MindQuest

2027 REGISTRATION OPEN

O-LEVEL PHYSICS

2026 PAPER 1

ANSWERS + FULL WORKED SOLUTIONS

6091/01 · October/November 2026 · All 40 questions

Step-by-step solutions, diagrams and the traps to avoid

• BRYAN LAI •

Mr Lai · MindQuest Learning Hub · Eunos and Jurong East

Reserve your seat for 2027

Complimentary Physics Codex when you register

WhatsApp +65 8758 4968 · mindquest.com.sg

Scan to WhatsApp

MindQuest

O-Level Physics 6091/01

Paper 1 Multiple Choice · October/November 2026

Answer Key and Full Worked Solutions by Mr Lai

FREE for every O-Level student · all 40 questions explained, with diagrams and the traps to avoid

1	2	3	4	5	6	7	8	9	10
C	B	B	B	D	A	C	B	B	C
11	12	13	14	15	16	17	18	19	20
D	D	C	C	C	A	B	B	A	D
21	22	23	24	25	26	27	28	29	30
D	B	A	C	A	A	D	C	D	C
31	32	33	34	35	36	37	38	39	40
C	A	A	A	D	D	A	B	C	D

Answer spread: A × 10 · B × 9 · C × 11 · D × 10

Section	Questions
Measurement, kinematics, forces, pressure, energy	1 – 14
Thermal physics	15 – 20
Waves, light and sound	21 – 27
Electricity and magnetism	28 – 38
Radioactivity	39 – 40

How to use this. Check your answers against the key above first. For every question you got wrong, read the full solution and the key point, then the reasons the other options are wrong — that is where most marks are lost. Answers checked by Mr Lai. The official answer key has not been released yet.

2027 classes now open for registration. Reserve your seat and get a complimentary Physics Codex. WhatsApp +65 8758 4968 · mindquest.com.sg

Question 1 — Kinematics · average speed — C

A runner covers 100 m in three stages (5.0 m in 1.0 s, 90 m in 12 s, 5.0 m in 1.1 s). Find the average speed.

Answer: C

Average speed is **total distance ÷ total time** for the whole journey.

$$\text{total distance} = 5.0 + 90 + 5.0 = 100 \text{ m}$$

$$\text{total time} = 1.0 + 12 + 1.1 = 14.1 \text{ s}$$

$$\text{average speed} = 100 \div 14.1 = 7.09 \text{ m/s} \approx \mathbf{7.1 \text{ m/s}}$$

> **Key point.** Never average the speeds of each stage. The stages take different times, so they do not count equally.

Why not the other options

- A (0.14 m/s): time ÷ distance, upside down (14.1 ÷ 100).
- B (5.7 m/s): the mean of the three stage speeds (5.0, 7.5 and 4.5 m/s) — not allowed.
- D (17 m/s): the three stage speeds added together.

Question 2 — Kinematics · motion graphs — B

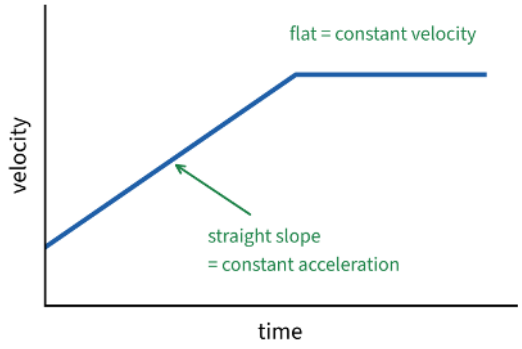
Which graph shows constant acceleration followed by constant velocity?

Answer: B

Read the y-axis label first. On a velocity–time graph, the gradient is the acceleration.

Graph B is a velocity–time graph. Its first part is a **straight sloping line**, so the gradient is constant: **constant acceleration**.

Its second part is **horizontal**, so velocity no longer changes: **constant velocity**.



> **Key point.** Same shape, different meaning: on a displacement–time graph, a straight slope means constant velocity, not constant acceleration.

Why not the other options

- A: displacement–time graph — constant velocity, then at rest.
- C: displacement–time curve that levels off — slowing down to rest.
- D: velocity–time curve with a decreasing gradient — acceleration decreasing, never constant.

Question 3 — Kinematics · area under v–t graph — B

Find the total distance travelled from $t = 0$ to $t = 10$ s from the velocity–time graph.

