



Oxford Cambridge and RSA

# Higher

**GCSE**

**Biology B Twenty First Century Science**

**J257/01: Breadth in Biology (Foundation 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.**

## 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)	Nucleotide, gene, chromosome, nucleus, cell ✓✓✓✓	4	1.1	Award one mark for: nucleotide before gene gene before chromosome chromosome before nucleus nucleus before cell																		
	(b)	<p>Tiger and cat have the same number of chromosomes ✓ But a tiger is larger than a cat <b>ORA</b> ✓</p> <p><b>OR</b></p> <p>Rat and panda have the same number of chromosomes ✓ But rats are smaller than pandas <b>ORA</b> ✓</p> <p><b>OR</b></p> <p>Cat/tiger has fewer chromosomes than a rat ✓ Cat/tiger is larger than a rat <b>ORA</b> ✓</p> <p><b>OR</b></p> <p>Earthworm and tiger/cat have similar number of chromosomes ✓ But a tiger/cat is larger than an earthworm <b>ORA</b> ✓</p> <p><b>OR</b></p> <p>Some larger animals have fewer chromosomes than smaller animals <b>ORA</b> ✓ Any correct example taken from the table ✓</p>	2	3.2b	<p><b>ALLOW</b> any correct use of data to support answer <b>IGNORE</b> simply quoting the number of chromosomes without making a comment e.g. just rat has 42 chromosomes and tiger has 38</p> <table border="1"> <tbody> <tr> <td>Polar Bear</td> <td>74</td> </tr> <tr> <td>Gorilla</td> <td>48</td> </tr> <tr> <td>Rat</td> <td>42</td> </tr> <tr> <td>Giant Panda</td> <td>42</td> </tr> <tr> <td>Tiger</td> <td>38</td> </tr> <tr> <td>Cat</td> <td>38</td> </tr> <tr> <td>Earthworm</td> <td>36</td> </tr> <tr> <td>Snail</td> <td>24</td> </tr> <tr> <td>Fly</td> <td>8</td> </tr> </tbody> </table> <p><b>ALLOW for 2 marks</b> earthworm has more chromosomes than a snail But they are a similar size</p>	Polar Bear	74	Gorilla	48	Rat	42	Giant Panda	42	Tiger	38	Cat	38	Earthworm	36	Snail	24	Fly	8
Polar Bear	74																						
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Question		Answer	Marks	AO element	Guidance																											
2	(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>b</td> <td>b</td> </tr> <tr> <td>B</td> <td>Bb</td> <td>Bb</td> </tr> <tr> <td>b</td> <td>bb</td> <td>bb</td> </tr> </table> <p style="text-align: right;">✓✓✓</p>		b	b	B	Bb	Bb	b	bb	bb	4	2.1	<p>Award one mark for:                      correct gametes for brown fur parent                      correct gametes for black fur parent                      correct Punnett square cross</p> <p>If incorrect gametes:  <b>ALLOW ECF</b> for Punnett square cross  <b>ALLOW ECF</b> for probability based on the Punnett square cross e.g.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td><u>b</u></td> <td><u>b</u></td> </tr> <tr> <td><u>B</u></td> <td><u>Bb</u></td> <td><u>Bb</u></td> </tr> <tr> <td><u>b</u></td> <td><u>bb</u></td> <td><u>bb</u></td> </tr> </table> <p><i>Probability of black fur is 1</i></p> <p>If genotypes given as gametes as seen below only allow the cross as shown</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td><u>bb</u></td> <td><u>bb</u></td> </tr> <tr> <td><u>Bb</u></td> <td><u>Bb</u></td> <td><u>Bb</u></td> </tr> <tr> <td><u>Bb</u></td> <td><u>bb</u></td> <td><u>bb</u></td> </tr> </table> <p><b>DO NOT ALLOW</b> ratio or 50/50</p>		<u>b</u>	<u>b</u>	<u>B</u>	<u>Bb</u>	<u>Bb</u>	<u>b</u>	<u>bb</u>	<u>bb</u>		<u>bb</u>	<u>bb</u>	<u>Bb</u>	<u>Bb</u>	<u>Bb</u>	<u>Bb</u>	<u>bb</u>	<u>bb</u>
	b	b																														
B	Bb	Bb																														
b	bb	bb																														
	<u>b</u>	<u>b</u>																														
<u>B</u>	<u>Bb</u>	<u>Bb</u>																														
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<u>Bb</u>	<u>bb</u>	<u>bb</u>																														
	(b)	Many genes ✓	1	2.1																												

