



Mark Scheme (Results)

November 2025

Pearson Edexcel International GCSE in Physics (Modular)
4WPH2/IP

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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.

Question number	Answer	Notes	Marks
1 (a) (i)	electron; neutron;	this order only allow e ⁽⁻⁾ and n ⁽⁰⁾	2
(ii)	B ($^{27}_{12}\text{Mg}$); <i>A is not the answer as the nucleon number is incorrect</i> <i>C is not the answer as neither number is correct</i> <i>D is not the answer as the nucleon and proton number have been exchanged.</i>		1
(b)	any two from: 2 protons / mass number of 2; 2 neutrons / nucleon number of 4; helium nucleus ; positively charged;		2
(c)	114; 47;		2

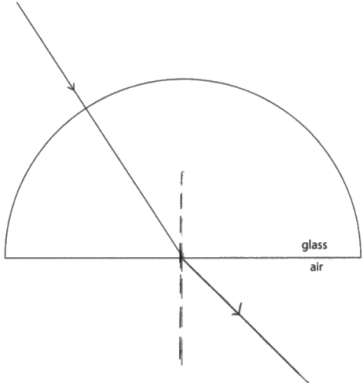
Total for question 1: 7 marks

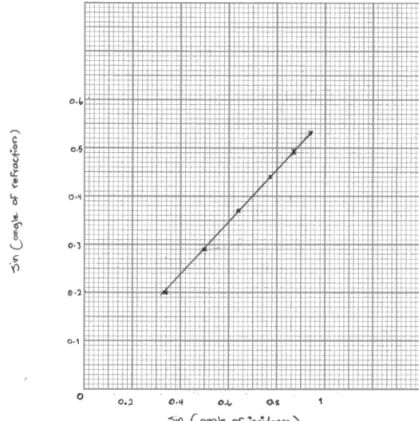
Question number	Answer	Notes	Marks
2 (a)	D (S); <i>A is not the answer as in P the field is that between a north pole and a south pole</i> <i>B is not the answer as in Q the field is that between two south poles</i> <i>C is not the answer as in R the field is that between a south pole and a north pole</i>		1
(b)	lines are straight / parallel; lines are evenly spaced;	ignore “lines are even”	2
(c)	MP1 a magnetic field is induced in the {iron/ring/iron ring}; MP2 (top part of ring is) opposite in polarity to the magnet / south; MP3 opposite poles (attract);	accept “iron {is/can be} magnetised” condone “produced” for induced accept unlike/different poles reject charges for MP2 and MP3	3

Total for question 2: 6 marks

Question number	Answer	Notes	Marks
3 (a)	longitudinal;	accept mechanical (wave)	1
(b) (i)	circle around 1.98;		1
(ii)	sum of times; evaluation of mean; e.g. $2.08 + 1.93 + 1.72 (= 5.73)$ $(5.73 \div 3) = 1.91 \text{ (s)}$	award both marks for correct answer seen in either table or on answer line allow ecf from 3(b)(i) if the anomaly is identified in 300 m row in table	2
(iii)	idea that the students should have used a distance of 200 m; (because) the sound has been reflected (by the wall);	accept “they should have multiplied the distance by 2” OWTTE accept “sound echoes” ignore “sound has travelled twice as far”	2
(iv)	plot a graph of (2x) distance on the x-axis against time on the y-axis; (draw a line of best fit) idea of finding the reciprocal of the gradient of the graph; OR plot a graph of (2x) distance on the y-axis against time on the x-axis; (draw a line of best fit) idea of finding the gradient of the graph;	ignore changes to the experimental method (e.g. repeats) accept “time/distance graph” or “time against distance” accept “1/gradient” accept “distance/time graph” or “distance against time”	2

Total for question 3: 8 marks

Question number	Answer	Notes	Marks
4 (a)	normal drawn at 90° to interface by eye; ray refracts when leaving block (to right hand side of normal); angle of refraction of ray greater than angle of incidence by eye; 	ignore arrows ignore measurements written on diagrams normal should extend both above and below glass/air interface normal does not need to be labelled accept a continuous or dashed line ignore any reflected rays reject multiple refracted rays judge rays by eye DOP	3