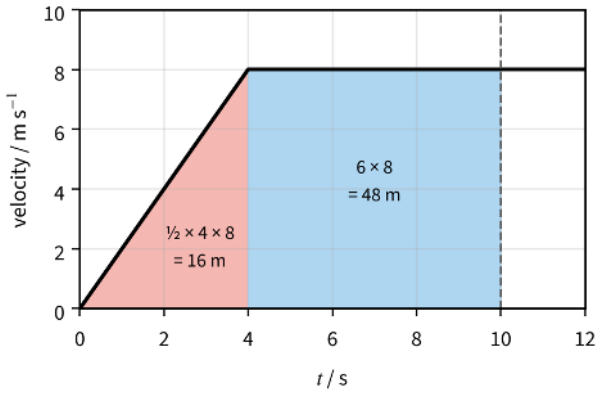
Answer: B

Distance travelled = area under the velocity–time graph. Split the area into simple shapes up to $t = 10$ s only.

triangle (0 to 4 s) = ½ × 4 × 8 = 16 m

rectangle (4 to 10 s) = 6 × 8 = 48 m

total distance = 16 + 48 = **64 m**



Key point. Stop the area at the time asked (10 s), not at the end of the graph.

Why not the other options

- A (48 m): only the rectangle; the triangle is missed.
- C (80 m): 8 × 10, as if the object moved at 8 m/s from the start.
- D (96 m): 8 × 12, the whole graph to 12 s at the top speed.

Question 4 — Mass, weight and density · weight — B

An object of mass 500 g, with $g = 10$ m/s². Find its weight.

Answer: B

Convert the mass to kilograms first: 500 g = 0.500 kg.

$$W = mg = 0.500 \times 10 = \mathbf{5.0\ N}$$

Key point. Always work in SI units: mass in kg before using $W = mg$.

Why not the other options

- A (0.050 N): 0.500 ÷ 10, divided instead of multiplied.
- C (50 N): 500 ÷ 10 — no kg conversion and g divided instead of multiplied.
- D (5000 N): used 500 g as 500 kg.

Question 5 — Forces · Newton's first law — D

A car rolls down a slope at constant speed. Which statement about the resultant force is correct?

Answer: D

The car moves in a straight line at constant speed, so its **velocity is constant** and its **acceleration is zero**.

$$F = ma = m \times 0 = 0$$

So the **resultant force is zero**. The component of weight down the slope is exactly balanced by friction (and air resistance) up the slope.

> **Key point.** Constant velocity means balanced forces. Motion does not need a resultant force; only a change in motion does.

Why not the other options

- A: "weight minus friction" would be non-zero and would make the car speed up. Also, only the component of weight along the slope matters.
- B and C: either would give the car an acceleration, so its speed would change.

Question 6 — Pressure · hydraulic press — A

Piston X has a smaller area than piston Y. Which statement is correct?

Answer: A

The liquid is **incompressible**, so pressure applied at X is **transmitted equally** throughout the fluid. Pressure on Y = pressure on X.

$$F = pA$$

With the same pressure, the piston with the larger area gets the larger force. $A_Y > A_X$, so a downward force on X causes a **larger force on Y**.

> **Key point.** Hydraulics: same pressure everywhere in the liquid, different forces on different areas.

Why not the other options

- B: force on Y is larger, not smaller.
- C and D: the pressure is the same on X and Y.

Question 7 — Mass, weight and density · density — C

A 1.0 g hollow ball (external volume 4.0 cm³) is injected with liquid until its overall density is 1.5 g/cm³. Find the mass of liquid.

Answer: C

The external volume does not change, so use it with the new density.

$$\text{new total mass} = \rho V = 1.5 \times 4.0 = 6.0 \text{ g}$$

$$\text{mass of liquid} = 6.0 - 1.0 = \mathbf{5.0\ g}$$

Key point. The 6.0 g is the whole ball. Subtract the ball's own mass to get the liquid.

Why not the other options

- D (6.0 g): forgot to subtract the 1.0 g of plastic.
- A (1.7 g): divided volume by density (4.0 ÷ 1.5 = 2.7) and then took away 1.0.
- B (3.0 g): does not give 1.5 g/cm³ for a 4.0 cm³ ball.

Question 8 — Pressure · manometer — B

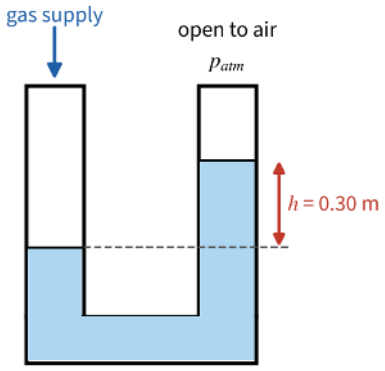
A water manometer is connected to a gas supply. The water on the gas side is 0.30 m lower than on the open side. Atmospheric pressure is 100 000 Pa. Find the gas pressure.

Answer: B

The gas pushes its side of the water **down**, so the gas pressure is **greater** than atmospheric pressure by $h\rho g$.

$$h\rho g = 0.30 \times 1000 \times 10 = 3000 \text{ Pa}$$

$$p_{\text{gas}} = p_{\text{atm}} + h\rho g = 100\,000 + 3000 = 103\,000 \text{ Pa} = \mathbf{1.03 \times 10^5\ Pa}$$



Key point. The manometer only measures the **difference** from atmospheric pressure. Total pressure = atmospheric + $h\rho g$.

