

GCSE (9–1)

Biology A (Gateway)

J247/02: Paper 2 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for Autumn 2021

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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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1. 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

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

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

3. 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:

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

For answers to section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	A ✓	1	1.1	
2	B ✓	1	1.1	
3	D ✓	1	1.1	
4	D ✓	1	1.1	
5	C ✓	1	1.1	
6	D ✓	1	2.2	
7	A ✓	1	1.1	
8	C ✓	1	2.1	
9	B ✓	1	1.1	
10	D ✓	1	2.2	
11	B ✓	1	2.1	
12	A ✓	1	2.2	
13	C ✓	1	1.1	
14	A ✓	1	1.2	
15	B ✓	1	1.2	

BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

Question			Answer	Marks	AO element	Guidance					
16	(a)	(i)	Habitat ✓ Population ✓	2	2 x 1.1						
		(ii)	<p>One mark for each correctly drawn line ✓</p>	2	2 x 2.1						
		(iii)	Photosynthesis ✓	1	1.1						
	(b)		<p><i>preventing platelets from working:</i> Stops (platelets) the blood clotting / platelets would clot the blood ✓</p> <p>Idea that allows flies to suck up more blood ✓</p> <p><i>numbing the skin:</i> Stops the person feeling the fly/swatting it ✓</p>	3	1.1 2.1 2.1	<p>ALLOW correct answers anywhere on answer lines</p> <p>IGNORE references to healing</p> <p>IGNORE person bleeds more</p>					
	(c)		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">E</td> <td style="text-align: center;">A</td> <td style="text-align: center;">B</td> <td style="text-align: center;">D</td> <td style="text-align: center;">C</td> </tr> </table>	E	A	B	D	C	3	1.1	<p>A anywhere before B ✓</p> <p>B anywhere before D ✓</p> <p>D anywhere before C ✓</p>
E	A	B	D	C							

Question			Answer	Marks	AO element	Guidance								
17	(a)	(i)	Lacho ✓	1	2.1									
		(ii)	Langhe ✓ Badana ✓	2	2 x 2.1	either order								
		(iii)	Choose the offspring that give the required characteristics ✓ Breed the chosen offspring together ✓ Repeat the breeding for many generations ✓	3	1.2 1.2 1.2	ALLOW specified characteristics - meat and wool								
	(b)	(i)	Causes disease ✓	1	1.1	ALLOW idea that it makes the sheep ill								
		(ii)	Pesticide ✓	1	1.1									
	(c)	(i)	Warmer winters / less frosts ✓ So fewer insects killed ✓	2	2 x 2.1	ALLOW temperature increase / climate is hotter ALLOW more insects								
		(ii)	<table border="1"> <tr> <td>Aseptic control</td> <td></td> </tr> <tr> <td>Biological control</td> <td>✓</td> </tr> <tr> <td>Genetic control</td> <td></td> </tr> <tr> <td>Hydroponic control</td> <td></td> </tr> </table>	Aseptic control		Biological control	✓	Genetic control		Hydroponic control		1	1.2	
Aseptic control														
Biological control	✓													
Genetic control														
Hydroponic control														
		(iii)	Move the genes/DNA/genetic material ✓ From one organism to another ✓	2	2 x 1.2	ALLOW modifying/altering the genome/genes/DNA/genetic material								

Question		Answer	Marks	AO element	Guidance								
18	(a)	<table border="1"> <tr> <td>Causes them to divide uncontrollably</td> <td>✓</td> </tr> <tr> <td>Makes them produce antibodies</td> <td></td> </tr> <tr> <td>Makes them start producing hormones</td> <td></td> </tr> <tr> <td>Stops them dividing by mitosis</td> <td></td> </tr> </table>	Causes them to divide uncontrollably	✓	Makes them produce antibodies		Makes them start producing hormones		Stops them dividing by mitosis		1	1.1	
Causes them to divide uncontrollably	✓												
Makes them produce antibodies													
Makes them start producing hormones													
Stops them dividing by mitosis													
	(b)	<p>Oestrogen is made in the ovaries ✓</p> <p>Oestrogen levels will fall ✓</p>	2	2 x 2.1	ALLOW no oestrogen produced								
	(c)	(i) <p>First check answer on the answer line If answer = 45000 award 3 marks</p> <p>$30\,000\,000 / 400 = 75\,000$ ✓</p> <p>$75\,000 \times \frac{60}{100}$ ✓</p> <p>= 45 000 (females) ✓</p>	3	3 x 2.2									
		(ii) <p>Any two from:</p> <p>May not actually develop breast cancer ✓</p> <p>Would not be able to produce eggs ✓</p> <p>Possible side effects of reduced oestrogen ✓</p>	2	2 x 3.1b	<p>ALLOW only a 60% chance</p> <p>ALLOW would not be able to have children</p> <p>ALLOW reference to menopause</p>								

