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Mark Scheme (Results)

Summer 2024

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

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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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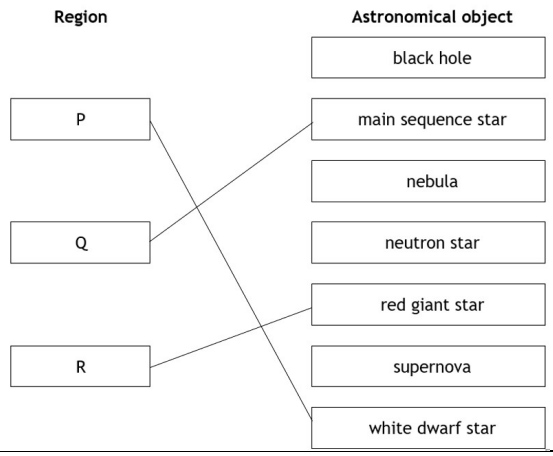
Question number	Answer	Notes	Marks
1 (a)	one mark for each correct line;  	reject mark if more than one line drawn from region	3
(b)	(a measure of) brightness; (of a star) at a {standard / fixed / same / set} distance;	allow power, luminosity, intensity ignore description of scale for idea of magnitude allow correct distance e.g. 10 parsecs/32(.6) light years ignore incorrect distance	2

Total for Question 1 = 5 marks

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Question number	Answer	Notes	Marks
2 (a)	substitution into moment = force × distance; evaluation;	accept dimensionally correct substitution -1 for POT error	3
	matching unit;	condone case error	
	e.g.		
	moment = 28 × 0.15	allow 28 × 15	
	(moment =) 4.2 N m	allow 420 N cm	
(b)	apply a larger force / eq;	allow pivot for nut	2
	apply force further from nut / eq;	allow use a longer wrench condone bigger wrench	
(c) (i)	circumference of circle calculated;		2
	divided by 4 to find distance;	answer evaluated as a decimal only ecf candidate's circumference	
	e.g.	22/7 for π gives 94.3	
	(circumference = $2\pi r = 2 \times \pi \times 15$) = 94(.2) (cm)		
	(distance = 94 / 4 =) 24 (cm)	allow anything that would round to 24 (cm)	
		condone 23.5 (cm)	
(ii)	conversion of cm to m;	allow ecf from (i) seen explicitly or implied by working	3
	substitution;		
	evaluation;	answer evaluated as a decimal only -1 for POT error	
	e.g.		
	work done = force × distance		
	work done = 28 × 0.24 (work done =) 6.7 (J)	allow any answer that rounds to 6.6 (J) or 6.7 (J) using 0.94 for the distance gives an answer that rounds to 26 (J) ecf 3 marks	

Total for Question 2 = 10 marks

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Question number	Answer	Notes	Marks
3 (a)	any six from: MP1. idea of equal volume of water in each bottle;	allow marks from suitable diagram	6
	MP2. place both bottles an equal distance from the heater; MP3. idea of same heater output for both bottles;	 condone have 'heater setting' the same for both bottles	
	MP4. same starting temperature of water in both bottles;	allow 'measure initial temp of water'	
	MP5. measure temperature of water in both bottles after a given time;	allow measure time in for a given temperature change	
	MP6. repeat investigation (more than once);	i.e. the candidate has shown they understand that both bottles have been measured more than once	
	MP7. calculate a mean;	condone average	
	MP8. safety guidance to avoid the hazard of burn/scald/electrocution;	e.g. take care to avoid burns from heater, clean up water spillages etc.	
(b)	 two lines drawn showing an increase in temperature over time;	reject whole response if both lines show a decrease ignore starting temperature ignore flat sections	2
	line identified by candidate as black is always above the line identified by candidate as silver;	lines must be labelled for this mark allow "silver" line reaching same temperature as "black" line at a later time	

Total for Question 3 = 8 marks

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Question number	Answer	Notes	Marks
4 (a) (i)	A (friction); B is incorrect because gravity is not the force C is incorrect because magnetic is not the force D is incorrect because tension is not the force		1
(ii)	A (the rod gains electrons);		1
	B is incorrect because this would produce a positive charge		
	C is incorrect because protons are not transferred		
	D is incorrect because protons are not transferred		
(b) (i)	reading at −80 circled		1
(ii)	repeat or check **that** test or **that** result / ignore the result / idea of not including (that result) in the mean;	condone idea of "repeat the whole experiment"	1
(iii)	mean calculated including anomaly giving an answer that rounds to -67 = 1 mark max;		2
	mean calculated correctly ignoring anomaly i.e. -60 = 2 marks;;	allow ecf from (i) (-59+-61/2 =) -89.5 scores 1	
		(+)60 scores 1 (+)67 scores 0	

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(iv)		reject response with references to magnets	3
	MP1 : suitable apparatus that would demonstrate rod is charged	e.g. suspended second rod, hair, water stream, bits of paper, electroscope, coulombmeter	
	MP2: indication that a charged rod will apply a force on the 'other object'	e.g. (charged) rods attract, (charged) rods repel, water stream bends, hair attracts, electroscope foil deflects	
	MP3: evidence that both attraction and repulsive forces will happen with opposite and like charges	e.g. like charged rods will move away from each other but unlike charged rods will move together, condone gold leaf deflects one way with positive object then other way with negative object, coloumbmeter shows positive with one test and negative with another	

