OCR
Oxford Cambridge and RSA

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GCSE (9–1)

Biology B (Twenty First Century Science)

J257/02: Depth in biology (Foundation 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 B:

	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	(a)		double ✓ helix ✓	**2**	1.1	
	(b)		(nitrogenous) base ✓	**1**	1.1	**ALLOW** adenine / A **ALLOW** cytosine / C **ALLOW** guanine / G **ALLOW** thymine / T
	(c)		cell before nucleus ✓ nucleus before chromosome ✓ chromosome before gene ✓ gene before nucleotide ✓	**4**	1.1	
	(d)		nucleus ✓	**1**	2.1	

Question			Answer	Marks	AO element	Guidance
2	(a)		sperm (cells) ✓	1	1.1	
	(b)		2 ✓	1	1.1	
	(c)		X Y ✓ male ✓	2	2.1	**ALLOW** Y X **ALLOW** boy/man
	(d)		**Any two from:** pill not 100% effective/doesn't always work (even when taken correctly) ✓ she might not have taken the pill(s) correctly ✓ she might already have ovulated / released an ovum/egg (before starting the pill) ✓ hormone levels (from pill) might not be high enough to prevent ovulation ✓ other medications can interfere ✓ sickness/vomiting can interfere ✓	2	2.1	 e.g. missed a day, or taken at different times of day **ALLOW** idea that it may take a while to build up to the required level
	(e)		96 ✓ 48 48 ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
3	(a)		cow's milk ✓ 0.6 ✓	2	3.1a	
	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 60(%) award 2 marks** 1.8 ÷ 3 = 0.6 ✓ x 100 = 60(%) ✓	2	2.2	
	(c)	(i)	**Any two from:** eggs generate less greenhouse gasses than sausages / comparison of 1.8 kg for sausages and 0.5 kg for eggs / total amount of gasses will decrease ✓ save/difference/decrease of 1.3 kg ✓ total amount of gasses will decrease to 1.7 kg ✓ **AND:** less greenhouse gasses will cause less (global) warming / climate change / environmental change / less damage to biodiversity ✓	3	3.1a 3.1b	
		(ii)	so that people can decide/choose what foods to eat (based on data/evidence) ✓ (these decisions) reduce greenhouse gasses / emissions / carbon footprint / (global) warming / climate change / effects on biodiversity ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
	(d)		**Any four from:** (greenhouse gasses linked to) (global) warming / climate change / changes in environmental conditions ✓ example of an environmental consequence ✓ some plants/animals will not survive / will not be adapted (to the new conditions) / will move to other areas ✓ new pest(s)/disease(s) could develop ✓ idea that food chains will be disrupted ✓ humans depend on plants/animals for food ✓	**4**	2.1	e.g. • warming/acidification of oceans • melting ice/snow • rising sea levels / flooding • desertification • extreme weather events **ALLOW** example of plant/animal upon which humans depend for food

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>pathogens ✓
genes ✓
lifestyle ✓</td><td>3</td><td>1.1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td><table>
<tr><th>Disease</th><th>Type…</th><th>Spread…</th></tr>
<tr><td>HIV/AIDS</td><td>virus ✓</td><td>sex(ual intercourse) / sexually (transmitted) ✓</td></tr>
<tr><td>Malaria</td><td></td><td>(getting bitten) by mosquitoes/insects ✓</td></tr>
<tr><td>Salmonella</td><td>bacterium /bacteria ✓</td><td></td></tr>
</table></td><td>4</td><td>1.1</td><td>ALLOW (contaminated) blood/needles/body fluids for spread of HIV

