



Oxford Cambridge and RSA

# Foundation

**GCSE**

**Biology B Twenty First Century Science**

**J257/03: Breadth in Biology (Higher Tier)**

General Certificate of Secondary Education

**Mark Scheme for June 2023**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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**MARKING INSTRUCTIONS****PREPARATION FOR MARKING****RM ASSESSOR**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM 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 available in RM Assessor.
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

**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 RM Assessor 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 RM Assessor messaging system.
5. **Crossed Out Responses**

Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

**Rubric Error Responses – Optional Questions**

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

**Multiple Choice Question Responses**

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate). *When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

**Contradictory Responses**

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

**Short Answer Questions** (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

**Short Answer Questions** (requiring a more developed response, worth **two or more marks**)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

**Longer Answer Questions** (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

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. Award No Response (NR) if:

- there is nothing written in the answer space.

Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The RM Assessor **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 RM Assessor 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 **X** and **X**

## 11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

<b>Annotation</b>	<b>Meaning</b>
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
<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



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

Question			Answer	Marks	AO element	Guidance																		
1	(a)	(i)	<table border="1"> <thead> <tr> <th>Process</th> <th>It requires glucose</th> <th>It requires oxygen</th> <th>It produces carbon dioxide</th> <th>It produces water</th> <th>It produces lactic acid</th> </tr> </thead> <tbody> <tr> <td>Aerobic respiration</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>Anaerobic respiration</td> <td>✓</td> <td></td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table> <p style="text-align: right;">✓✓✓</p>	Process	It requires glucose	It requires oxygen	It produces carbon dioxide	It produces water	It produces lactic acid	Aerobic respiration	✓	✓	✓	✓		Anaerobic respiration	✓				✓	3	1.1	5 columns correct = 3 marks 4 columns correct = 2 marks 3/2 columns correct = 1 mark
Process	It requires glucose	It requires oxygen	It produces carbon dioxide	It produces water	It produces lactic acid																			
Aerobic respiration	✓	✓	✓	✓																				
Anaerobic respiration	✓				✓																			
		(ii)	<p>Aerobic respiration produces more ATP than anaerobic respiration. <input checked="" type="checkbox"/></p> <p>Anaerobic respiration produces more ATP than aerobic respiration. <input type="checkbox"/></p> <p>Both aerobic and anaerobic respiration produce the same amount of ATP. <input type="checkbox"/></p> <p>Neither aerobic or anaerobic respiration produces ATP. <input type="checkbox"/></p> <p style="text-align: right;">✓</p>	1	1.1																			
	(b)	(i)	<p><b>Any two from:</b></p> <p>Mitochondria are needed for (cellular) respiration ✓</p> <p>Mitochondria produce ATP ✓</p> <p>(Heart) muscle needs ATP to contract ✓</p>	2	2.1	<p><b>DO NOT ALLOW</b> anaerobic respiration occurs in the mitochondria</p> <p><b>ALLOW</b> mitochondria release energy</p> <p><b>DO NOT ALLOW</b> mitochondria produce /make energy</p> <p><b>IGNORE</b> to pump blood.</p>																		
		(ii)	A number or range between 33 and 60 (inclusive) ✓	1	2.2																			

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	<p><b>Any two from:</b></p> <p>(From 1940) the percentage of rainforest decreased until around 1987 ✓</p> <p>From 1987 the percentage of rainforest increased ✓</p> <p>Idea that there has been a net/overall/25% decrease ✓</p>	2	3.1a	<p><b>ALLOW</b> any year from 1987 to 1997</p> <p><b>ALLOW</b> any year from 1987 to 1997</p> <p><b>N.B stated year e.g. 1987 (or equivalent) need only be stated to award MP1 and MP2</b></p> <p><b>If no marks awarded</b> <b>ALLOW</b> 'it decreased and then increased' for 1 mark</p>
		(ii)	Any date from 1983 to 1996 inclusive ✓	1	3.1b	<b>ALLOW</b> a range given within the stated values
		(iii)	2030 ✓	1	3.1b	
	(b)	(i)	<p><b>Any two from (benefits):</b></p> <p>Idea of carbon offsetting e.g. Act as a carbon sink, plants use carbon dioxide (in photosynthesis) ✓</p> <p>Idea of tackling global warming ✓</p> <p>Idea that it will help tackle climate change ✓</p> <p>Maintain/increase biodiversity ✓</p> <p>Prevent extinction of species / reduce number of endangered species ✓</p> <p>Protects/improves food supply/chains ✓</p> <p>Provide materials/resources ✓</p> <p>Protect populations ✓</p>	2	2.1	<p><b>ALLOW</b> any sensible suggestion</p> <p><b>ALLOW</b> protect endangered species</p> <p><b>ALLOW</b> named examples of resources</p>

