Oxford Cambridge and RSA

F

GCSE (9–1)

Biology B (Twenty First Century Science)

J257/01: Breadth in biology (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

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.

Annotations

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	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.

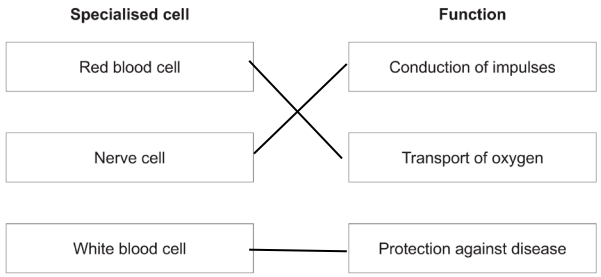
You should ensure that you have copies of these materials.

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)		 ✓✓	2	1.1 x 2	3 correct lines = 2 marks 2 correct lines = 1 mark 1 correct line = 0 marks **IGNORE** any box with more than 1 line joined to it
	(b)		When the egg is fertilised ☐ Before the eight-cell stage ☐ After the eight-cell stage ✓ ✓	1	1.1	
	(c)		mitochondrion ✓ chloroplast ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	dominant ✓ homozygous ✓	2	2.1	
		(ii)	RR ☐ Rr ☐ rr ✓ ✓	1	2.1	
		(iii)	R and r separated in both male and female gametes✓ Correct genotypes in Punnett square✓ Probability correct 0.75/75%/¾/3 in 4 ✓	3	2.1	<table><tr><td></td><td>R</td><td>r</td></tr><tr><td>R</td><td>RR</td><td>Rr</td></tr><tr><td>r</td><td>Rr</td><td>rr</td></tr></table> **ALLOW ECF** for mp 2 and 3
	(b)		phenotype ✓	1	1.1	
	(c)	(i)	The chromosomes inherited from the mother ☐ The DNA found in the sperm cell ☐ The entire genetic material of an organism ✓ ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
		(ii)	Chloroplast ☐ Cytoplasm ☐ Nucleus ✓ ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
3	(a)		Zone of inhibition or white area (in B) is greater (than A and C) / (B) killed more bacteria (than A and C) ✓	1	3.2b	**ALLOW** B has largest zone of inhibition/white area **ALLOW** B killed most bacteria **IGNORE** B has large zone of inhibition/white area
	(b)		Antibiotic C ✓ No bacteria killed / no zone of inhibition or white area ✓	2	3.2b	 **ALLOW** the plate is all grey / the bacteria are growing right up to the antibiotic
	(c)		D B A C ✓✓✓	3	2.1	D before B = 1 mark B before A = 1 mark A before C = 1 mark
	(d)		Darwin and Wallace ✓ Mendel and Darwin Wallace and Mendel ✓	1	1.1	
	(e)		Idea of (fossils showing) change occurring over time/the fossils in the diagram show the skull changed over time / idea of transitional species ✓ **AND Any two from** (examples of change from the diagram): shape of skull ✓ volume of skull ✓ jaw shape ✓	3	2 .1	 **ALLOW** any reasonable change indicated in the diagram

Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	phototropism ✓	1	1.1	
		(ii)	gravitropism ✓	1	1.1	
		(iii)	auxin ✓	1	1.1	
	(b)		They have a cell wall. ✓ They have platelets. They have white blood cells. They produce antibodies. They produce antimicrobial substances. ✓ ✓✓	2	1.1	
	(c)	(i)	Anaerobic (respiration) ✓	1	1.1	
		(ii)	Active transport uses ATP. ✓ Active transport requires a concentration gradient. Active transport needs water. Less ATP is made in aerobic respiration. Less ATP is made in anaerobic respiration. ✓ ✓✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
5	(a)		39 ✓	1	2.2	
	(b)		Meiosis ☐ Mitosis ✓ Replication ☐ ✓	1	1.1	
	(c)		Genetic variation ✓	1	1.1	
	(d)		humans have different chromosomes / are not Z and W / are X and Y✓ idea that male chickens have two of the same chromosome, in humans this is seen in the female/ idea that female chickens have two different chromosomes, in humans this is seen in the male ✓	2	2.1	

