OCR
Oxford Cambridge and RSA

GCSE (9-1)

Biology B (Twenty First Century)

Unit **J257F/01**: Foundation Tier – Breadth in biology

General Certificate of Secondary Education

Mark Scheme for June 2018

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 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

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**.

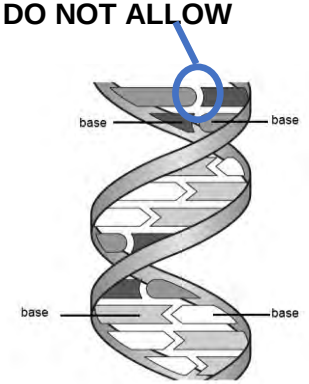
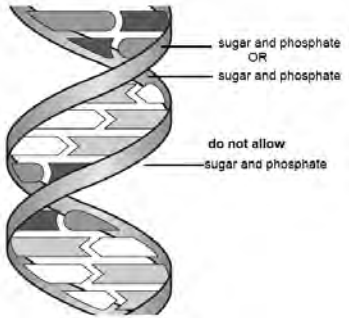
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

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)		iris ✓ cornea ✓ lens ✓ ciliary muscle ✓	3	1.1 x 3	three or four correct = 3 marks two correct = 2 marks one correct = 1 mark
	(b)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 4.6 (mm) award 2 marks** (4.0 +3.8+6.0)/3 ✓ = 4.6 (mm) ✓ **OR** 13.8/3 ✓ = 4.6 (mm) ✓	2	2.2 x 2	
		(ii)	6.0 / experiment 3 ✓ because it is far greater than the other two results / it is greater than the range stated ✓	2	3.1b x 2	**ALLOW** outside the range / the other two results are **only** 0.2mm different / too high (compared to the other results) / the other results are between 2 -4mm or within the range **IGNORE** not closely related / 6.0 (it) is the greatest
		(iii)	repeat his experiment again ✓	1	3.3b	**IGNORE** do more experiments / repeat it on different people / another experiment / do it more than once
		(iv)	pupil drawn is bigger than that in the first diagram ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
		(v)	A rapid and involuntary response ✓	1	1.1	more than one tick = 0 marks
		(vi)	sensory neuron ✓	1	1.1	more than one ring = 0 marks
	(c)		**Any three from:** Amir is long sighted ✓ the light rays do not meet at the retina / the light is not focussed at the retina / light is focussed behind the retina / light rays meet behind the retina ✓ use glasses with convex lenses ✓ they will make the light rays bend more / focus the light or the image on the retina ✓	3	2.1 x 3	**ALLOW** has hyperopia or hypermetropia **ALLOW** the eyeball is too **short** / lens is too thin or narrow / light is not refracted or bent **enough** / lens cannot become round enough **DO NOT ALLOW** responses that refer to light reflecting in the eye

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	base correctly labelled ✓	1	1.1	**label lines must clearly touch the relevant part of the molecule** **only one of the four types of base need to be labelled** **ALLOW A, T, C or G for the base** **DO NOT ALLOW** 
		(ii)	sugar and phosphates correctly labelled ✓	1	1.1	**label lines must clearly touch the relevant part of the molecule** 
	(b)		23% of the sample will be base T ✓ 27% of the sample will be base C ✓	2	1.2	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td>(i)</td><td>TT ✓</td><td>1</td><td>2.1</td><td>more than one tick = 0 marks</td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><td></td><td>T</td><td>T ✓</td></tr><tr><td>t</td><td>Tt</td><td>Tt</td></tr><tr><td>t</td><td>Tt</td><td>Tt ✓</td></tr></table></td><td>2</td><td>2.2 x 2</td><td>one mark awarded for correct gamete genotypes

one mark awarded for correct offspring genotypes derived from gamete genotypes

ALLOW ECF from (a)(i)

