

GCSE (9–1)

Biology A (Gateway Biology)

J247/01: Paper 1 (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 for GCSE (9-1) in Biology A:

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

Question		Answer				Marks	AO element	Guidance	
16	(a)		Sub-cellular structure	Only in Eukaryotic cells	Only in Prokaryotic cells	In both Eukaryotic and prokaryotic cells	3	3 x 1.1	more than one answer in a row = no mark
		cell membrane			(✓)				
		nucleus	✓						
		mitochondria	✓						
		plasmid		✓					
(b)	(i)	adjust the focus knob to see the image			5	2	2 x 1.2	ALL correct = 2 marks 3 or 4 correct = 1 mark	
		place the plant cells onto the microscope slide			1				
		place microscope slide on stage			4				
		place a coverslip over the plant cells			2				
		select low power objective lens			(3)				
	(ii)	(x)400 ✓				1	2.2		
	(iii)	2000 (µm) ✓				1	2.2	ALLOW ECF from part (ii) for incorrect magnification	

Question		Answer	Marks	AO element	Guidance
	(iv)	<p>Any 2 from:</p> <p>(Chloroplasts) photosynthesise ✓</p> <p>Contain chlorophyll ✓</p> <p>Idea of absorb light ✓</p>	2	2 x 2.1	ALLOW photosynthesis needs chlorophyll = 2 marks
	(v)	<p>Sugars are the monomers ✓</p> <p>Sugars are joined together to make the (polymer/cellulose) ✓</p>	2	2 x 2.1	<p>ALLOW sugar/glucose is smallest unit of carbohydrate</p> <p>ALLOW cellulose is made up of glucose (molecules)</p> <p>ALLOW (cellulose is a polymer) made up of sugar/glucose monomers = 2 marks</p>

Question		Answer	Marks	AO element	Guidance
17	(a)	Breathing rate ✓	1	2.2	
	(b)	The gender/sex of the person exercising ✓ Time doing the exercise ✓	2	2 x 3.2a	
	(c)	To be able to compare effect of exercise to no exercise ✓ OR Measure change/increase in (breathing rate) ✓	1	3.1a	ALLOW provides a baseline measurement ALLOW two students may have different breathing rates at rest
	(d)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 36.8(%) award 3 marks (37 – 11) = 26 ✓ 26-19 / 19 x 100 ✓ 36.8 (%) ✓	3	3 x 2.2	ALLOW 36.842(%) for 2 marks Clear evidence of correct rounding to 1 d.p. of incorrect answer = 1 mark
	(e)	Increases (breathing rate) ✓ Idea different exercises/star jumps effects breathing rate more ✓	2	2 x 3.2b	ALLOW different exercises/star jumps increase the breathing rate more = 2

Question			Answer	Marks	AO element	Guidance
	(f)	(i)	<p>Any two from:</p> <p>Age of person exercising ✓</p> <p>Health/size/fitness of person exercising ✓</p> <p>Idea sample size is too small / only tested 2 people ✓</p> <p>Only did the experiment once ✓</p> <p>Idea of inaccuracy in measure breathing rate ✓</p>	2	2 x 3.1b	ALLOW difficulty in measuring own breathing rate / not recording continuous breathing rate / only recording breathing rate
		(ii)	<p>Any one from:</p> <p>Same age ✓</p> <p>Same fitness/size/health ✓</p> <p>Bigger sample size ✓</p> <p>Repeat experiment ✓</p> <p>Idea use independent observer to measure breathing rate ✓</p>	1	3.3b	ALLOW idea of measuring breathing volumes with face masks on treadmill

Question			Answer		Marks	AO element	Guidance
18	(a)	(i)	Stage	Description of what happens ✓✓	2	2 x 1.1	All 3 correct = 2 marks 1 or 2 correct = 1 mark
			S	DNA replication			
			G2	growth and preparation for mitosis			
			M	movement of chromosomes			
			G1	cell growth			
		(ii)	Double helix ✓	1	1.1		
	(b)	(i)	Differentiated cells can do different jobs/functions ✓ Allowing organisms to become more efficient ✓	2	2 x 1.1	ALLOW organism can become more complex If no other mark scored credit make specialised cells	
		(ii)	Meristem ✓	1	1.1		
	(c)		(Root hairs) absorb water ✓ (Root hairs) absorb minerals ✓ Plant might wilt / grow slower / less photosynthesis ✓	3	3 x 2.1	IGNORE plant survival	