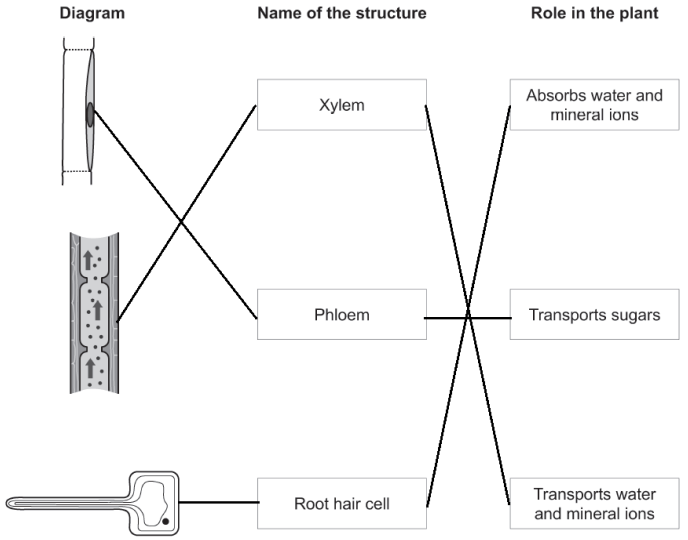
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>6</td><td>(a)</td><td></td><td>high✓
pancreas✓
more✓</td><td>3</td><td>1.1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><th>Statement about hormonal control</th><th>True</th><th>False</th></tr><tr><td>Effects can be long-lasting.</td><td>✓</td><td></td></tr><tr><td>Hormones are transported by the blood.</td><td>✓</td><td></td></tr><tr><td>Target cells have specific receptors.</td><td>✓</td><td></td></tr><tr><td>Hormones are usually fast-acting.</td><td></td><td>✓</td></tr><tr><td>Hormones are secreted by glands.</td><td>✓</td><td></td></tr></table>✓✓</td><td>2</td><td>1.1</td><td>4 or 5 correct = 2 marks
2 or 3 correct = 1 mark
DO NOT ALLOW more than one tick in a row
ALLOW any indication of the correct answer e.g. crosses instead of ticks</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Unspecialised cells/undifferentiated cells ✓

Can turn into any type of cell ✓</td><td>2</td><td>2.1</td><td>ALLOW for two marks they are able to specialise/differentiate into any type of cell</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	Male = 450 Female = 300 ✓	1	2.2	Both values needed for 1 mark
		(ii)	Men are generally at greater risk of dying from bowel cancer than women. ✓ The male risk is always double that of the female. Men and women are at the same risk of bowel cancer. More women in the age category 45–49 die of bowel cancer than men. ✓	1	3.2b	
	(b)		**Any two from:** being overweight ✓ eating processed meat ✓ low fibre diet ✓	2	3.2a	**MAX 1 MARK** if any other cause is selected in addition to two or more correct causes
	(c)		**Any two from:** HIV is infectious/can be passed on / cancer is not infectious /cannot be passed on ✓ cancer is (a disease) caused by uncontrolled cell division or growth / HIV is (a disease) not caused by uncontrolled cell division or growth ✓ cancer has genetic causes/HIV does not have genetic causes ✓	2	1.1	**IGNORE** HIV is a pathogen/virus or AIDS is caused by a pathogen/virus **IGNORE** cancer is caused by rapid cell division **ALLOW** tumours are seen in cancer

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	Three correct plots ✓✓	2	2.2	two correct plots = 1 mark **ALLOW** tolerance of ± half a square **IGNORE** width of bars and spacing between bars
		(ii)	The number of cases roughly doubled between 2010 and 2011. ✓ The number of cases confirmed was lowest in 2014. The number of cases in 2016 was roughly half that of 2015. The number of cases peaked in 2012. ✓ The number of cases in 2016 was lower than the number of cases in 2014. ✓✓	2	3.1a	One mark for each correct answer
		(iii)	2012 ✓ 2013 2014 ✓	1	3.2a	
	(b)		The vaccination stimulates the production of platelets. The vaccination makes the heart beat faster. The vaccination makes the body make more red blood cells. The vaccination causes the white blood cells to make antibodies. ✓ ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
	(c)		**Idea of how the disease could spread max. one mark:** hands/physical contact/surfaces✓ droplet/airborne ✓ **Idea of how the spread could be prevented max. two marks:** treatment/antibiotics ✓ isolation/restrict travel ✓ hygiene or example of hygienic practice e.g. use and dispose of tissues/washing hands ✓ barriers e.g. masks/gloves/cough or sneeze into your elbow /cover your mouth ✓ vaccination ✓	**3**	2.1	**ALLOW** cough/sneeze

Question			Answer	Marks	AO element	Guidance
9	(a)		 ✓✓✓✓✓	5	1.1	6 correct lines = 5 marks 5 correct lines = 4 marks 4 correct lines = 3 marks 3 correct lines = 2 marks 1 or 2 correct lines =1 mark **IGNORE** any box with more than 1 line joined to it
	(b)		stage ✓ objective lens ✓ focussing knob ✓	3	1.2	
	(c)	(i)	9 ✓	1	2.2	
		(ii)	(9 × 60 =) 540 ✓	1	2.2	**ALLOW ECF**
		(iii)	Repeat (the procedure) on more of the leaf/more areas/more fields of view (on the same leaf) ✓ use this to calculate a mean and multiply by the total area (of this leaf)/60 ✓	2	3.3b	**IGNORE** just repeat **DO NOT ALLOW** the idea of testing more leaves **IGNORE** average
		(iv)	Number estimated could be too small/too big ✓	1	2.2	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>10</td><td>(a)</td><td></td><td>C ✓

