

# **Markscheme**

**May 2023**








**Integrated Sciences**








**On-screen examination**

This markscheme is **confidential** and for the exclusive use of examiners in this examination session.

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The following are the annotations available to use when marking responses.

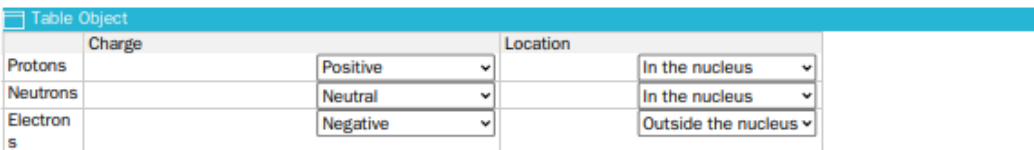
Annotation	Explanation
	Correct point, place at the point in the response where it is clear that the candidate deserves the mark. For use in analytically marked questions only.
	Omission, incomplete
CON	Contradiction
	Valid part (to be used when more than one element is required to gain the mark)
	Error carried forward
	Dynamic annotation, it can be expanded to surround work
	Underline tool (can be expanded)
	Highlight tool that can be expanded to mark an area of a response

Annotation	Explanation
	Not good enough
	The candidate has given a response but it is not worthy of any marks
	Text box used for additional marking comments
	Seen; must be stamped on all blank response areas and on duplicate pages of concatenated responses
	Vertical wavy line that can be expanded
	Words to that effect
	Award 1, 2, 3, 4 marks. For use in holistically marked questions only

## Marking instructions

- 1 Mark positively. Give candidates credit for what they have achieved and what is correct. Do not deduct marks for incorrect responses. Do not deduct marks for spelling errors.
- 2 Follow the markscheme provided and award only whole marks.
- 3 Each marking point appears on a separate line.
- 4 The maximum mark for each subpart is indicated in the “Total” column.
- 5 Where a mark is awarded a tick should be placed in the text at the precise point where it is clear the candidate deserves the mark.
- 6 Each marking point in a question part should be awarded separately unless there is an instruction to the contrary in the Notes column.
- 7 A question subpart may have more marking points than the total allows. This will be indicated by the word “**max**” in the Answer column. Further guidance may be given in the Notes column.
- 8 Additional instructions on how to interpret the markscheme are in bold italic text in the Answer column.
- 9 Alternative wording may be indicated in the Answer column by a slash (/). Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.
- 10 Alternative answers are indicated in the Answer column by “**or**”. Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.
- 11 If two related points are required to award a mark, this is indicated by “**and**” in the answer column.
- 12 Words in brackets ( ) in the Answer column are not necessary to gain the mark.
- 13 Words that are underlined are essential for the mark.
- 14 In some questions a reverse argument is also acceptable. This is indicated by the abbreviation *ORA (or reverse argument)* in the Notes column. Candidates should not be rewarded for reverse arguments unless *ORA* is given in the Notes column.
- 15 If the candidate’s response has the same meaning or is clearly equivalent to the expected answer the mark should be awarded. In some questions this is emphasized by the abbreviation *WTTE (or words to that effect)* in the Notes column.
- 16 When incorrect answers are used correctly in subsequent question parts the follow through rule applies. Award the mark and add ECF (error carried forward) to the candidate response.
- 17 The order of marking points does not have to be the same as in the Answer column unless stated otherwise.
- 18 Marks should not be awarded where there is a contradiction in an answer. Add CON to the candidate response at the point where the contradiction is made.
- 19 Do not penalize candidates for errors in units or significant figures unless there is specific guidance in the Notes column.
- 20 Questions with higher mark allocations will generally be assessed using a level response method using task specific clarifications developed with reference to the criteria level descriptors. A candidate’s work should be reviewed to determine holistically the mark for each row of the holistic grid and a mark awarded for each row.

Question		Answers	Notes	Total	Crit
1	a	Ant		1	A
	b	Oxygen <b>and</b> glucose	Accept any order	1	A
	c	<b>Sticky tongue:</b> Allows it to eat ants or catch the prey <b>Sharp claws:</b> Allow it to dig into ground to find ants or to defend itself against the hyena	WTTE	2	A
	d	20-40 (seconds)		1	A
	e	Gradient calculation seen or implied  Speed= 12 (ms <sup>-1</sup> )  Final answer = 43(.2) (km h <sup>-1</sup> )	Award 3 marks if 43 or 43.2 is seen with no calculation	3	A
2	a	Group 7 <b>or</b> the halogens	Accept group 17	1	A
	b	6		1	A
	c	Synthesis of proteins		1	A
	d	Cell wall acts as a barrier <b>or</b> protective layer <b>or</b> protection  (so) when it is damaged chemicals can enter (and disrupt cell functions)	WTTE	2	A
	e	Third law of motion  <b>Justification:</b> Person exerts a downward force on board by jumping  Board exerts an equal and opposite <b>or</b> upwards force on the person to push the person away	Second and third marks do not depend on the first mark  WTTE	3	A
	f	10 (N)  Forwards <b>or</b> to the right <b>or</b> in the direction of 130N		2	A

