

# Mark Scheme (Results)

## November 2010

IGCSE

IGCSE Physics (4420) Paper 03  
IGCSE Science (Double Award) (4437) Paper 09

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IGCSE PHYSICS 4420/03 4437/09 - November 2010

The following abbreviation has been used

**dna**            do not allow

Question Number	Acceptable Answers	Extra Information	Mark
1(a)	44-45 (mm)		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(b)	stopwatch /stop clock / chronometer /timer		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(c)(i)	same length of rod in the water/air	allow 'cork in the same position (on rod)'	1
	same thickness/radius/diameter / width		1
		<b>dna</b> features that should be constant e.g. same water temperature, time, wax	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
1(c)(ii)	<i>ANY TWO</i> <ul style="list-style-type: none"> <li>• same (starting) temperature of the (hot) water</li> <li>• same room temperature</li> <li>• same volume/mass of (hot) <u>water</u> (in the tank)</li> <li>• same time (20 s)</li> <li>• same type of wax (same melting point)</li> </ul>	allow any feature(s) not already given credit  allow 'tank filled to the same level'  <b>dna</b> allow 'same amount of wax'	
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
1(d)(i)	does not fit the pattern (of the other results)	allow 'is not similar to the other results'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(d)(ii)	ignore it/do not use it to calculate the average	allow 'repeat (that part of) the experiment'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
1(e)(i)	axes both labelled with unit		1
	all data correctly transposed from the table	allow vertical axis not starting from zero	1
	all columns the same width (up to and including 20 mm wide)		1
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
1(e)(ii)	<p><i>ANY ONE</i></p> <ul style="list-style-type: none"> <li>• for a line graph both variables should be continuous</li> <li>• the names (of the metals are not continuous they) are categoric</li> <li>• only one quantity has a value/number</li> <li>• the points on the line (between data points) are meaningless</li> <li>• the slope (of the line(s)) is meaningless</li> </ul>		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(a)	to prevent light getting to other parts of the panel	Allow 'absorbs light' but not 'absorbs heat'	1
	so that only some of the panel is exposed/different areas of the panel can be exposed		1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
2(b)	to prevent light from the room reaching the panel/interfering with the result		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
2(c)	distance between the (centre of) the lamp and the (centre of) the panel	accept 'the same distance'	1
	voltage/current/power (to the lamp) /light intensity	allow 'same voltage supply'	1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
2(d)(i)	(milli)voltmeter		1
	370 (mV)		1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
2(d)(ii)	64 (cm <sup>2</sup> )		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark															
2(e)(i)	appropriate headings		1															
	units given in (cm <sup>2</sup> )and in (mV)		1															
	<u>all</u> in order	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>A / cm<sup>2</sup></th> <th>V / mV</th> </tr> </thead> <tbody> <tr> <td>26</td> <td>110</td> </tr> <tr> <td>40</td> <td>160</td> </tr> <tr> <td>60</td> <td>250</td> </tr> <tr> <td>78</td> <td>320</td> </tr> <tr> <td>90</td> <td>30</td> </tr> <tr> <td>120</td> <td>500</td> </tr> </tbody> </table>	A / cm <sup>2</sup>	V / mV	26	110	40	160	60	250	78	320	90	30	120	500		1
		A / cm <sup>2</sup>	V / mV															
		26	110															
		40	160															
60	250																	
78	320																	
90	30																	
120	500																	
			(3)															

Question Number	Acceptable Answers	Extra Information	Mark
2(e)(ii)	both axes labelled correctly and with area on the $x$ axis		1
	both axes with correct units	<i>maximum penalty of 1 mark for unit error/omission in (e)</i>	1
	scale of 10 mm equivalent to 50 mV on the $y$ axis		1
	all points plotted correctly	-1 for each error down to zero and 'blobs'	2
	line of best fit	and tramlines or dot to dot with or without a ruler	1
			(6)

Question Number	Acceptable Answers	Extra Information	Mark
2(e)(iii)	in the range 410 - 420	or correct reading from candidate's line	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(a)	ray box / laser / torch plus slit	dna 'light box'	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(b)	place <u>paper</u> under the block		1
	mark <u>two</u> points on the ray	the points may be marked with pins or with a pencil	1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
3(c)(i)	line drawn at P, at right angles to the surface, goes <u>up and down</u> and <u>labelled</u>	line does not have to be a dashed line	
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
3(c)(ii)	angle $i = 60$ ( $^{\circ}$ )	or in the range 59-61	1
	angle $r = 37$ ( $^{\circ}$ )	or in the range 36-38	1
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
3(c)(iii)	answer/result is to ten (significant) figures / more than (two) sig. Figs / needs to be rounded		1
	data is only correct to two (sig.) figs.		1
	result cannot be more accurate than the data (from which it comes)		1
			(3)



Question Number	Acceptable Answers	Extra Information	Mark
3(d)	<p>ANY THREE</p> <ul style="list-style-type: none"> <li>• (averaging is) more reliable</li> <li>• results from one pair (of measurements) may not be accurate</li> <li>• (averaging generally) helps to cancel out (possible) errors</li> <li>• allows an anomalous (pair of) measurement(s) to be identified (and ignored)</li> </ul>	do not credit 'more accurate'	
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
4(a)	either	dna 'pressure exerted by the dinosaur'	1
	compressibility/softness/water content of the mud		1
	the greater this is the deeper the footprint(s) (will be)		
	or		
	if the dinosaur was moving faster /accelerating	allow an argument that leads to the opposite conclusion e.g. 'during running the feet make lighter contact with the ground and footprint is shallower'	
	the force on the mud would have been greater/the footprints would be deeper		
			(2)

Question Number	Acceptable Answers	Extra Information	Mark
4(b)(i)	horizontal line at two equivalent levels on the wooden block		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
4(b)(ii)	14 - 15 (mm)		
			(1)

Question Number	Acceptable Answers	Extra Information	Mark
4(c)(i)	some appropriate indication of counting /tallying / dots or shading on the diagram	for example total of complete squares <b>plus</b> half the total of the incomplete squares	1
	some appropriate method of calculation		2
			(3)

Question Number	Acceptable Answers	Extra Information	Mark
4(c)(ii)	100 cm <sup>2</sup>		
			(1)



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