



Mark Scheme (Results)

Summer 2023

Pearson Edexcel International GCSE
In Physics (4PH1) Paper 1PR

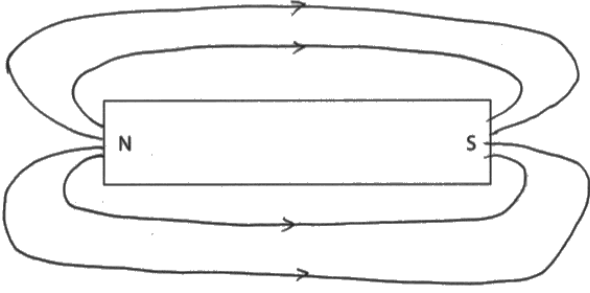
Question number	Answer	Notes	Marks														
1 (a)	<div>3 correct ticks;;;</div> <div>2 correct ticks;;</div> <div>1 correct tick;</div> <table><thead><tr><th>Statement</th><th>Correct</th></tr></thead><tbody><tr><td>all electromagnetic waves are longitudinal</td><td></td></tr><tr><td>all electromagnetic waves travel at the same speed in free space</td><td>✓</td></tr><tr><td>radio waves have the longest wavelength in the electromagnetic spectrum</td><td>✓</td></tr><tr><td>x-rays have the highest frequency in the electromagnetic spectrum</td><td></td></tr><tr><td>all electromagnetic waves transfer energy</td><td>✓</td></tr><tr><td>all electromagnetic waves can cause cancer</td><td></td></tr></tbody></table>	Statement	Correct	all electromagnetic waves are longitudinal		all electromagnetic waves travel at the same speed in free space	✓	radio waves have the longest wavelength in the electromagnetic spectrum	✓	x-rays have the highest frequency in the electromagnetic spectrum		all electromagnetic waves transfer energy	✓	all electromagnetic waves can cause cancer		<div>-1 for each additional tick if more than three ticks shown</div>	3
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(b) (i)	<div>microwaves:</div> <div>one valid use;</div> <div><div>• communication /eq</div><div>• heating food /eq</div></div> <div>one valid harmful effect;</div> <div><div>• internal heating (of body tissue) / eq</div></div>	<div>allow other valid uses e.g. radar, locating rain clouds etc.</div> <div>reject "cancer" apply "list principle"</div>	2														
(ii)	<div>gamma rays:</div> <div>one valid use;</div> <div><div>• sterilising {food / medical equipment}</div><div>• kill microbes or bacteria;</div><div>• treating cancer / radiotherapy;</div><div>• medical tracing</div></div> <div>one valid harmful effect;</div> <div><div>• ionisation / mutation of cells /eq</div><div>• risk of cancer</div></div>	<div>allow other valid uses e.g. gamma photography, identifying cancer etc.</div> <div>condone damages or kills cells or tissues</div>	2														

Total for Question 1 = 7 marks

Question number	Answer	Notes	Marks
2 (a)	C (the Moon); A is incorrect because comets orbit stars B is incorrect because Mars orbits the Sun D is incorrect because the Sun orbits in the Milky Way galaxy		1
(b)	D (gravitational); A is incorrect because there is no air in space; B is incorrect because the ISS is not charged; C is incorrect because friction would act in the opposite direction to motion, not towards Earth		1
(c) (i)	substitution into given formula ($v = 2\pi r/T$); conversion of minutes to seconds; evaluation; e.g. orbital speed = $2 \times \pi \times 6.8 \times 10^3 / 93(\times 60)$ 93 minutes = 93×60 (= 5580 seconds) (orbital speed =) 7.7 (km/s)	mark independently -1 for POT errors if km/s changed to m/s unnecessarily	3
(ii)	successful conversion of orbital period and a day into the same unit; evaluation of ratio to 15.48... to at least 3 sf; e.g. 1 day = $24 \times 60 = 1440$ minutes $1440/93 = 15.5$	allow 7.656... 459.4, 15.31, 27565, 7.6 scores 2 marks e.g. 1 day = 24 hours = 1440 mins = 86400 seconds, 1 orbit = 0.0645 days = 1.55 hours = 5580 seconds, allow use of number of orbits = distance travelled in 24 hours ÷ circumference of orbit	2