Why not the other options

- A (3.00 × 10³ Pa): only the extra pressure $h\rho g$; atmospheric pressure is left out.
- C and D: power-of-ten errors.

Question 9 — Forces · inertia — B

Which property measures the inertia of an object?

Answer: B

Inertia is the reluctance of an object to change its state of rest or motion.

The larger the **mass**, the harder it is to start, stop or change its motion. So **mass** is the measure of inertia.

> **Key point.** Mass is the measure of inertia; it does not change from place to place.

Why not the other options

- A and C: density and volume do not decide how hard an object is to accelerate.
- D: weight depends on the gravitational field strength, so it changes with location; inertia does not.

Question 10 — Energy · kinetic energy — C

P has mass m and kinetic energy $2E$. Q has mass $2m$ and kinetic energy E. Compare their speeds.

Answer: C

Rearrange the kinetic energy formula for speed:

$$E_k = \tfrac{1}{2}mv^2 \text{ so } v^2 = 2E_k \div m$$

$$\text{P: } v_P{}^2 = 2(2E) \div m = 4E \div m$$

$$\text{Q: } v_Q{}^2 = 2E \div 2m = E \div m$$

$$v_P{}^2 \div v_Q{}^2 = 4, \text{ so } v_P \div v_Q = \sqrt{4} = \mathbf{2}$$

The speed of P is **twice** the speed of Q.

> **Key point.** The ratio of v^2 is 4, but the question asks for speed. Take the square root at the end.

Why not the other options

- D (four times): forgot the square root.
- A and B: kinetic energy ratio or mass ratio used without the formula.

Question 11 — Energy · power — D

Which two quantities alone are needed to calculate the power developed by a force?

Answer: D

Power is the **rate of doing work**:

$$P = W \div t \text{ (work done} \div \text{time taken)}$$

So you need the **work done by the force** and the **time taken**.

> **Key point.** Power always needs time. Any option without time cannot give power.

Why not the other options

- A: force × distance gives work done only; no time.
- B: force and time alone — no distance, so the work done is unknown.
- C: no time.

Question 12 Energy · efficiency and power **D**

A motor (input power 200 W, efficiency 15%) lifts a 50 kg box through 6.0 m. Find the time taken (g = 10 N/kg).

Answer: D

Useful energy gained by the box:

$$E_p = mgh = 50 \times 10 \times 6.0 = 3000 \text{ J}$$

Useful output power of the motor:

$$\text{useful power} = 0.15 \times 200 = 30 \text{ W}$$

$$t = \text{energy} \div \text{power} = 3000 \div 30 = \mathbf{100\ s}$$

Check another way: input energy = 3000 ÷ 0.15 = 20 000 J, and 20 000 ÷ 200 = 100 s.

> **Key point.** Match like with like: useful energy with useful power, or total input energy with input power.

Why not the other options

- B (15 s): 3000 ÷ 200, efficiency ignored.
- A and C: efficiency applied wrongly.

MindQuest

Question 13 Turning effect of forces · principle of moments C

A 1.0 m uniform plank (40 N) rests on a bench edge P, 0.30 m from its left end. A 200 N block acts 0.20 m left of P. Find the maximum distance x of a 50 N block to the right of P before the plank rotates about P.

Answer: C

At the maximum x, the plank is just about to tip about P (the bench pushes only at P). Take moments about P.

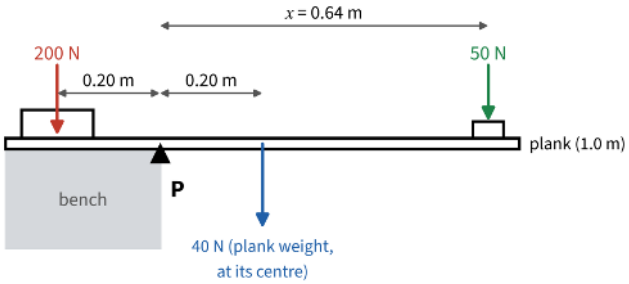
The plank is uniform, so its weight acts at its centre: 0.50 m from the left end, which is 0.50 − 0.30 = **0.20 m to the right of P**.

$$\text{anticlockwise moment} = 200 \times 0.20 = 40 \text{ N m}$$

$$\text{clockwise moment} = 40 \times 0.20 + 50 \times x = 8 + 50x$$

Principle of moments: $40 = 8 + 50x$ so $x = 32 \div 50 =$ **0.64 m**

Check: 0.64 m is less than 0.70 m (the plank's right end), so the block can sit there.



Key point. The weight of the plank itself has a moment. It acts at the centre of the plank, not at P.

