



Mark Scheme (Results)

Summer 2024

Pearson Edexcel International GCSE
In Science Single Award (4SS0) Paper 1P

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General Marking Guidance

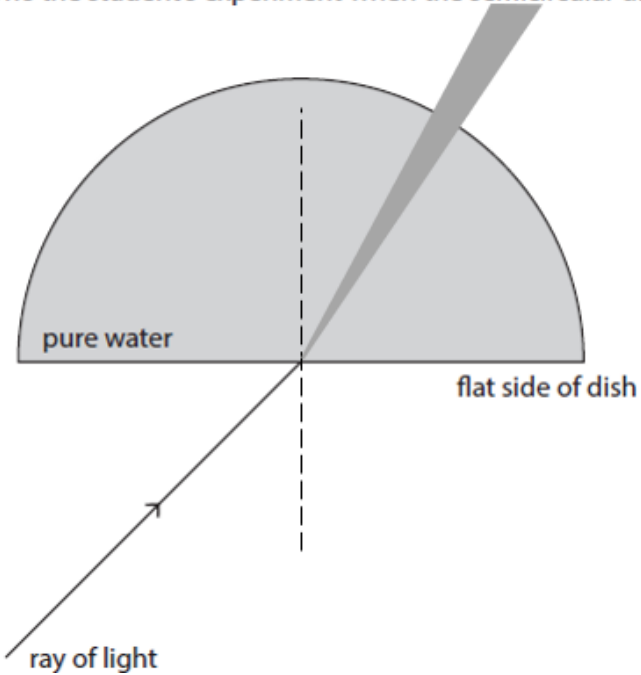
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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) circuit will still be open (if only one switch is pressed); idea that there is no current ;	allow circuit is (still) incomplete/broken allow flow of charge for current ignore current not reaching motor	2
	(ii) any suggestions that switches are linked to safety;	e.g. motor won't turn on accidentally etc.	1
(b)	(i) voltage = current × resistance;	allow rearrangements and standard symbols e.g. $R = V / I$ ignore C, c for current	1
	(ii) substitution; rearrangement; evaluation; unit; e.g. $18 = 8.6 \times \text{resistance}$ $\text{resistance} = 18 / 8.6$ (resistance =) 2.1 ohms / Ω	mark independently allow 2, 2.09... condone spelling errors	4
(c)	LED drawn in series OR parallel with motor; orientation of LED is correct;	condone missing arrows as long as symbol is clear DOP	2

Total for question 1 = 10 marks

Question number	Answer	Notes	Marks
2 (a)	(i) Viking 2 shown in circular orbit; Mars drawn at the centre of the orbit;		2
	(ii) force arrow drawn towards Mars and line of action must pass through Viking 2; arrow labelled "gravity" / "gravitational force";	arrow does not need to start at Viking 2 allow gravitational pull ignore weight	2
(b)	(i) weight = mass × gravitational field strength;	allow rearrangements and standard symbols e.g. $m = W / g$ ignore gravity condone G for g	1
	(ii) substitution; rearrangement; evaluation; e.g. $2.1(\times 10^3) = \text{mass} \times 3.7$ $\text{mass} = 2.1(\times 10^3) / 3.7$ (mass =) 570 (kg)	ignore units -1 for POT error if no marks awarded, correctly converting kN to N scores 1 mark e.g. 2100 or $\times 1000$ seen anywhere in the working allow 600, 568, 567.6, 567.5...(kg) condone 567 (kg)	3
	(iii) any one from: <ul style="list-style-type: none"> • Mars is less dense than Earth; • Mars has less mass than Earth; 	ignore responses relating to size etc.	1

Total for question 2 = 9 marks

Question number	Answer	Notes	Marks																								
3 (a)	<p>all 5 rows correct = 4 marks</p> <p>4 rows correct = 3 marks</p> <p>2-3 rows correct = 2 marks</p> <p>any 1 row correct = 1 mark</p> <table border="1" data-bbox="304 427 1249 831"> <thead> <tr> <th>Variable</th> <th>Independent</th> <th>Dependent</th> <th>Control</th> </tr> </thead> <tbody> <tr> <td>amount of water</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>angle of incidence</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>angle of refraction</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>mass of sugar</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>wavelength of light</td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table>	Variable	Independent	Dependent	Control	amount of water			✓	angle of incidence			✓	angle of refraction		✓		mass of sugar	✓			wavelength of light			✓	reject row if more than one tick given	4
Variable	Independent	Dependent	Control																								
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wavelength of light			✓																								
(b) (i)	<p>normal drawn perpendicular to boundary where incident ray hits it;</p>	<p>normal only needs to be drawn on the water side of the normal</p>	1																								
(b) (ii)	<p>ray drawn refracting in the correct direction; angle of refraction is equal to 32 degrees;</p> <p>e.g. The diagram shows the student's experiment when the semicircular dish contains pure water.</p> 	<p>judge by eye - ray should intersect "mic" in "semicircular" if extended (dark grey region in diagram below)</p> <p>ignore reflected rays</p>	2																								

