

GCSE (9-1)

Biology B (Twenty First Century Science)

J257/01: Breadth in biology (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2019

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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.

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Annotations available in RM Assessor

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
1	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.

C	Question		Answer		AO element	Guidance	
1	(a)		arrow drawn to any part of the stage ✓	1	1.2	e.g.	
	(b)		use the (focussing)knob/wheel / use coarse/fine focus / change the position of the stage ✓	1	1.2	ALLOW descriptions of focussing process DO NOT ALLOW any reference to magnification or lenses Check the diagram	
	(c)		multiply the (power of the) objective lens by the (power of the) eyepiece lens ✓	1	1.2	ALLOW objective lens x eyepiece lens / times them together	
	(d)		Nucleus ✓	1	1.1		

C	uestio	n Answer	Marks	AO element	Guidance
2	(a)	cytoplasm ✓ mitochondria ✓	2	2 x 1.1	
	(b)	energy/heat is released ✓	1	1.1	ALLOW warms/transfers energy to surroundings / temperature of surroundings increases DO NOT ALLOW energy/heat is created
	(c)	Produces ethanol False Produces lactic acid True Does not produce ATP False Uses glucose True Uses oxygen False	3	3 x 1.1	4/5 correct = three marks 3 correct = two marks 1/2 correct = one mark
	(d)	They have a higher resolution ✓	1	1.2	

Q	Question		Answer		AO element	Guidance	
3	(a)	(i)	James ✓	1	2.1		
		(ii)	Mia ✓	1	2.1		
		(iii)	Amir ✓	1	2.1		
		(iv)	Beth ✓	1	2.1		
	(b)		Unspecialised cells ✓	1	2.1		
	(c)		DNA ✓ Physical similarities/differences✓	2	2 x 1.1		

C	Question		Answer		AO element	Guidance	
4	(a)	(i)	Biuret ✓	1	1 x 1.2		
		(ii)	Selective breeding ✓	1	1 x 2.1		
	(b)		(day) 21 ✓	1	1 x 3.1a		
	(c)	(i)	28 (hours) ✓	1	1 x 1.2	ALLOW 2 - 30 (hours)	
		(ii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 8 (hours) award 2 marks	2	2 x 1.2		
			64÷ 8 ✓ = 8 (hours) ✓				
	(d)		Hormones ✓	1	1 x 1.1		

C	Question		Answer		AO element	Guidance	
5	(a)		there will be fewer sand eels ✓	2	1 x 3.1a	IGNORE sand eels will die out	
			because there will be more Minke whales (to eat them) ✓		1 x 3.2b		
	(b)	(i)	bioaccumulation ✓	1	1 x 1.1		
		(ii)	Any two from: microorganisms/decomposers/bacteria/fungi ✓ break down the whale's body/dead organic material ✓ for the (re)cycling ✓ of carbon/carbon dioxide/nitrogen/nitrogen compounds/minerals ✓ so dead bodies don't build up ✓	2	2 x 1.1	DO NOT ALLOW reference to microorganisms/decomposers/bacteria/fungi unless in the correct context of decomposition ALLOW returns minerals/elements/compounds to the ground/soil/environment	
		(iii)	increases ✓ enzymes ✓	2	2 x 1.1		

Q	uestic	on	Answer	Marks	AO element	Guidance	
6	(a)		Carbon dioxide – diffusion ✓ Water – osmosis ✓	2	2 x 1.1	DO NOT ALLOW more than one line from a substance to a process	
	(b)	(i)	(0)7.00/7(am) to 20.00/8(pm)	1	1 x 3.1a		
		(ii)	(0)9.00/9(am) to 18.00/6(pm) ✓	1	2 x 3.1a		
		(iii)	an X clearly placed on the graph where photosynthesis and respiration are the same rate ✓	1	1 x 3.1a	rate of photosynthesis rate of plant respiration on the day ALLOW only one point needing to be identified for the mark.	
	(c)		Any three from: makes less/not enough chlorophyll/chloroplasts ✓ idea of less photosynthesis ✓	3	3 x 2.1	IGNORE no chlorophyll/chloroplasts made ALLOW less/not enough light absorbed IGNORE no photosynthesis	
			less/not enough glucose produced ✓ glucose needed for growth ✓			IGNORE no glucose produced/less food produced If no other mark awarded: ALLOW for one mark idea that chlorophyll is needed for photosynthesis	

