

Predicted Mock Paper 1: mark scheme

Physics · Higher Tier · for the June 2027 exams · 100 marks

How to use this mark scheme

- Each marking point is worth 1 mark unless stated. Alternative acceptable answers are shown with **allow**; answers that do not score are shown with **do not accept**.
- **Calculations:** full marks for the correct answer with no working. If the answer is wrong, award marks for correct working (substitution, rearrangement, unit conversion).
- **Errors carried forward (ecf):** an error in one part is only penalised once; credit later working that correctly uses an earlier wrong value.
- **Lists:** if more answers are given than asked for, a wrong answer cancels a right one.
- **6-mark questions** are marked by levels. Decide the level from the overall quality, then the mark within the level from how much of the indicative content is covered.
- Grade estimate (Higher): roughly 70%+ ≈ 7, 55% ≈ 6, 45% ≈ 5, 35% ≈ 4. These are a guide only: real grade boundaries change every year.

Why these questions? (the prediction)

The prediction is based on AQA's published examiner reports for recent series (June 2023–2025), the specification, and the 2027 arrangements (the Physics Equations Sheet is provided again in 2027).

- **Weak areas are revisited.** In June 2025, Paper 1H series and parallel circuits were answered very poorly, students confused what happens to internal energy during a change of state, and unit conversion (cm → m, minutes → s, kJ → J) cost many marks. This paper deliberately tests these again.
- **Recently-tested required practicals rotate.** Specific heat capacity (RP1) was the 2025 Paper 1 six-mark practical, so this paper uses thermal insulation (RP2) and I–V characteristics (RP4) instead.
- **Physics-only content** such as static electricity, nuclear fission and medical uses of radiation appears less often, so it is due a showing.
- **Multi-step calculations** (6 marks) have appeared every year, so one is included in the energy question.

Question 1

Why it's predicted: Energy resources appear on almost every Paper 1. Examiners report that comparisons are weak unless both resources are discussed with data.

Q	Answers / marking points	Mark	Spec
01.1	• Hydro-electricity	1	4.1.3
01.2	• gas is more reliable / wind farm is less reliable • because the gas station produces its maximum output for a greater percentage of the time (85% compared with 35%) / wind depends on the weather • gas power station releases carbon dioxide (350 g per kWh); the wind farm releases none when generating • carbon dioxide contributes to global warming / climate change • *allow* other valid environmental points, e.g. wind farm has visual impact / noise / affects marine habitats Max 4. Both power stations must be referred to for full marks; at least one point must use data from Table 1.	4	4.1.3
01.3	• step-up transformers increase the potential difference (for transmission) • which decreases the current (for the same power) • so less energy is dissipated / wasted by heating the cables (allow: lower power loss, $P = I^2R$)	3	4.2.4.3
01.4	• 400 kV = 400 000 V • P = 400 000 × 1500 • P = 6.0×10^8 W An answer of 600 000 000 W scores 2 marks (not in standard form). An answer of 6.0×10^5 scores 1 mark (kV not converted).	3	4.2.4.1
01.5	• step-down transformer	1	4.2.4.3

Question 2

Why it's predicted: Required practical 2 (thermal insulation) has not been the six-mark practical recently; RP1 was in 2025. Method questions in 2025 lost marks for unclear measurements, so this checks exactly that.

Q	Answers / marking points	Mark	Spec
02.1	**Level 3:** A detailed and coherent answer that covers the points below in a logical sequence, linking ideas clearly. (5–6 marks) **Level 2:** A clear answer covering several relevant points, but with some gaps or less logical order. (3–4 marks) **Level 1:** Simple, relevant statements with little linking or structure. (1–2 marks) **Level 0:** No relevant content. (0 marks) **Indicative content** • wrap a beaker in a layer of insulating material (e.g. bubble wrap / cotton wool / newspaper) • pour a fixed volume of hot water into the beaker (measured with a measuring cylinder) / same starting temperature • put a lid on the beaker and a thermometer through the lid • record the starting temperature, start a stopwatch and record the temperature after a fixed time (e.g. 10 minutes) • calculate the temperature decrease • repeat with different numbers of layers (e.g. 0 to 4 layers) • control variables: same volume of water, same starting temperature, same beaker, same type of insulation, same time, same room temperature • repeat each test and calculate a mean Level 3 needs a method that could be followed to get valid results, including measurements and at least two control variables.	6	4.1.2.1 RP2
02.2	• as the number of layers increases, the temperature decrease gets smaller • each extra layer has a smaller effect / the decrease is not proportional	2	4.1.2.1
02.3	• use a digital thermometer / temperature probe and data logger with a resolution of 0.1 °C	1	WS 3.5