Question		Answer	Marks	AO element	Guidance
3	(a)	April ✓	1	2.2	IGNORE A
	(b)	7 ✓	1	2.2	
	(c)	Antibodies <input type="checkbox"/> Cell walls <input checked="" type="checkbox"/> Platelets <input type="checkbox"/> Waxy leaf cuticle <input checked="" type="checkbox"/> White blood cells <input type="checkbox"/>	2	1.1	
	(d)	(i) <b>Any one from:</b> Clean/wash/disinfect his bike/tyres/shoes/clothes ✓  Do not remove any material e.g. soil/leaves from the woodland ✓  Use a different bike / don't take the bike to another woodland ✓	1	2.1	IGNORE just wash without specifying what is washed  IGNORE wash hands  IGNORE don't visit other woodland  IGNORE cycle on path/road
		(ii) Bacterium <input type="checkbox"/> Fungus <input checked="" type="checkbox"/> Virus <input type="checkbox"/>	1	1.1	

Question	Answer	Marks	AO element	Guidance
(e)		2	1.2	2 or 3 correct lines = 2 marks 1 correct line = 1 mark

Question		Answer	Marks	AO element	Guidance
4	(a)	water ✓ oxygen ✓ hydrogen ✓ carbon dioxide ✓	4	1.1	
	(b)	Fat <input type="checkbox"/> Glycerol <input type="checkbox"/> Protein <input type="checkbox"/> Starch <input checked="" type="checkbox"/>	1	1.1	

Question		Answer	Marks	AO element	Guidance
5	(a)	(i) <b>Any two from:</b> (Idea that) producers/photosynthesis/plants make/provide food/glucose/sugar/carbohydrate ✓  Producers/photosynthesis/plants take in carbon (dioxide) ✓  Consumers use glucose/sugar in (cellular) respiration ✓  (Idea that) consumers cannot get carbon from the atmosphere / depend on eating producers for carbon ✓	2	1.1	<b>ALLOW</b> photosynthesis makes/provides nutrients <b>IGNORE</b> 'plants make their own food during photosynthesis' if there is no indication the food produced will be for consumers  <b>ALLOW</b> food is used in (cellular) respiration  <b>IGNORE</b> just consumers eat producers/plants <b>IGNORE</b> ideas to do with oxygen production
		(ii) <b>Any two from:</b> Consumers/(cellular) respiration produces carbon (dioxide) which is used in photosynthesis ✓  (Photosynthesis/producers make) carbon compounds/small organic molecules ✓  Producers use glucose/sugar in (cellular) respiration ✓	2	1.1	<b>DO NOT ALLOW</b> carbon (dioxide) is released during decomposition/death of consumers <b>DO NOT ALLOW</b> credit for responses that confuse breathing and respiration <b>IGNORE</b> cellular respiration in producers produces carbon dioxide  <b>ALLOW</b> (photosynthesis/producers make) glucose/sugars/food  <b>ALLOW</b> producers use food in (cellular) respiration



Question		Answer	Marks	AO element	Guidance
	(b)	<b>First check the answer on answer line If answer = 1.1 award 2 marks</b>  $11 \div 10 \checkmark$ $=1.1 \checkmark$	2	2.2	

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	<p><b>Any three from:</b></p> <p>Use a water bath / description of water bath ✓</p> <p>(Place tube in water bath) for a set/stated period of time ✓</p> <p>Measure the temperature of the liquid (at the start and) at the end <b>OR</b> work out the change in temperature of the liquid in the test-tube ✓</p> <p>Change the temperature of the water (bath) at least three times (e.g. ice, tap water and warm water) <b>OR</b> States at least three different temperatures <b>OR</b> Gives a temperature range for the water surrounding the tube ✓</p>	3	3.3a	<p><b>ALLOW</b> measure the time taken for the temperature to change (from 37°C/starting temperature) to a stated temperature <b>IGNORE</b> measure the temperature of the surrounding liquid</p> <p><b>IGNORE</b> just 'change the temperature of the water'</p>
		(ii)	<p>Volume of (red) liquid (in the test-tube) <b>OR</b> Length of time <b>OR</b> Volume of water (in the water bath) <b>OR</b> Starting temperature of the (red) liquid ✓</p>	1	3.3b	<p><b>IGNORE</b> amount of liquid</p> <p><b>IGNORE</b> just temperature of the (red) liquid</p>

