

Markscheme

May 2019

Integrated Sciences

On-screen examination



14 pages

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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.
λ	Omission, incomplete
CON	Contradiction
	Valid part (to be used when more than one element is required to gain the mark)
ECF	Error carried forward
0	Dynamic annotation, it can be expanded to surround work
~~~	Horizontal wavy line that can be expanded
	Highlight tool that can be expanded to mark an area of a response

Annotation	Explanation
NGE	Not good enough
0	The candidate has given a response but it is not worthy of any marks
T	Text box used for additional marking comments
SEEN	Seen; must be stamped on all blank response areas and on duplicate pages of concatenated responses
~~~	Vertical wavy line that can be expanded
WITE	Words to that effect
✓ 1 ✓ 2 ✓ 3 ✓ 4	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.
- 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 <u>underlined</u> 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.

Que	estion	Answers	Notes	Total	Criterion
1	а	Light or Heat / thermal	If more than one answer is given, mark the first answer and ignore the second. Accept radiant energy	1	A
	b	Carbon dioxide / CO ₂ and water (vapour) / H ₂ O only	Accept CO2 and H2O Ignore reactants, energy	1	А
	C Viniversal Canvas Object Draggable items: Nuclear Input energy 100 J Electrical energy Heat energy			1	A
	d	20 Joules / J	No calculation required Award this mark separately	2	А
	e	 Conversion: Convert hours into seconds Calculation: Multiply time by 3000 Calculated value: 10800000 (J) Standard form mark: 1.08 × 10⁷ (J) or 1.08 x 10⁴ (kJ) 	No ecf Accept 1(.1) x 10 ⁷ (J) or 1(.1) x 10 ⁴ (kJ) Award 4 marks if only 1.08 x 10 ⁷ (J) or 1.08 x 10 ⁴ (kJ) is seen	4	A

2 a	Image: Tertiary consumer Image: Tertim Tertiary consumer <th>Ignore mixed terminology if the trophic level is correct Check carefully for CON if more than one label is present for any trophic level</th> <th>2</th> <th>A</th>	Ignore mixed terminology if the trophic level is correct Check carefully for CON if more than one label is present for any trophic level	2	A
b	15 or 15000 kg or g	Do not award the second mark unless the first mark has been awarded	2	A
С	mercury travels up the food chain organisms that are higher up the food chain are exposed to more mercury or	WTTE Second marking point scores both marks	2	A

3	а	Substance must be a liquid <i>or</i> red colour (is easily seen)	Do not award the first mark if the candidate mentions mercury		
		(substance must be liquid) over the temperature range (it measures)	Award marking points two and three separately Accept high boiling point or low freezing point	3	A
		Liquid must expand with increasing temperature	ORA		
	b	As temp increases, (kinetic) energy of the particles increases or energy is transferred to the substance in the thermometer So the particles move or vibrate faster or push away from each other or increase their potential energy (move or vibrate faster and therefore) take up more space	do not accept the particles expand	3	A
	С	Carbon <i>and</i> hydrogen <i>and</i> oxygen	Names must be seen, do not accept C,H,O	1	А
	d	Number of atoms for each element: C = 5, H =12, O=1			
		Masses of each element correct	No ECF	3	A
		88 (g)	award 3 marks if only 88 is seen		

а	Height measurements			
	Day 5: 3.1± 0.1			
	Day 6: 6.1±0.1			
	Day 7: 8.4± 0.1			
	Three correct measurements			
	Average calculations: Day 5: 3.5± 0.1 Day 6: 6.0± 0.1 Day 7: 8.3± 0.1		4	с
	One average calculated correctly falling in the range above	Accept values in the response box or the		
	All averages calculated correctly falling in the range above	table Ignore number of decimal places for this mark		
	All averages rounded correctly to 1 decimal place	ecf from wrongly measured values only if calculation is shown		
b	pH=5 pH=7 pH=9			
	Acidic Neutral Alkaline		1	A
С	(How does the) different pH			
	affect the growth (of mung bean shoots)	Accent references to time or rate of arowth	2	В
d	Independent variable: pH	Accept acidity of the soil		
	Dependent variable: length or height of the mung bean shoot	Accept growth		
	Accept any two reasonable control variables, for example (2 max)			
	duration/time of the experiment		4	В
	 volume of solution (with different pH solution) 		-	
	Temperature of the room			
	Similar initial length or beight			
			1	1

4

а

е	 Accept any two reasonable justifications of the importance of control variables, for example: (2 max) Fair test – conclusion is valid the dependent variable is affected only by the change in independent variable results are affected only by the change in independent variable 	2	В
f	pH 7	1	С
g	Graph C 💌	1	С

5	а	If candidate answers invalid:	Do not award any marks for this question		
		Invalid because there is more than one independent variable	part if candidate states the method is valid		
		or			
		a general statement that they have not controlled all of the variables			
		Independent variables: nutrient levels and pH or water retention			
		Reference to a specific control variable that was either controlled or not controlled			
		Justification of why is it important to control this variable		4	C
		<i>If candidate answer partially valid:</i> partially valid because some CVs have been controlled, eg amount of water, number of seeds or type of seeds		4	C
		Independent variables: nutrient levels or pH or water retention			
		Reference to a specific control variable that was either controlled or not controlled			
		Justification of why it is important to control this variable			

b	 Any reasonable improvement and correctly linked justification, for example: (1 max) Do more experiments or increase the range of IV as this will give a clearer trend Run the investigation for longer as this will give a clearer trend More trials will give a clearer trend line More trials and calculate an average 		1	С
С	 Most nutrients were in sheep manure Fastest growth rate / germination rate was in peat moss (therefore) hypothesis is not supported Any correct, additional point: (1 max) Use of data from the graph to support answer eg peat moss grew to 13.4 cm Beans grown in sheep manure took the longest to start to grow / germinate/ The growth rate towards the end of the experiment was similar for all levels of nutrients The experiment should have been left for a longer period of time Effect of other variables were not studied e.g acidity 	ORA ORA	4	С