if Tt or tT identified as genotype
<table><tr><td></td><td>T</td><td>t ✓</td></tr><tr><td>t</td><td>Tt</td><td>tt</td></tr><tr><td>t</td><td>Tt</td><td>tt ✓</td></tr></table>
or if tt identified as genotype
<table><tr><td></td><td>t</td><td>t ✓</td></tr><tr><td>t</td><td>tt</td><td>tt</td></tr><tr><td>t</td><td>tt</td><td>tt ✓</td></tr></table></td></tr>
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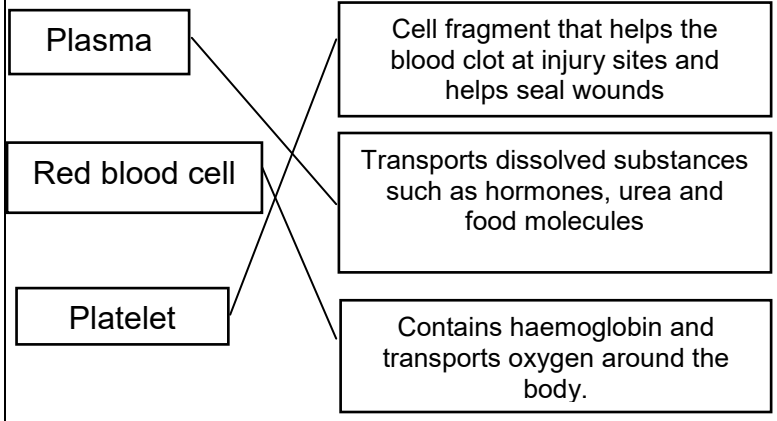
Question			Answer	Marks	AO element	Guidance
		(iii)	1 / 100% / certain ✓	1	3.2b	**ALLOW ECF from (a) (ii)** if Tt or tT identified as genotype probability is 0.5 / 50% / ½ ✓ if tt identified as genotype probability is 0% ✓
		(iv)	**Any two from:** sex chromosomes/ X and Y chromosomes / 23rd pair of chromosomes ✓ male is XY and female is XX ✓ genes on the Y chromosome trigger the development of testes ✓ 50% sperm carry X and 50% carry Y so the outcome of XY and XX is 50:50 ✓	2	1.1 x 2	**ALLOW** female has XX chromosomes and male has XY chromosomes for 2 marks
		(v)	contraceptive pill ✓ *plus one from:* because it prevents ovulation / prevents release of an ovum or egg ✓ thickens the mucus of the cervix so sperm can't pass through ✓ if they are happy to have unprotected sex / AW ✓	2	1.1 x 2	suggested form of contraception = 1 mark justification = 1 mark

Question			Answer	Marks	AO element	Guidance
			OR condom ✓ *plus one from:* because it prevents sperm reaching ovum or egg / prevents sperm entering the vagina or cervix or uterus ✓ also protects against spread of STIs / AW ✓ **OR** female condom ✓ *plus one from:* because it prevents sperm reaching ovum or egg / prevents sperm passing into the uterus or through the cervix ✓ also protects against spread of STIs / AW ✓ **OR** intra-uterine device / system or IUD or coil ✓ *plus one from:* can remain in place for a long time or up to ten years ✓ prevents sperm surviving in the uterus ✓ stops egg or ovum being fertilised ✓ prevents embryo implanting in the uterus ✓ **OR** diaphragm ✓ *plus* prevents sperm entering the uterus ✓			**IGNORE for condom, IUD and diaphragm** justification that refers to sperm not entering the woman's body **IGNORE** throughout justification referring to cost or availability or efficacy or safety

Question			Answer	Marks	AO element	Guidance
			OR contraceptive implant ✓ *plus one from:* works for up to 3 years ✓ prevents ovulation / prevents ovum or egg being released ✓ **OR** surgical method / vasectomy / sterilisation ✓ *plus one from:* a permanent solution (as they don't want any more children) ✓ prevents eggs and sperm meeting as tubes are cut ✓ no sperm released with vasectomy ✓ egg cannot pass down oviduct with female sterilisation ✓ **OR** rhythm method / abstinence ✓ *plus one from:* no chemicals are used ✓ there are no religious or ethical objections ✓			**DO NOT ALLOW** prevents eggs or sperm being made

Question			Answer	Marks	AO element	Guidance
4	(a)		non-communicable ✓ DNA ✓ mitosis ✓ tumour ✓	4	1.1 x 4	
	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 64 (%) award 2 marks** (4736 / 7399) x 100 ✓ = 64 (%) ✓	2	2.2 x 2	**ALLOW** 64.01(%) for 2 marks
	(c)		**Any one from:** infection ✓ death ✓ bleeding ✓ damage to other cells, tissues or organs ✓	1	2.1	**IGNORE** won't be able to have children / the operation could go wrong / cancer could spread / scarring

