



# Mark Scheme (Results)

Summer 2019

Pearson Edexcel GCSE  
In Biology (1BI0) Paper 2F

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## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		Command Word	
Strand	Element	Describe	Explain
AO1		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

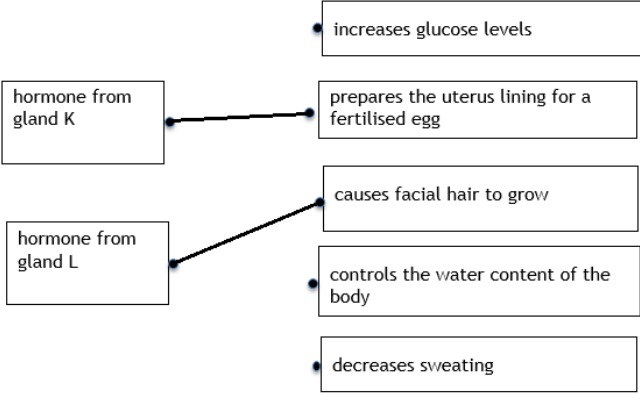
Question Number	Answer	Mark
1(a)(i)	<p>Process G = Precipitation / type of precipitation eg rain (1)</p> <p>Process H = Evaporation / vaporisation (1)</p>	<p><b>(2)</b></p> <p>AO1.1</p>

Question number	Answer	Mark
1(a)(ii)	<p><b>A</b> the water vapour cools down</p> <p><b>The only correct answer is A</b></p> <p><i>B is not correct because the water vapour does not heat up to form clouds.</i></p> <p><i>C is not correct because the temperature of the water vapour does not stay the same to form clouds</i></p> <p><i>D is not correct because the trees do not absorb more water to form clouds</i></p>	<p><b>(1)</b></p> <p>AO1.1</p>

Question number	Answer	Additional guidance	Mark
1(b)	<p>filtering (1)</p> <p>pathogens (1)</p> <p>accept phonetic spellings</p>	<p>answers must be in the correct order</p>	<p><b>(2)</b></p> <p>AO2.1</p>

Question number	Answer	Additional guidance	Mark
1(c)	<p>A description including <b>two</b> of the following:</p> <ul style="list-style-type: none"> <li>• desalination/ remove salt from the water (1)</li> <li>• evaporate the water (1)</li> <li>• condense water (vapour and collect it) (1)</li> </ul>	<p>accept alternative methods.</p> <p>accept heat or boil water.</p> <p>accept distillation for both MP2 and 3 (2)</p>	<p>(2)</p> <p>AO2.2</p>

**(Total for Question 1 = 7 marks)**

Question number	Answer	Mark
2(a)	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <span>hormone</span> <span>effect of hormone</span> </div>  <p>Do not award mark if two lines are drawn from hormone box K</p> <p>Do not award mark if two lines are drawn from hormone box L</p>	<p>(2)</p> <p>CS 7.1 AO2.1</p>

Question number	Answer	Mark
2(b)	<p><b>C</b> dissolved in blood plasma (1)</p> <p><b>The only correct answer is C</b></p> <p><i>A is not correct because adrenalin is not transported by transpiration.</i></p> <p><i>B is not correct because the adrenalin is not transported by osmosis</i></p> <p><i>D is not correct because the adrenalin is not transported by red blood cells</i></p>	<p>(1)</p> <p>AO1.1</p>

Question number	Answer	Mark
2(c)	<p><b>D</b> homeostasis (1)</p> <p><b>The only correct answer is D</b></p> <p><i>A is not correct because respiration is not the name given to the process of maintaining the internal body conditions.</i></p> <p><i>B is not correct because diffusion is not the name given to the process of maintaining the internal body conditions.</i></p> <p><i>C is not correct because digestion is not the name given to the process of maintaining the internal body conditions.</i></p>	<p>(1)</p> <p>AO1.1</p>