Question		Answer	Marks	AO element	Guidance
	(b)	Idea that the human body has ways to maintain temperature / has homeostatic mechanisms <b>ORA</b> ✓	1	2.2	<p><b>ALLOW</b> thermoregulation (occurs in human)</p> <p><b>ORA</b></p> <p><b>ALLOW</b> idea that human body has cells/tissues/organs or named examples e.g. skin</p> <p><b>ALLOW</b> human body made of more or different substances/components/is not made of glass</p> <p><b>ALLOW</b> human body has insulation</p> <p><b>ALLOW</b> human body is more complex/the tube contains only liquid</p> <p><b>IGNORE</b> the test tube isn't alive</p>

Question		Answer	Marks	AO element	Guidance
7	(a)	<p><b>First check the answer on answer line</b>  <b>If answer = 1400 award 3 marks</b>  <math>(1200 + 900 + 300) = 2400 \checkmark</math></p> <p><math>(900 + 100) = 1000 \checkmark</math>  <math>2400 - 1000 = 1400 \checkmark</math></p>	3	2.2	If answer incorrect but $2400 - 1000$ seen = 2 marks
	(b)	Partially $\checkmark$ Osmosis $\checkmark$ Burst $\checkmark$	3	2.1	
	(c)	(i)	1	2.1	
		Motor <input checked="" type="checkbox"/> Receptor <input type="checkbox"/> Relay <input type="checkbox"/> Sensory <input type="checkbox"/>			
		(ii)	1	3.1a	
		<p><b>Any one from:</b>            May stop (nerve) impulses in other/nearby neurones (not involved in sweating) <math>\checkmark</math></p> <p>May stop other glands working <math>\checkmark</math></p> <p>May stop muscles working <math>\checkmark</math></p> <p>Idea of thermoregulation problems e.g. overheating (if sweating is prevented) <math>\checkmark</math></p> <p>Side effects/allergic reaction <math>\checkmark</math></p>			<p><b>IGNORE</b> just 'stops the functioning of neurones'</p> <p><b>ALLOW</b> may cause paralysis</p> <p><b>ALLOW</b> pain/needle phobia/infection</p>

Question		Answer	Marks	AO element	Guidance
	(iii)	Biuret test ✓ Purple ✓	2	1.2	

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	<p><b>First check the answer on answer line</b>  <b>If answer = 27 award 3 marks</b></p> <p><math>(28 + 26 + 29 + 22 + 27 + 30 + 28) = 190 \checkmark</math>  <math>190 \div 7 = 27.142857</math> (recurring) <math>\checkmark</math></p> <p><math>= 27</math> (to nearest whole number) <math>\checkmark</math></p>	3	1.2	<p><b>ALLOW ECF</b> for marking points 2 and 3, if incorrect calculation performed for marking point 1</p> <p><b>ALLOW</b> value to any number of correct decimal places</p>
		(ii)	28 $\checkmark$	1	2.2	
		(iii)	<p>Female 4 <math>\checkmark</math></p> <p>Menstrual cycle shorter than the others <math>\checkmark</math></p>	2	3.1a 3.2a	<p><b>ALLOW 22</b></p> <p>Look for comparative e.g. shortest/least days/only 22 days/finished earlier  <b>ALLOW</b> her cycle is 22 and the mean is 27</p>

Question	Answer	Marks	AO element	Guidance
(b)	<p><b>Any two from:</b></p> <p>Control the menstrual cycle ✓</p> <p>Cause egg development ✓</p> <p>Cause ovulation/release of the egg ✓</p> <p>Cause sperm production ✓</p> <p>Repair/grow/maintain/prepare the lining of the uterus ✓</p> <p>(Idea that) cause changes that happen in puberty so that sexual reproduction can occur ✓</p>	2	1.1	<p><b>ALLOW</b> produce (female) gamete(s)</p> <p><b>ALLOW</b> egg production</p> <p><b>ALLOW</b> produce (male) gametes</p> <p><b>ALLOW</b> for 1 mark any other correct description of the role of hormones in sexual reproduction e.g. development of secondary sexual characteristics / example of correctly named secondary sexual characteristic / maintenance of pregnancy</p> <p><b>IGNORE</b> named hormones</p>