Question			Answer	Marks	AO element	Guidance
	(d)	(i)	**Any one from:** from day 1 to day 6 there is no change in number of white blood cells ✓ number of white blood cells **starts to** fall on day 6 (after treatment) ✓ number of white blood cells falls (rapidly) on day 7 (after treatment) ✓ the number of white blood cells falls 7-14 days (after treatment) ✓ **AND** **Any one from:** the number of white blood cells is at its lowest 14 days (after treatment) ✓ the number of white blood cells (starts to) rise on or from 14 days (after treatment) ✓ the number of white blood cells increases **rapidly** on or from day 15 (after treatment) ✓ the number of white blood cells has returned to normal 21 days (after treatment) ✓	**2**	**3.2b x 2**	**ALLOW** lowest between days 13-14 (after treatment) **IGNORE** number of white blood cells starts to rise on day 15 **IGNORE** answers that refer to weeks

Question			Answer	Marks	AO element	Guidance
		(ii)	**Any two from:** white blood cells engulf or ingest **and** digest pathogens✓ white blood cells produce antibodies ✓ white blood cells become memory cells in case of re-infection ✓ **AND** **Any one from:** white blood cells contain enzymes to digest pathogens ✓ white blood cells have receptors that recognise antigens on pathogens ✓ the antibodies produced by white blood cells are specific to pathogens ✓	**3**	**1.1 x 3**	**ALLOW** carry out phagocytosis **NOT** white blood cells produce antigens
		(iii)		**2**	**1.1 x 2**	two or three correct lines = 2 marks one correct line = 1 mark

Question			Answer	Marks	AO element	Guidance
		(iv)	Eve ✓ Mia ✓	2	2.1 x 2	
	(e)	(i)	**Any two from:** a placebo contains no active drug (so treatment is effectively witheld) ✓ cancer would not be treated / disease could get worse ✓ it is not ethical to withhold treatment ✓	2	3.2a x 2	**DO NOT ALLOW** could affect the person's health
		(ii)	The combination of drugs given to Group A was the most effective ✓	1	3.2b	
		(iii)	Tests for both ✓ Tests for safety ✓ Tests for both ✓	3	1.1 x 3	**IGNORE** any row containing more than one tick

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	**Any two from** stem cells are unspecialised/undifferentiated ✓ (in the right conditions) stem cells can specialise / differentiate into cells that are needed ✓ stem cells can be used to replace damaged cells or tissues ✓	2	1.1 x 2	**ALLOW** stem cells can develop into many different or any type of cell that is needed **ALLOW** specific examples of when stem cells are needed e.g. when a patient with leukaemia is given stem cells, they can specialise to grow new bone marrow **IGNORE** produce new body parts
		(ii)	to reduce risk of contamination ✓	1	1.2	**IGNORE** to keep it clean
		(iii)	Bone marrow ✓ Embryos ✓	2	1.1 x 2	
		(iv)	results are looked at by other scientists or experts working in the field ✓ gives you greater confidence in or confirms the findings ✓	2	1.1 x 2	**IGNORE** results are looked at by other people in the same field **ALLOW** to obtain more evidence / to ensure the data is accurate or repeatable or reproducible / to evaluate the work
	(b)		78 ✓ 39 ✓	2	2.1 x 2	

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	**Any two from:** dogs with desirable characteristics are selected (by humans) ✓ these individuals are bred together ✓ to produce offspring with desirable characteristics ✓	**2**	**2.1 x 2**	
		(ii)	can cause health problems ✓	**2**	**1.1**	**ALLOW** examples of health problems such as heart, joint, breathing or behavioural problems
	(b)		a cockapoo can mate with other dogs to have offspring ✓ (the offspring) are fertile ✓	**2**	**2.1 x 2**	

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	**Any two from:** correlation between amount of cod caught and stock size✓ (catch and stock) increased from 1977 to 1981 ✓ catch dropped from 1981 to 2003 ✓ stock fell from 1981 to 2006 ✓ catch and stock remained at low levels from 2003 to 2006 ✓ (catch and stock) starts to increase from 2006/7 ✓ **Any one from:** due to over fishing / lots of fish caught so numbers dropped ✓ they were catching fish faster than they were reproducing ✓	**3**	**3.1a x 2** **3.2b**	**ALLOW** as the stock levels fall so does the catch **ORA** **IGNORE** as the catch falls the stock falls / the lower the catch the lower the stock **IGNORE** over time both values decreased **ALLOW** catch was highest in 1981 and lowest in 2003 **ALLOW** stock was highest in 1981 and lowest in 2006 **If no other mark awarded** allow for 1 mark the idea that the number of fish increased then decreased

