, energy from nowhere, a speed above c. Two options often fail at a glance; choosing from two is a 50% guess even if you get stuck.
- Read **all four** options before choosing. The question asks for the **best** response.

2 · Use proportion, not full calculation

- Write how the answer depends on the variable that changes, then use the factor: **new = old × factor**.

WORKED EXAMPLE

A satellite moves from an orbit of radius R to one of radius 2R (measured from the planet's centre). What happens to the gravitational field strength and the gravitational potential?

1. $g \propto 1/r^2$, so g becomes ¼ of its value.
2. **$V \propto -1/r$, so V becomes half as negative (V/2).**

WORKED EXAMPLE

The wind speed at a turbine rises from 6 m s^{-1} to 9 m s^{-1}. By what factor does the power available increase?

1. $P \propto v^3$
2. **$(9/6)^3 = 1.5^3 = 3.4$ (3.375). Cube the ratio; don't cube the difference.**

3 · Check units and dimensions

- Reduce every option to **SI base units** (kg, m, s, A, K, mol). Only one option usually matches. Examiners note that many students stop at derived units such as N or Ω.

WORKED EXAMPLE

What are the SI base units of resistivity?

1. $\rho = RA/L$, so units are Ω m.
2. $\Omega = V\ A^{-1}$ and $V = W\ A^{-1} = kg\ m^2\ s^{-3}\ A^{-1}$, so $\Omega = kg\ m^2\ s^{-3}\ A^{-2}$.
3. **ρ: $kg\ m^3\ s^{-3}\ A^{-2}$.**

4 · Try a limiting case

- Put θ = 0° or 90°, a mass of zero, or an infinite resistance into each option. The correct expression must give a sensible result.
- Example: the component of weight down a slope must be **0 when θ = 0°**, so mg sin θ survives and mg cos θ does not.

5 · Ask what the gradient and area mean

- Divide the y-unit by the x-unit for the **gradient** (m s^{-1} ÷ s = acceleration); multiply them for the **area** (N × m = work).
- **Instantaneous** values come from a tangent; **average** values from the change between two points.

6 · Cause or description?

- Some items list four statements that are all true and ask which one **explains** the effect. Pick the cause, not the consequence.
- Example: a gas is compressed quickly and its temperature rises. "The molecules collide with the walls more often" is true but doesn't explain the rise. The cause is that **the moving piston does work on the gas, increasing the molecules' kinetic energy**.

3 Worked mini-examples

WORKED EXAMPLE

A diffraction grating has 500 lines per mm. Light of wavelength 600 nm falls on it normally. How many bright maxima are seen in total?

1. $d = 1/500$ mm $= 2.0 \times 10^{-6}$ m
2. $n \le d/\lambda = 2.0 \times 10^{-6} \div 6.0 \times 10^{-7} = 3.3$, so $n_{max} = 3$
3. **maxima: 3 on each side + the central one = 7 (always odd).**

WORKED EXAMPLE

A ray meets a glass surface at 40° to the surface. What is the angle of incidence?

1. Angles are measured from the **normal**.
2. **$i = 90° - 40° = 50°$.**

WORKED EXAMPLE

A star has a parallax angle of 0.25 arcseconds. How far away is it?

1. d (pc) $= 1 / p$ (arcsec)
2. **$d = 1/0.25 = 4$ pc.**

WORKED EXAMPLE

A wooden block and an iron block of the same volume are both held completely under water. Which has the greater buoyant force?

1. Buoyant force = weight of fluid displaced = $\rho_{fluid}\, V\, g$
2. **same V, same fluid: the forces are equal. The object's density doesn't matter.**

4 Misconception bank (from the subject reports)

Mechanics and thermal

Trap students fall into	What is actually true
Buoyant force depends on the object's density	It depends on the **fluid's** density and the volume displaced (under 20% correct on one item)
A car turning at constant speed has no resultant force	It needs a **centripetal** (resultant) force towards the centre
Average and instantaneous acceleration are the same	Instantaneous = gradient of the tangent at that time
Power = KE ÷ time, using the final KE	Power = **change** in KE ÷ time
Adding mass to a mass–spring system changes the elastic PE at a given extension	Mass changes the frequency and the KE, not the EPE for a given extension
Compressing a gas heats it because the molecules collide more	Work done by the piston increases molecular KE
Coal is a secondary energy source	Coal, oil, gas, wind and sunlight are **primary**; electricity is secondary
Albedo = reflected ÷ absorbed	Albedo = reflected ÷ **incident** (incident = absorbed + reflected)

Waves

Trap students fall into	What is actually true
Particles in a wave move at the wave speed	Particles oscillate about fixed points; the wave speed is different (about 60% chose wave speed)
Reflection at a free end is inverted	It is **not** inverted; reflection at a fixed end is
Angles of refraction are measured from the surface	From the **normal**
A grating can give an even number of maxima	Always **odd**: the central maximum plus equal numbers on each side
Path-difference conditions work for any sources	The data-booklet conditions assume sources **in phase**; swap them for antiphase sources

Fields and nuclear

Trap students fall into	What is actually true
Doubling a planet's diameter doubles r in $g = GM/r^2$	Use the **radius**; check whether the question gives diameter
Gravitational potential $\propto 1/r^2$	Potential $\propto 1/r$ (field strength $\propto 1/r^2$)
An induced current always opposes the magnet's motion in the same way	Lenz's law: the current opposes the **change in flux**; increasing and decreasing flux give opposite currents
A Compton-scattered photon gains energy	It **loses** energy: its wavelength increases
β^+ decay happens in neutron-rich nuclei	β^- in neutron-rich nuclei; β^+ in **proton-rich** nuclei

Number traps

- **Area conversions:** 1 $mm^2 = 10^{-6}$ m^2, not 10^{-3} m^2. 1 $cm^3 = 10^{-6}$ m^3.
- **Revolutions:** use the **average** angular velocity when the rotation speeds up uniformly.
- **SHM at t = 0:** check whether the object starts at equilibrium (maximum speed) or at an extreme (zero speed) before choosing a sine or cosine graph.

5 Last-week checklist

- Do **at least two full Paper 1A sets under time**, together with a Paper 1B, so you feel the shared clock.
- Learn the **data booklet** layout: in the exam you should find any equation in seconds.
- Re-read every misconception table above; for each one, say the correct physics out loud.

LINKING QUESTION

Revise the physics behind these traps in A.2 Forces and momentum, C.3 Wave phenomena and D.1 Gravitational fields. Then try Paper 1B data skills and Paper 2 answers.

Test yourself — cover the answers first

QUICK CHECK

1. Is there negative marking in Paper 1A?
2. The distance to a planet's centre triples. What happens to g?
3. What are the SI base units of the newton?
4. A ray makes 25° with a surface. What is the angle of incidence?
5. A grating gives n_max = 4. How many maxima are seen?
6. Does the buoyant force on a submerged object depend on its density?

Show answers

1. no; answer every question
2. it becomes 1/9 of its value
3. kg m s^{-2}
4. 65°
5. 9
6. no; on the fluid's density and the volume displaced

Stuck on a question?

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