Why not the other options

- D (0.80 m): the plank's own weight was left out (40 ÷ 50).
- B (0.56 m): plank weight taken 0.30 m from P.
- A (0.40 m): plank weight taken 0.50 m from P (that is its distance from the left end, not from P).

Question 14 Centre of gravity · stability C

Which change makes the standing student more stable?

Answer: C

An object is more stable when its **centre of gravity is lower** and/or its **base is wider**.

Squatting with the body upright lowers the centre of gravity, while it still stays above the base. He must tilt through a bigger angle before the line of action of his weight falls outside the base.

Key point. Stability: low centre of gravity, wide base.

Why not the other options

- A: heavy books high on his back raise the centre of gravity and shift it backwards — less stable.
- B: raising the arms raises the centre of gravity — less stable.
- D: feet together makes the base narrower — less stable.

Question 15 Kinetic particle model · Brownian motion C

More air is pumped into the sealed smoke box at the same temperature. What changes?

Answer: C

The specks move randomly because **air molecules collide with the smoke particles** unevenly from all sides.

More air at the same volume means **more air molecules per unit volume**. The smoke particles are hit **more frequently**, so they change direction more often and travel a **shorter distance between changes**.

The temperature is unchanged, so the average kinetic energy (and speed) of the air molecules is unchanged.

> **Key point.** Temperature decides how fast; the number of molecules decides how often.

Why not the other options

- A: the number of smoke particles is constant, so the number of specks seen is the same.
- B: faster movement needs a higher temperature, which did not happen.
- D: the motion does change — the path becomes more jagged.

Question 16 Thermal properties · changes of state A

Which statement about changes of state is correct?

Answer: A

When a liquid **solidifies**, the particles form bonds and **release latent heat** to the surroundings. So energy is transferred **from** the liquid. A is correct.

> **Key point.** Melting, boiling and evaporation take in energy; condensation and solidification give out energy.

Why not the other options

- B: condensation and solidification give out energy, so not "all".
- C: evaporation happens at any temperature, from the surface.
- D: while boiling, the temperature stays constant at the boiling point; the energy goes into breaking bonds.

Question 17 Kinetic particle model · gas pressure B

At constant temperature, a gas is compressed and its pressure rises. Why?

Answer: B

Temperature is constant, so the molecules move with the **same average speed**.

A smaller volume means more molecules per unit volume, so molecules **collide with the walls more frequently**.

There is a greater force per unit area on the walls, so the **pressure increases**.

> **Key point.** Pressure comes from molecules hitting the walls, not from molecules hitting each other.

Why not the other options

- A: collisions between molecules do not push on the walls.
- C and D: the molecules do not move faster — the temperature is constant.

Question 18 Transfer of thermal energy · conduction B

Which processes describe conduction in a metal?

Answer: B

Statement 1 is correct: at the hot end, **ions vibrate more and collide with neighbouring ions**, passing energy along the lattice.

Statement 2 is correct: **free electrons** gain kinetic energy, move to colder regions and **collide with ions** there. This is why metals conduct so well.

Statement 3 is wrong: ions in a solid stay in fixed positions. Movement of the material itself is convection, which only happens in fluids.

> **Key point.** Conduction in metals: lattice vibration plus free electrons. No particles flow from place to place.

Why not the other options

- A, C, D: all include statement 3, which is wrong.

Question 19 Energy resources A

Which energy resource releases carbon dioxide when generating electricity?

Answer: A

Fossil fuels (coal, oil, natural gas) are **burned**. Combustion of carbon-based fuel produces carbon dioxide.

> **Key point.** Burning releases CO_2; the other resources do not burn anything.

Why not the other options

- B (geothermal): uses heat from hot rocks.
- C (hydroelectric): uses gravitational potential energy of water.
- D (nuclear): uses nuclear fission; no burning, no CO_2 during generation.

Question 20 Internal energy — D

Which process increases the internal energy of the substance named?

Answer: D

Internal energy is the total kinetic and potential energy of the particles. It increases when energy is **transferred into** the substance.

An electric heater transfers energy into the water, so its particles gain kinetic energy and the water's internal energy increases.

> **Key point.** Ask: is energy going into the substance or out of it?

Why not the other options

- A: condensing vapour gives out latent heat — internal energy decreases.
- B: the air is cooled — energy is removed.
- C: the most energetic molecules escape, so the remaining water cools; with insulation no energy comes in, so its internal energy decreases.

Done with O-Level? JC Physics starts in a few months.
H2 Physics jumps fast in JC1. Start strong with Mr Lai. 2027 classes are open for registration. Scan to WhatsApp +65 8758 4968.

Question 21 General wave properties · wave equation — D

A bar vibrates 30 times per minute; the wave speed is 4.0 cm/s. Find the wavelength.

