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**...day June 20XX – Morning/Afternoon**

**GCSE (9–1) Biology B (Twenty First Century Science)**

**J257/02 Depth in biology (Foundation Tier)**

**SAMPLE MARK SCHEME**

**Duration:** 1 hour 45 minutes

**MAXIMUM MARK      90**



**This document consists of 24 pages**

**MARKING INSTRUCTIONS****PREPARATION FOR MARKING****SCORIS**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to scoris and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

**MARKING**

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the scoris messaging system.

5. Work crossed out:
  - a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
  - b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.
6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.
7. There is a NR (No Response) option. Award NR (No Response)
  - if there is nothing written at all in the answer space
  - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
  - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).
8. The scoris **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.** If you have any questions or comments for your Team Leader, use the phone, the scoris messaging system, or email.
9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer. Once the level is located, award the higher or lower mark:

**The higher mark** should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

**The lower mark** should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

**In summary:**

**The skills and science content determines the level.**

**The communication statement determines the mark within a level.**

Level of response questions on this paper are **3(e)** and **9(b)**.

## 11. Annotations

<b>Annotation</b>	<b>Meaning</b>
<b>DO NOT ALLOW</b>	Answers which are not worthy of credit
<b>IGNORE</b>	Statements which are irrelevant
<b>ALLOW</b>	Answers that can be accepted
( )	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
<b>ECF</b>	Error carried forward
<b>AW</b>	Alternative wording
<b>ORA</b>	Or reverse argument

## 12. Subject-specific Marking Instructions

### INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Biology B:

	<b>Assessment Objective</b>
<b>AO1</b>	<b>Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.</b>
<b>AO1.1</b>	Demonstrate knowledge and understanding of scientific ideas.
<b>AO1.2</b>	Demonstrate knowledge and understanding of scientific techniques and procedures.
<b>AO2</b>	<b>Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.</b>
<b>AO2.1</b>	Apply knowledge and understanding of scientific ideas.
<b>AO2.2</b>	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
<b>AO3</b>	<b>Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.</b>
<b>AO3.1</b>	Analyse information and ideas to interpret and evaluate.
<b>AO3.1a</b>	Analyse information and ideas to interpret.
<b>AO3.1b</b>	Analyse information and ideas to evaluate.
<b>AO3.2</b>	Analyse information and ideas to make judgements and draw conclusions.
<b>AO3.2a</b>	Analyse information and ideas to make judgements.
<b>AO3.2b</b>	Analyse information and ideas to draw conclusions.
<b>AO3.3</b>	Analyse information and ideas to develop and improve experimental procedures.
<b>AO3.3a</b>	Analyse information and ideas to develop experimental procedures.
<b>AO3.3b</b>	Analyse information and ideas to improve experimental procedures.

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Question		Answer	Marks	AO element	Guidance
1	(a)		3	1.1	Mark each structure separately Both lines need to be correct for 1 mark
	(b)	<ol style="list-style-type: none"> <li>1. Same DNA / genes ✓</li> <li>2. Resulting from a single fertilised egg / zygote that splits into two ✓</li> <li>3. Idea of environmental differences ✓</li> <li>4. One example of an environmental difference ✓</li> </ol>	4	2.1	MP4 e.g. scar, piercings, dyed hair, different clothes

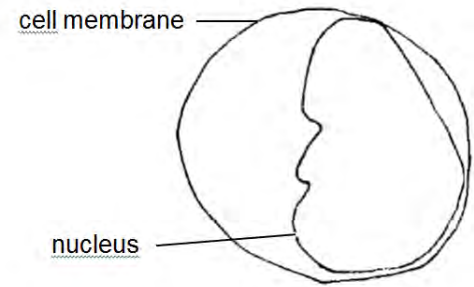
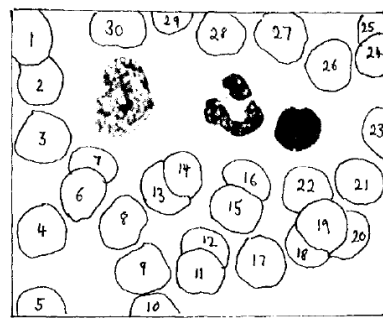