Question number	Answer	Mark
2(d)(i)	<p>A description including two from:</p> <ul style="list-style-type: none"> <li>• fluctuates / stays roughly the same (1)</li> <li>• and then increases (1)</li> <li>• correct reference to data from the graph (1)</li> </ul>	<p>(2)</p> <p>AO3 1a 1b</p>



Question number	Answer	Additional guidance	Mark
2(d)(ii)	<p>An explanation including two from the following:</p> <ul style="list-style-type: none"> <li>• (more) insulin (is released) (1)</li> <li>• which makes the {cells / tissues / liver / muscles} absorb glucose (1)</li> <li>• to be {stored as /changed into} glycogen (1)</li> <li>• (glucose is) used to supply energy / in respiration / during exercise (1)</li> </ul>	<p>Reject create / make energy</p>	<p><b>(2)</b> AO1 1 2.1</p>

**(Total for Question 2 = 8 marks)**

Question number	Answer	Mark
3(a)(i)	<p><b>A</b> carbon dioxide (1)</p> <p><b>The only correct answer is A</b></p> <p><b>B</b> is not correct because glucose is not needed for photosynthesis.</p> <p><b>C</b> is not correct because oxygen is not needed for photosynthesis.</p> <p><b>D</b> is not correct because nitrogen is not needed for photosynthesis</p>	(1) AO1.1

Question number	Answer	Additional guidance	Mark
3(a)(ii)	<p>Substitution 0.08 (mm) x 50 (1)</p> <p>evaluation = 4 (mm)</p>	Full marks for correct answer with no working shown	(2)  AO2.1

Question number	Answer	Additional guidance	Mark
3(b)	<p>water (1) area (1)</p> <p>accept phonetic spellings</p>	Answers must be in the correct order	(2) AO2.1

Question number	Answer	Additional guidance	Mark
3(c)	An explanation including two from: <ul style="list-style-type: none"> <li>• auxin (1)</li> <li>• {building up on / moving to} the shaded side (1)</li> <li>• causing (cell) elongation (1)</li> </ul>	accept there is more on the shaded side (if MP1 given)  accept shaded side elongates / grows quicker	(2)  AO2.1

**(Total for Question 3 = 7 marks)**

Question number	Answer	Additional guidance	Mark
<b>4(a)(i)</b>	<p>line A = 8(mm) line B = 4(mm)</p> <p>The below measurements are an accepted answer for modified papers.</p> <p>The letter pre-fixing the log number denotes the size.</p> <p>A4 18pt X56407</p> <p>A 8mm B 4mm</p> <p>A4 24pt Y56407</p> <p>A 8mm B 4mm</p> <p>A3 24pt Q56407</p> <p>A 12mm B 6mm</p> <p>A3 36pt V56407</p> <p>A 12mm B 6mm</p>	<p>accept <math>\pm 0.5\text{mm}</math> for both measurements.</p>	<p><b>(1)</b> A02.2</p>
<b>4(a)(ii)</b>	<p>2:1 (1)</p>	<p>accept 8:4 / 4:2</p> <p>ecf: accept a ratio of candidate's measurements of line A to line B from 3ai</p>	<p><b>(1)</b> A02.1</p>

Question number	Answer	Mark
4(b)(i)	<ul style="list-style-type: none"> <li>to stop backflow of blood / to ensure blood flows in {one direction /right direction/towards the heart} / because the blood pressure in them is (too) low .</li> </ul>	(1) AO1.1
4(b)(ii)	<p>(the) aorta</p> <p>accept phonetic spellings. Do not award if spelling is closer to artery than aorta.</p>	(1) AO1.1

Question number	Answer	Additional Guidance	Mark
4(c)(i)	<p>A description including:</p> <ul style="list-style-type: none"> <li>The more exercise you do the more likely you are able to run at 3 metres per second for 20 minutes (1)</li> <li>A comparison of the data of 2 groups (1)</li> </ul>	Ignore just quoting data from the table	(2) AO31a 1b