3	a	Efficiency of incandescent 10 (%)  Efficiency of LED 75(%)		2	A
	b	<p><b>First mark: Two correct physical properties, for example</b></p> <ul style="list-style-type: none"> <li>tungsten is a metal</li> <li>argon is a non-metal</li> <li>tungsten has a high melting point</li> <li>argon has a low melting point</li> <li>tungsten conducts electricity or heat</li> <li>argon does not conduct electricity or heat</li> <li>tungsten is a solid at room <b>or</b> normal <b>or</b> working temperature</li> <li>argon is a gas at room <b>or</b> normal <b>or</b> working temperature</li> </ul> <p><b>Second mark:</b> a further <u>two</u> correct physical properties from the list above</p>	Allow a maximum of two properties for each element seen in any box	2	A
	c	It is unreactive <b>or</b> has low reactivity <b>or</b> prevents burning <b>or</b> prevents corrosion <b>or</b> is stable	Do <b>not</b> accept it is a noble gas	1	A
	d	 <p>Charges all correct</p> <p>Locations all correct</p>		2	A
	e	So that each light bulb works independently <b>or</b> So they all get the same voltage	WTTE	1	A

4	a	<div>input energy at the bottom of the slope → output energy at the top of the slope</div> <div><div>Electrical energy</div><div>Gravitational potential energy</div></div> <div>Electrical energy</div> <div>Gravitational potential energy</div>		2	A																				
	b	How does changing the angle (of the slope) affect the kinetic energy (of the ball <b>or</b> skier at the bottom of the slope)	<i>Do <b>not</b> accept speed</i>	1	B																				
	c	IV: Angle (of the slope)  DV: Kinetic energy		2	B																				
	d	<div><div>Table Object</div><table><tr><th>Angle / degrees</th><th>Kinetic energy / J</th></tr><tr><td>5</td><td>0.003</td></tr><tr><td>7</td><td>0.005</td></tr><tr><td>10</td><td>0.007</td></tr><tr><td>12</td><td>0.008</td></tr><tr><td>15</td><td>0.010</td></tr><tr><td>19</td><td>0.012</td></tr><tr><td>20</td><td>0.013</td></tr><tr><td>25</td><td>0.017</td></tr><tr><td>30</td><td>0.021</td></tr></table><div>Columns for angle <b>and</b> kinetic energy</div><div>Correct units in header only degrees <b>and</b> J</div><div>Five readings or more</div><div>Minimum angle 5 degrees <b>and</b> maximum angle 30 degrees</div></div>	Angle / degrees	Kinetic energy / J	5	0.003	7	0.005	10	0.007	12	0.008	15	0.010	19	0.012	20	0.013	25	0.017	30	0.021	<i>Accept data arranged in rows</i>	4	C
	Angle / degrees	Kinetic energy / J																							
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e	Use of at least two data points  As the angle increases, the energy at the bottom increases also  So therefore the hypothesis is invalid	<i>Award marking point 3 only if marking point 1 or marking point 2 is awarded</i>	3	C																					