Question		Answer	Marks	AO element	Guidance
		Provides/protect habitats ✓ Idea of aesthetics (wellbeing) ✓ For tourism ✓ Prevent landslides/flooding/soil erosion ✓			
	(ii)	<b>Any two from:</b> <b><i>Challenges in relation to growing trees</i></b> Idea that (tree growth) takes a long time ✓ (Because it's) difficult to make trees germinate / mature / survive ✓ Soil quality may be poor ✓ Tree selection e.g. right saplings ✓ Unpredictable weather may affect growth ✓  <b><i>Challenges in relation to the land</i></b> Idea that there may be less land available because it is being used for another named purpose ✓ Disruption of existing habitats / organisms living in area to be reforested ✓  <b><i>Challenges in relation to people</i></b> No obvious direct benefit for people ✓ May lose income / economic implications ✓  <b><i>Challenges in relation to money</i></b> Costs money / can be expensive (to conserve/re-grow species or habitats) ✓ May need to compensate people ✓  <b><i>Challenges to stopping it shrinking</i></b> Continued deforestation / illegal logging ✓ Idea that it could be difficult to protect ✓	2	2.1	<b>ALLOW</b> any sensible suggestion

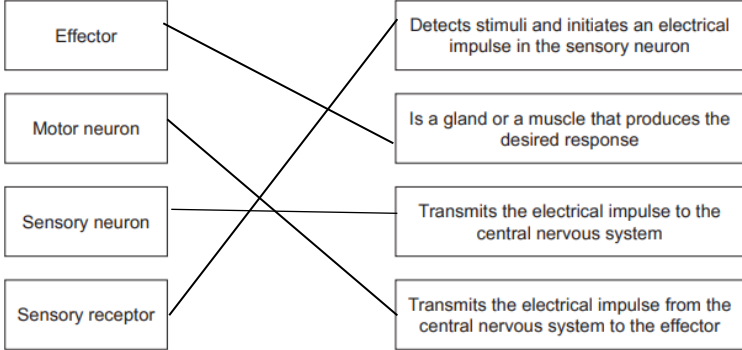
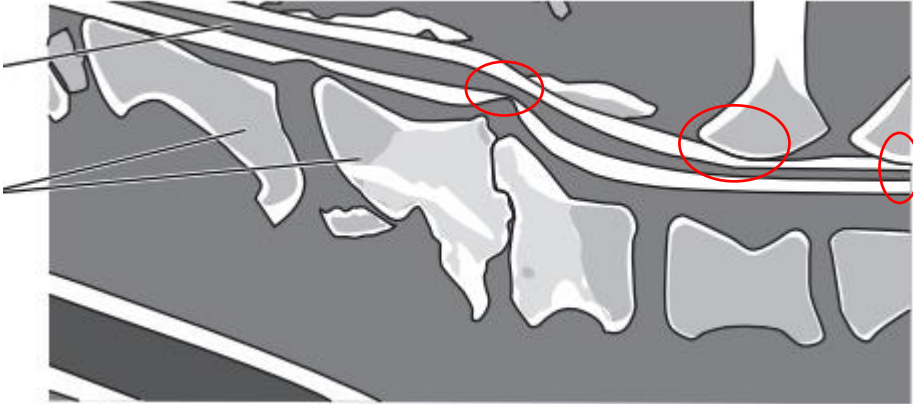
Question		Answer			Marks	AO element	Guidance
	(c)				3	1.1	4 correct = 3 marks 3 correct = 2 marks 2 correct = 1 mark
			Sexual reproduction	Asexual reproduction			
		Occurs at a slower rate	✓				
		Offspring are all susceptible to the same diseases		✓			
		Only one parent is needed		✓			
		Provides offspring with genetic variation	✓				
					✓✓✓		