Question 3

Why it's predicted: In June 2025, over 80% of Higher students scored no marks on a series and parallel circuits question. Expect this again: potential dividers with a sensor are a favourite.

Q	Answers / marking points	Mark	Spec
03.1	• they are in series / there is only one path for the charge	1	4.2.2
03.2	• total resistance = 10 + 20 = 30 Ω • I = V ÷ R = 6.0 ÷ 30 • I = 0.2 A	3	4.2.4
03.3	• V = 0.2 × 10 • V = 2.0 V (allow ecf from 03.2)	2	4.2.4
03.4	• resistance of the thermistor decreases • so the total resistance decreases and the current increases • so the p.d. across the resistor / voltmeter reading increases • *allow*: the thermistor takes a smaller share of the 6.0 V, so the resistor takes a larger share Max 3.	3	4.2.1.4
03.5	• the total resistance (of the circuit) decreases (the parallel pair has a smaller resistance than 10 Ω) • so the current from the battery increases	2	4.2.4

Question 4

Why it's predicted: Static electricity and electric fields are Physics-only content that has not featured heavily in recent Paper 1s.

Q	Answers / marking points	Mark	Spec
04.1	• electrons are transferred • from the jumper to the balloon (by friction / rubbing) Do not accept: positive charges/protons move.	2	4.2.5.1
04.2	• radial lines (at least four, evenly spaced) starting at the surface of the sphere • arrows pointing towards the sphere	2	4.2.5.2
04.3	• there is a large potential difference between the sphere and the earthed rod • this produces a strong electric field in the air between them • the field is strong enough to make (ionise) the air conduct / charge (electrons) flows across the gap	3	4.2.5.1
04.4	• 30 kV = 30 000 V • Q = E ÷ V = 0.012 ÷ 30 000 • Q = 4.0×10^{-7} C (allow 0.0000004 C)	3	4.2.4.2

Question 5

Why it's predicted: Students in 2025 often said kinetic energy increases during melting, and many lost marks converting minutes to seconds. This combines both with reading a graph.

Q	Answers / marking points	Mark	Spec
05.1	• 55 °C	1	4.3.2.2
05.2	• internal energy increases • the energy supplied breaks bonds between particles / increases the potential energy of the particles • the kinetic energy of the particles stays the same (so the temperature is constant)	3	4.3.2.1
05.3	• time melting = 8 minutes = 480 s • E = P t = 50 × 480 = 24 000 J • L = E ÷ m = 24 000 ÷ 0.25 • L = 96 000 J/kg An answer of 1600 J/kg (minutes not converted) scores 2 marks.	4	4.3.2.3
05.4	• some energy from the heater is transferred to the surroundings / container (not to the wax), so the energy used is overestimated	1	WS
05.5	• $\Delta E = 0.25 \times 2200 \times 15$ • $\Delta E = 8250$ J	2	4.3.2.2

Question 6

Why it's predicted: Half-life from a graph and nuclear equations appear most years. In 2025 students lost marks for not stating the number of half-lives, so the working is tested here.

Q	Answers / marking points	Mark	Spec
06.1	• the electron moves to a higher energy level • further from the nucleus	2	4.4.1.1
06.2	• iodine-127: 53 protons and 74 neutrons • iodine-131: 53 protons and 78 neutrons	2	4.4.1.2
06.3	• $^{9}_{39}Y$ • $^{0}_{-1}e$ (allow β)	2	4.4.2.2
06.4	• construction lines on the graph from 800 to 400 Bq (or any halving) • half-life = 8 days	2	4.4.2.3
06.5	• 40 ÷ 8 = 5 half-lives • $(½)^5 = 1/32$ (allow 0.03125) Allow ecf from 06.4.	2	4.4.2.3

Question 7

Why it's predicted: Choosing a source using half-life and type of radiation is a classic AO2/AO3 question. Fission and chain reactions are Physics-only content due to appear.

