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Mark Scheme (Results)

Summer 2023

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

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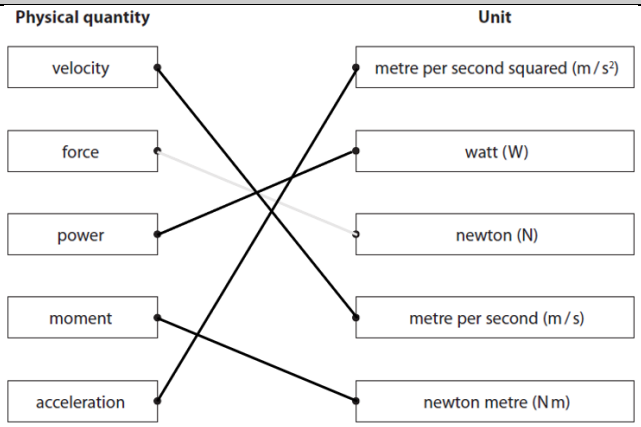
Summer 2023
Question Paper Log Number P71958RA
Publications Code 4PH1_2PR_2306_MS
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General Marking Guidance

- 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.

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Question number	Answer	Notes	Marks
1 (a)		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
(ii)	any correct scalar;	e.g. speed, distance, length, mass, time, temperature, energy, power etc.	1

Total for Question 1 = 5 marks

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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 CO_2 / 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

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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 = charge × 6000 charge = (0.00)5 / 6000 (charge =) 8.3×10^{-7} (C)	ignore unit conversions until evaluation −1 for POT error allow 8×10^{-7}, $8.33\ldots \times 10^{-7}$ (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

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Question number	Answer	Notes	Marks
4 (a) (i)	momentum = mass × 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 = mass × 14 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 = Δp / 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 Δp = (80 × 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

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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.; e.g. $3500 = 58 \times c \times [37-21]$ $c = 3500 / 58 \times 16$ $c = 3.8$	 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

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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; **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
(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

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(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. 2×500g = 1kg e.g. 500g gives 1.50A and 1000g is double 500g, 100g gives 0.30A and 1000g is 10 times 100g	3

Total for Question 6 = 12 marks

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<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>7 (a)</td><td>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></td><td>if either A or F ticked then award 0 marks</td><td>2</td></tr>
<tr><td>(b)</td><td>wave drawn with lower amplitude throughout;

wave drawn with lower frequency throughout;</td><td>ignore vertical position of wave in the grid
peak to peak should be less than 4 squares
vertically throughout trace should be less than 2½ waves in the trace</td><td>2</td></tr>
<tr><td>(c) (i)</td><td>conversion of temperature into kelvin;

substitution and evaluation;

e.g.
temperature = 46 + 273 = 319 K
speed = (0.606 × 319) + 166 = 360 (m/s)</td><td>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)</td><td>2</td></tr>
<tr><td>(ii)</td><td>substitution into speed = frequency × wavelength;
rearrangement;
evaluation;

e.g.
360 = 15 000 × wavelength
wavelength = 360 / 15 000
(wavelength =) 0.024 (m)</td><td>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)</td><td>3</td></tr>
</table>

Total for Question 7 = 9 marks

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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 1st mark being awarded dependent on 1st 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>super</u>giant; 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. $\Delta\lambda = (7.780\text{-}7.774) = 6 \times 10^{-10}$ (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 =) 2.315×10^{5} (m/s)	 −1 if 7.780×10^{-7} used as λ 2.314×10^{5} (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

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