Question number	Answer	Additional Guidance	Mark
4(c)(ii)	<p>an explanation linking three from:</p> <ul style="list-style-type: none"> <li>• They had not warmed up / stretched (muscles before exercise) (1)</li> <li>• not enough blood / oxygen (gets to muscles / legs / around body) (1)</li> <li>• <b>anaerobic</b> respiration occurs (1)</li> <li>• lactic acid (produced / builds up) (1)</li> </ul>		(3) AO2.1

(Total for Question 4 = 9 marks)

Question number	Answer	Additional guidance	Mark
5(a)	<p>An explanation linking two from:</p> <ul style="list-style-type: none"> <li>• <b>outcompeted</b> (by nettles) (1)</li> <li>• by nettles absorbing (most of) the light (1)</li> <li>• so can't photosynthesise (sufficiently) (1)</li> </ul>	<p>accept (grass) can't compete</p> <p>accept too dark / shaded / no light</p> <p>accept other resources used by nettles eg water, space or mineral ions</p> <p>accept suitable reasons for lack of water / space / mineral ions</p>	<p>(2)</p> <p>AO2.1</p>

Question number	Answer	Additional guidance	Mark
5(b)(i)	<p>substitution (7.5 - 6.0 =) 1.5(g) (1)</p> <p>evaluation (1.5) x 10 = 15 (g)</p>	<p>Award full marks for correct answer with no working shown</p>	<p>(2)</p> <p>AO2.1</p>

Question number	Answer	Mark
5(b)(ii)	<p>A description including two from:</p> <ul style="list-style-type: none"> <li>• some food is egested / not digested (1)</li> <li>• some food is respired / used to released energy (1)</li> <li>• in homeostasis / keeping warm / movement / metabolism / lost to surroundings as heat (1)</li> </ul>	(2) AO1.1

Question number	Answer	Additional guidance	Mark
5(c)	<p>An method that combines four points to provide a method:</p> <ul style="list-style-type: none"> <li>• put nettles in different temperatures (1)</li> <li>• time period stated (1)</li> <li>• control of one relevant variable. (1)</li> <li>• a way of measuring growth stated eg (change in) height / mass / number of leaves (1)</li> <li>• repeat investigation / use more than one nettle in each temperature (1)</li> </ul>	<p>minimum is in two different temperatures.</p> <p>minimum time 2 days</p> <p>reject keep the temperature the same.</p>	(4) AO3.3a

(Total for Question 5 = 10 marks)



Question number	Answer	Mark
6(a)	<ul style="list-style-type: none"> <li>a diagram of the cell that reflects its shape and some of the internal structures. (1)</li> <li>with any <b>three</b> cell structures labelled from: nucleus / chloroplast / vacuole / cytoplasm / cell wall / cell membrane (3)</li> </ul>	(4) AO1.2

Question number	Answer	Mark
6(b)	<p><b>A</b> respiration</p> <p><b>The only correct answer is A</b></p> <p><i>B is not correct because the <b>to</b> make proteins is not the function of mitochondria in a plant cell.</i></p> <p><i>C is not correct because the photosynthesis is not the function of mitochondria in a plant cell</i></p> <p><i>D is not correct because the store water is not the function of mitochondria in a plant cell.</i></p>	(1) <b>AO1.1</b>

Question number	Answer	Additional guidance	Mark
6(c)(i)	<ul style="list-style-type: none"> <li>Used as a control / to compare with the results of the other tubes</li> </ul>		(1) AO1.2

Question number	Answer	Mark
6(c)(ii)	<p>Any two variables from:</p> <ul style="list-style-type: none"> <li>• temperature (1)</li> <li>• age / variety of potato (1)</li> <li>• {size / volume / length / width / shape / mass / surface area} of chip (before investigation) (1)</li> <li>• volume of solution (1)</li> <li>• time left in solutions (1)</li> </ul>	<p>(2)</p> <p>AO1.2</p>
Question number	Answer	Mark
6(c)(iii)	<p>An explanation including:</p> <ul style="list-style-type: none"> <li>• There is a higher concentration of sodium chloride outside (the cell) than inside / higher concentration of water molecules inside (the cell) than outside (1)</li> <li>• water moves out of {cells / chips} / into (sodium chloride) solution (1)</li> <li>• by <u>osmosis</u> (1)</li> </ul>	<p>(3)</p> <p>AO1.2</p>