Answer: D

Frequency must be per **second**:

$$f = 30 \div 60 = 0.50 \text{ Hz}$$

$$\lambda = v \div f = 4.0 \div 0.50 = \mathbf{8.0\ cm}$$

> **Key point.** Convert "per minute" into hertz before using $v = f\lambda$.

Why not the other options

- A (0.13 cm): used $f = 30$ Hz.
- B (0.50 cm): the frequency, not the wavelength.
- C (2.0 cm): multiplied $v \times f$ instead of dividing.

Question 22 General wave properties · transverse and longitudinal **B**

Which statement about longitudinal and transverse waves is correct?

Answer: B

All waves **transfer energy without transferring matter**. The particles only oscillate about fixed positions.

> **Key point.** Waves carry energy, not matter.

Why not the other options

- A: both types refract.
- C: sound (longitudinal) cannot travel in a vacuum at all.
- D: both types can travel in water (sound travels in water too).

Question 23 Light · reflection and deviation **A**

A ray strikes a plane mirror at 40° to the mirror surface. Through which angle, and in which sense, is it deviated?

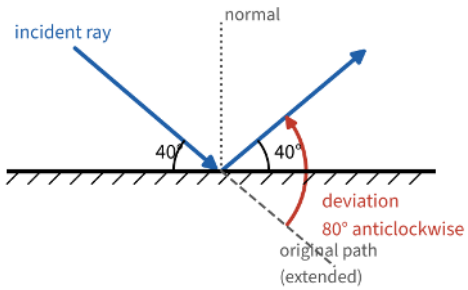
Answer: A

The 40° is measured from the **mirror**, not the normal. So the angle of incidence is 90° − 40° = 50°, and the angle of reflection is also 50°. The reflected ray also leaves at 40° to the mirror.

Deviation is the angle between the original direction of travel (extended) and the new direction.

$$\text{deviation} = 180° - (i + r) = 180° - 100° = \mathbf{80°} \ (= 2 \times 40°)$$

The ray was travelling down to the right and now travels up to the right. It has turned **anticlockwise**.



> **Key point.** 100° is the angle between the incident and reflected rays at the mirror. The deviation is measured from the extended original path: 80°.

Why not the other options

- B: correct size, wrong sense — the ray turns anticlockwise in this diagram.
- C and D (100°): this is $i + r$, the angle between the two rays, not the deviation.

Question 24 Light · thin converging lens **C**

An object is placed at X (beyond 2F), Y (between F and the lens) and Z (on the other side, between the lens and F). Where is the image virtual?

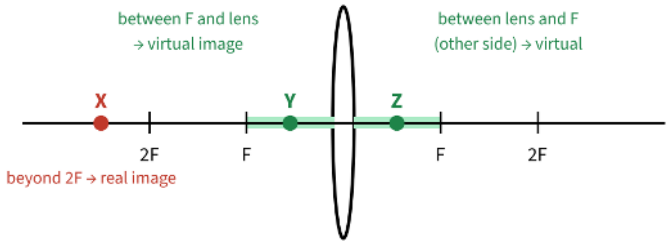
Answer: C

A converging lens forms a **virtual image only when the object is between the lens and the focal point** (object distance < f).

X is beyond 2f: the image is **real**, inverted and diminished.

Y is between F and the lens: **virtual** image (magnifying glass).

Z is less than f from the lens on the other side. A lens has a focal point on **both** sides, so an object at Z also gives a **virtual** image.



Key point. A thin lens works the same way from either side. What matters is the distance from the lens compared with f.

Why not the other options

- A and B: X gives a real image.
- D: misses Z — Z is also within one focal length of the lens.

Question 25 Sound · echo **A**

A bat hears the echo of its pulse 0.064 s after sending it. Sound travels at 0.34 km/s. How far is the wall?

Answer: A

Convert: 0.34 km/s = 340 m/s. The pulse travels **to the wall and back**, so the total distance is 2d.

$$2d = vt = 340 \times 0.064 = 21.76 \text{ m}$$

$$d = 21.76 \div 2 = 10.9 \text{ m} \approx \mathbf{11\ m}$$

Key point. Echo questions: always halve the total distance.

Why not the other options

- B (22 m): forgot to halve — this is the there-and-back distance.
- C and D: divided speed by time instead of multiplying (0.34 ÷ 0.064 = 5.3 km; halved gives 2.7 km).

Question 26 Sound · ultrasound **A**

Why is ultrasound, not X-rays, used to scan an unborn baby?

Answer: A

X-rays are ionising: they can damage or kill living cells and harm the developing baby. **Ultrasound does not cause ionisation**, so it is safe.

> **Key point.** Choose the statement that explains the safety reason, not just a true fact.

Why not the other options

- B: true, but the wave type has nothing to do with safety.
- C: false — both need a machine to detect them.
- D: true, but speed is not why X-rays are avoided.

