Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE
In Physics (4PH1) Paper 2PR

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Notes	Marks
1 (a) (i)	idea of rubbing / friction; (causing) transfer of <u>electrons</u>;	condone rubbing between particles reject transfer of protons/positive charge	2
(ii)	like / identical / (the) same / similar; repulsive / repelling / repulsion;	allow equivalent phrases e.g. <u>both</u> have negative (charges) ignore unqualified negative, positive allow equivalent phrases ignore opposite	2
(b)	idea that earthing prevents the metal channels / particles from becoming charged; prevents a spark from occurring;	allow idea that {charge/electrons/current} can pass {through the earth wire / to earth / ground} allow idea that channel/particles remain neutral/become discharged allow idea that risk of spark is reduced ignore references to explosions	2

Total for Question 1 = 6 marks

Question number	Answer	Notes	Marks
2 (a)	(nuclei with) same number of protons; different number of neutrons;	ignore references to electrons allow same atomic number ignore same element allow different (atomic) mass, nucleon/mass number	2
(b) (i)	**A (92)**; *B is incorrect because this is the number of neutrons* *C is incorrect because this is the number of nucleons* *D is incorrect because this is the nucleon number and proton number added together*		1
(ii)	neutron;	ignore n condone spelling mistakes	1
(c) (i)	recognition that 46 minutes is 2 half-lives; correct final evaluation; e.g. 46 ÷ 23 = 2 OR 60 × ½ × ½ (mass =) 15 (g)	allow attempt to halve twice in calculation allow 2 half-lives seen explicitly in working	2
(ii)	**C (** $^{239}_{93}\mathrm{Np}$ **)**; *A is incorrect because neither the number of neutrons or protons has changed* *B is incorrect because a neutron has been added with no change to the number of protons* *D is incorrect because a proton has been added with no change to the number of neutrons*		1

Total for Question 2 = 7 marks

Question number	Answer	Notes	Marks
3 (a)	any two from: MP1. idea that it is renewable; MP2. does not produce carbon dioxide / greenhouse gases; MP3. does not produce sulfur dioxide / oxides of nitrogen / acid rain; MP4. idea that it is reliable / tides are dependable; MP5. does not produce radioactive waste;	ignore references to cost allow idea that resource will not run out allow does not contribute to global warming ignore toxic/polluting gases ignore toxic/polluting gases allow doesn't depend on sunlight, wind etc. condone can be used at any time	2
(b)	any two from: MP1. potential impact on wildlife; MP2. idea that it cannot (always) provide electricity when needed (e.g. at high tide); MP3. changes shipping routes; MP4. idea that tides may vary (over time); MP5. idea that not suitable in all locations;	ignore references to cost allow idea that it blocks migration routes, wading bird habitats etc. allow idea that (electrical) output varies allow idea that it doesn't work if not near the sea	2
(c) (i)	substitution; evaluation; e.g. energy transferred = 1 × 10 × (8.0) (energy transferred =) 80 (J)	allow use of g = 9.8, 9.81 (N/kg) condone substitution of mass in grams for this mark only allow 78, 78.4, 78.5, 78.48 (J)	2
(ii)	conversion of kW to W; setting up calculation; evaluation; e.g. 240 000 kW = 240 000 000 W 240 000 (000) = mass × 10 × 8(.0) (÷ 1) (mass of water =) 3 000 000 (kg)	allow ecf from (i) and from incorrect power conversion answers between 3000 and 3100 (kg) scores 2 marks allow use of ratio e.g. mass = 240 000 (000) / 80 allow $3(.0) \times 10^6$ (kg) allow answers between 3 000 000 and 3 100 000 (kg)	3

Total for Question 3 = 9 marks

Question number	Answer	Notes	Marks
4 (a)		all marking points can be awarded from labelled diagram	3
	two coils (of wire);	allow two coils drawn in diagram even if not labelled as "coils"	
	secondary coil has more turns than primary coil;	allow RA condone more coils on secondary relative numbers of turns can be inferred from diagram	
	iron core (linking the coils);	allow "magnetically soft" for iron allow both coils wound round a single iron core	
(b) (i)	input power = output power;	allow if expressed in terms of voltages and currents e.g. $V_p I_p = V_s I_s$ allow p/s, 1/2, in/out, i/o for subscripts	1
(ii)	substitution; rearrangement; evaluation; e.g. $230 \times 4.5 = V \times 0.21$ $V = 230 \times 4.5 / 0.21$ (V =) 4900 (V)	allow 5000, 4930, 4929, 4928.6, 4928.57… (V) condone 4928, 4928.5 (V)	3