Question		Answer	Marks	AO element	Guidance
3	(a)	<p>Idea that disease compromises our health / health is being disease free / if you have a disease you are not healthy / people with good health are less likely to get a disease ✓</p> <p><b>Max one from:</b></p> <p>Health is the state of physical and mental well being ✓ Disease can affect mental and/or physical wellbeing ✓</p> <p>Health is compromised by infection by a pathogen/an organism's genes/environment /lifestyle or trauma ✓</p> <p>People with disease/unhealthy individuals are more likely to succumb to other disease. ✓</p>	2	1.1	<p><b>ALLOW</b> named lifestyle factors e.g diet, exercise</p> <p><b>ALLOW</b> named examples of disease <b>ALLOW</b> idea that physical health can impact on mental health</p>
	(b)	<p>pathogens ✓ digest ✓ antibodies ✓ memory ✓</p>	4	1.1	
	(c)	<p><b>Any one from:</b> Water loss may exceed water gain ✓</p> <p>May become (very) dehydrated ✓ Osmotic effect on cells / cells will shrivel/shrink/crenate ✓ Idea blood composition becomes too concentrated ✓ Risk of death ✓ Impact excretion/kidney/toxin removal ✓</p>	1	2.1	<p><b>ALLOW</b> named examples of minerals lost from the body e.g K</p> <p><b>ALLOW</b> cells need water to function</p> <p><b>ALLOW</b> blood pressure changes <b>ALLOW</b> risk of coma</p>

Question		Answer	Marks	AO element	Guidance
	(d)	<b>Any one from:</b> Good sanitation ✓ Good hygiene ✓ Isolating those with the disease ✓	1	2.1	<b>ALLOW</b> examples of good hygiene (hand washing) and good sanitation (safe disposal of human waste). <b>ALLOW</b> quarantine and named examples of prevention of physical contact  <b>ALLOW</b> vaccination <b>IGNORE</b> education unqualified
	(e)	<b>Any three from:</b> Both have a cell membrane ✓ Both have cytoplasm ✓ Both have ribosomes ✓ Both have genetic material/DNA ✓	3	1.1	<b>IGNORE</b> cell wall <b>IGNORE</b> microscopic  <b>DO NOT ALLOW</b> both have genetic material contained in a nucleus



Question		Answer	Marks	AO element	Guidance															
4	(a)	<table border="1"> <thead> <tr> <th>Statement</th> <th>True</th> <th>False</th> </tr> </thead> <tbody> <tr> <td>During interphase the number of chromosomes double.</td> <td>✓</td> <td></td> </tr> <tr> <td>Gametes are produced by mitosis.</td> <td></td> <td>✓</td> </tr> <tr> <td>In meiosis there are two cell divisions.</td> <td>✓</td> <td></td> </tr> <tr> <td>Interphase occurs in both mitosis and meiosis.</td> <td>✓</td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">✓✓</p>	Statement	True	False	During interphase the number of chromosomes double.	✓		Gametes are produced by mitosis.		✓	In meiosis there are two cell divisions.	✓		Interphase occurs in both mitosis and meiosis.	✓		2	1.1	4 correct = 2 marks 3/2 correct = 1 mark
Statement	True	False																		
During interphase the number of chromosomes double.	✓																			
Gametes are produced by mitosis.		✓																		
In meiosis there are two cell divisions.	✓																			
Interphase occurs in both mitosis and meiosis.	✓																			
	(b)	Idea that the number of chromosomes returns to the original number/does not double at fertilisation when gametes fuse/zygote forms/in the offspring ✓	1	1.1	<b>ALLOW</b> return to the diploid number <b>ALLOW</b> correct reference to chromosome number if a species is named or an example of the haploid number e.g 23 and diploid number e.g 46 are present in the answer															
	(c)	Changes in the cells DNA ✓  Uncontrollable/rapid cell division/mitosis ✓	2	1.1	<b>ALLOW</b> gene mutation  <b>DO NOT ALLOW</b> cells divide by meiosis <b>IGNORE</b> mutation unqualified, uncontrolled growth <b>IGNORE</b> cells multiply/reproduce <b>IGNORE</b> growth															