Question		Answer				Marks	AO element	Guidance												
	(c)	<table border="1"> <thead> <tr> <th>Type of contraception</th> <th>Prevents ovulation</th> <th>Reduces the chance of pregnancy</th> <th>Reduces risk of transmission of STIs</th> </tr> </thead> <tbody> <tr> <td>Condom</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Oral pill</td> <td>✓</td> <td>✓</td> <td></td> </tr> </tbody> </table>				Type of contraception	Prevents ovulation	Reduces the chance of pregnancy	Reduces risk of transmission of STIs	Condom		✓	✓	Oral pill	✓	✓		3	1.1	1 mark for each correct column
Type of contraception	Prevents ovulation	Reduces the chance of pregnancy	Reduces risk of transmission of STIs																	
Condom		✓	✓																	
Oral pill	✓	✓																		

✓✓✓



Question		Answer	Marks	AO element	Guidance
9		gametes ✓ interphase ✓ two ✓ half ✓	4	1.1	

Question		Answer	Marks	AO element	Guidance
10	(a)	(i) Vaccine contains safe form of pathogen/virus <b>OR</b> antigens (of the pathogen) ✓  (Causes an) immune response / white blood cells (make antibodies) ✓	2	2.1	<b>ALLOW</b> weakened/dead/inactive pathogen/virus <b>IGNORE</b> small dose of the pathogen <b>IGNORE</b> denatured/harmless pathogen <b>IGNORE</b> small/weak dose of the disease <b>IGNORE</b> cells/part of the virus/bacteria  <b>ALLOW</b> plasma cells/lymphocytes <b>IGNORE</b> the person is immune
		(ii) (Idea that) the person is immune ✓  (so this means that) the person is protected against the virus/pathogen / future infection will be prevented ✓	2	2.1	<b>ALLOW</b> not all of the antibodies have broken down / been destroyed  <b>ALLOW</b> memory cells have stayed in the body to make antibodies against the virus/pathogen
		(iii) 10 days ✓  (Idea that) there are no antibodies before day 9/day 10 <b>OR</b> (Idea that) there are antibodies present from day 9/day 10 ✓	2	3.1a  3.2a	<b>ALLOW</b> if 10 days is not given as answer but 9, or a number greater than and including 11 is given for the number of days (idea that) antibodies are present e.g. Number of days - 50 Explanation – there are antibodies present = 1 mark

Question		Answer	Marks	AO element	Guidance																		
	(iv)	<p><b>Any two from:</b>                      Use insect repellent ✓                      Use mosquito nets / door screens / stay inside ✓                      Wear long sleeved clothing/long trousers/socks ✓                      Isolate individuals with yellow fever ✓                      Rapid diagnosis of infected people ✓                      Test for yellow fever on entry ✓                      Restrict travel in/to/from infected areas ✓                      Kill mosquitoes / use insecticide / destroy their breeding sites / breed genetically modified mosquitoes ✓</p>	2	2.1	<p><b>ALLOW</b> any sensible suggestion</p> <p><b>ALLOW</b> kill insects</p>																		
	(b)	<p><b>Any one from:</b>                      To protect people who don't have the vaccination / don't develop immunity after vaccination ✓</p> <p>(Idea that) the chance of unvaccinated/susceptible people coming into contact with the pathogen/virus is reduced ✓</p>	1	1.1	<p><b>ALLOW</b> to protect people who have weak immune systems  <b>ALLOW</b> named examples of people who might have weak immune systems</p> <p><b>ALLOW</b> herd immunity</p>																		
	(c)	<table border="0"> <tr> <td></td> <td>True</td> <td>False</td> </tr> <tr> <td>Cancer is a communicable disease.</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Cancer can be caused by our environment and lifestyle.</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Cancer is a result of changes in a cell's DNA.</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Cancer is a result of cells dividing uncontrollably by meiosis.</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td></td> <td>✓✓✓</td> </tr> </table>		True	False	Cancer is a communicable disease.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Cancer can be caused by our environment and lifestyle.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Cancer is a result of changes in a cell's DNA.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Cancer is a result of cells dividing uncontrollably by meiosis.	<input type="checkbox"/>	<input checked="" type="checkbox"/>			✓✓✓	3	1.1	<p>4 correct = 3 marks                      3 correct = 2 marks                      2 correct = 1 mark</p>
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		(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
12	(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>Challenges in relation to growing trees</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>Challenges in relation to the land</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>Challenges in relation to people</b> No obvious direct benefit for people ✓ May lose income / economic implications ✓  <b>Challenges in relation to money</b> Costs money / can be expensive (to conserve/re-grow species or habitats) ✓ May need to compensate people ✓  <b>Challenges to stopping it shrinking</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	✓				
					✓✓✓		

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