



Mark Scheme (Results)

January 2023

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

Question number	Answer	Notes	Marks
1	electrons; negative; positive; electrons; attract;	accept recognisable spellings	5

Total for Question 1 = 5 marks

Question number	Answer	Notes	Marks
2 (a)	particles in a solid have a regular arrangement; particles in a liquid have an irregular arrangement; particles in both are closely packed;	ignore references to motion all marks can be given from clear, titled diagrams	3
(b)	particles vibrate (about fixed positions) in a solid; idea that particles move around in a liquid/eq;	e.g. "particles slide over each other"/"particles flow"	2
(c)	evaluation of temperature change; substitution into $\Delta Q = m \times c \times \Delta T$; evaluation; e.g. $\Delta T = (21 - 3) = 18 (^{\circ}\text{C})$ $\Delta Q = 0.016 \times 4200 \times 18$ ($\Delta Q =$) 1200 (J)	allow ecf from incorrect ΔT or use of 3, 21 or 24 -1 for POT error allow 1210, 1209.6 condone 1209 200, 201.6 scores 2 1400, 1411 scores 2 1600, 1613 scores 2	3

Total for question 2 = 8 marks

Question number	Answer	Notes	Marks
3 (a)	daughter nuclei / named nuclei e.g. krypton or barium/ neutron(s);	reject daughter cells condone nucleus ignore atom reject uranium allow gamma (radiation)	1
(b)	any two from: MP1. radioactive waste; MP2. uranium is radioactive; MP3. non-renewable; MP4. risk of nuclear accident/eq; MP5. higher {setup / decommissioning} cost;	allow radiation can cause cancer/mutate {cells/DNA} accept long term storage argument allow named event e.g. Chernobyl, Fukushima ignore unqualified "high cost" argument	2
(c) (i)	rate of {energy transfer/doing work};	allow energy transferred per {unit time / second} reject energy transferred in a unit time reject $P = \text{current} \times \text{voltage}$	1
(ii)	substitution into $P = W / t$; rearrangement; evaluation; e.g. $7.49 \times 10^9 = 6.47 \times 10^{14} / t$ $t = 6.47 \times 10^{14} / 7.49 \times 10^9$ (t =) 86 400 (s)	-1 for POT error allow 86000, 86382, 86381.8...	3

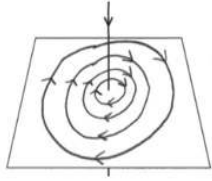
Total for question 3 = 7 marks

Question number	Answer	Notes	Marks
4 (a)	IV = temperature (of ball); DV = height (of bounce);	condone 'T' allow vertical distance condone 'h'	2
(b)	measurement from floor to <u>bottom</u> of ball; correct use of scale; e.g. distance = 6.2 (cm) distance = (6.2 × 4 =) 24.8 (cm)	accept range 6.1-6.3 (cm) accept range 24.4-25.2 (cm) ECF candidate's value for measurement. 25.6-30.0 (cm) scores 1 mark	2
(c)	six marks as distributed: apparatus (2 marks max.) MP1. ruler / tape measure; MP2. idea of water bath (and thermometer); measurements (2 marks max.) MP3. range of temperatures; MP4. height of the ball's (first) bounce; MP5. height measured at eye level; MP6. repeats taken at each temperature and mean found; control variables (2 marks max.) MP7. height ball is dropped from; MP8. surface the ball bounces on; MP9. condition of drop; MP10. idea of using multiple copies of the same ball;	marks can be awarded if clear from diagram allow use of heated beaker and water with thermometer reject idea of heating ball directly with a Bunsen burner allow other methods of direct heating must be clear that different temperatures are tested allow reduce parallax error allow use of phone/video camera AND idea of freeze frame or ruler in shot i.e. non-human dropping mechanism or checking that ball is dropped from rest	6

