

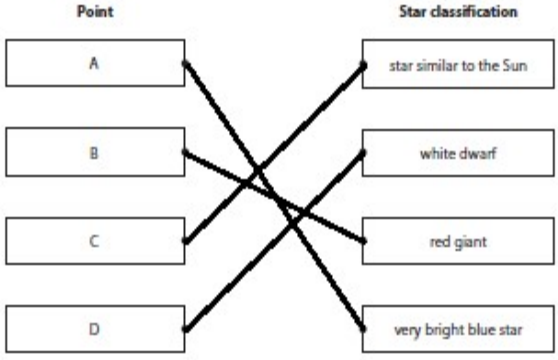


Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE

In Physics (4PH1) Paper 2PR

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. $\text{speed} = \text{distance} / \text{time}$ $\text{speed} = \text{frequency} \times \text{wavelength}$	5

(b)	(i) period represented by 4 squares; correct use of x-scale; correct evaluation; e.g. period = 4 squares period = $4 \times 5.0 (\times 10^{-3})$ period = 20 ms = 2.0×10^{-2} (s) (ii) substitution into given formula; correct evaluation; e.g. frequency = $1 / 0.02$ frequency = 50 (Hz)	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) allow ECF from (i)	3 2
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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) <u>force</u> (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. $2.9 \times 10^8 = (2 \times \pi \times 1.1(\times 10^3)) \div \text{orbital period}$ $\text{orbital period} = (2 \times \pi \times 1.1(\times 10^3)) \div 2.9 \times 10^8$ (orbital period =) 2.4×10^{-5} (s)	-1 for POT error allow $2.383... \times 10^{-5}$ (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. $\Delta T = 100 - 16 = 84 (^{\circ}\text{C})$ 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 $\frac{4}{10}$ minutes	1
(b) (ii)	conversion of time into seconds; substitution into $P = W/t$ OR rearrangement; correct evaluation; e.g. time = 264 (s) $2200 = W / 264$ OR $W = P \times t$ 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 $n = \sin(i) \div \sin(r)$; evaluation; e.g. refractive index = $\sin(82) \div \sin(47)$ (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 $\times$ distance; evaluation of moment to at least 3s.f.; e.g. moment = $480 \times (0.)84$ 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 = $F \times 3.2$; rearrangement; evaluation; e.g. $403.2 = F \times 3.2$ $F = 403.2 / 3.2$ (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