Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE
In Physics (4WPH2) Unit 2PR

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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)	$n = \frac{\sin i}{\sin r}$	accept correct rearrangements	1
(ii)	substitution; rearrangement; evaluation of sin r; evaluation of r; e.g. 1.6 = sin 13 / sin r; sin r = sin 13 / 1.6 sin r = 0.14059… r = 8.1 (degrees)	 accept 8.082…	4
(b)	moving from high {refractive index / n} to low {refractive index / n}; at an angle (of incidence) greater than critical angle;	accept (optical) density for refractive index accept moving from low speed to high speed	2
(c)	ray of light is reflected back into fibre / does not leave fibre; further reflections occur (to keep the ray in the fibre)	 accept idea of reflection, e.g. bounces	2

Total for question 1: 9 marks

Question number	Answer	Notes	Marks
2 (a)	any two from: (a method of) transferring energy; (by means of) oscillations / vibrations; without transferring matter;		2
(b)	infrared / IR; x-ray;	this order only	2
(c) (i)	radiation absorbed by water (molecules) causing molecules to vibrate more / gain KE / causing temperature of molecules to increase;	 accept particles	2
(c) (ii)	idea of shielding;		1

Total for question 2: 7 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>3 (a)</td><td>
<table>
<tr><th>Variable</th><th>Dependent</th><th>Independent</th><th>Control</th></tr>
<tr><td>thickness of string</td><td></td><td>✓</td><td></td></tr>
<tr><td>length of string</td><td></td><td></td><td>✓</td></tr>
<tr><td>force to tighten string</td><td></td><td></td><td>✓</td></tr>
<tr><td>time period</td><td>✓</td><td></td><td></td></tr>
</table>
</td><td>2 correct ticks = 1 mark

4 correct ticks = 2 marks</td><td>2</td></tr>
<tr><td>(b)</td><td>measuring across more than one oscillation;
evaluation;

e.g.
6/4
1.5 (ms)</td><td>

answer with no working scores max. 1 mark</td><td>2</td></tr>
<tr><td>(c) (i)</td><td>addition of frequencies ÷ 4 shown;
evaluation;

e.g.

659+656+663+661 /4
660 (Hz)</td><td>accept answer in table or in working

accept 659.75 (Hz)</td><td>2</td></tr>
<tr><td>(ii)</td><td>use more thicknesses of string;

either

plot a graph;

OR

take ratio / product of values and compare;</td><td></td><td>2</td></tr>
</table>

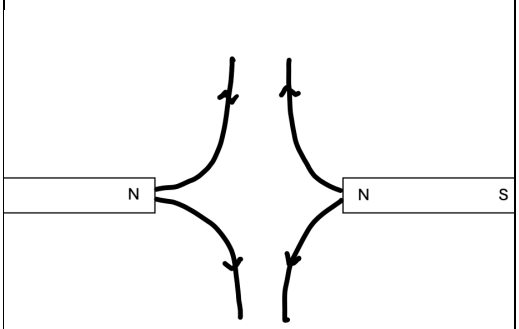
Total for question 3: 8 marks

Question number	Answer	Notes	Marks
4 (a) (i)	D – a planet it is not object A because it has an almost circular orbit it is not objects B or C as they do not orbit stars		1
(ii)	A – a comet it is not object D because it has an highly elliptical orbit it is not objects B or C as they do not orbit stars		1
(iii)	B - gravitational it is not A, C or D because they are the incorrect forces		1
(b) (i)	substitution; rearrangement; evaluation; answer in standard form; e.g. $6.87 = 2 \times \pi \times 414\,000\,000 \div T$ $T = 2 \times \pi \times 414\,000\,000 \div 6.87$ $T = 379\,000\,000$ $T = 3.79 \times 10^8$ (s)	accept 378637367.9	4
(ii)	10^8 or 8	allow ecf from (b)(i)	1

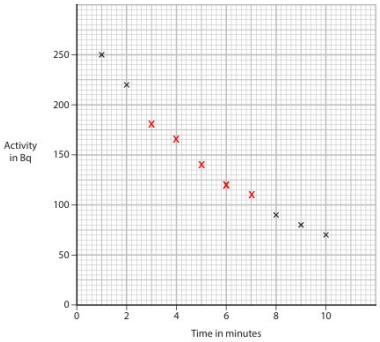
Total for question 4: 8 marks

Question number	Answer	Notes	Marks
5 (a) (i)	primary voltage ÷ secondary voltage = primary turns ÷ secondary turns;	accept correct symbols	1
(ii)	substitution; rearrangement; correct evaluation; e.g. 25 000 ÷ 275 000 = 265 ÷ N_S N_s = 275 000 x 265 ÷ 25 000 N_s = 2915	 accept 2900 or 2920	3
(b) (i)	primary voltage x primary current = secondary voltage x secondary current	accept correct symbols	1
(ii)	substitution; rearrangement and evaluation; e.g. 25 000 x I = 275 000 x 903 I = 9930 A	 accept 9933 or 9900	2
(iii)	(transformer is) 100% efficient	accept answers relating to no energy / power loss	1
(c)	MP1 – idea of the primary coil is like an electromagnet; MP2 - because it produces a magnetic field when a {alternating / changing} {current / voltage} is applied; MP3 – idea of the secondary coil uses electromagnetic induction; MP4 - as it produces a current / voltage in a changing magnetic field AND the statement is correct;	allow first coil allow second coil, “next coil” etc. reject MP4 if “statement is incorrect”	4