Question 27 Electromagnetic spectrum **D**

Which component can damage human skin cells by ionisation?

Answer: D

Ultraviolet has the highest frequency of the four options. It is **ionising** and damages skin cells (sunburn, skin cancer).

> **Key point.** Ionising radiation: ultraviolet, X-rays, gamma rays.

Why not the other options

- A, B, C: infrared, visible light and microwaves have lower frequencies and are non-ionising (infrared and microwaves can heat tissue, but do not ionise).

Question 28 Static electricity · charging by induction C

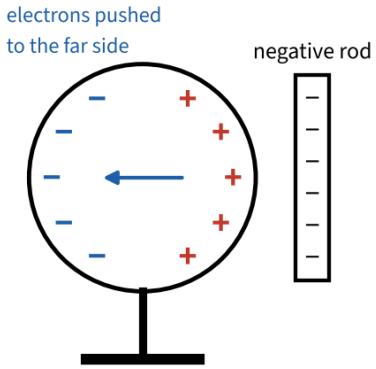
A negatively charged rod is brought near an uncharged metal sphere on an insulated stand. Which diagram shows the charges?

Answer: C

The free **electrons** in the metal are **repelled** by the negative rod and move to the **far side** of the sphere.

The near side is left with a **shortage of electrons**, so it is **positive**.

The sphere is insulated, so no charge enters or leaves: the sphere is still **neutral overall**, with equal amounts of + and −. Only diagram C shows this.



Key point. Induction separates charges but does not change the total charge. The near side is always opposite to the rod.

Why not the other options

- A: shows only + charge, so the sphere would be charged overall.
- B: negative charge near a negative rod — like charges repel, so this is wrong.
- D: charges the wrong way round.

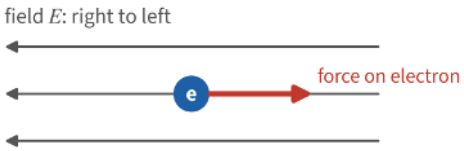
Question 29 Static electricity · electric field D

What is the direction of the electric field that pushes a stationary electron to the right?

Answer: D

The direction of an electric field is the direction of the force on a **positive** charge.

An electron is **negative**, so the force on it is **opposite** to the field. Force to the right means the field points **from right to left**.



Key point. Field lines show the push on a positive charge. Electrons always feel the opposite.

Why not the other options

- A and B: a field into or out of the paper gives a force into or out of the paper, not to the right.
- C: this is the direction of the force on a positive charge.

Question 30 Current electricity · potential difference C

What is the definition of p.d. across a component?

Answer: C

Potential difference is the **work done to drive unit charge** through the component:

$$V = W \div Q$$

Key point. Learn this word for word: work done per unit charge.

Why not the other options

- A: rate of doing work is power.
- B: rate of flow of charge is current.
- D: work per unit current has no meaning here.

Question 31 D.C. circuits · parallel resistors C

10 mA enters a parallel pair: 2.0 mA flows through 300 Ω, the rest through R. Find R.

Answer: C

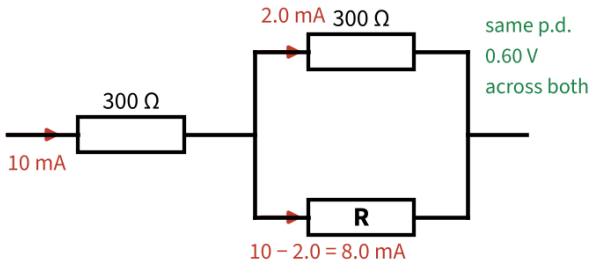
Current splits at the junction: the current in R = 10 − 2.0 = **8.0 mA**.

Parallel branches have the **same p.d.**:

$$V = IR = 2.0 \times 10^{-3} \times 300 = 0.60 \text{ V}$$

$$R = V \div I = 0.60 \div (8.0 \times 10^{-3}) = \mathbf{75\ \Omega}$$

The first 300 Ω resistor is in series before the junction; it does not affect this calculation.



Key point. Parallel: same p.d., currents add up.

Why not the other options

- B (60 Ω): used the total 10 mA instead of 8.0 mA.
- D (1500 Ω): scaled the wrong way — the branch with more current must have the smaller resistance.

Question 32 Practical electricity · cost of electricity A

Which use of appliances costs the most?

Answer: A

Cost depends on **energy used**: $E = Pt$ (in kW h).

A: 0.250 kW × 2.5 h = **0.625 kW h**

B: 6 × 0.010 kW × 8.0 h = 0.48 kW h

C: 2 × 0.090 kW × 3.0 h = 0.54 kW h

D: 2 × 1.6 kW × (10 ÷ 60) h = 0.53 kW h

A uses the most energy, so it costs the most.

Key point. Convert minutes into hours, and remember to multiply by the number of appliances.

Why not the other options

- D is the trap: very high power but only 10 minutes.