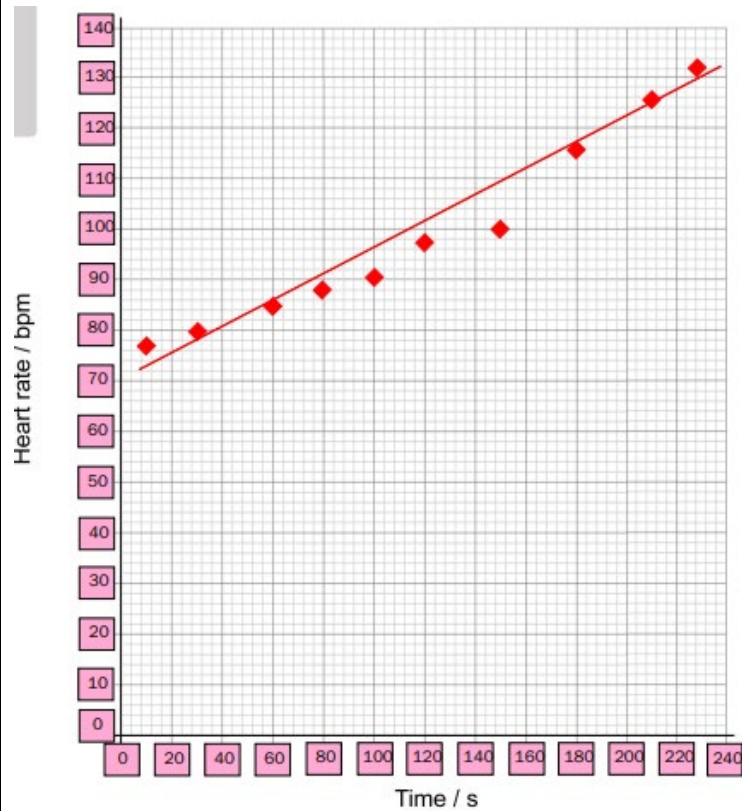
	<b>f</b>	<p><b>Accept any two reasonable comments, for example [max 2]</b></p> <ul style="list-style-type: none"> <li>• weather conditions would be different on ski slope</li> <li>• variables would be more difficult to control on a ski slope</li> <li>• surface of the slope would vary in real life</li> <li>• the angle of a mountain is fixed</li> <li>• the data collected was appropriate to model the movement of the skier</li> </ul>	WTTE	2	C
	<b>g</b>	<p><b>Accept any reasonable improvement, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• use ice or different surface</li> <li>• use a fan</li> <li>• change temperature</li> </ul> <p><b>Accept any correctly linked justification, for example [max 1]</b></p> <ul style="list-style-type: none"> <li>• (use ice) this is closer to the friction of a snow slope</li> <li>• (use a fan) this mimics the wind when skiing down a slope</li> <li>• (change temperature) the temperature affects the behaviour of the snow</li> </ul>		2	C



5			<b>1 mark</b>	<b>2 marks</b>	<b>3 marks</b>	<b>4 marks</b>	15	B
		1.V	IV as height <b>or</b> DV as speed identified	IV identified as height <b>and</b> DV identified as speed	IV identified as height <b>and</b> DV identified as speed <b>and</b> at least 1 CV identified	IV identified as height <b>and</b> DV identified as speed <b>and</b> at least 2 CV identified		
		2.RQ	RQ includes one variable only	RQ links an IV and DV				
		3.E	Some additional equipment mentioned but may not be relevant	Measuring tape (ruler) to measure IV <b>or</b> Equipment to control or monitor one stated CV	Measuring tape (ruler) to measure height <b>and</b> Equipment to control or monitor one stated CV			
		4.M	Attempt at a method but detail is insufficient to follow	Method can be followed but detail is incomplete or incorrect	Complete method to vary height is described, fully explained and can be followed			
		5.D	Method includes 5 values of IV <b>or</b> 3 trials	Method includes 5 values of IV <b>and</b> 3 trials	Method includes 5 values of IV <b>and</b> with 3 trials <b>and</b> plans to calculate average			

6	a	<p><b>Accept any two reasonable CV, for example [ max 2]</b></p> <ul style="list-style-type: none"> <li>• the same runner</li> <li>• the speed of the runner</li> <li>• the angle of the treadmill</li> <li>• speed of the treadmill</li> </ul> <p><b>Accept any correctly linked justification, for example [ max 2]</b></p> <ul style="list-style-type: none"> <li>• health of cardiovascular system changes with age, sex, health status</li> <li>• the faster the runner is moving, the higher the heart rate</li> <li>• the greater the angle, the higher the intensity of exercise or heart rate</li> <li>• running at different speeds, different amount of effort</li> </ul>	<p><i>Do <b>not</b> accept length of time exercising as this is the IV</i></p> <p><i>Accept any link to change in exercise intensity</i></p>	4	B
	b	<p>131.67</p> <p>132</p>	<p><i>Award 2 marks for final correct answer</i></p>	2	C

**c**



X axis scale has numbers at equal increments and starts at zero with plotted points taking up at least half of the graph

Y axis scale has numbers at equal increments and starts at any point below 77 (the y-intercept)

Five points plotted correctly

All points plotted correctly

Best fit line roughly going through all or most points (ignore anomalous point at 150s)

**5**

**C**

	<b>d</b>	At 150 seconds (trial 2)  <b>Reasons:</b> water break, rest, human error...	<i>Award marking point 2 only if marking point 1 is awarded</i>	<b>2</b>	<b>C</b>
	<b>e</b>	This is because there is an increased demand for oxygen in the body <b>or</b> muscles <b>or</b> ATP production <b>or</b> for energy demand  (for cellular) respiration	<i>WTTE</i>	<b>2</b>	<b>C</b>