Question	Answer	Marks	AO element	Guidance
5 (a)		3	1.1	4 correct = 3 marks 2/3 correct = 2 marks 1 correct = 1 mark
(b)	Uncoordinated movement /slower movement/slower reactions/poor balance/pain/muscle spasms/unconscious movement ✓	1	2.1	<b>ALLOW</b> any sensible suggestion <b>IGNORE</b> wobbles unqualified <b>IGNORE</b> if the dog can walk properly
(c)	 <p>Arrow drawn on Fig 5.1 where a compression is shown ✓</p>	1	3.2a	

Question	Answer	Marks	AO element	Guidance
(d)	<p><b>Any one from:</b></p> <p>The outcome of the surgery e.g how successful it is likely to be ✓            Other medical conditions the dog may have ✓            Cost ✓            Age of the dog ✓            Severity of the disease ✓            How high risk is the surgery ✓</p>	1	3.2a	<p><b>ALLOW</b> named risks such as use of anaesthetic/ nature of the surgery (spinal)  <b>IGNORE</b> consent  <b>IGNORE</b> benefit outweighs risk</p> <p><b>ALLOW</b> any sensible suggestion  <b>IGNORE</b> passes to the CNS</p>
(e)	<p>(a reflex response) does not involves the brain/processing centre  <b>ORA</b>✓            (a reflex response) uses only the relay neuron (in the spinal cord-)  <b>ORA</b>✓</p>	2	2.1	

Question		Answer	Marks	AO element	Guidance
6	(a)	<p><b>Max two from:</b> Idea that grass photosynthesises ✓  Grass produces glucose/starch carbohydrate ✓  Plants convert glucose into starch/cellulose/long chain carbohydrate ✓</p> <p><b>Max two from:</b>  Idea that restricted grazing/grass intake restricts glucose/carbohydrate intake ORA ✓  Idea that alternative diet could control/contain less carbohydrate ✓</p>	3	2.1	<p><b>ALLOW</b> grass is a source/contains glucose/sucrose/sugar//starch/cellulose/carbohydrate</p> <p><b>ALLOW</b> starch/cellulose/sugar/sucrose</p> <p><b>ALLOW</b> starch in grass will be digested to release sugar/glucose</p>
	(b)	<p>Horse C/New Forest ✓ Uses the graph to identify that it is a breed that is at a high risk and has two other risk factors/names the two risk factors ✓</p>	2	3.2a	<p><b>DO NOT ALLOW</b> it has the most risk factors unqualified</p>
	(c)	<p>Insulin / Glucagon ✓</p>	1	1.1	<p><b>ALLOW</b> adrenaline</p>
	(d)	<p><b>Any three from:</b> Some parts of the plant will not be eaten e.g roots ✓ Not all of the grass will be digested/some will be as faeces ✓ Used in (cellular) respiration ✓</p>	3	2.1	<p><b>IGNORE</b> waste <b>ALLOW</b> egested <b>DO NOT ALLOW</b> excreted in faeces</p> <p><b>ALLOW</b> excreted in urine</p>

