Oxford Cambridge and RSA

F

GCSE (9–1)

Biology B (Twenty First Century Science)

J257/02: Depth in Biology (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for Autumn 2021

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.

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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.

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.

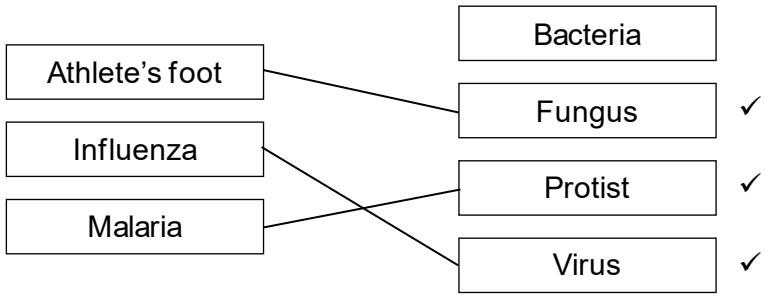
You should ensure that you have copies of these materials.

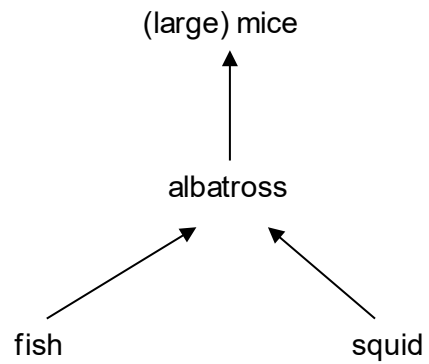
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New 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 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)		 ✓ ✓ ✓	3	1.1	
	(b)		bacterium / bacteria ✓	1	3.2b	
	(c)		White blood cells ✓	1	1.1	
	(d)		**Any three from:** some diseases are spread by direct contact with (infected) person ✓ some diseases are spread by touching (contaminated) surfaces ✓ some diseases are spread by body fluids/blood/semen / sexually transmitted ✓ some diseases are spread by mosquitoes/insects/animals ✓ some diseases are spread in (contaminated) food/water ✓ some diseases are inherited ✓	3	1.1	

Question			Answer	Marks	AO element	Guidance
2	(a)		all names on correct levels of food web ✓ all connecting lines have arrowheads pointing in correct direction (towards predator) ✓	2	2.1	 **ALLOW** "chicks" instead of "albatross"
	(b)	(i)	**Any two from:** changing environmental conditions / example ✓ toxic substances / example ✓ decrease in availability of their food/fish/squid ✓ new pathogen/disease/bacterium/virus ✓ human activity / example ✓	2	2.1	 e.g. temperature, sea level e.g. plastic, air/sea pollution e.g. over fishing/hunting, habitat destruction
		(ii)	D before B ✓ B before A ✓ A before C ✓	3	2.1	The correct order is DBAC

Question			Answer	Marks	AO element	Guidance
2	(b)	(iii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 57 award 2 marks** 32 + 64 + 50 + 79 + 60 = 285 ✓ 285 ÷ 5 = 57 ✓	2	1.2	
		(iv)	**Any two from:** humans introduced the mice / not supposed to be there / invasive species ✓ ref. to decrease/downward trend in population size shown in data from 1980 to 2000/2020 ✓ (so) it is our duty to protect the albatross / benefits outweigh objections ✓ killing the mice could halt/reverse the decrease / could save the albatross (on the island) from going extinct ✓	2	3.2a	**ALLOW** reverse argument (i.e. not acting could lead to extinction of the albatross)

Question			Answer	Marks	AO element	Guidance
3	(a)		artery ✓ withstand high pressure of blood carried away from the heart ✓ vein ✓ prevent blood from flowing backwards ✓	4	1.1	**ALLOW** idea of elastic recoils smoothing flow of blood in arteries/maintaining high blood pressure **DO NOT ALLOW** ref. to carrying blood away from the heart (as arteries also carry blood to the cardiac muscle) **DO NOT ALLOW** ref. to carrying oxygenated blood (as this is not related to the structure described in the middle column of the table) **DO NOT ALLOW** ref. to carrying blood towards the heart (as veins also carry blood away from the cardiac muscle) **DO NOT ALLOW** ref. to carrying deoxygenated blood (as this is not related to the structure described in the middle column of the table)