Total for question 5: 12 marks

Question number	Answer	Notes	Marks
6 (a)	idea of remaining a magnet (when an external field is removed); OR idea of difficult to magnetise/demagnetise;	ignore examples, e.g. steel	1
(b)	MP1: method to show shape; MP2: use of (plotting) compass to show direction; MP3: further detail;	e.g. use of (plotting) compass OR iron filings / dust / shavings e.g. move (plotting) compass / use multiple (plotting) compasses in different places / plot multiple lines / sprinkle iron filings AND tap card "compass" or "iron filings" stated with no method scores a maximum of one mark	3
(c)	one correct line; four correct lines AND none touching / crossing; all directions shown on field lines correct (from N); e.g.  	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 reject contradictory arrows ignore arrows inside the magnet	3
(d)	(the field) lines are parallel (to each other); (field) lines are evenly spaced;	accept a labelled diagram for both marks straight, equidistant lines score 2 marks.	2

Total for question 6: 9 marks

Question number	Answer	Notes	Marks
7 (a)	time (taken); for the {activity of / mass of (undecayed) nuclei in / number of (undecayed) nuclei in} a sample to decrease by half;	do not accept “half the time” ignore atoms, particles	2
(b) (i)	5 points correctly plotted;	+ / – half a small square  3 180 4 165 5 140 6 120 7 110	1
(b) (ii)	smooth curve of best fit;		1
(b) (iii)	evidence of looking for halving pattern; conclusion;	can be from table or graph e.g. a line drawn horizontally at 125 meeting the data line OR halving from 220 to 110 (takes 5 minutes) half-life consistent with graph/table	2

(b) (iv)	student's conclusion relating to trend is correct; attempt to calculate product of time and activity for one value; attempt to calculate product of time and activity for two or more values; (time x activity) not constant;	DOP Sample data: Time / Activity / Time x Activity 1 / 250 / 250 2 / 220 / 440 3 / 180 / 540 4 / 165 / 660 5 / 140 / 700 6 / 120 / 720 7 / 110 / 770 8 / 90 / 720 9 / 80 / 720 10 / 70 / 700	4

Total for question 7: 10 marks

Question number	Answer	Notes	Marks
8 (a) (i)	(wave) speed = frequency × wavelength;	allow standard symbols and rearrangements i.e. $\lambda = v / f$ allow v, c and s for speed	1
(ii)	substitution; rearrangement; evaluation in mm to at least 2s.f.; e.g. $3.0 \times 10^8 = 1.6 \times 10^{11} \times \lambda$ $\lambda = 3.0 \times 10^8 / 1.6 \times 10^{11}$ λ = (0.0019 (m) =) 1.9 (mm)	 allow 1.88, 1.875 (mm) condone 1.87 (mm)	3
(b)	idea that wavelength has increased (over time); because <u>Universe</u> is expanding;	allow wavelength has stretched ignore wavelength has expanded ignore red-shift	2
(c)	(most galaxies show a) red-shift because they are moving away (from Earth / each other); further galaxies show a greater red-shift; further galaxies are travelling (away from Earth) faster; idea that all matter must have originated from a single point;	condone use of stars, planets, objects for galaxies for this marking point only allow faster galaxies have greater red-shift	4

Total for question 8: 10 marks

Question number	Answer	Notes	Marks
9 (a)	(molecules have) more frequent collisions (with the walls); more force; force per unit area gives the pressure;	accept particles / atoms for molecules throughout formula alone is insufficient	3
(b)	calculation of increase; use of ratio; evaluation; e.g. 1.25x $\frac{35}{1.25}$ 28 (cm^3) alternative method: calculation of pV; calculation of new pressure; evaluation; e.g. 103 × 35 **OR** 3605 103 × 1.25 **OR** 128.75 $\left(\frac{3605}{128.75} =\right)$ 28 (cm^3)		3
(c)	kinetic energy (of the molecules) increases; velocity / speed (of the molecules) increases;		2

Total for question 9: 8 marks

Question number	Answer	Notes	Marks
10 (a) (i)	correct nucleon number of Zr; correct proton number of Zr; beta particle with correct values; e.g. $\left(^{90}_{39}Y \rightarrow\right)^{90}_{40}Zr + {}^{0}_{-1}\beta$	allow one mark if proton and nucleon numbers are interchanged accept use of ß, ß$^-$, e, e$^-$ reject ß$^+$, e^+	3
(ii)	idea of exposed to ionising radiation; idea of does not contaminate;		2
(b)	identification of radiation source; (radioactive isotopes within the source) produce <u>ionising</u> radiation (which can be detected);	ignore radioactive waste examples of sources: rocks radon gas food medical equipment cosmic rays	2
(c)	identification of risk; method of reducing risk;	e.g. radioactive waste gives off (named) ionising radiation; store in containers made of lead / concrete which radiation cannot penetrate; radioactive waste can have a long half-life; waste must be securely stored for a long period of time; radioactive waste could contaminate the environment; waste can be vitrified into glass / stored underground / stored in areas with low geological activity / in areas away from groundwater do not accept risks relating to the operation of power stations, e.g. meltdown, particles escaping from the reactor etc.	2

Total for question 10: 9 marks

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