6	а	Plant A	Plant B	Plant C			
		Phosphorus 💌	Nitrogen	Potassium 💌		1	С
	b	Accept any two res • N fertilizers in • NPK fertilizers • Both types ind • N fertilizer ind • NPK fertilizer • N or NPK fertilizer	sponses from the list: (2 m acrease the yield s increase the yield crease the yield by <u>similar</u> ar creases the yield by 0.212 kg increases the yield by 0.236 tilizers increase the yield by	nounts gm ² 5 kgm ² approx. 70-80%		2	С
	С	Total cost to buy fer Total sale price of w Profit = 946.79 (USI	tilizer = 33.5 (USD) /heat = 1080(.29) (USD) D) or 947 (USD)		ECF from first marking point	3	С
	d	NPK and gives the b	biggest profit		ECF from 6c	1	С

	1	2	3	4		
1. RQ	RQ is suggested	RQ links IV and DV				
(Research question)						
2.V (Variables)	IV and DV implied	IV identified as fertilizer concentration and DV explicitly identified as height or time taken to reach a specified height	IV identified as fertilizer concentration and DV explicitly identified as height or time taken to reach a specified height and at least 1 CV explicitly identified	IV identified as fertilizer concentration and DV explicitly identified as height or time taken to reach a specified height and at least 2 CV explicitly identified		
3.E (Equipment used in method)	Some equipment is listed	Measuring cylinder to vary concentration (IV) used in method or Ruler to measure height of plant or stopwatch to measure time (DV) used in the method	Measuring cylinder to vary concentration (IV) used in method and Ruler to measure height of plant or stopwatch to measure time (DV) used in the method and Equip linked to one CV that has been identified the method	Measuring cylinder to vary concentration (IV) used in the method and Ruler to measure height of plant or stopwatch to measure time (IV) used in the method and Equip linked to all CV that have been identified used in the method	18	
4.M (Details of Method)	Attempt at a method but detail is insufficient to follow	Method can be followed but detail is incomplete or incorrect	Complete method to vary concentration is described, fully explained and could easily be followed			
5.D (Data)	Method implies a range of values	Method includes 5 values of IV with 3 trials	Method includes 5 values of IV with 3 trials and plans to calculate average			
6.S (Safety issues)	One safety precaution is considered	One relevant safety precaution correctly linked to the corrosive				

8 a	 Any reasonable method to kill insects, for example: (1 max) Planting plants to encourage natural predators of the insects Planting plants around the field which are toxic to the insects Setting up traps for the insects Use of organic pesticides. Increase population of animals that feed on insects 	1	D
b	Any two reasonable comment on liquid pesticides, for example: (max 2) • (They can be sprayed) quickly using machinery (planes, tractors) • Spread over large areas • Easily transported • (Very concentrated and can be) diluted on site for use • Easy to store • Dissolves quickly on soil • Easily absorbed	2	D
C	 Accept two any reasonable problems for streams or rivers, for example: (2 max) Spread to other areas Harm the people/creatures that eat the fish which have been exposed to them Kill insects which are useful to humans Can enter or affect the food chain Contain harmful chemicals that can affect the food chain in river or streams 	2	D
d	Accept any three ethical considerations, for example: (3 max) • Difficult to test harmful things on humans • unethical to test harmful things on humans • long term means it takes many years to get back data • additional many years to reproduce or check data • data available is derived from accidental exposure	3	D

9							
		1 mark	2 marks	3 marks	4 marks		
	1.A (Advantages of each method for reducing mosquito population)	An advantage of removing standing water is implied or an advantage of using DDT is implied	removing standing water eliminates larvae or stops the mosquitoes breeding or using DDT kills all adults or stops the adults spreading disease	removing standing water eliminates larvae or stops the mosquitoes breeding and using DDT kills all adults or stops the adults spreading disease	removing standing water eliminates larvae or stops the mosquitoes breeding and using DDT kills all adults or stops the adults spreading disease and one further justification linked to		
	2.D (Disadvantages or each method for reducing mosquito population)	A disadvantage of removing standing water is implied or a disadvantage of using DDT is implied	Removing standing water does not affect adult mosquitoes or using DDT does not affect larvae	Removing standing water does not affect adult mosquitoes and using DDT does not affect larvae	mosquito life cycle Removing standing water does not affect adult mosquitoes and using DDT does not affect larvae and one further justification linked to mosquito life cycle	18	D
	3.S (Social impacts of reducing mosquito population of your chosen proposal)	A social impact on the local community is implied	A statement of a social impact on the local community	A statement of more than one social impact on the community eg less disease, no water for crops, reduced amount of food	A statement of more than one social impact on the community eg less disease, no water for crops, reduced amount of food <i>and</i> one of these social impacts justified		
	4.E (Environmental impacts of your chosen proposal)	An impact on the environment is implied	A statement of one impact on the environment eg loss of habitat for water based species	A statement of more than one impact on the environment eg loss of habitat for water based species, loss of water for crop irrigation	A statement of more than one impact on the environment eg loss of habitat for water based species, loss of water for crop irrigation and one of these environmental impacts justified		
	5.C (Conclusion and justification)	A recommendation is made	A recommendation is made and linked to one of arguments presented				