Question	Answer	Marks	AO element	Guidance
(b)*	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)** Describes the correct sequence of blood travelling to the gaseous exchange system first, returning to the heart, and then travelling to the rest of the body. **AND** Links most of the organs to the correct systems. *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)** Describes the basic sequence of blood travelling to the gaseous exchange system first before the rest of the body. **AND** Links some of the organs to the correct systems. *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)** Describes the basic sequence of blood travelling to the gaseous exchange system first before the rest of the body. **OR** Includes some of the organs. *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 Applying knowledge and understanding of circulatory system by describing sequence starting from right side of heart** • the blood leaves the right side/ventricle of the heart • the blood travels to the gaseous exchange system first • to take in oxygen • before returning, oxygenated, to the left side/atrium of the heart • then travelling to the rest of the body / other organ systems • and then returning to the right side/atrium of the heart (then up to the right ventricle again) • ref. to double circulatory system / passing through the heart twice in each complete circuit of the body **AO1.1 Describing the organs visited in each organ system by relating circulatory system with 3 other systems** • blood travels to the alveoli/lungs in the gaseous exchange system (where carbon dioxide/oxygen exchanged) • blood travels to the villi/intestines (in second circuit) in the digestive system (where water and dissolved food molecules move into the blood) • blood travels to the kidney(s) (tubules) in the excretory system (where urea exchanged with water)

Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	23 ✓	1	2.1	**ALLOW** "half"
		(ii)	46 ✓	1	2.1	
	(b)	(i)	**Any three from:** the pill contains/releases hormones ✓ the hormones stop Sarah from ovulating ✓ no egg/ovum is released ✓ fertilisation/conception cannot take place ✓	3	2.1	
		(ii)	**Any three from:** pill not 100% effective / reason why pill may not work ✓ condom provides a (physical) barrier ✓ which stops Ben's sperm from reaching Sarah's egg ✓ also stops transmission of STI/STD/pathogens/bacteria/viruses (which pill does not) ✓	3	2.1	e.g. Sarah might have missed a day, or taken at different times of day, or she might have already ovulated before taking it **ALLOW** named example of STI

Question			Answer	Marks	AO element	Guidance
5	(a)		interphase ✓ mitosis ✓ (C) B D A ✓✓✓	5	1.1 x 2 2.2 x 3	 In descending order
	(b)		the root (tip) is growing (longer) ✓ (growth is achieved by) making new cells ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	**Any two from:** temperature ✓ air movement / drafts / wind ✓ size/age of plants **OR** (total) size/number/surface area of leaves on each plant ✓ type/species of plants ✓	**2**	**3.3a**	
		(ii)	plant A received more light ✓ so would photosynthesise more ✓ the plant would need more water because it's an input/reactant for photosynthesis / the plant would need more water because more would be lost through open stomata (which are open to provide carbon dioxide for photosynthesis and get rid of waste oxygen) ✓	**3**	**2.1**	ORA for plant B throughout
	(b)	**(i)**	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 40 award 2 marks** 280 ÷ 7 ✓ = 40 (ml/day) ✓	**2**	**2.2**	
		(ii)	Potometer ✓	**1**	**3.3b**	more than one ring = 0 marks
	(c)	**(i)**	520 (g) ✓	**1**	**3.1a**	

Question			Answer	Marks	AO element	Guidance
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 420 (%) award 2 marks** (156 – 30) ÷ 30 = 4.2 ✓ 4.2 x 100 = 420 (%) ✓	**2**	**2.2**	
		(iii)	**Any two from:** plants do not take in soil ✓ the increase in mass of the plant was 126 g / it increased from 30 g to 156 g ✓ (but) the decrease in mass of the (pot and) soil was (only) 15 g / it decreased from 535 g to 520 g ✓ qualitative expression of the idea that the plant gained more mass than the soil lost / the decrease in mass of the soil was not large enough to account for the plant's increase in mass ✓	**2**	**3.1b**	
		(iv)	**Any two from:** they did not measure/investigate whether the plant took in carbon dioxide ✓ they measured how much water the added to the soil but not how much was taken up by the plant ✓ the water that was added to the soil may have been taken up by the plant or it may have evaporated/drained away ✓ the plant's increase in mass may have been due to another substance/factor they didn't measure/investigate ✓	**2**	**3.1b**	