(Total for Question 6 = 11 marks)

Question number	Answer	Additional guidance	Mark
7(a)	72 million	Accept any number between 68 and 73 million.	(1) AO3.2b

Question number	Answer	Mark
7(b)	<p><b>D</b> increased crop yield</p> <p><b>The only correct answer is D</b></p> <p><i>A is not correct because increased reforestation would not improve food security.</i></p> <p><i>B is not correct because increased animal farming would not improve food security.</i></p> <p><i>C is not correct because increased human population would not improve food security.</i></p>	(1) AO 1.1

Question number	Answer	Additional guidance	Mark
7(c)(i)	<p>(food sample ) E contains starch</p> <p>accept phonetic spellings.</p>	<p>ignore carbohydrate</p> <p>accept starchy food</p>	(1) AO 3.2ab

Question number	Answer	Additional guidance	Mark
7(c)(ii)	(reducing) sugar and protein	accept sugar <b>or</b> protein	(1) AO 3.2ab
Question number	Answer	Additional guidance	Mark
7(c)(iii)	a description including: <ul style="list-style-type: none"> <li>• (fats are digested by) enzyme/ lipase (1)</li> <li>• into glycerol <b>and</b> fatty acids (1)</li> </ul>	accept: bile emulsifies fats (1)	(2) AO 1.1

Question number	Indicative content	Mark																												
7(d)*	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <table border="0" data-bbox="416 640 1177 1939"> <tr> <td data-bbox="416 640 746 674"><b><u>Stated Advantage</u></b></td> <td data-bbox="751 640 1177 674"><b><u>Details of advantage</u></b></td> </tr> <tr> <td data-bbox="416 680 746 741">• provides jobs / can sell biofuels</td> <td data-bbox="751 680 1177 741">• more money to spend /in local economy</td> </tr> <tr> <td data-bbox="416 786 746 819">• carbon neutral</td> <td data-bbox="751 786 1177 853">• does not add to greenhouse gases / global warming</td> </tr> <tr> <td data-bbox="416 898 746 958">• renewable / will not run out</td> <td data-bbox="751 898 1177 958">• Less dependent on fossil fuels / fossil fuels last longer</td> </tr> <tr> <td data-bbox="416 1003 746 1037">• provides fuels locally</td> <td data-bbox="751 1003 1177 1104">• allows more local development /fuels are cheaper</td> </tr> <tr> <td data-bbox="416 1149 746 1209">• less transport of (other) fuels</td> <td data-bbox="751 1149 1177 1182">• reduces fuel costs / pollution</td> </tr> <tr> <td data-bbox="416 1254 746 1288"><b><u>Stated Disadvantage</u></b></td> <td data-bbox="751 1254 1177 1288"><b><u>Details of disadvantage</u></b></td> </tr> <tr> <td data-bbox="416 1294 746 1355">• costs to set system up</td> <td data-bbox="751 1294 1177 1355">• may end up being controlled by outside organisation</td> </tr> <tr> <td data-bbox="416 1366 746 1400"></td> <td data-bbox="751 1366 1177 1426">• may prevent starting growing biofuels</td> </tr> <tr> <td data-bbox="416 1471 746 1505">• machinery used</td> <td data-bbox="751 1471 1177 1532">• may offset savings/ cause pollution</td> </tr> <tr> <td data-bbox="416 1581 746 1641">• uses land to grow biofuel crop</td> <td data-bbox="751 1581 1177 1641">• less food crops grown /food shortages / less food security</td> </tr> <tr> <td data-bbox="416 1686 746 1747">• high water demand (to irrigate)</td> <td data-bbox="751 1686 1177 1747">• less water for drinking / irrigation (for other crops)</td> </tr> <tr> <td data-bbox="416 1798 746 1859">• loss of habitat /deforestation</td> <td data-bbox="751 1798 1177 1859">• reduction in biodiversity / extinction of species</td> </tr> <tr> <td data-bbox="416 1904 746 1937">• leaves are poisonous</td> <td data-bbox="751 1904 1177 1937">• reduce biodiversity</td> </tr> </table>	<b><u>Stated Advantage</u></b>	<b><u>Details of advantage</u></b>	• provides jobs / can sell biofuels	• more money to spend /in local economy	• carbon neutral	• does not add to greenhouse gases / global warming	• renewable / will not run out	• Less dependent on fossil fuels / fossil fuels last longer	• provides fuels locally	• allows more local development /fuels are cheaper	• less transport of (other) fuels	• reduces fuel costs / pollution	<b><u>Stated Disadvantage</u></b>	<b><u>Details of disadvantage</u></b>	• costs to set system up	• may end up being controlled by outside organisation		• may prevent starting growing biofuels	• machinery used	• may offset savings/ cause pollution	• uses land to grow biofuel crop	• less food crops grown /food shortages / less food security	• high water demand (to irrigate)	• less water for drinking / irrigation (for other crops)	• loss of habitat /deforestation	• reduction in biodiversity / extinction of species	• leaves are poisonous	• reduce biodiversity	(6)  AO2.1
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Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. Presents a description with some structure and coherence.
Level 2	3-4	Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. Presents a description that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. Presents a description that has a well-developed structure which is clear, coherent and logical.