Question			Answer	Marks	AO element	Guidance												
19	(a)	(i)	(Have D allele) because they will develop CJD ✓ (Have d allele) because they have a child/parent who does not develop CJD ✓	2	2 x 3.1a	ALLOW her mother can only pass on d (allele) / passes on d (allele) to child												
		(ii)	<table border="1" style="margin-left: 20px;"> <tr> <td></td> <td></td> <td>d</td> <td>d</td> </tr> <tr> <td>person A</td> <td>D</td> <td>Dd</td> <td>Dd</td> </tr> <tr> <td></td> <td>d</td> <td>dd</td> <td>dd</td> </tr> </table> <p style="text-align: right; margin-right: 20px;">✓</p> <p>probability = 0.5 / 50% / 1/2 ✓</p>			d	d	person A	D	Dd	Dd		d	dd	dd	2	2.2 3.2b	ALLOW 1 in 2 / 1:1 / 2/4
		d	d															
person A	D	Dd	Dd															
	d	dd	dd															
	(b)		<p>Any two from: Make sure it is safe / identify side effects ✓ To see if it works ✓ To find the correct dosage ✓</p>	2	2 x 1.2	<p>ALLOW could go wrong / unknown effect IGNORE can't test on humans</p> <p>ALLOW see results</p>												

Question	Answer	Marks	AO element	Guidance
20*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Provides a detailed explanation of the problems facing China regarding food security. AND Provides a detailed explanation of how China is changing its food production to solve these problems.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Provides a detailed explanation of the problems facing China regarding food security OR Provides a detailed explanation of how China is changing its food production to solve these problems. OR Provides a basic explanation of the problems facing China regarding food security. AND Provides a basic explanation of how China is changing its food production to solve these problems. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Provides a basic explanation of the problems facing China regarding food security. OR</p>	6	4 x 2.1 2 x 3.1b	<p>AO2.1 Apply knowledge and understanding of the issues threatening food security.</p> <ul style="list-style-type: none"> • population in China has increased • e.g. population is 1400 million in 2015 compared to 660 million in 1960 • so, a greater demand for food • however less land is available to grow food • e.g. area of land available to grow now 26 million of hectares in 2014 compared to 36 million of hectares in 1969 <p>AO3.1b Analyse information and ideas to draw conclusions about how China is maintaining food security.</p> <ul style="list-style-type: none"> • have developed hybrid rice • hybrid rice has a higher yield than old types of rice • e.g. yield is 3100 kg/hectare compared to 2100 • percentage of rice grown that is hybrid rice is increasing • able to grow more rice on the same area of land

Question			Answer	Marks	AO element	Guidance
			<p>Provides a basic explanation of how China is changing its food production to solve these problems.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks <i>No response or no response worthy of credit.</i></p>			

Question		Answer	Marks	AO element	Guidance								
	(d)	<table border="1"> <tr> <td>How many genes a person has</td> <td></td> </tr> <tr> <td>The environment</td> <td></td> </tr> <tr> <td>The number of chromosomes a person has</td> <td></td> </tr> <tr> <td>Whether a person has a Y chromosome</td> <td>✓</td> </tr> </table>	How many genes a person has		The environment		The number of chromosomes a person has		Whether a person has a Y chromosome	✓	1	1.1	
How many genes a person has													
The environment													
The number of chromosomes a person has													
Whether a person has a Y chromosome	✓												
	(e)	(i) First check answer on the answer line If answer = 168 award 2 marks 56% of 300 ✓ = 168 ✓	2	2 x 2.2									
		(ii) Small(er) eggs produce more males ✓	1	3.1a									
		(iii) Testosterone is the male (sex) hormone ✓ Idea that higher levels of testosterone made more of the embryos develop as males / male (embryos) will make more testosterone ✓	2	1.1 3.1b									