<b>7</b>	<b>a</b>	<b><i>Accept any possible effect of increased or decreased global temperature, for example [ max 1]</i></b> <ul style="list-style-type: none"> <li>• reduce crop yields or decrease in amount of food supply</li> <li>• change <b>or</b> migration of species</li> <li>• soil erosion and depletion of nutrients</li> <li>• loss of agricultural land</li> <li>• harvesting calendars may change</li> </ul> <b><i>Accept any correctly linked justification [max 1]</i></b>		<b>2</b>	<b>D</b>
	<b>b</b>	<b><i>Accept any two reasonable advantages, for example [ max 2]</i></b> <ul style="list-style-type: none"> <li>• less groundwater pollution</li> <li>• can be done at home/small portions of land</li> <li>• less harmful effect on animals</li> <li>• crop spraying not needed so air pollution is lower</li> <li>• soil preservation</li> </ul> <b><i>Accept any two reasonable limitations, for example [ max 2]</i></b> <ul style="list-style-type: none"> <li>• higher price</li> <li>• time-consuming</li> <li>• standards high to meet</li> <li>• government offices need to approve for large-scale production</li> <li>• development of pests due since no pesticides</li> <li>• depends on weather conditions</li> </ul>	<i>Accept answers in any box</i>  <i>Do <b>not</b> accept: no pesticides, no synthetic fertilizers, no antibiotics or no hormones are not used as this information is in the question</i>   <i>Do <b>not</b> accept a lower amount of food is produced, lower yield or requires larger areas as this information is in the question</i>	<b>4</b>	<b>D</b>

	<b>c</b>					<b>6</b>	<b>D</b>
			<b>1 mark</b>	<b>2 marks</b>	<b>3 marks</b>		
		<b>Benefits of a plant-based diet</b>	one benefit for the body	two benefits for the body <b>or</b> one benefit with further support	two benefits for the body <b>and</b> at least one of them fully supported		
		<b>Limitations of a plant-based diet</b>	one limitation for the body	two limitations for the body <b>or</b> one limitation with further support	two limitations for the body <b>and</b> at least one of them fully supported		

8	a	Accept any two reasonable suggestions, for example [max 2] <ul style="list-style-type: none"><li>• efficiency</li><li>• monitors all fish farming processes (feeding, reproduction, size)</li><li>• measuring levels of chemicals</li><li>• pumping</li><li>• aeration</li><li>• reduce physical labour</li></ul>					2	D																								
	b	<table><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Aquaculture</td><td>A statement of an impact on quality <b>or</b> quantity</td><td>A statement of an impact on quality <b>and</b> quantity <b>or</b> A statement of an impact on quality or quantity <b>and</b> further detail</td><td>A statement of an impact on quality <b>and</b> quantity <b>and</b> further detail for one</td><td>A statement of an impact on quality <b>and</b> quantity <b>and</b> further detail for both</td></tr><tr><td>Environmental</td><td>A statement of a positive environmental impact <b>or</b> a negative environmental impact</td><td>A statement of a positive environmental impact <b>and</b> a negative environmental impact</td><td>A statement of a positive environmental impact <b>and</b> a negative environmental impact <b>and</b> at least one of them fully justified.</td><td>A statement of a positive environmental impact <b>and</b> a negative environmental impact <b>and</b> both fully justified.</td></tr><tr><td>Economic</td><td>A statement of a positive economic impact <b>or</b> a negative economic impact</td><td>A statement of a positive economic impact <b>and</b> a negative economic impact</td><td>A statement of a positive economic impact <b>and</b> a negative economic impact <b>and</b> at least one of them fully justified.</td><td>A statement of a positive economic impact <b>and</b> a negative economic impact <b>and</b> both fully justified.</td></tr><tr><td>Conclusion</td><td>An opinion is given</td><td>An opinion is given comparing aquaculture with conventional fishing</td><td></td><td></td></tr></table>					1	2	3	4	Aquaculture	A statement of an impact on quality <b>or</b> quantity	A statement of an impact on quality <b>and</b> quantity <b>or</b> A statement of an impact on quality or quantity <b>and</b> further detail	A statement of an impact on quality <b>and</b> quantity <b>and</b> further detail for one	A statement of an impact on quality <b>and</b> quantity <b>and</b> further detail for both	Environmental	A statement of a positive environmental impact <b>or</b> a negative environmental impact	A statement of a positive environmental impact <b>and</b> a negative environmental impact	A statement of a positive environmental impact <b>and</b> a negative environmental impact <b>and</b> at least one of them fully justified.	A statement of a positive environmental impact <b>and</b> a negative environmental impact <b>and</b> both fully justified.	Economic	A statement of a positive economic impact <b>or</b> a negative economic impact	A statement of a positive economic impact <b>and</b> a negative economic impact	A statement of a positive economic impact <b>and</b> a negative economic impact <b>and</b> at least one of them fully justified.	A statement of a positive economic impact <b>and</b> a negative economic impact <b>and</b> both fully justified.	Conclusion	An opinion is given	An opinion is given comparing aquaculture with conventional fishing				14
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