(b)	(i)	labelled axes; appropriate scale; correct plotting; 	allow reversed axes plots cover at least half of the grid +/- half a small square <table border="1" data-bbox="933 385 1279 575"><thead><tr><th>sin (angle of incidence)</th><th>sin (angle of refraction)</th></tr></thead><tbody><tr><td>0.34</td><td>0.20</td></tr><tr><td>0.50</td><td>0.29</td></tr><tr><td>0.64</td><td>0.37</td></tr><tr><td>0.77</td><td>0.44</td></tr><tr><td>0.87</td><td>0.49</td></tr><tr><td>0.94</td><td>0.53</td></tr></tbody></table>	sin (angle of incidence)	sin (angle of refraction)	0.34	0.20	0.50	0.29	0.64	0.37	0.77	0.44	0.87	0.49	0.94	0.53	3
sin (angle of incidence)	sin (angle of refraction)																	
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0.77	0.44																	
0.87	0.49																	
0.94	0.53																	
	(ii)	appropriate straight line;	in region of plotted points	1														
	(iii)	one correct read-off from graph; calculation of gradient;	accept use of points in gradient calculation if they lie within half a small square of the line expected answer in range 1.75 to 2.00 working must be seen condone explicit or implied of (0,0) if within half a small square of line reject calculation of sine of values in table	2														
(c)		substitution; rearrangement; evaluation; e.g. $\sin c = 1 \div 2.417$ $c = \arcsin (1 \div 2.417)$ $c = 24.4(^{\circ})$	accept substitution and rearrangement in either order accept $\sin^{-1}$ for arcsin accept 24.4397...	3														

Total for question 4: 12 marks

Question number	Answer	Notes	Marks
5 (a)	more frequent collisions between molecules and walls; (internal surface) area (of container) decreases; (so) pressure increases;	accept atoms and particles for molecules throughout ignore references to molecules moving faster / colliding with greater force do not accept "more collisions" without a reference to time	3
(b)	<u>kinetic</u> energy of molecules increases; (average) speed of molecules increases;	accept atoms and particles for molecules throughout	2
(c)	D (373 K); <i>A, B and C are not the answer as these are not the equivalent of 100°C.</i>		1
(d) (i)	dependent: pressure (of gas); independent: temperature (of gas);	this order only	2
(ii)	conversion from/to kPa; substitution; rearrangement; evaluation; e.g. 1.93×10^5 (Pa) or 146 (kPa) seen $1.46 \times 10^5 \div 280 = 1.93 \times 10^5 \div T_2$ $\frac{1.93 \times 10^5 \times 280}{1.46 \times 10^5}$	independent mark accept substitution and rearrangement in either order conversion between kPa to Pa can be at any point in the calculation. allow ecf from incorrect	4

	370 (K)	conversion for substitution and rearrangement accept 370.136...(K) POT error scores 3 marks	
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Total for question 5: 12 marks

Question number	Answer	Notes	Marks
6 (a)	A (experiment A) <i>B is not the answer as it produces a smaller force</i> <i>C is not the answer as it produces a force into the page</i> <i>D is not the answer as it produces a force into the page</i>		1
(b)	(moveable) cone / coil vibrates; idea of (copper) coil moving relative to (circular) magnet; idea of coil/wire cutting the magnetic field (of magnet); inducing a voltage between the ends of the copper wires;	accept idea of changing magnetic flux (linkage) ignore electricity / current	4
(c)	conversion to s; substitution; evaluation; e.g. (t =) 1 / 110 (t =) 0.0090909... (t =) 0.0091 (s)	accept answers in standard form i.e. 9.0909×10^{-3}	3

Total for question 6: 8 marks

Question number	Answer	Notes	Marks
7 (a) (i)	$N_p / N_s = V_p / V_s$	any correct rearrangement. Allow word equation Allow "T", "turns" for N. Allow clear yet different annotation from primary and secondary i.e. p and s, 1 and 2, A and B etc.	1
(ii)	substitution; rearrangement; correct evaluation; e.g. $180/345 = V_p / 230$ $V_p = 230 \times 180 / 345$ $V_p = 120 \text{ V}$	NB substitution into an incorrectly arranged formula scores zero.	3
(iii)	step up (transformer);		1
(iv)	substitution and rearrangement; correct evaluation; e.g. $(I =) 230 \times 1.4 \div 120$ OR $(I =) 322 \div 120$ $(I =) 2.7 \text{ (A)}$	accept $320 \div 120$ ecf from (a)(ii) accept 2.68333...(A) rounded correctly accept 2.666...(A) rounded correctly	2
(b)	any two from: MP1 two coils; MP2 (coil/coils) made from copper wire; MP3 copper wire is insulated; with any two from: MP4 core; MP5 (core) made from a magnetically soft material; MP6 laminated (sheets);	all marking points can be awarded from a labelled diagram accept iron	4