Question		Answer	Marks	AO element	Guidance
7	(a)	<p><b>Any three from:</b>            Measure the persons resting pulse rate/heart rate/breathing rate ✓</p> <p>(a person exercises) measure pulse rate/heart rate/breathing rate after exercise ✓</p> <p>determine how long it takes for pulse rate/heart rate/breathing rate to return to normal ✓</p>	3	1.2	<p><b>ALLOW</b> a description of how to take the measurement</p> <p><b>IGNORE</b> take rate during exercise</p>
	(b)	<p>Sample size should be a minimum of 5 people ✓</p> <p><b>Any one from:</b></p> <p>Idea that larger samples are more likely to be representative e.g. will include different ages, gender, fitness levels, body mass, ethnicity ✓</p> <p>Too few and you may not see any difference between recovery rates ✓</p>	2	3.3a	<p><b>ALLOW</b> gives a good range of recovery rates</p> <p><b>ALLOW</b> idea that it is less affected by chance</p>

Question		Answer	Marks	AO element	Guidance
8	(a)	(i)	1	3.2a	ALLOW any sensible suggestion
		(ii)	2	3.2a	ALLOW any sensible suggestion  ALLOW idea that it frees up GP time for other consults / financial benefits to NHS
	(b)		3	1.1	ALLOW FSH and LH IGNORE ref to progesterone maintaining lining of uterus

Question		Answer	Marks	AO element	Guidance
	(c)	<p>Hormones are always fast-acting. <input type="checkbox"/></p> <p>Hormones are always slow-acting. <input type="checkbox"/></p> <p>Hormones bind to receptors on effectors. <input checked="" type="checkbox"/></p> <p>Hormones provide slower, longer-lasting responses. <input checked="" type="checkbox"/></p> <p>Hormones are secreted by glands. <input checked="" type="checkbox"/></p> <p>Hormones are transported by neurons. <input type="checkbox"/></p> <p style="text-align: right;">✓✓</p>	2	1.1	Three correct = 2 marks Two correct = 1 mark
	(d)	<p>Biuret and purple ✓</p> <p>Ethanol and cloudy ✓</p>	2	1.2	<b>ALLOW</b> one mark if both reagents are correct and no other mark awarded

Question		Answer	Marks	AO element	Guidance									
9	(a)	8 data plots ✓✓	2	1.2	<p><b>ALLOW</b> no obvious data plot for 0.0 if a line is drawn for plant B and it goes through the origin</p> <p>Deduct one mark for an incorrect data plot. Half square tolerance</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Plant B water loss (cm<sup>3</sup>)</th> </tr> </thead> <tbody> <tr><td>0.00</td></tr> <tr><td>0.04</td></tr> <tr><td>0.09</td></tr> <tr><td>0.13</td></tr> <tr><td>0.16</td></tr> <tr><td>0.20</td></tr> <tr><td>0.24</td></tr> <tr><td>0.28</td></tr> </tbody> </table>	Plant B water loss (cm <sup>3</sup> )	0.00	0.04	0.09	0.13	0.16	0.20	0.24	0.28
Plant B water loss (cm <sup>3</sup> )														
0.00														
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0.28														
	(b)	<p><b>First check the answer on answer line</b> <b>If answer = 0.003 award 2 marks</b></p> <p>Any 'plant A water loss' value ÷ corresponding 'time from the start of investigation' value, e.g. <math>0.18 \div 60</math> ✓ = <math>0.003 \text{ cm}^3/\text{min}</math> ✓</p>	2	2.2	<p><b>ALLOW</b> answer given in standard form <math>3 \times 10^{-3}</math></p>									
	(c)	Plant B has a higher transpiration rate than plant A / Plant B lost more water than plant A / Plant B loses water more quickly than Plant A / Plant B has a higher rate of water loss than plant A <b>ORA</b> ✓	1	3.2b	<p><b>ALLOW</b> as time increases so does water loss from both plants.</p>									
	(d)	<p><b>Any two from:</b> (at higher temperatures) water loss from leaf cells by evaporation increases ✓ More/faster diffusion of water ✓ Out of the stomata ✓</p>	2	1.1										