Total for question 2 = 7 marks

Question number	Answer	Notes	Marks
3 (a) (i)	GPE = mass \times g \times height;	allow standard symbols and rearrangements e.g. $h = \text{GPE} / m \times g$ ignore 'gravity' for g	1
(ii)	substitution; rearrangement; evaluation; e.g. $3.2 = 0.40 \times 10 \times h$ $h = 3.2 / 0.40 \times 10$ ($h =$) 0.80 (m)	in either order -1 for POT error due to not converting g to kg but not if due to physics error such as missing g accept use of $g = 9.8(1)$ accept 1sf answer i.e. 0.8 (m) 0.815 or 0.816 or 0.82 if g used is 9.8(1) and then rounded	3
(iii)	3.2 (J);	this answer only	1
(b)	downward arrow labelled "weight"/"W"/"mg"; vertically downward arrow drawn equal in length to lifting force arrow;	ignore starting position of arrow ignore 'gravity/g/gravitational field strength' allow 'gravitational force' reject if both gravity force and weight force shown mark independently by eye reject any other labelled arrows for second mark	2
(c) (i)	recall of efficiency formula; substitution; evaluation; e.g. efficiency = $\frac{\text{useful energy output}}{\text{total energy output}}$ efficiency = $3.2 / 11.0 (\times 100\%)$ efficiency = 0.29 or 29%	may be implied from substitution allow 0.29, 0.2909..., 29%, 29.09...% 29 without % is PoT 2 marks	3
(ii)	idea that energy must be conserved; demonstration that $7.8 + 3.2 = 11(.0)$;	comparison in words e.g. total = useful + wasted /eq allow $11(.0) - 3.2 = 7.8$	2

Question number	Answer	Notes	Marks
4 (a)	B (copper); A is incorrect because it is magnetic C is incorrect because it is magnetic D is incorrect because it is magnetic		1
(b)	field line connecting one pole to the other; at least two complete field lines, but none touching / crossing; all directions shown on field lines correct (N to S); 	allow small gap where field line joins magnet ignore field lines inside the magnet ignore field lines that start outside the pole region only one arrow required for the mark but contradictory directions negates the mark ignore arrow(s) inside the magnet	3
(c)	steel is magnetic / eq; (therefore) magnet stays magnetised (for a long period of time) /eq ;	allow 'steel is a hard magnetic material' for both marks reject reference to charge	2

(b)	(i)	A (count measured by the detector); B is incorrect because this is a control variable C is incorrect because this is the independent variable D is incorrect because this is a control variable		1
	(ii)	idea of removing source (from the experiment); measure count(for a minute); subtract background count from results;	e.g. pointing source away, keeping source in its box, (huge) increase in distance, take count before using source	3
	(iii)	idea of repeating measurements (of count); to determine a mean value;	allow idea of using repeats to identify anomalies condone average for mean	2
	(iv)	count decreases (significantly) using paper; no (additional) effect on the count when using aluminium AND lead / eq; radiation must be alpha consistent with candidate's discussion;	both must be mentioned for this mark allow idea that count with aluminium and lead is background radiation / in the range of 11-14	3

Total for Question 7 = 15 marks

Question number			Answer	Notes	Marks
8	(a)	(i)	3.1 (cm);		1
		(ii)	any value above candidate's answer for (a)(i) up to and including 14.6cm;		1
	(b)	(i)	idea that speed is the gradient/slope of the graph; gradient is not constant; (therefore) speed is not constant;	e.g. "it's a curve"/"it's not a straight line" allow description of how the speed is varying e.g. zero at turning points, maximum when steepest	3
		(ii)	any cross drawn at a peak/trough on the curve; crosses drawn at all three peaks and all three troughs;	reject if contradicted by a cross drawn in an incorrect place by eye	2