Total for question 7: 11 marks

Question number	Answer	Notes	Marks														
8 (a)	colour is related to (surface) temperature; Betelgeuse is cooler than the Sun;	ORA	2														
(b)	MP1: one correctly named stage; MP2: any two stages in correct sequence; MP3: any three stages in correct sequence; MP4: all six stages in correct sequence; MP5: additional detail for any stage; MP6: additional detail for any stage; e.g. <table><tr><th>Stage</th><th>Possible additional detail</th></tr><tr><td>nebula</td><td>cloud of {gas/hydrogen} and dust</td></tr><tr><td>protostar</td><td>formed when nebula collapses under gravity temperature in core increases, starting (nuclear) fusion</td></tr><tr><td>main sequence</td><td>stable gravity balances radiation pressure hydrogen fuses to form helium in core</td></tr><tr><td>red supergiant</td><td>formed when star runs out of hydrogen in core formed when helium fusion starts larger than main sequence star</td></tr><tr><td>supernova</td><td>large explosion as star implodes outer layers leave star at high velocity</td></tr><tr><td>neutron star / black hole</td><td>very dense object formed from core of star</td></tr></table>	Stage	Possible additional detail	nebula	cloud of {gas/hydrogen} and dust	protostar	formed when nebula collapses under gravity temperature in core increases, starting (nuclear) fusion	main sequence	stable gravity balances radiation pressure hydrogen fuses to form helium in core	red supergiant	formed when star runs out of hydrogen in core formed when helium fusion starts larger than main sequence star	supernova	large explosion as star implodes outer layers leave star at high velocity	neutron star / black hole	very dense object formed from core of star	reject any incorrect stage not part of the sequence accept stages in correct order with a missing stage between them, e.g. nebula → main sequence	6
Stage	Possible additional detail																
nebula	cloud of {gas/hydrogen} and dust																
protostar	formed when nebula collapses under gravity temperature in core increases, starting (nuclear) fusion																
main sequence	stable gravity balances radiation pressure hydrogen fuses to form helium in core																
red supergiant	formed when star runs out of hydrogen in core formed when helium fusion starts larger than main sequence star																
supernova	large explosion as star implodes outer layers leave star at high velocity																
neutron star / black hole	very dense object formed from core of star																

(c)	substitution; rearrangement; evaluation; rounding; e.g. $3.3 \times 10^4 = 2 \pi \times 1.07 \times 10^{11} \div T$ $T = 2 \pi \times 1.07 \times 10^{11} \div 3.3 \times 10^4$ $T = 20\,372\,752\dots \text{ (s)}$ $T = 20\,000\,000 \text{ (s)}$	accept substitution and rearrangement in either order ignore powers of ten until evaluation accept $2.0 \times 10^7 \text{ (s)}$ do not accept $2 \times 10^7 \text{ (s)}$ without clear working for full marks	4
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Total for question 8: 12 marks

Question number	Answer	Notes	Marks
9 (a) (i)	substitution into given equation; rearrangement to find wavelength; correct evaluation; e.g. $(\lambda - 506)/506 = 1.7 \times 10^4 / 3.0 \times 10^5$ $\lambda = 506 \times (1.7 \times 10^4 / 3.0 \times 10^5) + 506$ $\lambda = 534.7 \text{ (nm)}$	allow $\Delta\lambda$ for change in wavelength POT error -1 here on either $\Delta\lambda$ or λ evidence of $\Delta\lambda$ of 29 nm scores first 2 marks accept any value that rounds to 530 (nm) accept any value that rounds to 29nm (change in wavelength) as final answer for 2 marks accept any value that rounds to 480 nm (subtraction of change in wavelength) for 2 marks wrong change in wavelength added to 506 nm gives 1 mark	3
(ii)	Galaxy B is further away (from Earth); (galaxies further away move faster due to) the expansion of the Universe;	ORA	2
(b) (i)	(a large collection of) billions of galaxies;		1
(ii)	any two from: MP1 idea that wavelength of CMB has increased over time (as the universe has expanded); MP2 Universe was (significantly) hotter in the past/eq; MP3 temperature is inversely proportional to wavelength (of CMB)	accept RA	2

Total for question 9: 8 marks

Question number	Answer	Notes	Marks
10 (a)	any four from: MP1 idea that fusion is nuclei joining together; MP2 idea that fission is a nucleus splitting; MP3 idea fusion creates energy as a result of a loss of mass from smaller nuclei; MP4 fission releases neutrons; MP5 fusion requires high temperature / pressure;	reject use of atoms/cells for one mark only ORA	4
(b)	any two of: idea of preventing radiation/particles escaping (the reactor); absorb emitted {(beta/gamma) radiation / neutrons}; idea of preventing {irradiation / contamination} (of the environment);	accept answers relating to keeping radiation away from people if a reason for this is given (e.g. because it can cause cancer) reject answers relating to nuclear explosions	2

Total for question 10: 6 marks