Level	Mark	Additional Guidance	General additional guidance
	0	No rewardable material.	
Level 1	1–2	<ul style="list-style-type: none"> <li>• A simple reference to an advantage or disadvantage of growing biofuels</li> <li>• Linked to a detail of the stated advantage / disadvantage</li> </ul>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>• Biofuels can provide jobs</li> <li>• Biofuels need land which could have been used to grow food.</li> </ul>
Level 2	3–4	<ul style="list-style-type: none"> <li>• A description from at least two advantages and / or disadvantages of growing biofuels</li> <li>• linked to a detail of the stated advantages / disadvantages.</li> </ul>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>• Growing plants for biofuels creates jobs and the fuels don't pollute the atmosphere</li> <li>• Growing plants for biofuels are carbon neutral because they take in the carbon dioxide growing that they produce when burnt and growing biofuels create jobs which puts money into the local towns.</li> </ul>
Level 3	5–6	<ul style="list-style-type: none"> <li>• A detailed description of at least three advantages / disadvantages including at least one advantage and one disadvantage</li> <li>• linked to details of a stated advantage and a stated disadvantage.</li> </ul>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>• Biofuels are carbon neutral, use up a lot of water from the surrounding area and give money to the local people as they have jobs.</li> <li>• Biofuels use land that could be used to grow food so people in the area may starve. The land also was forest which has been cut down making some animals more endangered but it is renewable as it can be planted again and again.</li> </ul>

**(Total for Question 7 = 11 marks)**

Question number	Answer	Mark
8(a)(i)	2108 (g)	(1) AO2.1

Question number	Answer	Additional Guidance	Mark
8(a)(ii)	<p>An explanation linking</p> <ul style="list-style-type: none"> <li>• population of earthworms will decrease (1)</li> <li>• because more earthworms will be eaten by hedgehogs (1)</li> </ul>	<p>accept earthworms will die out</p> <p>accept hedgehogs have only one food source</p> <p>accept population of earthworms will increase as more {food/cabbages} available (2 marks)</p>	(2) AO2 1