Question			Answer	Marks	AO element	Guidance
		(ii)	**Any one from** stocks were too low ✓ if fishing had continued stocks would have dropped further cod stocks so low that the species could have gone (locally) extinct if fishing continued ✓	1	3.2a	**ALLOW** so cod stocks could increase **IGNORE** because cod stocks had decreased **IGNORE** because they weren't able to catch as much cod / it was difficult to get hold of cod / less cod was being caught / the catch was too low **ALLOW** so cod didn't go extinct
		(iii)	**Any two from** idea of interdependence ✓ example of interdependence e.g. food / shelter / reproduction ✓ maintaining genetic diversity ✓ may be required in the future for medicines / industrial materials ✓ ecosystems (with high biodiversity) are more stable / able to adjust to changing conditions **ORA** ✓	2	1.1 x 2	**ALLOW** so food chains aren't affected **IGNORE** to protect living things/keep the planet safe / so species survive **ALLOW** species are less likely to become extinct **ALLOW** ecosystems with high biodiversity are more attractive e.g. for recreation or tourism
		(iv)	greater **genetic** variation in population✓	1	1.1	**ALLOW** more genetic diversity

Question			Answer	Marks	AO element	Guidance
	(b)	(i)	Benedict's solution tests for presence of (reducing) sugar ✓ use biuret solution to test for protein ✓	2	2.2 1.2	**ALLOW marks anywhere on the answer lines** **ALLOW** phonetic spellings of biuret **ALLOW** description of biuret chemicals ie sodium hydroxide and (dilute) copper (II) sulfate
		(ii)	Light blue to lilac/purple ✓	1	1.2	

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	There are differences between fossils and living examples of similar organisms✓ Isolated populations of the same species living in different places have different characteristics ✓	2	1.1 x 2	
		(ii)	natural selection ✓	1	1.1	**ALLOW** survival of the fittest
	(b)	(i)	chloroplast(s) ✓	1	1.1	**ALLOW** chlorophyll
		(ii)	water availability ✓	1	1.1	
	(c)	(i)	number of iguanas decrease ✓ due to a shortage of food ✓	2	2.1 x 2	 **ALLOW** they will starve **DO NOT ALLOW** (they will have) no food
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **if answer = 1.5 (m) award 2 marks** iguana drawing measures 10 cm 10 x 15 = 150 ✓ 150 cm ÷ 100 = 1.5 (m) ✓	2	2.2 x 2	 **ALLOW** working mark if measured incorrectly derived from length (cm) ÷ 100
		(iii)	(1.5 ÷ 100) x 80 = 1.2 (m) ✓	1	2.2	**ALLOW ECF from (c) (ii)**

Question			Answer	Marks	AO element	Guidance
		(iv)	The marine iguanas that decreased in size the most on average lived for a greater length of time ✓ The marine iguanas that did not decrease in size survived for approximately 2 years less than the marine iguanas that decreased in size by up to 60 mm ✓	2	3.2b x 2	

Question			Answer	Marks	AO element	Guidance
9	(a)		(capture a sample of woodlice from an area and) mark the individuals ✓ release the individuals ✓ collect a second sample and count the number of marked individuals ✓ use the equation estimated population size = (number of) individuals given mark x (number of) individuals recaptured ÷ (number of) recaptured individuals that have a mark ✓ **OR** randomly place **quadrat** ✓ count number of woodlice (in the quadrat) ✓ repeat procedure **and** work out mean number of woodlice in one quadrat ✓ correct description of how to process data to calculate population in whole area ✓	4	2.2 x 4	**ALLOW** mark, release, recapture or capture - mark - recapture for 2 marks **ALLOW** (number in) 1st sample x (number in) 2nd sample / (number in) 2nd sample marked **ALLOW** average **ALLOW** correct description of how to calculate mean
	(b)		lose less water / don't dry out **ORA** ✓ less/by evaporation ✓ water required for decomposition (by microorganisms) of food source ✓	2	2.1 x 2	**ALLOW** woodlice need water for their gills to work or to breathe **ALLOW** osmosis **ALLOW** because this is where they find their food

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