Question			Answer	Marks	AO element	Guidance
7	(a)		**Any two from:** stored in the nucleus ✓ some also stored in organelles e.g. mitochondria ✓ as chromosomes / long molecules of DNA ✓ **AND** used (as instructions to join amino acids together) to make proteins/enzymes ✓	3	1.1	
	(b)		**Any two from:** stored in the cytoplasm / there is no nucleus ✓ circular chromosome / (large) loop of DNA ✓ plasmid(s) ✓	2	1.1	**ALLOW** description of plasmids if clear (e.g. "small extra loops of DNA"
	(c)	(i)	her sex chromosomes ✓ would be XX in a female ✓	2	2.1	**ALLOW** presence of 'XX' for one mark
		(ii)	genetic testing ✓ to look for allele(s)/mutation(s)/genetic variant(s) that cause(s) blue eye colour ✓	2	2.1	**ALLOW** genome sequencing
		(iii)	**Any three from:** her diet ✓ the amount of exercise she had ✓ diseases she caught/developed ✓ injuries she had ✓ toxins/poisons/chemicals she was exposed to ✓ sunlight/temperatures/weather she was exposed to ✓	3	2.1	Marks are awarded for environmental/lifestyle factors (e.g. diet/exercise) NOT for the features they affect (e.g. height/weight) **ALLOW** fighting/accidents
		(iv)	Most of our features ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	Particles of water ✓	1	1.1	more than one box ticked = 0 marks
		(ii)	From where they are concentrated - to where they are less concentrated ✓	1	1.1	more than one line drawn = 0 marks
		(iii)	**Any two from:** it is partially-permeable / semi-permeable ✓ it has holes/pores that are big enough to let small molecules through, but too small to let bigger molecules through ✓ idea that active transport carries some/specific molecules through the membrane ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
8	(b)	(i)*	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)** Most key steps of the method are described, with reference to the apparatus used to carry them out **AND** a description of how the measurements would be processed to calculate (mean) percentage change in mass. *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)** Most key steps of the method are described, with reference to the apparatus used to carry them out. **OR** Most key steps of the method are described, with a description of how the measurements would be processed to calculate (mean) percentage change in mass. *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)** Some key steps of the method are described. *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	3.3a	**AO3.3a Description of key steps in method** For example: • Weigh each potato piece before placing in the solution. • Soak each piece for suitable/same period of time. • Remove the pieces from the solution, and dry/remove water from the surface. • Weigh each piece again. • Idea of repeating or soaking multiple pieces in each solution so that the mean (of the percentage change in mass) can be calculated. **AO3.3a Description of apparatus used** For example: • Weigh each potato piece using a balance. • Time the soaking using a stopwatch/timer. • Remove potato pieces from solutions using forceps. • Dry potato pieces using paper towel/blotting paper. **AO3.3a Description of data processing** For example: • Calculate difference in mass by taking initial mass from final mass • Calculate percentage change in mass as follows: $\frac{\text{(final mass – initial mass)}}{\text{initial mass}} \times 100$

Question			Answer	Marks	AO element	Guidance
8	(b)	(ii)	"mean % change in mass (%)" label correctly added to y-axis ✓ both points plotted correctly at 0,16 and 6,–24 ✓	2	1.2	 **IGNORE** lines drawn to connect plots **ALLOW** a half square tolerance for each point
		(iii)	**Max two from:** when the water contained 0 g or 2 g of sugar, the potato pieces increased in mass ✓ when the water contained 4 g or 6 g of sugar, the potato pieces decreased in mass ✓ no change of mass at 2.5g ✓ **Max two from:** (increase in mass) due to water moving into the potato (cells) (by osmosis) ✓ (decrease in mass) due to water moving out of the potato (cells) (by osmosis) ✓ at equilibrium/2.5g there is no net movement/same number of particles moving each way ✓	4	3.1a x 2 2.1 x 2	 **DO NOT ALLOW** negative correlation
		(iv)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.1 (g/cm^3) award 2 marks** (0% change at) 2.5 g ✓ 2.5 g ÷ 25 cm^3 = 0.1 g/cm^3 ✓	2	 3.2a 3.2b	 **ALLOW** any number from 2.4 to 2.6 inclusive **ALLOW** any number from 0.09 – 0.11 inclusive

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