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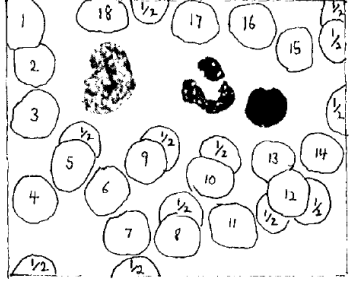
Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	<b>Idea</b> that Huw is an example of health which is a state of well-being ✓ <b>Idea</b> that Mary and Paolo are examples of disease which is a disorder of structure or function on the body ✓	2	2.1	
		(ii)	Flu (Mary) is communicable <b>AND</b> can be passed from person to person ✓ Huntingdon's disease (Paolo) is not communicable <b>AND</b> cannot be passed from person to person ✓	2	2.1	<b>IGNORE</b> reference to infections
		(iii)	Condom ✓ It is a physical barrier ✓	2	1.1	<b>ALLOW</b> idea that body fluids can't come into contact
	(b)			2	1.1	Three lines correct = 2 marks One or two lines correct = 1 mark
	(c)		Leaf cuticle ✓ Cell wall ✓	2	1.1	

Question		Answer	Marks	AO element	Guidance
3	(a)	<p>Correct cell drawn <b>AND</b> taking up 50% or more of space ✓                      Continuous, unfeathery lines, no shading ✓                      Label lines drawn with a ruler ✓                      Nucleus <b>AND</b> cell membrane correctly labelled ✓</p>	4	<p>1.2 x3  1.1</p>	<p>Drawing should take up approximately 50% of space                      e.g.</p> 
	(b)	10 : 1 / 8 : 1 ✓	1	2.2	 <p>If all red blood cells are estimated as whole cells as shown above, then ratio is 10 : 1</p>

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Question		Answer	Marks	AO element	Guidance	
					 <p>If partial or overlapping red blood cells are estimated as half cells as shown above, then ratio is 8 : 1</p>	
	<b>(c)</b>	<b>(i)</b>	Correctly labelled vena cava / pulmonary artery ✓	<b>1</b>	<b>2.1</b>	
		<b>(ii)</b>	Coronary artery ✓	<b>1</b>	<b>2.1</b>	
	<b>(d)</b>	<b>(i)</b>	A / C ✓	<b>1</b>	<b>2.1</b>	Mark first answer on the line A second letter given which is incorrect = 0 marks
		<b>(ii)</b>	B / D ✓	<b>1</b>	<b>2.1</b>	Mark first answer on the line A second letter given which is incorrect = 0 marks

Question	Answer	Marks	AO element	Guidance
(e)*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p><b>Level 3 (5–6 marks)</b></p> <p><i>Explains the function of three vessels and relates this to their structure using evidence from the diagrams</i>  <b>AND</b>  <i>Draws a conclusion from the data in support of the functions.</i></p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated</i></p> <p><b>Level 2 (3–4 marks)</b></p> <p><i>Explains the function of two vessels and relates this to their structure using evidence from the diagrams</i>  <b>AND</b>  <i>Makes reference to the data.</i></p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p>	6	<b>1.1</b> <b>x4</b>  <b>3.2b</b> <b>x2</b>	<p><b>AO1.1 Description of structure related to function</b>  For example:</p> <p><b>Arteries:</b></p> <ul style="list-style-type: none"> <li>• Blood carried away from the heart</li> <li>• Under high pressure</li> <li>• Thick outer walls</li> <li>• Thick layer of muscle</li> <li>• Thick layer of elastic fibres</li> </ul> <p><b>Veins:</b></p> <ul style="list-style-type: none"> <li>• Carry blood back to the heart</li> <li>• Under lower pressure than arteries</li> <li>• Thin walls</li> <li>• Thin layer of muscle</li> <li>• Thin layer of elastic fibres</li> <li>• Valves to ensure one way flow of blood</li> </ul> <p><b>Capillaries:</b></p> <ul style="list-style-type: none"> <li>• Exchange materials / oxygen / carbon dioxide</li> <li>• Thin walls</li> <li>• One cell thick</li> <li>• Thin lumen brings red blood cells close to body cells</li> </ul> <p><b>AO3.2b Analyse the data in the table and draw a conclusion</b>  For example:</p> <p><b>Data:</b></p> <ul style="list-style-type: none"> <li>• Veins more stretchy than arteries</li> <li>• Arteries have more recoil than veins</li> <li>• Quote of data</li> </ul>