Total for Question 8 = 7 marks

Question number	Answer	Notes	Marks
10 (a) (i)	pressure difference = height \times density $\times g$;	allow in words or standard symbols e.g. $p = h \times \rho \times g$ condone d for density	1
(ii)	substitution; evaluation of pressure difference in kPa; evaluation of total pressure by adding 100 (kPa); e.g. (pressure difference =) $35 \times 1000 \times 10$ (pressure difference =) 350 (kPa) (pressure = $350 + 100$ =) 450 (kPa)	allow 343 (kPa) for use of $g=9.8 \text{ N/kg}$ ECF candidate's water pressure allow 443 (kPa) for use of $g=9.8(1) \text{ N/kg}$ allow 450 000 Pa with clear intent from candidate i.e. removal of 'k' from unit on answer line. -1 for POT error but not if due to physics error such as missing g , substitution of 100 (kPa) for g 350 kPa gets 2 marks 350 100 kPa gets 2 marks unqualified 350 000 (kPa) gets 1 mark	3
(b) (i)	pressure = force \div area;	allow in words or standard symbols e.g. $p = F / A$	1
(ii)	substitution; rearrangement; evaluation; corresponding unit of area; e.g. $260\,000 = 430 / \text{area}$ (area =) $430 / 260\,000$ (area =) 0.0017 m^2	condone pressure in Pa or kPa accept standard form i.e. $1.7 \times 10^{-3} \text{ (m}^2\text{)}$ allow 0.0016538... m^2 etc allow 17, 16.5... (cm^2) etc allow 1.65... m^2 scores 3 allow 1.65... cm^2 scores 2	4
(c)	pressure (at bottom) is greater than before / eq; wider base /eq;	allow stronger material/eq ignore taller	2

Total for Question 10 = 11 marks

Question number	Answer	Notes	Marks																					
11 (a)	<p>substitution into given formula; evaluation of constant;</p> <p>evaluation of constant for a second set of data; conclusion consistent with candidate's evidence; e.g. calculated value of constant doesn't change (much) so formula is justified constant decreases so formula isn't justified</p> <table><tr><th>Distance from centre of Mars in km</th><th>Gravitational field strength in N/kg</th><th>Constant</th></tr><tr><td>4000</td><td>2.66</td><td>42560000</td></tr><tr><td>5000</td><td>1.70</td><td>42500000</td></tr><tr><td>6000</td><td>1.18</td><td>42480000</td></tr><tr><td>7000</td><td>0.87</td><td>42630000</td></tr><tr><td>8000</td><td>0.67</td><td>42880000</td></tr><tr><td>9000</td><td>0.53</td><td>42930000</td></tr></table>	Distance from centre of Mars in km	Gravitational field strength in N/kg	Constant	4000	2.66	42560000	5000	1.70	42500000	6000	1.18	42480000	7000	0.87	42630000	8000	0.67	42880000	9000	0.53	42930000	<p>allow any consistent PoT</p> <p>DOP</p>	4
Distance from centre of Mars in km	Gravitational field strength in N/kg	Constant																						
4000	2.66	42560000																						
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6000	1.18	42480000																						
7000	0.87	42630000																						
8000	0.67	42880000																						
9000	0.53	42930000																						
(b)	<p>rearrangement of given formula; substitution of constant and distance; evaluation;</p> <p>e.g. gravitational field strength = constant / distance² gravitational field strength = 42 700 000 / 3410²</p> <p>gravitational field strength = 3.67 (N/kg)</p>	<p>allow ecf from (a) allow mean constant condone 3.7</p> <p>allow range of 42 500 000 to 42 900 000 for constant allow range of 3.65-3.69</p>	3																					

Total for Question 11 = 7 marks