Question number	Answer	Additional Guidance	Mark
8(a)(iii)	<p>A description including</p> <ul style="list-style-type: none"> <li>• use of quadrat / belt transect (1)</li> <li>• count the number of slugs in the sampled area (1) <ul style="list-style-type: none"> <li>• multiplication factor to make the estimate (1)</li> </ul> </li> </ul>	<p>accept description of quadrat 1m x 1m /1m<sup>2</sup></p> <p>accept calculate the mean numbers of slugs from all samples</p>	(3) AO3 3a



Question number	Answer		Mark
8(b)	<p>An explanation linking three from</p> <ul style="list-style-type: none"> <li>• {squirrels / earthworms / cabbages} release carbon dioxide (1)</li> <li>• from respiration (1)</li> <li>• cabbages take in carbon dioxide (1)</li> <li>• (cabbages) for photosynthesis (1)</li> <li>• when organisms die decomposers release carbon dioxide (1)</li> <li>• {squirrels/earthworms} eat {cabbages/plants} which contain <b>carbon</b> (1)</li> <li>• egestion releases <b>carbon</b> (into the soil) (1)</li> </ul>	<p>accept CO<sub>2</sub> reject CO<sup>2</sup></p> <p>accept <b>decomposers</b> respire</p> <p>accept squirrels eat earthworms which contain carbon</p> <p>accept named methods of egestion</p>	<p><b>(3)</b> AO2 1</p>

Question number	Answer	Additional Guidance	Mark
8(c)	Any three from: <ul style="list-style-type: none"> <li>• (add) artificial fertilisers (1)</li> <li>• (add) manure / slurry / (use) green manuring (1)</li> <li>• use crop rotation (1)</li> <li>• nitrogen fixing bacteria (1)</li> <li>• nitrifying bacteria (1)</li> </ul>	accept add fertiliser / add nitrates / named nitrate compound.  accept description of green manuring / add faeces /compost /decomposing matter.          accept nitrification accept lightning (1)	<b>(3)</b>  A01.1

**(Total for Question 8 = 12 marks)**

Question number	Answer	Additional Guidance	Mark
9(a)(i)	<p>Any two from:</p> <ul style="list-style-type: none"> <li>• same concentration of indicator (1)</li> <li>• same mass of organisms (1)</li> <li>• same volume of indicator (1)</li> <li>• same temperature (1)</li> <li>• same volume / size of test tube (1)</li> <li>• repeat the experiment (1)</li> <li>• use a control (1)</li> </ul>	<p>accept weight for mass accept mass/weight</p> <p>ignore references to time as this is in the stem of the question</p>	<p><b>(2)</b></p> <p>A03.3b</p>

Question number	Answer	Additional guidance	Mark
9(a)(ii)	<p>A description including:</p> <ul style="list-style-type: none"> <li>• same test tube, gauze and bung with (hydrogencarbonate) indicator (1)</li> <li>• without any live organisms / with a mass of inert object e.g.stones /dead peas/glass beads(1)</li> </ul>	<p>accept set up the same {apparatus/equipment}</p>	<p><b>(2)</b></p> <p>Ao2 2</p>

Question number	Answer:	Additional guidance	Mark
9(b)(i)	<p>An explanation linking</p> <ul style="list-style-type: none"> <li>germinating peas <b>produce</b> carbon dioxide (1)</li> <li>because germinating peas were respiring (aerobically) (1)</li> </ul>	<p>accept dried peas did not <b>produce</b> carbon dioxide</p> <p>accept because dried peas <b>do not</b> respire</p>	<p><b>(2)</b></p> <p>AO3 1ab</p>

Question number	Answer	Mark
9(b)(ii)	<p><b>B</b> when glucose is broken down in the presence of oxygen</p> <p><b>The only correct answer is B</b></p> <p><i>A is not correct because the carbon dioxide was not produced by photosynthesis in this investigation.</i></p> <p><i>C is not correct because the carbon dioxide was not produced when glucose is broken down in the absence of oxygen in this investigation.</i></p> <p><i>D is not correct because the carbon dioxide was not produced by the reaction between oxygen and water in this investigation.</i></p>	<p><b>(1)</b></p> <p>AO3 1ab</p>

