



Mark Scheme (Results)

Summer 2023

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

Question number	Answer	Notes	Marks
1 (a)	Physical quantity Unit	ignore line drawn from force as already given 3 marks if all correct 2 marks if 2 correct 1 mark for any 1 correct ignore line if more than one physical quantity or unit are linked to each other	3
(b) (i)	idea that vectors have a direction but scalars do not;	allow idea that only vectors have a direction	1
(b) (ii)	any correct scalar;	e.g. speed, distance, length, mass, time, temperature, energy, power etc.	1

Total for Question 1 = 5 marks

Question number	Answer	Notes	Marks
2 (a)	chemical (energy store);		1
(b)	any one advantage of natural gas from: MP1. idea that electricity generated can change to meet demand; MP2. idea that it is reliable; any one disadvantage of natural gas from: MP3. non-renewable / gas will eventually run out; MP4. burning gas produces CO₂ / greenhouse gases; MP5. dependency on other countries to supply gas; any one advantage of wave power from: MP6. idea that it is renewable; MP7. produces no polluting gases; any one disadvantage of wave power from: MP8. idea that waves might not always be present; MP9. (may) cause harm to wildlife; MP10. possible storm damage to the generator;	ignore references to cost allow idea that startup time is (very) short e.g. is always available, does not depend on weather allow causes air pollution, contributes to global warming ignore references to visual pollution allow waves are weather dependent	4

Total for Question 2 = 5 marks

Question number	Answer	Notes	Marks
3 (a)	any three from: MP1. idea that plastic is an insulator OR that metal is a conductor; MP2. idea that charge/electrons are transferred (by rubbing/friction); MP3. charge/electrons remain/build up on plastic parts; MP4. charge/electrons flow through the metal parts/travel to earth;	allow plastic has no free electrons allow plastic does not conduct allow electrons gained / lost must be clearly linked to plastic must be clearly linked to metal	3
(b) (i)	substitution into energy = charge × voltage; rearrangement; evaluation; e.g. $(0.00)5 = \text{charge} \times 6000$ $\text{charge} = (0.00)5 / 6000$ (charge =) 8.3×10^{-7} (C)	ignore unit conversions until evaluation -1 for POT error allow 8×10^{-7} , $8.33... \times 10^{-7}$ (C)	3
(ii)	idea of bringing pad near another uncharged insulator; attraction used to demonstrate charge on sponge;	allow water from tap, (small) pieces of paper, hair, balloon etc. as the insulator allow gold leaf electroscope reject references to repulsion unless linked to gold leaf electroscope	2

Total for Question 3 = 8 marks

Question number	Answer	Notes	Marks
4 (a) (i)	momentum = mass $\times$ velocity;	all standard symbols and rearrangements e.g. $m = p / v$ ignore m, M for momentum	1
(ii)	substitution; rearrangement; evaluation to 2 or more s.f.; e.g. $1100 = \text{mass} \times 14$ $\text{mass} = 1100 / 14$ (mass =) 79 (kg)	answer of 78 (kg) gets 2 marks only allow 78.6, 78.57... condone 78.5	3
(b)	substitution into $F = \Delta p / t$; rearrangement; evaluation; e.g. $15\,000 = 1100 / t$ $t = 1100 / 15\,000$ (t =) 0.073 (s)	ignore not converting kN to N allow use of $\Delta p = (80 \times 14 =) 1120$ -1 for POT error allow 0.07, 0.0733..., 0.075, 0.0746...	3
(c)	idea that airbag increases the (collision) time; reduces the rate of change of momentum;	condone slows down change of momentum allow reduces acceleration allow use of equation AND statement that change in momentum is constant (which reduces the force)	2

Total for Question 4 = 9 marks

Question number	Answer	Notes	Marks
5 (a)	energy required; for a unit mass / per gram (of mass) / per kilogram (of mass); to change per unit temperature / change by 1° (C) / change by 1 K;	ignore equations ignore heat for energy allow other statements that imply changing e.g. increasing, raising, heat up, decreasing etc.	3
(b) (i)	substitution into $\Delta Q = mc\Delta T$; rearrangement; correct evaluation to 2 or more s.f.;	answer of 2.9, 1.6, 1.0 gets 1 mark for showing rearrangement allow 3.77...	3
(ii)	any one from: MP1. <u>energy</u> also heating boiling tube; MP2. <u>energy</u> is being transferred/lost to/gained from surroundings; MP3. stearic acid may be impure;	ignore suggestions of human error allow thermometer, support allow alternatives to surroundings e.g. air	1

Total for Question 5 = 7 marks

Question number	Answer	Notes	Marks														
6 (a)	idea that there must be a current in the wire; this current must be to the right;	allow charge/electrons moving in the wire reject references to positive electrons allow electrons moving to the left	2														
(b) (i)	any one of: MP1. idea of avoiding fall objects from hitting hands/feet etc; MP2. taking care of heating effect of current; MP3. idea of protecting floor from damage;	ignore electric shocks, safety glasses, gloves allow idea of not standing underneath	1														
(ii)	correct calculation of mean; answer given to 3 significant figures; e.g. (mean current =) 1.833...(A) (mean current =) 1.83 (A)	independent mark	2														
(iii)	y-axis scale with a sensible, continuous scale such that plotted data covers 50% of the grid; y-axis labelled with current/I AND amps/A; all data plotted correctly; <table><tr><th>Mass of load in g</th><th>Mean current in A</th></tr><tr><td>100</td><td>0.30</td></tr><tr><td>200</td><td>0.58</td></tr><tr><td>300</td><td>0.89</td></tr><tr><td>400</td><td>1.23</td></tr><tr><td>500</td><td>1.50</td></tr><tr><td>600</td><td>1.83</td></tr></table>	Mass of load in g	Mean current in A	100	0.30	200	0.58	300	0.89	400	1.23	500	1.50	600	1.83	reject if scale uses multiples of 0.3, 0.7 or 0.9 or if discontinuous allow ecf from (ii) reject if scale is discontinuous data should be plotted to within half a small square	3
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(iv)	straight line drawn with approximately equal distribution of points either side;	allow ecf from incorrect plotting/scale line does not need to pass through origin	1														

