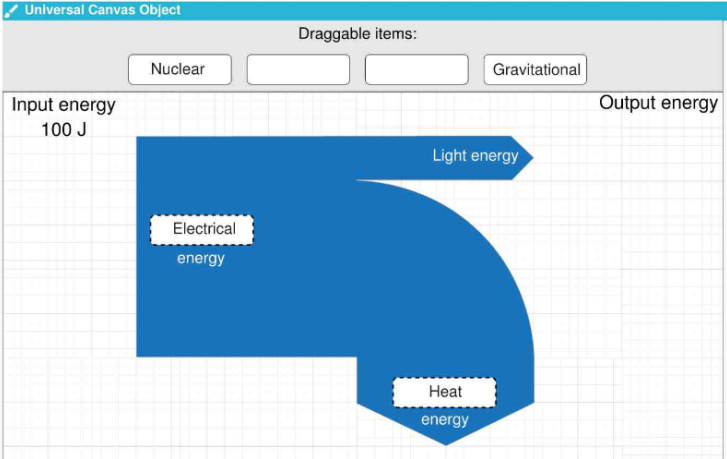
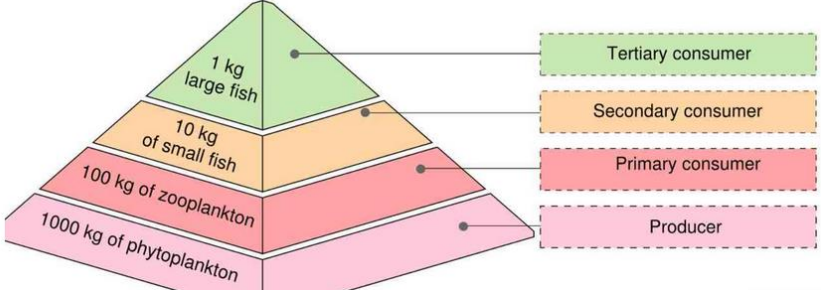


Question	Answers	Notes	Total	Criterion
1 a	Light or Heat / thermal	<i>If more than one answer is given, mark the first answer and ignore the second.</i> <i>Accept radiant energy</i>	1	A
b	Carbon dioxide / CO ₂ and water (vapour) / H ₂ O only	<i>Accept CO₂ and H₂O</i> <i>Ignore reactants, energy</i>	1	A
c	 <p>Electrical and heat in correct locations</p>		1	A
d	20 Joules / J	<i>No calculation required</i> <i>Award this mark separately</i>	2	A
e	<p>Conversion: Convert hours into seconds</p> <p>Calculation: Multiply time by 3000</p> <p>Calculated value: 10800000 (J)</p> <p>Standard form mark: 1.08 × 10⁷ (J) or 1.08 × 10⁴ (kJ)</p>	<p><i>No ecf</i></p> <p><i>Accept 1(.1) × 10⁷(J) or 1(.1) × 10⁴(kJ)</i></p> <p><i>Award 4 marks if only 1.08 × 10⁷ (J) or 1.08 × 10⁴ (kJ) is seen</i></p>	4	A

<p>2</p>	<p>a</p>	 <p>tertiary consumer / third order consumer / carnivore secondary consumer / second order consumer/ carnivore primary consumer / first order consumer / herbivore producer</p> <p>Any two correct</p> <p>All correct</p>	<p><i>Ignore mixed terminology if the trophic level is correct</i></p> <p><i>Check carefully for CON if more than one label is present for any trophic level</i></p>	<p>2</p>	<p>A</p>
	<p>b</p>	<p>15 or 15000</p> <p>kg or g</p>	<p><i>Do not award the second mark unless the first mark has been awarded</i></p> <p><i>Units must match value</i></p>	<p>2</p>	<p>A</p>
	<p>c</p>	<p>mercury travels up the food chain</p> <p>organisms that are higher up the food chain are exposed to more mercury</p> <p>or</p> <p>organisms higher up the food chain could get a lethal dose of mercury or toxic levels</p>	<p><i>WTTE</i></p> <p><i>Second marking point scores both marks</i></p>	<p>2</p>	<p>A</p>

3	a	Substance must be a liquid or red colour (is easily seen) (substance must be liquid) over the temperature range (it measures) Liquid must expand with increasing temperature	<i>Do not award the first mark if the candidate mentions mercury</i> <i>Award marking points two and three separately</i> <i>Accept high boiling point or low freezing point</i> <i>ORA</i>	3	A
	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	<i>do not accept the particles expand</i>	3	A
	c	Carbon and hydrogen and oxygen	<i>Names must be seen, do not accept C,H,O</i>	1	A
	d	Number of atoms for each element: C = 5, H =12, O=1 Masses of each element correct 88 (g)	<i>No ECF</i> <i>award 3 marks if only 88 is seen</i>	3	A

