OCR
Oxford Cambridge and RSA

H

GCSE (9–1)

Biology A (Gateway Biology)

J247/03: Paper 3 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

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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.

Annotations

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

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

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.

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

Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 3 : 1 award 2 marks** 24 : 8 or 3 ✓ 3 : 1 ✓	2	2.2	**ALLOW** answer in the table but answer on answer line takes preference
		(ii)	higher SA:V ratio faster rate of diffusion / ORA ✓	1	3.2b	**ALLOW** positive correlation **ALLOW** reference to less time instead of faster rate **IGNORE** they are directly proportional
		(iii)	reduces (total) SA of alveoli/air sacs / reduces SA : Vol ratio of alveoli/air sacs ✓ so diffusion (of oxygen) reduced ✓	2	2 x 3.1a	 **ALLOW** harder for oxygen to diffuse **IGNORE** oxygen cannot diffuse into the blood in emphysema
	(b)		sickle red blood cells release/take up/carry/deliver/transport less oxygen ✓ sickle cells have a smaller surface area (to vol ratio) / tend to get stuck in blood vessels/capillaries / cannot pass through blood vessels/capillaries so easily ✓	2	1.1 2.1	**IGNORE** less oxygen binds to RBCs / sickle cells cannot carry oxygen **IGNORE** references to smaller volume / less Hb / less space on the RBCs

Question			Answer	Marks	AO element	Guidance
	(c)		cells absorb water ✓ by osmosis ✓ (red blood) cells/cytoplasm swells / increased pressure in the cell/on the cell membrane / cell membrane ruptures/bursts ✓	3	3 x 1.1	**IGNORE** references to water potential **IGNORE** just cell bursts

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>17</td><td>(a)</td><td>(i)</td><td>The higher the BMI then the higher the mass of urea (in urine) / ORA ✓</td><td>1</td><td>2.1</td><td>ALLOW positive correlation
IGNORE they are directly proportional
IGNORE linear relationship</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 0.0016 (g/cm^3) award 2 marks

1.6 ÷ 1000 ✓
= 0.0016 (g/cm^3) ✓</td><td>2</td><td>2.2</td><td>

ALLOW 1.6 x 10^{-3}</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>idea that there is a greater increase in mass of urea as BMI increases in Fig 17.2/second graph ✓

idea that first graph/17.1 has stronger correlation / more points closer to line of best fit / less spread of data ✓</td><td>2</td><td>2 x 3.2b</td><td>ALLOW larger mass of urea per BMI gained
ALLOW line is steeper/higher gradient in Fig17.2
IGNORE higher BMI for greater mass of urea

ALLOW second graph does not follow the line of best fit so closely</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><td>Bowman’s capsule</td><td>1</td></tr><tr><td>Collecting duct</td><td>5</td></tr><tr><td>Proximal convoluted tubule</td><td>2</td></tr><tr><td>Loop of Henlé</td><td>3</td></tr><tr><td>Second coiled region</td><td>4</td></tr></table>✓✓✓</td><td>3</td><td>3 x 1.1</td><td>5 before 2 ✓
2 before 3 ✓
3 before 4 ✓</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
18	(a)		more accurate/precise measurement (of volume/amount of gas) ✓	1	3.3b	**ALLOW** gas could dissolve in water / less gas can escape **IGNORE** gives exact measurement of gas release
	(b)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 2.3 (cm^3 / min) award 3 marks** $\frac{25+23+22}{3}$ = 23.3333333 ✓ $\frac{23.3\dot{}}{10}$ = 2.3333333 ✓ = 2.3 (cm^3 / min) ✓	3	**1 x 1.2** **2 x 2.2**	**ALLOW** one mark for clear evidence of rounding incorrect answer correctly to one dp.
		(ii)	increased movement of molecules / increased kinetic energy ✓ therefore, more chance of substrate colliding with enzymes/active sites ✓ more chance of substrate entering active site ✓	3	2 x2.1	increased KE of enzymes and substrates leads to more collisions = 2 marks **ALLOW** more enzyme-substrate complexes forming
	(c)		(phenols) alter the shape of the active site/enzyme / block active site/enzyme ✓ so substrate no longer fits/binds with active site/enzyme ✓	2	2.1	**IGNORE** reference to denaturing need reference to active site once only for 2 marks