Question		Answer	Marks	AO element	Guidance
	(d)	Any two from: Controlling germination ✓ Fruit ripening ✓ Flower opening ✓ Shedding of leaves ✓	2	2 x 1.1	ALLOW abscission/leaf fall ALLOW reference to tropisms

Question		Answer	Marks	AO element	Guidance								
19	(a)	Pancreas ✓	1	1.1									
	(b)	(i) Cells in pancreas that make insulin are destroyed ✓	1	2.1	ALLOW symptoms developed quite quickly								
		(ii) Injection of insulin ✓	1	1.1	ALLOW insulin pump								
	(c)	(i) Blood will have higher concentration /more (sugar) in it ✓ So will lower the water potential ✓	2	2 x 2.1	IGNORE reference to viscosity of blood								
		(ii) Any 2 from: Water will move from (body) cells into the blood ✓ By osmosis ✓ Cells crenate ✓	2	2 x 2.1	ALLOW water diffuses out of body cells ALLOW water moves from high to low water potential/concentration ALLOW body cells become dehydrated / shrivel								
	(d)	<table border="1"> <thead> <tr> <th>Change caused to the kidney</th> <th>Part of tubule affected</th> </tr> </thead> <tbody> <tr> <td>Glomerulus filters too much glucose from the blood.</td> <td>A ✓</td> </tr> <tr> <td>Proximal convoluted tubule only reabsorbs some of the glucose back into the blood.</td> <td>E ✓</td> </tr> <tr> <td>Collecting duct sends urine with glucose present to the bladder.</td> <td>C ✓</td> </tr> </tbody> </table>	Change caused to the kidney	Part of tubule affected	Glomerulus filters too much glucose from the blood.	A ✓	Proximal convoluted tubule only reabsorbs some of the glucose back into the blood.	E ✓	Collecting duct sends urine with glucose present to the bladder.	C ✓	3	3 x 3.2a	
Change caused to the kidney	Part of tubule affected												
Glomerulus filters too much glucose from the blood.	A ✓												
Proximal convoluted tubule only reabsorbs some of the glucose back into the blood.	E ✓												
Collecting duct sends urine with glucose present to the bladder.	C ✓												

Question			Answer	Marks	AO element	Guidance
20	(a)	(i)	Sensory neurone/nerve ✓	1	1.1	
		(ii)	Hormones ✓ Travel through the blood(stream)✓	2	2 x 1.1	ALLOW chemical messengers ALLOW hormones bind to specific receptors on cells
	(b)		<p>Cornea</p> <p>Iris</p> <p>Lens</p> <p>Optic nerve</p> <p>Can carry electrical impulses from retina to</p> <p>Changes shape to control amount of light. entering eye</p> <p>Changes shape to focus light onto retina.</p> <p>Curved to refract light into eye.</p>	2	2 x 1.1	All 3 correct = 2 marks 1 or 2 correct = 1 mark DO NOT ALLOW more than 1 line from each letter

Question		Answer	Marks	AO element	Guidance
	* (c) (i)	<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) Identifies the retina as the part of the eye that contains light sensitive cells. AND Provides an explanation of the colours the colour blind person has trouble identifying. AND Provides an explanation how glasses treat colour blindness.</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) Identifies the retina as the part of the eye that contains light sensitive cells. AND Provides an explanation of the colours the colour blind person has trouble identifying. OR Identifies the retina as the part of the eye that contains light sensitive cells. AND Provides an explanation how glasses treat colour blindness. OR Provides an explanation of the colours the colour blind person has trouble identifying. AND Provides an explanation how glasses treat colour</p>	6	2 x 1.1 2 x 2.1 2 x 3.1b	<p>AO1.1 Demonstrate knowledge and understanding of parts of the eye</p> <ul style="list-style-type: none"> light sensitive cells are in the retina found in the fovea <p>AO2.1 Apply knowledge and understanding of the mechanisms involved in colour blindness</p> <ul style="list-style-type: none"> idea that in the colour-blind person the cells that detect red and green have similar sensitivities the similar sensitivities are at wavelengths 560-640 nm therefore the brain cannot easily distinguish red or green colours / colours in range 560-640nm <p>AO3.1b Analyse information and ideas to evaluate the effect of colour blindness glasses</p> <ul style="list-style-type: none"> glasses remove (wavelengths) in the region where the red and green overlap idea that brain is now able to identify/distinguish red and green colours