Total for Question 4 = 7 marks

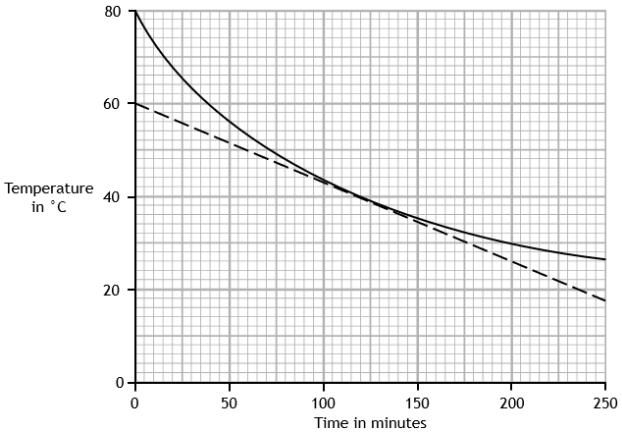
Question number	Answer	Notes	Marks
5 (a)	arrow drawn vertically downwards such that its line of action passes through the centre of the ball; arrow labelled "weight";	ignore any additional arrows judge by eye ignore starting position of arrow allow force due to gravity, gravitational force ignore gravity	2
(b) (i)	initial momentum calculated; final momentum calculated; evaluation of change in momentum; consistent unit; e.g. (initial momentum = 0.057 × 2.5 =) 0.14 (final momentum = 0.057 × 1.9 =) 0.11 (change in momentum = 0.14 + 0.11 =) 0.25 kg m/s	ignore any minus signs allow if calculated in kg m/s or g m/s change in momentum of 0.034(2) scores first two marks allow 0.142, 0.143, 0.1425 allow 0.108, 0.1083 allow 0.251, 0.2508 allow N s allow g m/s only if consistent with values	4
(ii)	substitution into given formula; evaluation; direction of force = upwards; e.g. (force =) 0.25 / 0.0060 (force =) 42 (N) direction = upwards	allow ecf from (i) ignore units allow upwards arrow ignore north allow 41-42 (N)	3
(c)	any **two** marks max. from: MP1. independent variable is type of ball; MP2. dependent variable is height of bounce; MP3. any named control variable; any **two** marks max. from: MP4. ensure distances are measured vertically; MP5. use of set square; MP6. measure at eye level;	related to variables allow material of ball allow coefficient of restitution e.g. drop height, surface used, temperature of ball, released from rest related to accuracy allow ruler/tape measure perpendicular to ground can be awarded from well-drawn diagram ignore unqualified "avoid parallax"	6

	MP7. use of (slow motion) camera to measure height; any **two** marks max. from: MP8. repeats taken for each ball; MP9. identify anomalies; MP10. calculate mean values;	ignore use of light gates related to reliability allow repeat investigation allow average for mean	

Total for Question 5 = 15 marks

Question number	Answer	Notes	Marks
6 (a) (i)	(wave) speed = frequency × wavelength;	allow standard symbols and rearrangements i.e. $\lambda = v / f$ allow v, c and s for speed	1
(ii)	substitution; rearrangement; evaluation in mm to at least 2s.f.; e.g. $3.0 \times 10^8 = 1.6 \times 10^{11} \times \lambda$ $\lambda = 3.0 \times 10^8 / 1.6 \times 10^{11}$ λ = (0.0019 (m) =) 1.9 (mm)	 allow 1.88, 1.875 (mm) condone 1.87 (mm)	3
(b)	idea that wavelength has increased (over time); because <u>Universe</u> is expanding;	allow wavelength has stretched ignore wavelength has expanded ignore red-shift	2
(c)	(most galaxies show a) red-shift because they are moving away (from Earth / each other); further galaxies show a greater red-shift; further galaxies are travelling (away from Earth) faster; idea that all matter must have originated from a single point;	condone use of stars, planets, objects for galaxies for this marking point only allow faster galaxies have greater red-shift	4

Total for Question 6 = 10 marks

Question number	Answer	Notes	Marks
7 (a)	mention of infrared (radiation); idea that surface is a poor absorber (of infrared);	allow IR for infrared allow idea that surface is a (good) reflector condone surface reflects heat	2
(b)	lid traps air; which reduces/stops convection (currents);	allow steam/gas for air ignore traps heat/energy allow reduces evaporation	2
(c) (i)	suitable tangent drawn at point on curve corresponding to a temperature of 40 °C; e.g.  	if extrapolated, line should intersect temperature axis between 56 and 64 °C	1
(ii)	attempt at gradient calculation; gradient evaluated correctly; minus sign included in answer; e.g. gradient = (18 – 60) / (250 – 0) gradient = (−)0.17 (°C/minute) gradient = −0.17 (°C/minute)	allow ecf from (i) allow any clear **change** in temperature divided by a **change** in time allow range of 0.14 – 0.21 mark independently	3
(iii)	curve drawn consistently below existing curve; curve starts at same initial temperature and does not decrease below 20°C;	curve may start at 80°C, but does not have to for this mark DOP	2

Total for Question 7 = 10 marks

Question number	Answer	Notes	Marks
8 (a)	20 000 (Hz);	allow if full range given i.e. 20 - 20 000 (Hz) allow 20 kHz but matching unit needed	1
(b)	evaluation of time period; use of f = 1/T; evaluation of frequency; consistent conclusion comparing calculated frequency to answer in (a); e.g. $T = 4 \times 20 \times 10^{-6} = 8 \times 10^{-5}$ (s) $f = 1 / 8 \times 10^{-5}$ f = 12 500 (Hz) this is within human hearing range so can be heard	allow ecf from incorrect T for this mark only this mark can only be awarded if a frequency **calculation** has been attempted allow ecf from (a)	4
(c)	**A (10×10^{-6} seconds per square, 5 mV per square)**; *B is incorrect because this will cause the amplitude to decrease* *C is incorrect because this will cause there to be four waves on the screen* *D is incorrect because this will cause there to be four waves on the screen and the amplitude to decrease*		1

Total for Question 8 = 6 marks

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