4	a	<p>Height measurements Day 5: 3.1± 0.1 Day 6: 6.1± 0.1 Day 7: 8.4± 0.1</p> <p>Three correct measurements</p> <p>Average calculations: Day 5: 3.5± 0.1 Day 6: 6.0± 0.1 Day 7: 8.3± 0.1</p> <p>One average calculated correctly falling in the range above</p> <p>All averages calculated correctly falling in the range above</p> <p>All averages rounded correctly to 1 decimal place</p>	<p><i>Accept values in the response box or the table</i> <i>Ignore number of decimal places for this mark</i></p> <p><i>ecf from wrongly measured values only if calculation is shown</i></p>	4	C
	b	<p>pH=5 pH=7 pH=9</p> <p>Acidic Neutral Alkaline</p>		1	A
	c	<p>(How does the) different pH affect the growth (of mung bean shoots)</p>	<p><i>Accept references to time or rate of growth</i></p>	2	B
	d	<p>Independent variable: pH</p> <p>Dependent variable: length or height of the mung bean shoot</p> <p>Accept any two reasonable control variables, for example (2 max)</p> <ul style="list-style-type: none"> • duration/time of the experiment • volume of solution (with different pH solution) • Temperature of the room • Similar initial length or height • Intensity or duration of (sun) light 	<p><i>Accept acidity of the soil</i></p> <p><i>Accept growth</i></p>	4	B

e	<p>Accept any two reasonable justifications of the importance of control variables, for example: (2 max)</p> <ul style="list-style-type: none"> 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	B
f	pH 7		1	C
g	<input type="text" value="Graph C"/>		1	C

5	a	<p>If candidate answers invalid: Invalid because there is more than one independent variable or a general statement that they have not controlled all of the variables</p> <p>Independent variables: nutrient levels and pH or water retention</p> <p>Reference to a specific control variable that was either controlled or not controlled</p> <p>Justification of why is it important to control this variable</p> <p>If candidate answer partially valid: partially valid because some CVs have been controlled, eg amount of water, number of seeds or type of seeds</p> <p>Independent variables: nutrient levels or pH or water retention</p> <p>Reference to a specific control variable that was either controlled or not controlled</p> <p>Justification of why it is important to control this variable</p>	<p><i>Do not award any marks for this question part if candidate states the method is valid</i></p>	4	C
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	b	<p>Any reasonable improvement and correctly linked justification, for example: (1 max)</p> <ul style="list-style-type: none"> • 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	C
	c	<p>Most nutrients were in sheep manure</p> <p>Fastest growth rate / germination rate was in peat moss</p> <p>(therefore) hypothesis is not supported</p> <p>Any correct, additional point: (1 max)</p> <ul style="list-style-type: none"> • 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 	<p>ORA</p> <p>ORA</p>	4	C

6	a	<p>Plant A Plant B Plant C</p> <p>Phosphorus Nitrogen Potassium</p>		1	C
	b	<p>Accept any two responses from the list: (2 max)</p> <ul style="list-style-type: none"> • N fertilizers increase the yield • NPK fertilizers increase the yield • Both types increase the yield by <u>similar</u> amounts • N fertilizer increases the yield by 0.212 kgm² • NPK fertilizer increases the yield by 0.236 kgm² • N or NPK fertilizers increase the yield by approx. 70-80% 		2	C
	c	<p>Total cost to buy fertilizer = 33.5 (USD)</p> <p>Total sale price of wheat = 1080(.29) (USD)</p> <p>Profit = 946.79 (USD) or 947 (USD)</p>	<i>ECF from first marking point</i>	3	C
	d	NPK and gives the biggest profit	<i>ECF from 6c</i>	1	C

8	a	<p>Any reasonable method to kill insects, for example: (1 max)</p> <ul style="list-style-type: none"> • 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	<p>Any two reasonable comment on liquid pesticides, for example: (max 2)</p> <ul style="list-style-type: none"> • (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	<p>Accept two any reasonable problems for streams or rivers, for example: (2 max)</p> <ul style="list-style-type: none"> • 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	<p>Accept any three ethical considerations, for example: (3 max)</p> <ul style="list-style-type: none"> • 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	18	D
		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 mosquito life cycle		
		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	Removing standing water does not affect adult mosquitoes and using DDT does not affect larvae and one further justification linked to mosquito life cycle		
		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 and 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				