ALLOW vector</td></tr>
</table>

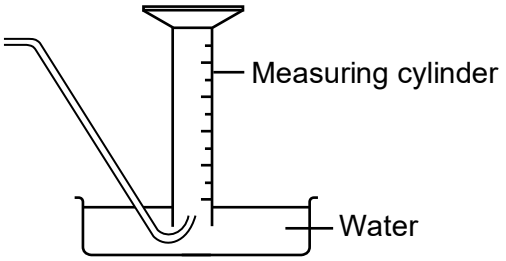
Question	Answer	Marks	AO element	Guidance
(c)	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Explains in detail how Jane could have become infected with the influenza, referring both to source of the virus and infection route. **AND** Explains in detail how the immune system will respond to the influenza. *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)** A limited explanation of how Jane could have become infected with influenza. **AND** A limited explanation of how the immune system will respond to influenza. *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)** Only attempts to explain how Jane could have become infected with influenza. **OR** Only attempts to explain how the immune system will respond to influenza. *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.*	**6**	3 x 2.1 3 x 1.1	**AO2.1 Explaining how Jane could have become infected with influenza** For example: *Source of (droplets containing) influenza/virus:* • other people's sneezes/coughs • the air • surfaces *Infection route:* • Jane breathed in the droplets/influenza/virus • Jane touched a surface contaminated with the droplets/influenza/virus • droplets/influenza/virus were transferred to Jane's nose/airways/mouth/eye **AO1.1 Explaining how the immune system will respond** For example: • white blood cells • recognising the virus/pathogen/microorganism as foreign/non-self • recognising antigens/proteins on the virus/pathogen/microorganism • making (specific) antibodies • antibodies attach to the virus/pathogen/microorganism/antigens • antibodies disable the virus / label it for attack • ingesting/engulfing/digesting the virus/pathogen/microorganism / phagocytosis • memory cells stay in the body

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	phloem ✓	**1**	2.1	
		(ii)	active transport ✓	**1**	1.1	
		(iii)	osmosis ✓	**1**	1.1	
	(b)	(i)	xylem ✓	**1**	2.1	
		(ii)	**Any four from:** water is lost from the leaves ✓ by transpiration ✓ due to evaporation ✓ through stomata ✓ pulls water up through xylem (because water molecules attract one another) ✓ roots take up water (from soil) by osmosis ✓ water can fill/move through xylem (tubes/vessels) because the dead cells have no cytoplasm/end walls / xylem cell walls are waterproof/lignified ✓	**4**	1.1	**ALLOW** aw cohesion-tension
	(c)	(i)	direct sunlight could damage the eye/retina ✓ suggested alternative e.g. use a lamp / use in shade/indirect light ✓	**2**	1.2 3.3b	**ALLOW** bulb

Question			Answer	Marks	AO element	Guidance
		(ii)	could smash the slide / damage the lens ✓ start with objective lens at lowest position / use coarse focus control to move it up/away from the slide ✓	2	1.2 3.3b	
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = (×)15000 award 2 marks** 45 ÷ 0.003 ✓ = (×)15000 ✓	2	2.2	
	(e)		**(No because):** Total magnification of Sarah's microscope = 10 x 40 = x400 ✓ Sarah's microscope is not powerful enough / insufficient magnification ✓	2	2.2 3.2a	

Question			Answer	Marks	AO element	Guidance
6	(a)		They are different colours ✓	1	2.1	
	(b)		idea that green straws are better camouflaged / hidden / blend in ✓ green straws are less likely to be seen/picked up (by the students/predators) ✓	2	2.1	**ALLOW** reverse argument for red straws for both marking points **DO NOT ALLOW** "they are green" without further explanation
	(c)		reasonable suggestion of characteristic that could affect ability to compete for straws ✓	1	2.1	e.g. how fast they can run / how many straws they can hold / eyesight / visual impairment
	(d)		Natural selection ✓	1	2.1	
	(e)	(i)	More green straws than red straws ✓	1	2.1	**DO NOT ALLOW** "more green straws" unqualified; must be in comparison to red, or as a proportion of the population
		(ii)	**Prediction:** idea that the remaining students will be those who are faster / can hold more straws / are better able to see the straws ✓ **Explanation:** they are better able/adapted to compete / to pick up (more) straws ✓	2	2.1	Explanation must relate to prediction **ALLOW** description of how the adaptation better enables them to pick up straws