Q	Answers / marking points	Mark	Spec
07.1	• B • gamma can pass out of the body and be detected / alpha would be absorbed in the body • short half-life so the activity falls quickly / the patient is not exposed for long (C would remain radioactive for years) No marks for B without a reason.	**3**	4.4.4.1
07.2	• keep as far away as possible / handle with tongs • spend as little time as possible near the source • use shielding (e.g. lead screens / lead apron) Any two.	**2**	4.4.3
07.3	• a neutron is absorbed by a (uranium-235 / plutonium-239) nucleus • the nucleus splits into two smaller nuclei (of roughly equal size) and releases two or three neutrons (and gamma rays / energy) • the neutrons released are absorbed by other nuclei, causing further fission	**3**	4.4.4.2
07.4	• control rods absorb neutrons • to control the rate of fission / prevent an uncontrolled chain reaction (explosion)	**2**	4.4.4.2

Question 8

Why it's predicted: Mains safety and power calculations with prefixes (kW) come up every year and are reliable marks for well-prepared students.

Q	Answers / marking points	Mark	Spec
08.1	• 50 Hz	**1**	4.2.3.1
08.2	• the metal case would be at 230 V / at the same potential as the live wire • a person touching the case is at 0 V, so there is a large potential difference across them • a current would flow through the person (to earth), giving an electric shock	**3**	4.2.3.2
08.3	• 9.2 kW = 9200 W • $I = P \div V = 9200 \div 230$ • $I = 40$ A	**3**	4.2.4.1
08.4	• the shower has a much larger current • thicker cables have a lower resistance, so less energy is transferred by heating ($P = I^2R$) / they do not overheat (fire risk)	**2**	4.2.4.1

Question 9

Why it's predicted: Multi-step calculations worth 5–6 marks have appeared on every recent Paper 1, and in 2025 students lost marks for not squaring the extension.

Q	Answers / marking points	Mark	Spec
09.1	• Ee = ½ × 400 × 0.050² • Ee = 0.50 J • 0.50 = 0.020 × 9.8 × h • h = 0.50 ÷ (0.020 × 9.8) • h = 2.6 m (allow 2.55 m)	5	4.1.1.2
09.2	• Ep = 0.020 × 9.8 × 1.8 = 0.3528 J • efficiency = 0.3528 ÷ 0.50 • efficiency = 0.71 (allow 71%) Allow ecf from 09.1.	3	4.1.2.2
09.3	• work is done against air resistance / friction (in the launcher) • energy is dissipated / transferred to the thermal store of the surroundings (wasted)	2	4.1.2.1

Question 10

Why it's predicted: RP4 (I–V characteristics) has not been the six-mark practical recently, and the 2025 report noted confusion about how components behave with current in one direction.

Q	Answers / marking points	Mark	Spec
10.1	**Level 3:** A detailed and coherent answer that covers the points below in a logical sequence, linking ideas clearly. (5–6 marks) **Level 2:** A clear answer covering several relevant points, but with some gaps or less logical order. (3–4 marks) **Level 1:** Simple, relevant statements with little linking or structure. (1–2 marks) **Level 0:** No relevant content. (0 marks) **Indicative content** • diode in series with an ammeter and a protective resistor / variable resistor • voltmeter connected in parallel with the diode • use a variable power supply / variable resistor to change the p.d. • record the current and the p.d. for a range of values • reverse the connections to the supply (diode) to obtain negative values • repeat readings and calculate means • keep the current low / switch off between readings so the diode doesn't heat up • plot a graph of current (y-axis) against p.d. (x-axis) Level 3 must include a correct circuit (ammeter in series, voltmeter in parallel), a way of changing the p.d., and obtaining negative values.	6	4.2.1.4 RP4
10.2	• zero (or almost zero) current for negative p.d. • current increases steeply once the positive p.d. is above a small value (about 0.6 V)	2	4.2.1.4