Question		Answer	Marks	AO element	Guidance
10	(a)	<p>Punnett square drawn showing that both parents must have a genotype of Hh (both heterozygous) ✓</p> <p>Correct offspring identified ✓</p> <p>Probability is therefore 0.25 ✓</p>	3	<p>3.2b</p> <p>2.1</p> <p>2.2</p>	<p><b>ALLOW</b> any letter (upper and lower case) to indicate the genotype in place of Hh as not given in question <b>DO NOT ALLOW</b> more than one letter used in the genotype</p> <p><b>DO NOT ALLOW</b> if any genotype other than hh (or equivalent) is highlighted <b>ECF</b></p> <p><b>ECF</b> <b>DO NOT ALLOW</b> if percentage does not match hh in punnet square <b>ALLOW</b> 25%, 1 in 4, <math>\frac{1}{4}</math></p> <p><b>IGNORE</b> ratios</p>
	(b)	<p><b>Any two from:</b> A genetic test will confirm her genotype/the alleles she has ✓ If she has the disease she can receive treatment sooner/informs healthcare/take preventative measures ✓ Idea that if the test is negative she won't need any treatment/no anxiety about future/peace of mind ✓</p>	2	2.1	<p><b>IGNORE</b> it will confirm if she has the genes.</p> <p><b>ALLOW</b> named positive/negative impacts for future decisions</p>
	(c)	<p><b>First check the answer on answer line</b> <b>If answer = 18 833 award 4 marks</b></p>	4		

Question			Answer	Marks	AO element	Guidance
			$56\,500\,000 \div 150 = 376\,666.667 \checkmark$ $376\,666.667 \times 5 \div 100 \checkmark$ $= 18833.3 \text{ (recurring)} \checkmark$ $= 18833 \text{ (nearest whole number)} \checkmark$		<b>2.2 x 3</b>  <b>1.2</b>	<b>ECF</b> throughout  <b>ALLOW</b> an incorrect evaluated number which is rounded to a whole number  <b>ALLOW</b> 376667 = 2 marks <b>ALLOW</b> 28250 = 2 marks <b>ALLOW</b> 2825000 = 2 marks

Question		Answer	Marks	AO element	Guidance
11	(a)	<p>Trophic level 2 are primary consumers, they are herbivores/eat the trees and leaf litter /plants/producers ✓</p> <p>Trophic level 3 are secondary consumers ,they are carnivores/eat the caterpillars and earthworms /primary consumers/herbivores/animals ✓</p>	2	2.1	<p><b>IGNORE</b> references to biomass</p> <p><b>IGNORE</b> omnivore</p>
	(b)	<p><b>First check the answer on answer line</b></p> <p><b>If answer = 10 (%) award 3 marks</b></p> <p>Select correct bars for primary and secondary consumers to use in calculation -10squares and 1 square ✓</p> <p><math>(1 \div 10) \times 100</math> ✓</p> <p>= 10 (%) ✓</p>	3	2.2	<p><b>ALLOW</b> 50 and 5 squares as using area not length of bars throughout answer</p> <p><b>ECF</b> if incorrect bars selected in MP1 or incorrect number of squares/area counted for primary and secondary consumers.</p>
	(c)	<p><b>Any two from:</b></p> <p>Plants produce glucose which is converted to biomass ✓</p> <p>Biomass produced by plants is eaten by animals at the start of the food chain/biomass produced by plants is transferred along the food chain ✓</p> <p>idea that when plants or animals are eaten the (named) molecules are broken down and used to build biomass/named molecules ✓</p>	2	1.1	<p><b>ALLOW</b> Plants are autotrophs, use products made to create biomass</p> <p><b>DO NOT ALLOW</b> plants make their own energy</p> <p><b>ALLOW</b> animals are heterotrophs</p>
	(d)	<p><b>Any two from:</b></p> <p>water</p> <p>carbon</p> <p>nitrogen</p> <p>✓</p>	1	1.1	<p><b>ALLOW</b> oxygen, hydrogen</p> <p><b>ALLOW</b> named mineral e.g phosphorous/phosphates, sulfur</p> <p><b>IGNORE</b> minerals, vitamins, carbon dioxide</p>

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