Question 33 Practical electricity · mains wiring **A**

Which statements about the wires in a plug on the a.c. mains are correct?

Answer: A

1 is correct: the **fuse is in the live wire**, so when it blows, the appliance is cut off from the high voltage.

2 is wrong: the switch must also be in the **live** wire, not the neutral.

3 is correct: the supply is **alternating**, so the live wire swings **positive and negative** relative to earth.

4 is wrong: the neutral wire stays at about **0 V**; it is never equal to the live wire.

So the answer is **1 and 3**.

> **Key point.** Fuse and switch: always in the live wire. Live alternates; neutral stays near 0 V.

Why not the other options

- B: statement 4 is wrong — if live and neutral were at the same voltage, no current would flow.
- C and D: statement 2 is wrong.

Question 34 D.C. circuits · thermistor **A**

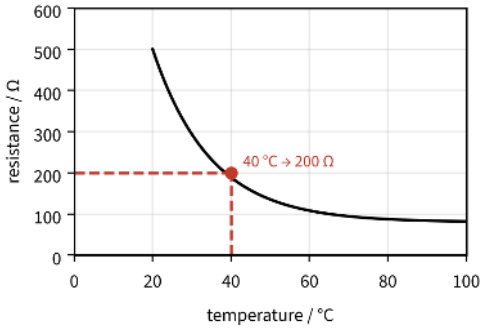
A thermistor and a 100 Ω resistor are in series with 6.0 V. Find the current at 40 °C.

Answer: A

Read the graph: at 40 °C, the thermistor resistance is **200 Ω**.

$$\text{total resistance} = 200 + 100 = 300\ \Omega$$

$$I = V \div R = 6.0 \div 300 = 0.020\ \text{A} = \mathbf{20\ mA}$$



> **Key point.** Series: add the resistances before using $V = IR$.

Why not the other options

- B (30 mA): thermistor alone (6.0 ÷ 200).
- D (60 mA): 100 Ω resistor alone (6.0 ÷ 100).

Question 35 D.C. circuits · potential divider **D**

A 4.5 V supply is across a uniform 100 cm wire PR. The p.d. between Q and R is 0.60 V. Find PQ.

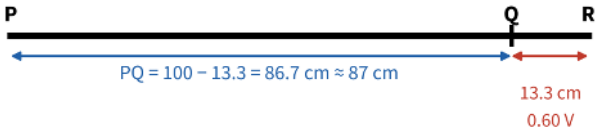
Answer: D

For a uniform wire, p.d. is **proportional to length**.

$$\text{p.d. per cm} = 4.5 \div 100 = 0.045 \text{ V/cm}$$

$$QR = 0.60 \div 0.045 = 13.3 \text{ cm}$$

$$PQ = 100 - 13.3 = 86.7 \text{ cm} \approx \mathbf{87 \text{ cm}}$$



Key point. Check which length is asked. The 0.60 V is across QR, but the question wants PQ.

Why not the other options

- A (13 cm): this is QR, not PQ.
- B and C: neither length gives 0.60 V across QR on a uniform 4.5 V wire.

Question 36 Magnetism · permanent magnets **D**

Which metal bar would become a permanent magnet in the solenoid?

Answer: D

A permanent magnet must be made of a **hard magnetic material**, which keeps its magnetism after the current is switched off. **Steel** is a hard magnetic material.

Key point. Steel: permanent magnets. Iron: temporary magnets (electromagnet cores).

Why not the other options

- C (iron): a soft magnetic material — magnetised easily but loses its magnetism when the current stops.
- A and B: aluminium and copper are non-magnetic.

Question 37 Electromagnetic induction · transformer **A**

A transformer has 910 primary turns at 210 V. Secondary coils XY and YZ in series give 9.0 V across XY and 12 V across XZ. Find the turns on YZ.

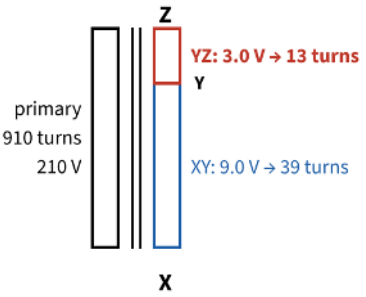
Answer: A

The two secondary coils are in series, so their p.d.s add:

$$\text{p.d. across YZ} = 12 - 9.0 = 3.0 \text{ V}$$

$$N_s \div N_p = V_s \div V_p \text{ so } N_{YZ} = 910 \times 3.0 \div 210 = \textbf{13 turns}$$

Check: XY = 910 × 9.0 ÷ 210 = 39 turns, XZ = 52 turns, and 39 + 13 = 52.



Key point. Same turns per volt on every coil of an ideal transformer (here 910 ÷ 210 ≈ 4.33 turns per volt).