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Question	Answer	Marks	AO element	Guidance
	<p><b>Level 1 (1–2 marks)</b></p> <p><i>Explains the function of one vessel and relates this to its structure using evidence from the diagram.</i></p> <p><i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i></p> <p><b>0 marks</b> <i>No response or no response worthy of credit.</i></p>			

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Question		Answer	Marks	AO element	Guidance										
4	(a)	All correct award 3 marks Any 3 or 4 correct award 2 marks Any 2 correct award 1 mark	3	2.1	Vacuole, nucleus, chloroplast, mitochondria, chromosome										
	(b)	<b>Any two from</b> Run out of space / food ✓ Conditions may not stay the same ✓ Some will die ✓ Not all cells divide at the same rate ✓	2	2.2											
	(c)	<table border="1"> <thead> <tr> <th>Type of cell division</th> <th>Correct daughter cell</th> <th>Reasons for your choice</th> </tr> </thead> <tbody> <tr> <td>Mitosis</td> <td>E ✓</td> <td>1. Identical to parent ✓</td> </tr> <tr> <td rowspan="2">Meiosis</td> <td rowspan="2">B ✓</td> <td>1. Half the number of chromosomes ✓</td> </tr> <tr> <td>2. One of each pair ✓</td> </tr> </tbody> </table>	Type of cell division	Correct daughter cell	Reasons for your choice	Mitosis	E ✓	1. Identical to parent ✓	Meiosis	B ✓	1. Half the number of chromosomes ✓	2. One of each pair ✓	5	2.1 x 2 (2nd column)  1.1 x 3 (3rd column)	
Type of cell division	Correct daughter cell	Reasons for your choice													
Mitosis	E ✓	1. Identical to parent ✓													
Meiosis	B ✓	1. Half the number of chromosomes ✓													
		2. One of each pair ✓													
	(d)	Mitosis ✓	1	1.1											

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	Berries / plantain ✓	1	2.1	
		(ii)	6 ✓	1	3.1a	
		(iii)	Movement / flow of biomass (from one trophic level to another) ✓	1	2.1	<b>IGNORE</b> reference to flow of energy
	(b)		Pyramid with large bottom level, smaller middle and smallest top level ✓ Correctly labelled with berries at bottom, titmouse in middle and fox at the top ✓	2	2.2	
	(c)	(i)	Quadrat ✓	1	1.2	<b>DO NOT ALLOW</b> 'quadrant'
		(ii)	Pitfall trap ✓	1	1.2	
	(d)		<b>Any four from</b> Butterfly population would decrease as another species eating them ✓ Dragonfly population would decrease as another species eating them ✓ Frogs would decrease as would have less to eat ✓ Ladybird population might increase as fewer being eaten as there are fewer dragonflies ✓ Berries might increase as fewer butterflies to eat them ✓ Greenflies and grasshoppers might increase as more berries to eat as fewer butterflies eating them ✓ Snake population might decrease as fewer frogs to eat ✓ This would mean fewer buzzards ✓ Titmouse increases as more berries ✓ Buzzards increase as more titmouse ✓ Snakes increase as more titmouse ✓	4	3.2b	<b>ALLOW</b> any other correct description linked to a correct explanation