Total for Question 4 = 10 marks

Question number	Answer	Notes	Marks
5	(a) (i) moment = force $\times$ (perpendicular) distance;	allow standard symbols and rearrangements allow d or s for distance condone m, M for moment	1
	(ii) correct calculation of or substitution for moment of block's weight; use of principle of moments; evaluation of force F; e.g. (moment of weight = $260 \times 0.25 =$) 65 (Nm) $65 = \text{force } F \times 0.80$ force F = 81 (N)	stated or implied POT -1 allow 6500 (Ncm) allow 81.25 (N) 118(.2) (N) scores 2	3
	(iii) force F increases; with any two from: - distance from support A increases / distance from support B decreases; - clockwise moment / moment of weight increases; - anti-clockwise moment / moment of force F increases (to keep balance);	ignore 'moves closer to B'	3
1	(b) (i) one vertical downwards arrow drawn; arrow starts at centre of gravity;	ignore label DOP	2
	(ii) any two from: MP1. tension force is upwards; MP2. tension force is same magnitude as weight / eq; MP3. idea of no resultant force / acceleration;	allow forces balance allow forces cancel out	2
	(iii) any two from: MP1. forces are acting on the same body; MP2. idea that forces are not the same type / origin; MP3. correct example of Newton's third law pair;	e.g. weight of block is balanced by gravitational force of block on Earth	2

Total for Question 5 = 13 marks

Question number	Answer	Notes	Marks
6 (a) (i)	single circle centred on the wire and parallel to the plane of the card; at least two concentric circles in the same plane; clockwise direction arrow marked on at least one line; e.g. 	allow gap where circle crosses wire circles do not have to stay within the card DOP by eye ignore spacing reject if contradicting arrows	3
(ii)	EITHER: MP1. iron filings (used); MP2. tap card / eq.; OR MP1. (plotting) compass (used); MP2. multiple compasses used / compass moved to new position;	ignore references to magnets, other current-carrying wires being used allow iron powder, steel dust etc. allow use of a magnetometer condone correct use of right-hand grip rule for 1 mark if no other mark scored	2
(b)	any three from: MP1. (both) wire(s) have magnetic fields around them; MP2. each wire has a current in a magnetic field; MP3. each wire experiences a force; MP4. forces are same size but in opposite directions; OR MP1. RH grip rule indicates relationship between current and field for one of the wires; MP2. LH rule indicates relationship between field from one wire, current in other wire and force on second wire; MP3. combination of these two will give force on second wire towards first wire;	ignore references to poles reject reference to opposite charge for MP2 allow 'fields interact' allow 'wires attract each other' allow reference to Newton III	3

Total for Question 6 = 8 marks

Question number	Answer	Notes	Marks
7 (a)	microphone;		1
(b) (i)	determination of number of squares for 1 period by finding average period from whole diagram; correct use of timebase of 0.5 ms seen; evaluation of time period; evaluation of frequency; e.g. 1 period = 8 squares $\div$ 5 = 1.6 squares time period = $1.6 \times 0.5(\times 10^{-3})$ time period = 8.0×10^{-4} s frequency = $(1/8.0 \times 10^{-4}) = 1250$ (Hz)	ignore units ignore PoT ecf candidate's time period apply PoT here time period of between 1.5 and 1.59 squares giving frequency between 1260 and 1333Hz scores 3 marks max.	4
(ii)	use of speed = frequency $\times$ wavelength; dimensionally correct substitution; evaluation; e.g. speed = frequency $\times$ wavelength speed = 1250×0.27 (speed =) 340 (m/s)	seen or implied allow ecf from (b)(i) -1 for POT error allow 337.5 (m/s)	3
(iii)	idea of adjusting timebase; idea of decreasing timebase/eq;	however described DOP ignore reference to y-axis	2

Total for question 7 = 10 marks

Question number	Answer	Notes	Marks
8 (a)	(i) idea that stars are not the same size / mass / brightness / (absolute) magnitude/ luminosity /temperature /depends on which star is in front;	ignore 'same intensity'	1
	(ii) any answer that rounds to 31 (years);		1
	(iii) conversion from years to seconds; substitution; rearrangement; evaluation; e.g. 31 years = 9.78×10^8 seconds $19 = 2\pi \times \text{radius} / 9.78 \times 10^8$ (radius =) $19 \times 9.78 \times 10^8 / 2\pi$ (radius =) 3.0×10^9 (km)	allow conversion from km/s to km/year allow ecf from (c)(ii) allow 2 956 255 958 (km) answer of 94 (km) gets 3 marks max. (no unit conversion)	4
(b)	any three from: MP1. light (from galaxy) has been red-shifted; MP2. {binary system / galaxy} is moving away (from Earth); MP3. universe is expanding; MP4. (therefore) universe must have been at a single point some time in the past;	ignore CMBR ignore references to any other galaxy allow idea of Hubble's Law i.e. speed and distance directly proportional	3

Total for Question 8 = 9 marks