Why not the other options

- B (39): turns on XY.
- C (52): turns on the whole XZ.

Question 38 Electromagnetic induction · Faraday's and Lenz's laws **B**

An e.m.f. is induced in a stationary coil by a magnet. Which statements are correct?

Answer: B

1 is correct: the coil is stationary, so the **magnet must be moving** to change the magnetic flux linkage.

2 is correct: **Lenz's law** — the induced e.m.f. opposes the change producing it.

3 is wrong: moving the magnet **more slowly** gives a smaller rate of change of flux linkage, so a **smaller** e.m.f.

4 is correct: **more turns** give a larger change in flux linkage, so a larger e.m.f.

So the answer is **1, 2 and 4**.

Key point. Induced e.m.f. depends on the rate of change of flux linkage: faster, stronger magnet, more turns.

Why not the other options

- A, C, D: all include statement 3, which is wrong.

Question 39 Radioactivity · penetrating power C

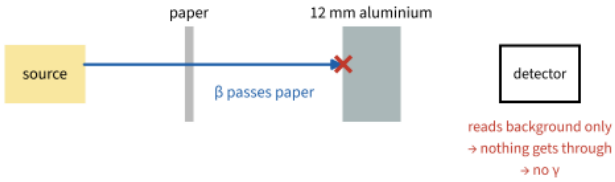
Count rate: background P; with the source, Q. Paper in between: still Q. 12 mm of aluminium: back to P. What does the source emit?

Answer: C

Paper makes **no difference**, so there is **no alpha** (alpha would be stopped by paper; at 15 mm in air it would still reach the detector).

12 mm of aluminium brings the count rate **down to background**, so everything from the source is stopped. Beta is stopped by a few mm of aluminium.

If there were gamma, it would pass through the aluminium and the count rate would stay above background. So there is **no gamma**. The source emits **beta only**.



Key point. Back to background means nothing gets through — that rules out gamma.

Why not the other options

- A: alpha would be stopped by the paper, but the count did not drop.
- B: gamma would get through the aluminium.
- D: gamma would not be stopped by 12 mm of aluminium.

Question 40 Radioactivity · half-life with background D

Half-life 3.0 h. Reading 920 counts/s, then 260 counts/s after 6.0 h. Find the background reading.

Answer: D

Only the count from the **source** halves; the background stays the same. Let the background be B.

6.0 h = 2 half-lives, so the source count falls to ¼ of its value.

$$260 - B = ¼\,(920 - B)$$

$$1040 - 4B = 920 - B \text{ so } 3B = 120 \text{ so } B = \textbf{40 counts/s}$$

Check: source count = 920 − 40 = 880 → 440 → 220 after 6.0 h; 220 + 40 = 260 ✓

Key point. Always remove the background first, then halve.

Why not the other options

- C (30 counts/s): halved 920 twice to get 230, then took 260 − 230 — the background was halved along with the source.

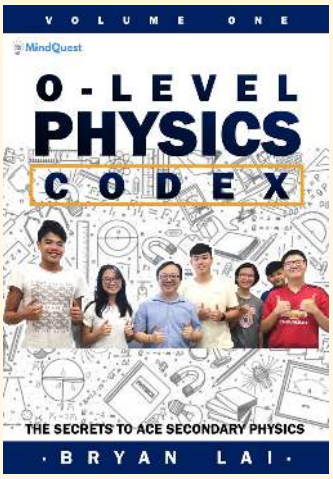
Reserve your seat for 2027

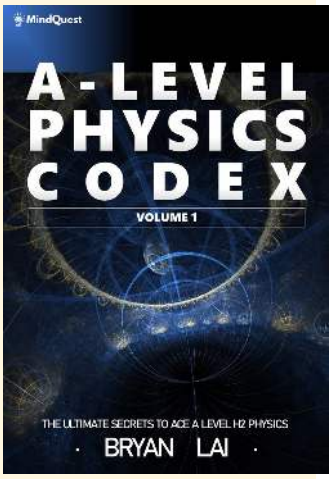
Classes now open for registration · Eunos and Jurong East

Sec 3 and Sec 4 O-Level Physics	Concepts built from the ground up, then every type of Cambridge question, so you score every mark with confidence.
JC1 and JC2 H2 Physics	For students moving on to JC. Master the big jump from O-Level to H2 early, not after the first common test.
IP Physics	Depth and rigour for Integrated Programme students.

Complimentary Physics Codex

Register for 2027 and receive Mr Lai's **Physics Codex**: the Cambridge keywords and definitions you must write word for word to score full marks. O-Level and A-Level editions.





Eunos 150 Changi Road, #02-02 Guthrie Building	**Jurong East** Blk 135 Jurong Gateway Road, #04-329

Seats are limited. Reserve yours now.

WhatsApp +65 8758 4968 · mindquest.com.sg

WhatsApp us

Website