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Question			Answer	Marks	AO element	Guidance
			Plantain could increase as grasshoppers eats more berries ✓ Plantain might decrease as more grasshoppers ✓ Rabbits might increase if plantain increases ✓ Buzzards might increase if there are more rabbits ✓ Mouse could increase as the plantain increases ✓ Buzzards could increase if there are more mice ✓			

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Question		Answer	Marks	AO element	Guidance									
6	(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>A</td> <td>a</td> </tr> <tr> <td>A</td> <td>AA</td> <td>Aa</td> </tr> <tr> <td>a</td> <td>Aa</td> <td>aa</td> </tr> </table>		A	a	A	AA	Aa	a	Aa	aa	2	2.2	<p>One mark for correct gametes for second parent</p> <p>One mark for correct completion of Punnett square</p> <p><b>ALLOW</b> aA for Aa</p>
	A	a												
A	AA	Aa												
a	Aa	aa												
	(b)	<p>Punnett square correct ✓</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>X</td> <td>X</td> </tr> <tr> <td>X</td> <td>XX</td> <td>XX</td> </tr> <tr> <td>Y</td> <td>XY</td> <td>XY</td> </tr> </table> <p>Probability is 50% / 0.5 / ½ ✓</p>		X	X	X	XX	XX	Y	XY	XY	2	2.1  2.2	<b>ALLOW</b> YX for XY
	X	X												
X	XX	XX												
Y	XY	XY												
	(c)	<p>Homozygous – having the same allele on both chromosomes of a pair e.g. AA or aa</p> <p>Heterozygous – when the alleles on a pair of chromosomes are different e.g. Aa</p>	2	1.1	<p><b>DO NOT ALLOW</b> 'have same gene on both chromosomes'</p> <p><b>DO NOT ALLOW</b> 'have different genes on both chromosomes'</p>									

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Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	<p><b>Any two from</b>  <i>Evaluating Lamarck's theory</i></p> <ol style="list-style-type: none"> <li>Idea that stretched neck is environmental ✓</li> <li>Environmental effects not inherited ✓</li> <li>Genes needed for inheritance ✓</li> </ol> <p><b>Any two from</b>  <i>Reasons why evolution is now believed</i></p> <ol style="list-style-type: none"> <li>Mutation in genes now understood ✓</li> <li>Variation in offspring shown to be linked to DNA differences ✓</li> <li>Idea of mole evidence to support theory ✓</li> </ol>	4	3.1b ×2  1.1 ×2	MP4 <b>ALLOW</b> idea of DNA better understood MP5 <b>ALLOW</b> an example MP6 <b>ALLOW</b> examples such as MRSA
		(ii)	Peer review ✓	1	1.2	
	(b)		E before A ✓ A before D ✓	2	2.2	
	(c)		<p><b>Any four from</b></p> <ol style="list-style-type: none"> <li>Fossils show how organisms have changed over time ✓</li> <li>Idea that size gets bigger over time ✓</li> <li>Idea that basic shape is the same ✓</li> <li>Similarity in shape indicates a common ancestor / specific example of similarity e.g. position / shape of jaw ✓</li> </ol>	4	2.1  3.1a ×3	<b>ALLOW</b> a statement the older the fossil, the smaller it is – mark points 1 and 4

