Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE

In Physics (4PH1) Paper 2PR

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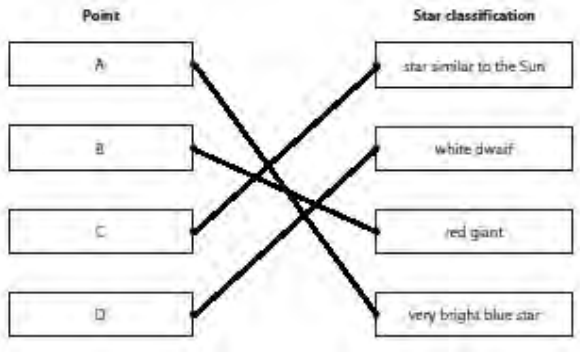
Summer 2022
Question Paper Log Number P70954A
Publications Code 4PH1_2PR_2206_MS

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)	1 mark for each correct line;;;;  	reject any box from the left with 2 lines	4
(b)	(a measure of) brightness; (of a star) at a {standard / fixed / same} distance;	allow power, luminosity, intensity allow correct distance e.g. 10 parsecs/32(.6) light years	2

Total for Question 1 = 6 marks

Question number	Answer	Notes	Marks
2 (a)	any five from: MP1. outlines a viable method; MP2. realistic values suggested for experiment to work; MP3. suitable measuring instrument named; MP4. further detail of setup; MP5. idea of repeats **AND** average; MP6. Correct formula for described method;	a fully labelled diagram can score all the marks e.g. • measuring time for a known distance • measuring wavelength for a known frequency e.g. • at least 1m for microphones/sound sensors and oscilloscope/data logger method • at least 100m for seeing and hearing a clap method • at least 50m for wall and echo method • wavelength measured at least 10cm e.g. stop clock, stopwatch, ruler, tape measure, oscilloscope, trundle wheel, timer e.g. • start timing when see a clap and stop when hear it • clap by wall and time how long for clap to come back • moving a microphone until waveforms line up on oscilloscope • for echo method, idea time and distance is "there and back" allow repeats AND identifying anomalies e.g. • speed = distance / time • speed = frequency × wavelength	5

(b)	(i)	period represented by 4 squares; correct use of x-scale; correct evaluation; e.g. period = 4 squares period = 4 × 5.0 ($\times 10^{-3}$) period = 20 ms = 2.0 × 10^{-2} (s)	 allow ECF from wrong number of squares if clear in working -1 POT error answer of 0.01, 0.04 (s) scores 2 marks allow 0.02 (s)	3
	(ii)	substitution into given formula; correct evaluation; e.g. frequency = 1 / 0.02 frequency = 50 (Hz)	allow ECF from (i)	2

Total for Question 2 = 10 marks

Question number	Answer	Notes	Marks
3 (a)	neutral particle has same number of protons and electrons; positive particle has more protons than electrons;	ignore neutral particle has no charge allow positive particle has lost electrons reject positive particle has gained protons	2
(b)	(sulfur particles are) attracted to negative plate/repelled by positive plate; (sulfur) particles experiences a (resultant) force (to the right);	accept correct use of "like charges repel" or "unlike charges attract"	2
(c) (i)	D – (into the page); A is incorrect because the force, direction of travel and magnetic field must be at right angles to each other B is incorrect because the force, direction of travel and magnetic field must be at right angles to each other C is incorrect because this would result in a force in the opposite direction to that shown		1
(ii)	substitution into given formula; rearrangement; evaluation; e.g. $2.9 \times 10^8 = (2 \times \pi \times 1.1(\times 10^3)) \div$ orbital period orbital period = $(2 \times \pi \times 1.1(\times 10^3)) \div 2.9 \times 10^8$ (orbital period =) 2.4×10^{-5} (s)	-1 for POT error allow $2.383\ldots \times 10^{-5}$ (s)	3