Question		Answer	Marks	AO element	Guidance
		<p>blindness.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Identifies the retina as the part of the eye that contains light sensitive cells. OR Provides an explanation of the colours the colour blind person has trouble identifying. OR Provides an explanation how glasses treat colour blindness.</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>			
	(ii)	Amino acids ✓	1	2.1	
	(d)	Cerebrum ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
21	(a)	(i)	Progesterone ✓	1	1.1	
		(ii)	Maintains lining of uterus / stops the lining of the uterus breaking down ✓	1	2.1	ALLOW higher level responses e.g. inhibits the release of FSH hormone / inhibits the development of follicle in ovary ALLOW slows down the rate of egg production IGNORE thickens the lining of the uterus
	(b)	(i)	Menstrual blood cells are adult stem cells / Menstrual blood cells/adult stem cells can only form certain types of cells ✓ (Embryo stem cells) can produce a wide range of cell types ✓	2	2 x 2.1	ALLOW Menstrual blood cells can only specialise into blood cells / menstrual blood cells are multipotent/partially differentiated ALLOW Embryo stem cells can produce any type of cell / embryo stem cells are pluripotent
		(ii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 77.6 (hours) award 2 marks 4 (generations) ✓ $4 \times 19.4 = 77.6$ (hours) ✓	2	2 x 2.2	
		(iii)	$\frac{48}{19.4} = 2.5$ ✓	1	2.2	ALLOW 2.4742 etc ALLOW any correct rounding

Question		Answer	Marks	AO element	Guidance
	(iv)	<p>Any two from: Quick to culture / divide rapidly / fast growth ✓ Easily obtainable source of stem cells ✓ Frequently accessible source of stem cells ✓ Less ethical issues in obtaining them (compared to stem cells from embryo tissue) ✓</p>	2	2 x 3.1b	<p>ALLOW reverse argument for embryo stem cells if stated assume menstrual blood stem cells if not stated</p> <p>IGNORE just quicker</p> <p>ALLOW idea of less invasive technique</p> <p>IGNORE just supply more</p>

Question			Answer	Marks	AO element	Guidance
22	(a)	(i)	Photosynthesis ✓	1	2.1	
		(ii)	Oxygen stops being produced ✓	1	3.1a	ALLOW because photosynthesis produces oxygen
	(b)	(i)	Light enables the moss ball plant to float/rise ✓ Idea of slight time lag between exposure to light and floating or sinking ✓	2	2 x 3.2a	ALLOW converse arguments in the dark
		(ii)	Any two from: Idea that exposure to light produces oxygen/allows photosynthesis, so ball floats ✓ Idea that (in experiment 1) dark conditions stop photosynthesis/oxygen production causing sinking ✓ Idea that the light is shone for a longer time in experiment 2, so the ball floats for longer ✓	2	2 x 2.1	DO NOT ALLOW in the dark respiration starts Answer needs to compare the length of time the light is shone and the length of time the ball floats to score this marking point

Question		Answer	Marks	AO element	Guidance
	(c)	<p>Any three from:</p> <p>(Increased temperature) will increase photosynthesis/respiration /transpiration/water uptake ORA ✓</p> <p>Molecules move faster / increased kinetic energy ✓</p> <p>Increased rate of collisions between enzymes and substrates/ increased rate of formation of ES complexes ✓</p> <p>High temperature levels/above 37°C will stop/reduce the rate of photosynthesis/respiration ✓</p>	3	3 x 1.1	<p>ALLOW increase evaporation</p> <p>ALLOW higher level responses to high temperature effects on enzymes e.g. enzymes/structural proteins in plants may start to denature</p>

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