AND Any one from:

idea that the 2 sides of the heart are separated / idea of septum / deoxygenated and oxygenated blood does not mix ✓

there are two ventricles ✓

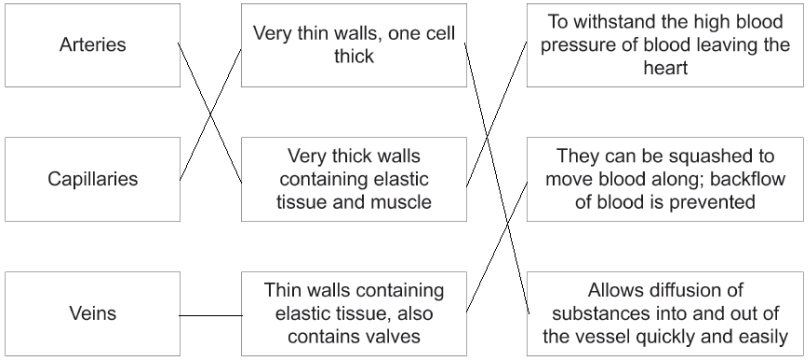
there are 4 separate chambers✓

the blood passes through the heart twice/double circulatory system ✓</td><td>2</td><td>2.1</td><td>ALLOW ECF if B is selected for mark points 2,3 and 4

ALLOW the idea that there are 4 sections in the heart or that in B the blood is only entering 2 chambers/sections of the heart

ALLOW a correct description of a double circulatory system

DO NOT ALLOW heart has valves</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><th></th><th colspan="3">Structure</th></tr><tr><th>Function</th><th>Heart valves</th><th>Cardiac muscle</th><th>Heart chambers</th></tr><tr><td>Contracts to force blood from atria to ventricles</td><td></td><td>✓</td><td></td></tr><tr><td>Contracts to force blood out of the ventricles through vessels</td><td></td><td>✓</td><td></td></tr><tr><td>Prevents backflow of blood during contractions</td><td>✓</td><td></td><td></td></tr><tr><td>Blood temporarily stored in these small spaces to allow blood to be pumped at a high pressure</td><td></td><td></td><td>✓</td></tr></table>✓✓✓✓</td><td>4</td><td>1.1</td><td>one mark for each correct row</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
	(c)		**Any one from:** baby will be more tired/won't have as much energy ✓ idea of fast or difficulty breathing ✓ idea of reduced cardiac output ✓ idea that there is slower growth/baby does not gain weight ✓ idea that there is less oxygen in (baby's) blood ✓ idea that oxygenated blood and deoxygenated blood can mix ✓	**1**	2.1	**IGNORE** backflow of blood **IGNORE** surgery **ALLOW** any other valid suggestion
	(d)		 ✓✓✓	**3**	1.1	6 correct lines = 3 marks 5/4 correct lines = 2 marks 3/2 correct lines = 1 marks **IGNORE** any box with more than 1 line joined to it

Question			Answer	Marks	AO element	Guidance
11	(a)		**Any one from:** idea that whales move / whales will spend time in different locations ✓ idea that whales live in the ocean so may not be visible/ difficult to find or words to that effect ✓ idea that the same whales could be counted twice ✓ idea that the population keeps changing/more will be born/some will have died ✓	**1**	2.1	**ALLOW** idea that it is impractical/difficult to count all whales or more efficient to estimate **ALLOW** ocean is vast **ALLOW** any sensible suggestions as to why the number is an estimate
	(b)		**Any one from:** Yes: numbers have increased greatly / there has been a 390% increase since ban / about 5 times as many as before the ban ✓ No: numbers are still low / idea that numbers have not returned to pre whaling figures / the number of whales is still only 19.6/20% of the pre whaling numbers ✓	**1**	3.1b	no mark for yes or no unqualified **DO NOT ALLOW** numbers have gone up unqualified **IGNORE** incorrect data manipulation if candidate has clearly stated rise in numbers is great

Question			Answer	Marks	AO element	Guidance
	(c)		**Any two from:** competition for food ✓ less food available ✓ climate change ✓ illegally hunted/could still be hunted ✓ increase in predators ✓ disease in whale population ✓ being killed by plastic / pollution in oceans ✓ idea that whales have difficulty reproducing / fewer to reproduce ✓ idea of negative effect of shipping on whales ✓	**2**	3.2b	**ALLOW** idea of long gestation period or imbalance in numbers of males and females **ALLOW** idea of less genetic variation in population
	(d)		**Any one from:** idea that numbers have not returned to previous levels / numbers are still very low ✓ idea that numbers could/would begin to fall (quickly) / previous whaling reduced numbers drastically (approx 95%) ✓ they could become endangered again ✓	**1**	3.2a	**ALLOW** idea that numbers could fall to the point where the whales could become extinct **ALLOW** will have an impact on the food web/chain / interdependence argument

Question			Answer	Marks	AO element	Guidance
	(e)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 130 award 3 marks** 5000 ÷ 1.6 = 3125 ✓ 3125 ÷ 24 = 130.2 ✓ 130.2 = 130 (given to 2 sig fig) ✓	**3**	 2.2 x 2 1.2	**ALLOW for 2 marks** 130.21/130.2 **ECF** one mark for a number divided by 24 **ALLOW** one mark for evidence leading to a number given to 2 sig fig

OCR (Oxford Cambridge and RSA Examinations)
The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk