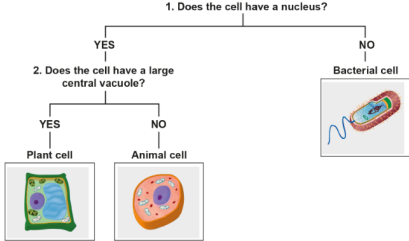


Question	Answers	Notes	Total	Crit
1	<p>a</p>  <p>all correct</p>		1	A
	<p>b</p> <p>Accept any reasonable suggestion, for example [max 1]</p> <ul style="list-style-type: none"> • does it have chloroplasts? • does it have a cell wall? 	Do not accept references to colour, shape or vacuole	1	A
	<p>c</p> <p>Mitochondrion</p>	Accept mitochondria	1	A
	<p>d</p> <p>Controls what enters or exits the cell or Separates the cell from the outside</p>	<p>WTTE</p> <p>Do not accept references to protection. Do not accept any reference to cell wall – this is a CON</p>	1	A
	<p>e</p> <p>Tissues are made out of cells</p> <p>Cells in a tissue are similar</p> <p>(and) work together (to perform a shared function)</p> <p>or</p> <p>Different tissues perform different functions</p>	<p>WTTE, Accept named examples of cells and tissues</p>	3	A

2	a	System 1: Nervous system System 2: Reproductive system		2	A
	b	Metabolism		1	A
	c	Breaks into smaller pieces or Easier to swallow To increase the surface area (so) chemical digestion is faster or (to) allow enzymes to work faster	WTTE <i>Do not accept easier</i>	3	A
	d	Sugars or a named sugar	<i>Accept disaccharide or monosaccharide</i>	1	A
	e	Accept any two correct features [max 2] <ul style="list-style-type: none"> • folds or villi or micro villi or finger-like projection or long length • good blood supply • walls of villi or small intestine are one cell thick or semi permeable • lacteal Accept any two correct explanations [max 2] <ul style="list-style-type: none"> • large surface area for absorption • to carry nutrients to cell or maintains concentration gradient • short diffusion distance or efficient transfer of nutrients • absorbs / transports fatty acids and glycerol 		4	A

3	a	<p>Accept any reasonable natural source, for example [max 1]</p> <ul style="list-style-type: none"> • decaying or dead plants or animals • animal waste • soil or dirt 	WTTE, do not accept named nutrients	1	A
	b	<p>Direct sources: accept any reasonable answer, for example [max 1]</p> <ul style="list-style-type: none"> • fish farm • sewage treatment plants • industrial plants <p>Indirect sources: accept any reasonable answer, for example [max 1]</p> <ul style="list-style-type: none"> • residential runoff • runoff from farms • runoff from industrial plants • runoff from sewage plant 	WTTE	2	A
	c	<p>Nutrients reaching water source from named source</p> <p>Providing the algae with increased nutrients</p> <p>(so) the algae reproduce more</p>	<p>Accept examples of nutrients</p> <p>WTTE</p> <p>WTTE Do not accept grow. Do not accept algal bloom. Do not award the third mark unless the second is awarded. Do not accept increase in the population of algae</p>	3	A
	d	<p>Algal bloom blocks out sunlight</p> <p>Aquatic plants die due to lack of (sunlight for) <u>photosynthesis</u></p> <p>Organic material broken down by bacteria causes oxygen in water to be depleted</p> <p>Oxygen depletion leads to death of aquatic organisms</p>	<p>WTTE</p> <p>Accept named organisms</p>	4	A

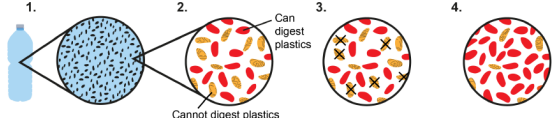
4	a	The colour of the solution or food colouring (added to water)		1	B
	b	Volume (of water in beaker) Final and initial volumes Time (over which change occurred) or duration of experiment	Accept quantity / amount / cm ³ of water Accept decrease in volume (of water) or change in volume (of water)	3	B
	c	Accept any two reasonable control variables, for example [max 2] <ul style="list-style-type: none"> • temperature of the environment • temperature of the water • species of plant • wind / air movement • dimensions of plant stem • surface area of plant leaves • light intensity / distance of light (from plant) 	WTTE Do not accept quantity / amount of light	2	B
	d	Accept any two improvements from the list [max 2] <ul style="list-style-type: none"> • stem was identified • solution identified as water • specified the numbers of dyes used / greater than 5 dyes used Accept any two correctly linked justifications from the list [max 2] <ul style="list-style-type: none"> • different parts of the plant may be affected differently • shows this is controlled, enables repetition of the experiment • gives information about how the IV is manipulated 	Do not accept group two posed a question	4	C
	e	Two significant figures used instead of one (so) smaller rounding errors or the measurements are more precise Inclusion of a control (control) enables a comparison to be made with no dye or normal water	WTTE Ignore "accurate" WTTE	4	C

	<p>f Accept any suggestion from the list [max 1]</p> <ul style="list-style-type: none"> • it is not clear if they followed the same method • too many variables were not explicitly controlled or monitored. • differences in the precision of data recorded • the two groups had different research questions 	<p><i>Do not accept the inclusion of control as not following the same method. Accept number of decimal places, do not accept accuracy</i></p>	<p>1</p>	<p>C</p>
	<p>g Water cannot evaporate directly from the beaker</p> <p>Change in volume is due to transpiration or Evaporation does not affect the volume of water lost</p>		<p>2</p>	<p>C</p>

5		1	2	3	4	17	B
	1.V (Variables)	Some variables are referred to that are connected to the problem, but these are not explicitly identified	IV <i>or</i> DV (allow rate here for max 2) <i>and</i> one CV is identified	IV <i>and</i> Measurable DV <i>and</i> one CV is identified	IV <i>and</i> Measurable DV <i>and</i> two CV are identified		
	2.H (Hypothesis)	Formulates a hypothesis connected to the variables but not explicitly linked to the DV with no explanation	Formulates a hypothesis correctly linked to the DV with no explanation	Formulates a hypothesis correctly linked to the DV with correct scientific reasoning			
	3.M (Manipulation / method)	Attempt at a method but detail is insufficient to collect relevant data	Detail of method is incomplete but some relevant data could be collected	Detail of method is sufficient to follow and similar data could be collected	Detail of method is sufficient to repeat the experiment		
	4.D (Data)	Plans to conduct at least three trials <i>or</i> measures for at least five different conditions of IV	Plans to conduct at least three trials <i>and</i> measures for at least five stated conditions of IV	Plans to conduct at least three trials <i>and</i> measures for at least five stated conditions of IV <i>and</i> includes a control condition			
	5. J (Justification)	Plans to calculate average <i>or</i> rate	Justification of calculation of average <i>or</i> rate				
	6.S (Safety)	A relevant safety consideration linked specifically to a stated hazard					

6	a	<p>Accept one point from the first list [max 1]</p> <ul style="list-style-type: none"> • too difficult / time-consuming to sample all leaves on a plant • to increase the accuracy of results • to allow the calculation of averages <p>Accept one point from the second list [max 1]</p> <ul style="list-style-type: none"> • to ensure the sample represents the whole plant • to avoid (sampling) bias • to avoid intentionally selecting certain leaves 		2	C																								
	b	<p>Accept any reasonable response, for example [max 1]</p> <ul style="list-style-type: none"> • the leaf might not be representative • the leaf might be damaged or dead or diseased 	WTTE	1	C																								
	c	<table border="1"> <thead> <tr> <th colspan="2">Table Object</th> </tr> <tr> <th>Maize leaf sample</th> <th>Number of stomata</th> </tr> </thead> <tbody> <tr><td>1</td><td>7</td></tr> <tr><td>2</td><td>9</td></tr> <tr><td>3</td><td>8</td></tr> <tr><td>4</td><td>8</td></tr> <tr><td>5</td><td>10</td></tr> <tr><td>6</td><td>5</td></tr> <tr><td>7</td><td>10</td></tr> <tr><td>8</td><td>6</td></tr> <tr><td>9</td><td>8</td></tr> <tr><td>10</td><td>9</td></tr> </tbody> </table> <p>9</p>	Table Object		Maize leaf sample	Number of stomata	1	7	2	9	3	8	4	8	5	10	6	5	7	10	8	6	9	8	10	9		1	C
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d	<p>Any correctly calculated average eg $80/10 = 8$</p> <p>Stomatal density is calculated: 88.88(...) or 88.89</p> <p>Correctly rounded to 89 (mm⁻²)</p>	<p>ECF from part c</p> <p>Award one mark max if average value is not used and correct working for stomatal density is shown ECF from 1st marking point. Award two marks max for 88.88</p> <p>Award three marks if only 89 is seen. ECF from 1st marking point</p>	3	C																									

e	Qualitative		1	C
f	<p>Accept any reasonable suggestion, for example [max 1]</p> <ul style="list-style-type: none"> • pondweed grows underwater • transpiration does not take place • gases diffuse through the epidermis (and not stomata) 	<p>WTTE Do not accept it is an aquatic plant</p>	1	C
g	<p>Sunflowers have stomata on both sides</p> <p>Water lilies have stomata on one side or the top only</p> <p>A further three explanatory points [max 3]</p> <ul style="list-style-type: none"> • (because) transpiration happens in both sunflowers and water lilies • no stomata on the surface in contact with water • gas exchange occurs between stomata and air or not between stomata and water • high stomatal density on the top of water lily leaves or water lilies have a greater stomatal density than sunflowers • water lilies do not need to limit water loss or sunflowers do need to limit water loss 		5	C

7	a	The interconnected food chains in an ecosystem		1	D
	b	<p>Enzymes break the <u>bonds</u> (between the building blocks)</p> <p>Enzymes speed up the break down of plastics</p> <p>Any further mark from the list [max 1]</p> <ul style="list-style-type: none"> • (by) lowering activation energy • specific enzymes will break down specific plastics <p>Terminology mark</p> <p>a correct use of one of the terms: catalyse, catalyst, active site, substrate, product, induced fit, lock-and-key, catabolic</p>	WTTE	4	D
	c	 <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px dashed black; padding: 5px; width: 20%;"> <p>Populations produce more offspring than the environment can support, so there is competition.</p> </div> <div style="border: 1px dashed black; padding: 5px; width: 20%;"> <p>Individuals in a population have different characteristics from one another.</p> </div> <div style="border: 1px dashed black; padding: 5px; width: 20%;"> <p>Individuals with characteristics adapted to the environment survive longer.</p> </div> <div style="border: 1px dashed black; padding: 5px; width: 20%;"> <p>Characteristics of individuals who reproduce become more common in the population.</p> </div> </div> <p>One of boxes 2, 3 or 4 correctly placed</p> <p>Boxes 2, 3 and 4 all correctly placed</p>		2	D

	<p>b <i>Accept any reasonable suggestion, for example [max 2]</i></p> <ul style="list-style-type: none"> • government actions (taxes, policy changes) • education (raise awareness of impact of pollution) • behavioural changes (choose alternatives, clean-up, reuse) <p><i>Accept any correctly linked justification [max 2]</i></p> <ul style="list-style-type: none"> • incentives would reward or penalize behaviours • knowing the impact of pollution • recognizing how personal responsibility leads to change 		4	D
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