(v)	any three from: MP1. indication that 1.0 kg is 1000 g; MP2. use of data from table to show that ratio supports 3.0 A current value; MP3. (because) current is (directly) proportional to mass; MP4. idea that 1.0 kg is (far) beyond range of collected data/graph; MP5. idea that pattern may not continue outside range of data collected/graph;	can be inferred from working e.g. $2 \times 500\text{g} = 1\text{kg}$ e.g. 500g gives 1.50A and 1000g is double 500g, 100g gives 0.30A and 1000g is 10 times 100g	3
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Total for Question 6 = 12 marks

Question number	Answer	Notes	Marks																					
7 (a)	C and D ticked with A and F unticked = 1 mark; all of B, C, D and E ticked with A and F unticked = 2 marks;; <table><tr><th>Sound wave</th><th>Frequency in Hz</th><th>Can be heard by humans</th></tr><tr><td>A</td><td>10</td><td></td></tr><tr><td>B</td><td>30</td><td>✓</td></tr><tr><td>C</td><td>500</td><td>✓</td></tr><tr><td>D</td><td>2000</td><td>✓</td></tr><tr><td>E</td><td>10 000</td><td>✓</td></tr><tr><td>F</td><td>25 000</td><td></td></tr></table>	Sound wave	Frequency in Hz	Can be heard by humans	A	10		B	30	✓	C	500	✓	D	2000	✓	E	10 000	✓	F	25 000		if either A or F ticked then award 0 marks	2
Sound wave	Frequency in Hz	Can be heard by humans																						
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D	2000	✓																						
E	10 000	✓																						
F	25 000																							
(b)	wave drawn with lower amplitude throughout; wave drawn with lower frequency throughout;	ignore vertical position of wave in the grid peak to peak should be less than 4 squares vertically throughout trace should be less than $2\frac{1}{2}$ waves in the trace	2																					
(c) (i)	conversion of temperature into kelvin; substitution and evaluation; e.g. temperature = $46 + 273 = 319 \text{ K}$ speed = $(0.606 \times 319) + 166 = 360 \text{ (m/s)}$	allow 319 seen anywhere in working apply ecf if 46 used as kelvin temperature giving 194, 193.9, 193.876 (m/s) for 1 mark allow 359, 359.3... (m/s)	2																					
(ii)	substitution into speed = frequency $\times$ wavelength; rearrangement; evaluation; e.g. $360 = 15\,000 \times \text{wavelength}$ wavelength = $360 / 15\,000$ (wavelength =) 0.024 (m)	allow ecf from (i) use of 194 (m/s) from (i) gives an answer of 0.013 (m) answer of 0.023 gets 2 marks only allow 0.02, 0.0239... (m)	3																					

Total for Question 7 = 9 marks

Question number	Answer	Notes	Marks
8 (a) (i)	idea that star A is closer (to Earth than star C);	allow RA	1
(ii)	star D; (because) it (is the only star that) has a mass (much) larger than the mass of the Sun; (because) it has a much lower value of absolute magnitude;	dependent on 1 st mark being awarded dependent on 1 st mark being awarded allow lowest value of absolute magnitude 2 marks max. if answer suggests that colour/temperature is relevant	3
(b)	any three from: MP1. (hydrogen) fusion stops (in core); MP2. core collapses; MP3. (which) restarts fusion (in core); MP4. star becomes red <u>supergiant</u> ; MP5. fusion of heavier elements stops (in core); MP6. star explodes (as supernova);	allow runs out of hydrogen allow core contracts allow idea that fusion of heavier elements starts allow super red giant allow planetary nebula formed	3
(c) (i)	evaluation of change of wavelength; substitution into $\Delta\lambda/\lambda = v/c$; rearrangement; evaluation of speed; e.g. $\Delta\lambda = (7.780 - 7.774) = 6 \times 10^{-10} \text{ (m)}$ $6 \times 10^{-10} / 7.774 \times 10^{-7} = v / 3.0 \times 10^8$ $v = 6 \times 10^{-10} / 7.774 \times 10^{-7} \times 3.0 \times 10^8$ (v =) $2.315 \times 10^5 \text{ (m/s)}$	-1 if 7.780×10^{-7} used as λ $2.314 \times 10^5 \text{ (m/s)}$ gets 3 marks only allow 2.3×10^5	4
(ii)	MP1. nearby galaxies show smaller {red-shift / change in wavelength}; MP2. nearby galaxies are travelling slower than further galaxies; MP3. (all light red-shifted) suggests universe is expanding; MP4. suggesting universe was once at a single point;	allow RA allow RA allow (all) galaxies are moving away from each other	4

Total for Question 8 = 15 marks