Question		Answer	Marks	AO element	Guidance	
22	(a)	<p><i>Quadrat:</i></p> <p>Sample the plants (in the hedge) ✓</p> <p>Count the number (of different species) in the quadrat ✓</p> <p><i>Key:</i></p> <p>Identify the species of plants ✓</p>	3	3 x 1.2	<p>ALLOW random placement</p> <p>ALLOW idea that the small area is representative of the rest of the hedge</p> <p>ALLOW key to identify species so they can be counted = 2 marks if counted not credited for quadrat</p>	
	(b)	(i)	All correct points correctly plotted ✓✓	2	2 x 2.2	<p>ALLOW +/- half a square</p> <p>0 to 2 correct points plotted = 0 mark</p> <p>3 or 4 correct points plotted = 1 mark</p> <p>All 5 correct points plotted = 2 marks</p>
		(ii)	Correctly drawn line of best fit ✓	1	2.2	<p>ALLOW best straight line or smooth curve</p> <p>DO NOT ALLOW dot to dot line</p> <p>ALLOW line of best fit for their plotting</p> <p>IGNORE any extrapolation of line</p> <p>DO NOT ALLOW double lines</p>
		(iii)	<p>FIRST CHECK ANSWER ON THE ANSWER LINE</p> <p>If answer = 261 (years) award 2 marks</p> <p>$2.1 \times 110 + 30$ ✓</p> <p>= 261 (years) ✓</p>	2	2 x 2.2	

Question		Answer	Marks	AO element	Guidance
	(iv)	<p>Yes (no mark)</p> <p>As the age of field increases the area of the field decreases ✓</p> <p>D/oldest field has small area and E/newest field has large area /</p> <p>261yr old/oldest field has 1500m² area and 162yr old/newest field has 10 000m² area ✓</p>	2	2 x 3.2b	<p>IF ANSWER IS NO THEN ZERO MARKS</p> <p>ORA</p>
	(c)	<p>Blackbirds eat/kill greenfly and/or caterpillars ✓</p> <p>Less wheat will be eaten ✓</p>	2	2 x 3.1a	<p>ALLOW blackbirds are predators to the greenfly and/or caterpillars</p> <p>ALLOW blackbirds hunt greenfly and/or caterpillars</p> <p>ALLOW greenfly and/or caterpillars are blackbirds prey</p> <p>ALLOW decrease consumers of the wheat</p>

Question		Answer	Marks	AO element	Guidance												
23	(a)	<table border="1"> <tr> <td>Acid will decrease the pH and cause the enzyme to change shape.</td> <td>✓</td> </tr> <tr> <td>Acid will increase the pH and cause the enzyme to change shape.</td> <td></td> </tr> <tr> <td>Acid will increase the pH and cause the substrate to change shape.</td> <td></td> </tr> <tr> <td>The enzyme will not fit into the active site of the substrate.</td> <td></td> </tr> <tr> <td>The substrate will denature</td> <td></td> </tr> <tr> <td>The substrate will not fit into the active site of the enzyme.</td> <td>✓</td> </tr> </table>	Acid will decrease the pH and cause the enzyme to change shape.	✓	Acid will increase the pH and cause the enzyme to change shape.		Acid will increase the pH and cause the substrate to change shape.		The enzyme will not fit into the active site of the substrate.		The substrate will denature		The substrate will not fit into the active site of the enzyme.	✓	2	2 x 2.1	More than 2 boxes ticked then each additional incorrect box negates a mark
		Acid will decrease the pH and cause the enzyme to change shape.	✓														
		Acid will increase the pH and cause the enzyme to change shape.															
		Acid will increase the pH and cause the substrate to change shape.															
		The enzyme will not fit into the active site of the substrate.															
		The substrate will denature															
The substrate will not fit into the active site of the enzyme.	✓																
(b) (i)	(Distilled) water ✓	1	2.2														
(ii)	<p>Yes:</p> <p>Increasing concentrations (of sulfur dioxide) are linked to lower rates of photosynthesis ✓</p> <p>No:</p> <p>Because there is no evidence that it is due to sulfur dioxide being an acid ✓</p>	2	2 x 3.2a	<p>ALLOW sulfur dioxide reduces the rate of photosynthesis</p> <p>IGNORE pH/acid references</p> <p>ALLOW reference to a correlation and not a cause/no causal mechanism</p>													
(iii)	Use different acids ✓	1	3.3b	<p>IGNORE measure the pH to show it is an acid</p> <p>IGNORE repeat experiment with different concentrations of sulphuric acid</p>													

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