(c)	(i)	all points plotted correctly;	allow to nearest $\frac{1}{2}$ square	1																		
		<table border="1"> <thead> <tr> <th>Mass of sugar in g</th> <th>Angle of refraction in $^{\circ}$</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>32.0</td> </tr> <tr> <td>25</td> <td>31.2</td> </tr> <tr> <td>50</td> <td>30.4</td> </tr> <tr> <td>75</td> <td>29.7</td> </tr> <tr> <td>100</td> <td>28.9</td> </tr> <tr> <td>125</td> <td>28.3</td> </tr> <tr> <td>150</td> <td>26.5</td> </tr> <tr> <td>175</td> <td>27.0</td> </tr> </tbody> </table>	Mass of sugar in g	Angle of refraction in $^{\circ}$	0	32.0	25	31.2	50	30.4	75	29.7	100	28.9	125	28.3	150	26.5	175	27.0		
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175	27.0																					
	(ii)	point at (150,26.5) circled;	allow if circled in table	1																		
	(iii)	smooth curve of best fit drawn that ignores anomaly;	reject straight line(s) curve should pass through every point curve does not need to extend beyond 175g	1																		
	(iv)	simple pattern statement e.g. as mass of sugar increases, angle of refraction decreases; relationship is non-linear;	ignore inversely proportional	2																		

Total for question 3 = 12 marks

Question number	Answer	Notes	Marks
4 (a)	(i) neutron(s);	ignore n	1
	(ii) idea that it decreases;		1
	(iii) idea that it increases;		1
(b)	(i) gamma is highly penetrating; gamma is harmful to humans; concrete absorbs / weakens radiation;	ignore gamma has high range allow given harmful effect e.g. mutates cells, causes cancer etc. allow gamma can't penetrate concrete allow idea that concrete acts as shielding	3
	(ii) understanding that energy falls to 10% of initial value; evaluation of 10% of initial value; thickness read correctly from graph; e.g. falling by 90% is falling to 10% 10% of 200 = 20 thickness = 18.5 (cm)		3 answer of 1 cm gains 2 marks (finding thickness that reduces energy to 90%) allow 18-19 (cm)

Total for question 4 = 9 marks

Question number	Answer	Notes	Marks
5 (a)	friction / drag / air resistance;	ignore wind resistance, resistance, braking force	1
(b) (i)	0.6 (s);		1
(ii)	understanding that distance = area; correct evaluation of thinking distance; correct evaluation of braking distance; addition to evaluate total stopping distance; e.g. distance = area thinking distance = $0.6 \times 26 = 16$ (m) braking distance = $\frac{1}{2} \times 4.0 \times 26 = 52$ (m) stopping distance = $16 + 52 = 68$ (m)	explicitly stated or implied from working allow ecf from (i) allow ecf from (i) allow ecf from incorrect thinking and braking distances if clear from working allow 15.6 (m) allow 67.6 (m)	4
(iii)	thinking distance does not change; road condition has no effect on reaction time; braking distance increases; idea that there is less grip / lower braking force;	allow reaction time unaffected allow less friction	4

Total for question 5 = 10 marks

Question number	Answer	Notes	Marks
6 (a)	(i) any two from: MP1. particles move in different directions; MP2. particles move at different speeds; MP3. particles move randomly;	ignore different velocities	2
	(ii) particles collide with walls of container; exerting a force;	allow hit, bounce etc. for collide ignore collisions with other particles	2
(b)	(i) substitution; rearrangement; evaluation; e.g. $9.8 \times 10^{-21} = \frac{1}{2} \times 7.3 \times 10^{-26} \times \text{speed}^2$ $\text{speed} = \sqrt{9.8 \times 10^{-21} / (\frac{1}{2} \times 7.3 \times 10^{-26})}$ (speed =) 520 (m/s)	-1 for POT error award 2 marks for using incorrect KE, giving 5.7×10^{14} (m/s) allow 518, 518.2, 518.16... (m/s)	3
	(ii) evaluation of number of particles using KE ratio; evaluation of total mass; e.g. number of particles = $1.2 \times 10^4 / 9.8 \times 10^{-21} = 1.2 \times 10^{24}$ total mass = $(1.2 \times 10^{24} \times 7.3 \times 10^{-26}) = 0.090$ (kg)	reject 0.08 (kg) allow alternative method using KE formula with total KE of gas particles allow 0.09, 0.089... (kg) allow 0.1 (kg) if supported by valid working	2
	(iii) B (the rate of energy transferred to the gas is 200 W); A is incorrect because the energy transferred is 100 J C is incorrect because the particles would move faster D is incorrect because the volume of the gas decreases		1

Total for question 6 = 10 marks

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