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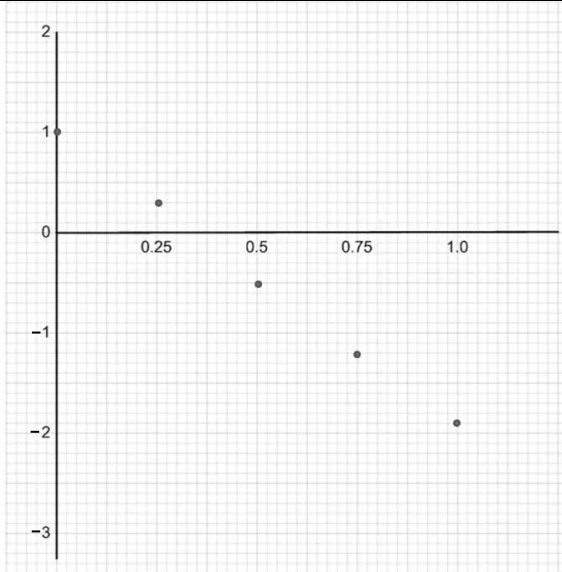
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Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	<b>FIRST CHECK THE ANSWER IN TABLE. If answer = +6.1 award 2 marks</b>  (0.3 ÷ 4.9) × 100 ✓ +6.1 ✓	2	2.2	<b>DO NOT ALLOW</b> answer if not given to 1d.p.
		(ii)	4, 1, 5, 3, 2 ✓	1	3.2a	
		(iii)	Does not take into account width ✓	1	3.3a	<b>ALLOW</b> reference to diameter / volume
		(iv)	Set up experiment as above and re-measure every 10 minutes / other suitable time period ✓ Find out how long it takes until there is now further change in length ✓	2	3.3b	
	(b)	(i)	X = sugar concentration (mol / dm <sup>-3</sup> ) <b>AND</b> Y = change in mean length (mm) ✓	1	2.2	<b>DO NOT ALLOW</b> axis labels without units
		(ii)		2	2.2	5 plots correct = 2 3 or 4 plots correct = 1

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Question		Answer	Marks	AO element	Guidance
					
	(iii)	Straight line through points ✓	1	2.2	
	(iv)	0.35 to 0.4 ✓	1	3.1a	
	(v)	<p><b>Any one from</b>            Idea that it is the same concentration as the potato cell content ✓            Water movement is the same in both directions / no net Flow in or out of the potato ✓</p>	1	3.2b	

Question		Answer	Marks	AO element	Guidance
9	(a)	Substrate – hydrogen peroxide <b>AND</b> enzyme – catalase ✓	1	2.1	
	(b)*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p><b>Level 3 (5–6 marks)</b> <i>Describes in detail the pattern of the graph</i> <b>AND</b> <i>Links this to an explanation of the effect of all temperatures on enzyme function</i> <b>AND</b> <i>Identifies the optimum temperature for the enzyme</i></p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p><b>Level 2 (3–4 marks)</b> <i>Describes the pattern of the graph</i> <b>AND</b> <i>Links this to an explanation of the effect of temperature on enzyme function</i> <b>OR</b> <i>Identifies the optimum temperature for the enzyme</i></p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p><b>Level 1 (1–2 marks)</b> <i>Describes the pattern of the graph</i> <b>AND</b> <i>Makes reference to the effect of temperature on enzyme</i></p>	6	3.1a x2 2.1 x3 3.2a x1	<p><b>AO3.1a Identification of patterns in graph</b> For example:</p> <ul style="list-style-type: none"> <li>Rate of reaction increases between 0°C and 30°C</li> <li>Rate of reaction decreases between 30°C and 60°C</li> </ul> <p><b>AO2.1 Details of effect of temperature on enzyme function</b> For example:</p> <ul style="list-style-type: none"> <li>Increase between 0 and 30°C is because there is more kinetic energy</li> <li>So more collisions</li> <li>So more ESC form</li> <li>Decrease between 30°C and 60°C is because enzyme is denatured</li> <li>Loss of 3D structure</li> <li>ESC can no longer form as substrate does not fit into the enzyme</li> </ul> <p><b>AO3.2a Identification of the optimum temperature of the enzyme</b> For example:</p> <ul style="list-style-type: none"> <li>Optimum temperature is 30°C</li> </ul>

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Question	Answer	Marks	AO element	Guidance
	<p><i>function between 0 and 30 °C</i>  <b>OR</b>  <i>Makes reference to the effect of temperature on enzyme function between 30 °C and 60 °C</i></p> <p><i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i></p> <p><b>0 marks</b>  <i>No response or no response worthy of credit.</i></p>			