Question number	Indicative content	Mark				
9(c)*	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p style="text-align: center;"><b>AO1 ( marks)</b></p> <p><b>Red blood cells</b></p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <p><b><u>structure</u></b></p> <ul style="list-style-type: none"> <li>• contains haemoglobin</li> <li>• biconcave disc shaped</li> <li>• small / flexible / smooth</li> <li>• no nucleus</li> </ul> </td> <td style="vertical-align: top; width: 50%;"> <p><b><u>function</u></b></p> <ul style="list-style-type: none"> <li>• to carry oxygen</li> <li>• oxygen is joined to haemoglobin.</li> <li>• to increase surface area / to absorb / to release oxygen quicker</li> <li>• so can fit through capillaries</li> <li>• so can contain more haemoglobin</li> </ul> </td> </tr> </table> <p><b>White blood cells</b></p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <p><b><u>structure</u></b></p> <p>has receptors on membrane</p> <ul style="list-style-type: none"> <li>• are large cells /can change shape / have flexible membranes</li> <li>• has a nucleus / ribosomes</li> </ul> </td> <td style="vertical-align: top; width: 50%;"> <p><b><u>function</u></b></p> <ul style="list-style-type: none"> <li>• is part of the immune system / fights disease</li> <li>• can recognise pathogens / antigens</li> <li>• can engulf pathogens</li> <li>• makes antibodies / antitoxins / remember antigens from a previous infection</li> </ul> </td> </tr> </table>	<p><b><u>structure</u></b></p> <ul style="list-style-type: none"> <li>• contains haemoglobin</li> <li>• biconcave disc shaped</li> <li>• small / flexible / smooth</li> <li>• no nucleus</li> </ul>	<p><b><u>function</u></b></p> <ul style="list-style-type: none"> <li>• to carry oxygen</li> <li>• oxygen is joined to haemoglobin.</li> <li>• to increase surface area / to absorb / to release oxygen quicker</li> <li>• so can fit through capillaries</li> <li>• so can contain more haemoglobin</li> </ul>	<p><b><u>structure</u></b></p> <p>has receptors on membrane</p> <ul style="list-style-type: none"> <li>• are large cells /can change shape / have flexible membranes</li> <li>• has a nucleus / ribosomes</li> </ul>	<p><b><u>function</u></b></p> <ul style="list-style-type: none"> <li>• is part of the immune system / fights disease</li> <li>• can recognise pathogens / antigens</li> <li>• can engulf pathogens</li> <li>• makes antibodies / antitoxins / remember antigens from a previous infection</li> </ul>	<p style="text-align: center;"><b>(6)</b></p> <p style="text-align: center;"><b>A01.1</b></p>
<p><b><u>structure</u></b></p> <ul style="list-style-type: none"> <li>• contains haemoglobin</li> <li>• biconcave disc shaped</li> <li>• small / flexible / smooth</li> <li>• no nucleus</li> </ul>	<p><b><u>function</u></b></p> <ul style="list-style-type: none"> <li>• to carry oxygen</li> <li>• oxygen is joined to haemoglobin.</li> <li>• to increase surface area / to absorb / to release oxygen quicker</li> <li>• so can fit through capillaries</li> <li>• so can contain more haemoglobin</li> </ul>					
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<b>Level</b>	<b>Mark</b>	
	0	No rewardable material.
Level 1	1-2	Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. Presents an explanation with some structure and coherence.
Level 2	3-4	Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. Presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. Presents an explanation that has a well-developed structure which is clear, coherent and logical.