Question			Answer	Marks	AO element	Guidance
19	(a)	(i)	water evaporates (on surface of spongy mesophyll) ✓ water (vapour) passes/diffuses through the stomata/pores ✓	2	1.1	Need evaporate or a description of the process
		(ii)	measure distance gas bubble moves ✓ over certain time / specified time ✓ vary distance of lamp from potometer ✓	3	1.2	**ALLOW** measure position of bubble before and after time taken for bubble to move a certain distance = 2 marks
		(iii)	absorbs heat/thermal energy (from lamp) / keeps (plants at) constant temperature✓ heat/temperature would affect transpiration ✓	2	2.2	**IGNORE** references to photosynthesis
	(b)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 57 (mm^3) award 3 marks** $\pi \times 0.5^2 \times 72$ ✓ = 56.52 ✓ = 57 (mm^3) ✓	3	3 x 2.2	**ALLOW** one mark for an answer of 226.08 and 2 marks for an answer of 230 (1.0 has been used as r) **ALLOW** one mark for clear evidence of incorrect answer correctly rounded to two sig figs.
		(ii)	42 (mm) / Trial 1 at 40cm ✓ reading taken too quickly after moving the lamp / error in measurement (distance bubble moved/time) / heat sink not in the way/radiating heat / change in room temp/air movements / potometer/light not at correct distance ✓	2	2 x 2.2	

Question			Answer	Marks	AO element	Guidance
		(iii)	Idea that they should remove/ignore the anomalous result (before processing) ✓	1	1.2	**ALLOW** repeat that reading
		(iv)	the mean is 73 mm ✓ the range of values is 71 to 75 / range is 4 mm / 2mm is half the range ✓	2	2 x 1.2	 **ALLOW** adding or subtracting 2 from 73 covers all the readings this is the mean ± half the range = 2 marks

Question			Answer	Marks	AO element	Guidance
20	(a)	(i)	**Any two from:** contains (plant) hormones ✓ causes excessive/rapid cell elongation/growth✓ only affects broadleaved plants ✓	2	2 x 1.1	**ALLOW** auxins **IGNORE** just plants grow faster **ALLOW** effects some plants/weeds and not others/the crop
		(ii)	**B** because B causes highest percentage death of horsenettle ✓ A/C do not kill other broadleaved plants/weeds / A/C not suitable as field contains other weeds / A/C only kills horsenettle ✓ D does not kill roots / much less effective at killing horsenettle ✓ Spring treatment because buds just growing and flowering yet to happen ✓	4	3.1b	**No mark for B on its own.** **NEED a choice of B or D to score any marks** **Mark first choice** Need reference to both buds and flowering **ALLOW D** for three marks if B is not chosen first: because D kills more species of weeds ✓ D much cheaper than B ✓ spring treatment because buds just growing and flowering yet to happen ✓

Question			Answer	Marks	AO element	Guidance
	(b)	(i)	breaks seed dormancy / elongation of shoots ✓	1	1.1	**ALLOW (**stimulates) flowering/ fruit development / fruit growth / seed formation / germination / growth of shoots / seedless fruits **DO NOT ALLOW** fruit ripening / seed growth
		(ii)	Idea that the ripeness colour scale can be used for comparison ✓ idea that a numerical estimate/quantitative measure for level of ripeness is better / idea that it gives multiple measures and not just two/ripe or unripe / removes objectivity / allows reproducibility ✓	2	2 x 3.3a	**ALLOW** can be used to choose from a selection of ripeness levels
	(c)		peak CO_2 level is close to the peak of ripening chemical level / CO_2 levels increasing as production of chemical increases✓ process is respiration ✓	2	2 x 3.2b	**DO NOT ALLOW** there is a spike/peak in CO_2 as the chemical increases **ALLOW** fermentation