Total for Question 3 = 8 marks

Question number	Answer	Notes	Marks
4 (a)	temperature difference calculated; substitution into given formula; correct evaluation; e.g. $\Delta T = 100 - 16 = 84$ (°C) energy supplied = $0.45 \times 4200 \times 84$ (energy supplied =) 160 000 (J)	e.g. 84 seen or 100 - 16 seen allow ecf for incorrect temperature <u>difference</u> 158 000 (J) scores 2 marks only allow 159 000, 158 760 (J)	3
(b) (i)	(7.4 – 3.0) = 4.4 (minutes);	allow 4 minutes and 24 seconds, 4 and $^4/_{10}$ minutes	1
(ii)	conversion of time into seconds; substitution into P = W/t OR rearrangement; correct evaluation; e.g. time = 264 (s) 2200 = W / 264 OR W = P × t energy supplied = 580 000 (J)	allow ECF from (i) allow ECF from (i) allow substitution in minutes 9700, 9680 (J) scores 2 marks allow 581 000, 580 800 (J)	3
(c)	idea of all water being the same temperature;	allow idea of distributing thermal/heat (energy) evenly throughout water	1
(d)	 **arrangement** idea that liquid has molecules that are close together; idea that gas has (widely) spaced molecules; **motion** idea that liquid has molecules that move/slide past each other; idea that gas has molecules that move {faster/freely/randomly/straight lines};	allow marks if seen on diagrams allow particles for molecules ignore random/irregular arrangement for liquid and gas	4

Total for Question 4 = 12 marks

Question number	Answer	Notes	Marks
5 (a)	step-up transformer increases voltage OR step-down transformer decreases voltage; step-up transformer reduces current; (lower current means) lower heating/energy losses; (town) requires low voltage {for safety / to reduce chance of electrocution / so appliances operate correctly};		4
(b) (i)	$N_p/N_s = V_p/V_s$;	allow any correct rearrangement or word formula allow n, T for turns allow 1, in for p allow 2, out for s	1
(ii)	substitution; rearrangement; evaluation; e.g. $3300/N_s = 15/340$ $N_s = (3300 \times 340) \div 15$ (N_s =) 75 000	 -1 for POT error allow 74 800	3
(c) (i)	thermal (store);	condone heat	1
(ii)	any three from: MP1. field lines cut by core; MP2. idea of an induced voltage; MP3. conductors have **free** electron(s); MP4. idea that there is a force on the electron(s); MP5. idea that the movement of electrons is the current;		3

Total for Question 5 = 12 marks

Question number	Answer	Notes	Marks
6 (a) (i)	**angle** of incidence;	ignore incident ray	1
(ii)	recognising 67 (degrees) as anomalous; evaluation of a mean; e.g. mean angle = (22 + 23) / 2 = 23 (degrees)	allow 1 mark if anomalous result included e.g. 37, 37.3… (degrees) allow 22, 22.5 (degrees)	2
(iii)	n calculated for multiple angles; mean value obtained **for n**; OR idea of graph plotted of sin(i) against sin(r); n found from gradient of (sin(i)-sin(r)) graph;		2
(b) (i)	substitution into n = sin(i) ÷ sin(r) ; evaluation; e.g. refractive index = sin(82) ÷ sin(47) (refractive index =) 1.4	 1.3 scores 1 mark only allow 1.35…	2
(ii)	sin(c) = 1/n;	allow any correct rearrangement	1
(iii)	substitution and rearrangement; evaluation; e.g. $c = \sin^{-1}(1/1.7) = \sin^{-1}(0.588…)$ (critical angle =) 36 (degrees)	 allow 36.03… (degrees)	2
(c)	light undergoes TIR; (because) angle (of incidence) is greater than critical angle;		2

Total for Question 6 = 12 marks

Question number	Answer	Notes	Marks
7 (a)	idea that extension increases as force increases; idea of a linear relationship;	ignore positive correlation allow "force is proportional to extension" for 2 marks if no other marks scored then mention of Hooke's law scores 1 mark	2
(b)	substitution into moment = force × distance; evaluation of moment to at least 3s.f.; e.g. moment = 480 × (0.)84 moment = 403 (Nm)	ignore units 1 mark max. for reverse calculation e.g. calculating the force or the distance allow 403.2 (Nm)	2
(c)	idea of principle of moments; moment of push force = F × 3.2; rearrangement; evaluation; e.g. 403.2 = F × 3.2 F = 403.2 / 3.2 (F =) 130 (N)	implied by substitution or written in words seen anywhere in calculation -1 for POT error allow use of 400 Nm, giving 125 N allow use of 403 Nm, giving 125.9…, 126 (N) clockwise moment = anti-clockwise moment allow 126 (N)	4
(d)	idea of spring exceeding/reaching elastic limit; idea of permanent deformation / not returning to original shape / permanent stretching;	ignore idea of spring losing elasticity / stop stretching allow limit of proportionality for elastic limit ignore spring breaking	2

Total for Question 7 = 10 marks

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