Total for Question 4 = 9 marks

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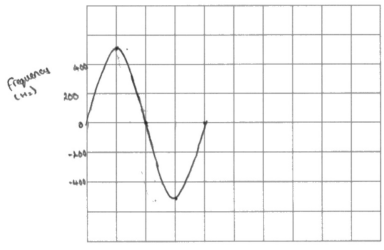
Question number	Answer	Notes	Marks
5 (a)	frequency;	ignore unit for frequency reject response with more than one quantity/property	1
(b)	C chosen;	condone E chosen condone 'C and E' condone 'C or E'	2
	(because) humans can hear up to 20 kHz / 20 000Hz;	accept additional reasonable qualification e.g. idea of upper range decreasing with age or hearing loss	
(c) (i)	substitution into f = 1/T;	accept use of standard form throughout working required	3
	rearrangement;	working required	
	evaluation in seconds and appropriate conversion to ms;	-1 for POT error	
	e.g. 500 = 1/T T = 1/500 T = 0.002 s = 2(.0) (ms)	accept reverse argument i.e converted to 0.002; substituted i.e. f = 1/0.002; evaluated to get 500 Hz;	
(ii)	one or more complete wave(s) drawn with consistent period by eye; each cycle is 4 squares; 	ignore amplitude e.g. all half-cycles the same number of squares horizontally mark independently	2

Total for Question 5 = 8 marks

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Question number	Answer	Notes	Marks
6 (a)		all ideas may be shown on diagram	3
	solenoid / coil (of wire);	e.g. labelled wire wrapped multiple times around a box shape on diagram	
	(direct/d.c.)current in the wire/coil/solenoid;	condone idea of connection to a voltage source e.g. battery, powerpack, cell etc ignore alternating current / a.c.	
	(soft) iron core;	ignore steel accept '**magnetically** soft material' reject indication of a complete (iron) loop reject explicit reference to bar magnet	
(b) (i)	idea of upwards/ towards top of page;	may be shown on diagram ignore 'north'	1
(ii)	any TWO from: force (always) at right angles (to velocity); causes the proton's direction to change; (because) proton motion is equivalent to a current; (this causes) the direction of the force on the proton to change; idea of magnitude of force is constant;	may be shown on the diagram	2
(iii)	(velocity changes because) the direction changes;	ignore idea of speed or magnitude of velocity changes	1

Total for Question 6 = 7 marks

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Question number	Answer	Notes	Marks
7 (a)	idea that source will not run out / can be replaced;	ignore 'recycled' or 're-used' condone 'infinite'	1
		accept 'replenished'	
(b)	any four from:	condone 'turns into', 'becomes' etc for 'transfers'	4
	MP1. water has (high) {gravitational potential energy/GPE (store)} ;	energy starts as gravitational (potential energy)	
	MP2. water loses GPE / gains {kinetic energy/KE};	transfers from GPE to KE scores MP1 and MP2	
	MP3. transfers mechanically (to water or to turbine or to generator);	allow at any correct stage i.e. for water, turbine or generator allow KE of water to KE of turbine allow KE of turbine to KE of generator	
	MP4. energy is transferred electrically (from power station);	transfers from KE (of water or generator) to electrical (energy)	
	MP5. energy is wasted by heating/radiation e.g. IR, sound;	allow transfer of heat (energy) to surroundings/eq allow transfer of sound (energy)	
(c) (i)	any one from: ● idea that energy can be supplied more reliably by HEP; ● idea that HEP produces less (environmental) noise; ● idea that HEP can respond (quickly) to demand;	ignore cost factors ignore visual pollution e.g. allow does not depend on the weather	1
(ii)	any one from: ● large area of land needs to be flooded; ● location dependent / mountainous area; ● damage to habitats / eq;	ignore cost factors ignore visual pollution	1

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(iii)	any THREE from: MP1 idea that wind farm cannot store energy; MP2 idea of wind powering the pump when (energy) demand is low;	 do not credit simple reference to wind farm powering pump (repeats question)	3
	MP3 idea that (therefore) upper lake acts as an energy store (for wind farm output); MP4 (so that) energy released from upper lake or to the HEP when demand is high MP5 idea that more electricity/energy is transferred usefully;	allow idea that upper lake acts like a battery (so that) energy can be released from the upper lake when it's not windy condone less energy or less electricity wasted condone less energy or less electricity lost	

Total for Question 7 = 10 marks

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Question number	Answer	Notes	Marks
8 (a)	288 (K);	allow 288.15 (K) allow 288.16 (K)	1
(b) (i)	(energy of molecules) increases; **kinetic** energy increases;	 scores both marks allow KE for kinetic energy	2
(ii)	substitution into E = V × I × t; conversion of minutes to seconds; evaluation; e.g. time = 45 × 60 = 2700 (s) energy = 230 × 1.5 × 2700 energy = 9.3×10^5 (J)	independent mark i.e. allow ×60 seen anywhere allow in either order allow 931 500 (J) however rounded 15 525 (J) scores 2 marks however rounded 258.75 (J) scores 2 however rounded	3
(iii)	substitution into Q = m × c × ΔT; rearrangement; evaluation; e.g. 9.3×10^5 = mass × 4200 × (60-15) mass = 9.3×10^5 / 4200 × 45 (mass =) 4.9 (kg)	allow ecf from (ii) allow in either order answer that rounds to 0.082 (kg) scores 3 ecf from 15 525 divided by (4200 x 45) answer that rounds to 0.0014 (kg) scores 3 ecf from 258.75 divided by (4200 x 45)	3

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(c)	(i)	particles are arranged randomly;	condone moving randomly condone irregular for random	2
		idea that particles are spread out or are widely spaced;	idea of 'large gaps'	
	(ii)	boiling happens at a specific or fixed temperature or 100 °C but evaporation happens at any temperature;	needs comparison condone idea of a lower temperature (compared to boiling point)	2
		boiling happens throughout a liquid but evaporation only happens at the surface /eq ;	ignore reference to bubbles	

Total for Question 8 = 13 marks

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