Question			Answer	Marks	AO element	Guidance
21	(a)		cerebral cortex / cerebrum ✓	1	1.1	**ALLOW** motor cortex
	(b)	(i)	can send impulses along a different number of neurones ✓ the more neurones that are stimulated then the greater the force of contraction✓ Or could stimulate motor neurone 1 or motor neurone 2 ✓ motor neurone 2 gives a stronger contraction / because motor neurone 2 supplies more muscle fibres ✓	2	2.1	answer must specifically refer to changes in the number of motor neurones stimulated to score marks (not just the order of motor neurones)
		(ii)	idea that the neurone supplying the leg muscle connects to many muscle fibres ORA ✓ this means that the contraction of the leg muscles can be less finely controlled ORA ✓ idea leg does not need such fine control for its function ORA ✓	3	2.1 3.2a 3.2a	

Question			Answer	Marks	AO element	Guidance
	*(c)		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Detailed explanation of how the body coordinates this specific response, including a detailed outline of the correct pathway, in the correct order. **AND** Explains why coordination in **B** is more complicated. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Attempts to explain how the body coordinates this specific response, including an outline of the correct pathway, in the correct order. **AND** Gives a reason why coordination in **B** is more complicated. **OR** Detailed explanation of how the body coordinates this specific response, including a detailed outline of the correct pathway, in the correct order. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Attempts to explain how the body coordinates a response. **OR**	**6**	**2 x 1.1** **2 x 2.1** **2 x 3.2a**	**AO1.1 Demonstrates knowledge and understanding of scientific ideas to identify the correct pathway** • receptors detect the stimulus and send impulse via a sensory neurone • CNS coordinates the response • CNS sends impulse to motor neurone • motor neurone causes muscles or effectors to respond **AO2.1 Applies knowledge and understanding of scientific ideas to explain how the body coordinates the response** • image dart board detected by retina/eye • cerebrum coordinates the response by sending impulses down spinal cord • motor neurone takes impulse from spinal cord to the muscles of the arm/hand • muscles in the arm/hand bring about the throwing response **AO3.2a Analyse information and ideas to make judgements about the differences between A and B** • coordination in **B** is more complicated because darts have different flight paths/ different positions of release • therefore, **B** needs to adjust the speed of the hand/force of the throw to match the throw angle

Question			Answer	Marks	AO element	Guidance
			Gives a reason why coordination in **B** is more complicated. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant*.**0 marks** *No response or no response worthy of credit.*			

Question			Answer	Marks	AO element	Guidance
22	(a)		**Any four from:** DNA unwinds/unzips ✓ during transcription mRNA is made ✓ mRNA moves from the nucleus to the cytoplasm/ribosomes ✓ translation on the ribosomes ✓ carrier molecules/tRNA bring specific amino acids ✓ amino acids joined to form a protein ✓	4	4 x 1.1	**DO NOT ALLOW** amino acids are produced
	(b)	(i)	polymers ✓ monomers ✓	2	2 x 1.1	
		(ii)	(**A** has) less ADH released/present ORA ✓ so less/no reabsorption of water / permeability of collecting duct is lower/has not changed ✓	2	2 x 2.1	**ALLOW** ADH release is inhibited in A / lack of ADH production in **A** **IGNORE** less movement of water out of the tubule (must state reabsorption)
		(iii)	**Any two from:** (low) water potential/(decreased) water levels are detected by hypothalamus ✓ will cause the release of ADH/ increased ADH levels ✓ increased permeability of collecting duct/kidney tubules / increased reabsorption of water (into blood) / decreased urine production / urine will become more concentrated ✓	2	2 x 2.1	**IGNORE** brain

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