Question			Answer	Marks	AO element	Guidance
7*			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)** A complete answer which explains detection, reflex arc and response. *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)** An incomplete answer which explains the reflex arc plus detection **OR** explains the reflex arc plus response **OR** explains detection plus response. *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)** An incomplete answer which explains only one aspect of what happens – either detection, or reflex arc, or response. *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.*	**6**	4 x 2.1 2 x 1.1	**AO2.1 Explaining how Nina detects the sharp stone** For example: • standing on the sharp stone causes pain/pressure • (sensory) receptors in Nina's foot/skin detect the pain/pressure/stimulus • nerve impulse • passes along sensory neuron • impulse travels to the spinal cord/central nervous system/CNS **AO1.1 Explaining how the reflex arc works** For example: • relay neuron • in the spinal cord • transmits nerve impulse from sensory neuron to motor neuron • via synapses • nerve impulse does not need to go to the brain/processing centre for there to be a response **AO2.1 Explaining how this causes Nina to respond** For example: • nerve impulse travels to an effector • along motor neuron • effector is muscle in Nina's leg/foot • effector/muscle is stimulated to respond/contract • this pulls Nina's foot away from the stone

Question			Answer	Marks	AO element	Guidance
8	(a)		B ✓	1	3.1a	**ALLOW** indication on diagram (e.g. ring around **B**)
	(b)		**Drawing includes:** upside-down measuring cylinder ✓ open end of measuring cylinder is under water ✓ end of delivery tube is inside or directly underneath the open end of the measuring cylinder ✓	3	3.3a	For example:  **ALLOW** maximum 2 marks if diagram **not** labelled
	(c)		the splint will stop glowing ✓ idea that (anaerobic) respiration produces carbon dioxide ✓	2	3.2a 2.1	**ALLOW** "it will be carbon dioxide/CO_2" for the result, but not for the explanation **ALLOW** indication (e.g. tick) in row 2 of table
	(d)		(anaerobic) respiration is an exothermic reaction / warms its surroundings / releases heat (energy) ✓	1	2.1	**ALLOW** "the reaction" for respiration **DO NOT ALLOW** "makes/creates/produces" energy
	(e)		**Any two from:** (water bath) controls the temperature / keeps the temperature constant ✓ only the sugar/substrate changes ✓ so the effect of changing the sugar/substrate can be seen (more clearly) ✓ reduces effects of random error / increases repeatability ✓	2	3.3b	**DO NOT ALLOW** ref. to "fair test" without explanation

Question			Answer	Marks	AO element	Guidance
8	(f)		both points plotted correctly at 400,42 and 450,45 ✓	1	2.2	**ALLOW** tolerance of +/- half a small square **IGNORE** any line(s) drawn to connect plots
	(g)		20 (cm^3) ✓	1	3.1	
	(h)		350 ✓ because no more gas was produced/collected after this time ✓	2	3.2b	**ALLOW** answer between 335 and 350 inclusive **ALLOW** line flat/horizontal/plateaus **IGNORE** "straight" line **ALLOW** volume of gas remained constant
	(i)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.24 (cm^3/s) award 2 marks** 34 – 10 **OR** 24 ✓ ÷ 100 = 0.24 ✓ cm^3/s ✓	3	 3.1a 2.2 2.2	 **ALLOW** ecf from mp1 **ALLOW** answer rounded to 0.2 **ALLOW** cm^3s^{-1}
	(j)		**Any two from:** the sugar is used up sooner ✓ maximum volume of gas is reached sooner ✓ gas starts to be produced sooner ✓ the line/volume is higher (at each time point / throughout) ✓ the line is steeper between 130 and 300 s ✓	2	3.2a	 **ALLOW** ref. to values **ALLOW** higher gradient

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