**(Total for Question 9 = 13 marks)**

Level	Mark	Additional Guidance	General additional guidance
	0	No rewardable material.	<p><b>The level is determined by the functions in the response</b></p> <p><b>The mark within the band is determined by the linkage of the structure to the function.</b></p>
Level 1	1–2	<ul style="list-style-type: none"> <li>• A simple reference to one function <b>or</b> structure of red <b>or</b> white blood cells.</li> <li>• Linked to the structure that relates to that function.</li> </ul>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>• Red blood cells carry oxygen</li> <li>• Red blood cells contain haemoglobin that join to oxygen.</li> </ul>
Level 2	3–4	<ul style="list-style-type: none"> <li>• A reference to at least two functions related to red <b>or</b> white blood cells.</li> <li>• Linked to the structures that relate to the stated functions.</li> </ul>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>• Red blood cells carry oxygen and white blood cells kill bacteria.</li> <li>• Red blood cells are small so they fit through capillaries and have haemoglobin to carry oxygen</li> <li>• Red blood cells are biconcave discs so they can absorb more oxygen and white blood cells have a flexible membrane so they can surround a bacterium.</li> </ul>
Level 3	5–6	<ul style="list-style-type: none"> <li>• A detailed reference to at least three functions related to red <b>and</b> white blood cells</li> <li>• Linked to a structure of red blood cells <b>and</b> a structure of white blood cells that are related to the stated functions.</li> </ul>	<p><u>Possible candidate responses</u></p> <ul style="list-style-type: none"> <li>• Red blood cells do not have a nucleus so that they can hold more haemoglobin which carries the oxygen. White blood cells fight disease</li> <li>• White blood cells produce antibodies and have sticky bits on their membrane that can recognise antigens. Red blood cells have a biconcave disc shape so that they have a large surface area to absorb oxygen.</li> </ul>

Question number	Answer	Mark
10(a)	Any two from: <ul style="list-style-type: none"> <li>• <b>starting</b> temperature of water (1)</li> <li>• volume of water (1)</li> <li>• number of layers / mass of tissue paper (1)</li> <li>• same {size / volume} flask (1)</li> </ul>	(2)  AO2.2

Question number	Answer	Additional guidance	Mark
10(b)(i)	correct data selected and subtracted  (98 - 22) = 76 (1)  rate calculated  (76 ÷ 8) = 9.5 (°C per minute)	accept full marks for correct answer on the answer line    accept 10	(2)    AO2 1

Question number	Answer	Additional guidance	Mark
10(b)(ii)	An answer comparing <ul style="list-style-type: none"> <li>• flask 1 and 2 decrease in temperature (1)</li> <li>• the temperature in flask 1 decreases faster than in flask 2 (1)</li> </ul> OR <ul style="list-style-type: none"> <li>• the temperature on flask 1 levels out after 7 minutes (1)</li> <li>• whereas the temperature in flask 2 keeps falling (1)</li> </ul>	accept rate is slower in flask 2 / ORA	(2)   AO3 2ab



Question number	Answer	Mark
10(c)	<p>An explanation linking two from:</p> <ul style="list-style-type: none"> <li>• sweat/water is released onto the skin (1)</li> <li>• is evaporated (1)</li> <li>• transferring {thermal energy /heat} (1)</li> </ul>	<p><b>(2)</b></p> <p>AO1.1</p>

Question number	Answer	Mark
10(d)	<p><b>C</b> hypothalamus</p> <p><b>The only correct answer is C</b></p> <p><i>A is not correct because the cerebellum does not control internal body temperature</i></p> <p><i>B is not correct because the medulla oblongata does not control internal body temperature</i></p> <p><i>D is not correct because the pituitary gland does not control internal body temperature</i></p>	<p><b>(1)</b></p> <p>AO1</p>

Question number	Answer	Additional guidance	Mark
10(e)	<p>An explanation linking</p> <ul style="list-style-type: none"> <li>• (internal) temperature is kept at the {<b>optimum</b>/best/37°C} (1)</li>   <li>• for enzyme action / (chemical ) reactions to take place (1)</li> </ul>	<p>accept at high temperatures enzymes will denature (2)</p>	<p>(2)</p> <p>AO1 1</p>

**(Total for Question 10 = 11 marks)**