C	Quest	ion	Answer	Marks	AO element	Guidance
7	(a)		males have half the number of chromosomes (compared to females) / females/queens have double/twice the number of chromosomes (as males) ✓	1	1 x 2.2	ALLOW males have less chromosomes (compared to the female/queen) ALLOW females/queens have more chromosomes (than males) ALLOW The queen has 32 but the male only has 16 (chromosomes) IGNORE references to genes
	(b)		meiosis√	1	1 x 2.1	DO NOT ALLOW miosis
	(c)		32 ✓ Female ✓ 16 ✓ Male ✓	4	2 x 2.2 2 x 2.1	Left-hand column = AO2.2 Right-hand column = AO2.1
	(d)	(i)	Any three from: invertase/enzyme has an active site✓ invertase/enzyme is the lock AND sucrose is the key ✓	3	3 x 2.1	ALLOW two marks for a fully labelled diagram e.g.
			(active site) is complementary to sucrose / substrate/sucrose fits into the active site ✓ invertase/enzyme is specific/will only catalyse the reaction for sucrose / only sucrose can fit ✓ products are released from the enzyme/invertase/active site ✓			IGNORE just sucrose/substrate goes in active site

C	uestion	Answer	Marks	AO element	Guidance
	(ii)	(rate of reaction) will decrease ✓	2	2 x 2.1	
		due to the active site changing shape / enzyme is denatured ✓			IGNORE the reaction stops
		OR			
		(the rate of reaction will) increase as the temperature increases up to the optimum ✓			
		due to molecules/particles having more (kinetic) energy / there being more successful collisions ✓			

	Questi	ion	Answer	Marks	AO element	Guidance
8	(a)		A Condensation B Evaporation C Precipitation Transpiration One mark for each one correct ✓✓✓✓	4	4 x 1.1	
	(b)		decrease ✓ increase ✓	2	2 x 2.1	
	(c)	(i)	organisms ✓	1	1 x 1.1	
		(ii)	All things have a right to live = ethical Species provide us with useful products = economic Removing one species can affect a whole ecosystem = environmental ✓	1	1 x 1.1	
	(d)		Biofuel✓	2	2 x 3.1a	Check graph for calculation
			has increased by 37% ✓			

Question	Answer	Marks	AO element	Guidance
(e) (i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 49(%) award 3 marks 104700 + 7500 + 800 / 113000 ✓ (113 000 ÷ 230 000) x 100 ✓ = 49 (%) ✓	3	3 x 2.2	ECF if 113 000 incorrect 49.1304347 correctly rounded to 3 or more sig figs = two marks
(ii	Any one from: (it is an estimate because) all orangutans may not have been counted / impractical/difficult to count <u>all</u> orangutans ✓ numbers are high / they are mobile / they may be difficult to find / the area is large / more have been born ✓ some orangutans may have been counted more than once / deaths ✓	1	1 x 3.1b	ALLOW you can't count them all

C	uesti	ion	Answer	Marks	AO element	Guidance
9	(a)		changing/modifying the genome/DNA/genetic material of an organism ✓	2	2 x 1.1	ALLOW introduce a gene from another organism
			to introduce desirable characteristics / altering the characteristics ✓			ALLOW example of a desired characteristic
	(b)		Diabetes ✓	2	2 x 2.1	IGNORE diabetics
			Type 1 ✓			ALLOW Type 1 and Type 2
	(c)		Any two from:	2	2 x 3.2a	Assume "it" refers to bacteria
			bacteria reproduce quickly / quicker process ✓			IGNORE easier
			(so) a great(er) amount of insulin can be made ✓			
			no ethical considerations using bacteria/ animal rights/ethical issues using pigs ✓			
			religious reasons against using pig insulin ✓			
			pig insulin may be rejected / may not work <u>as well</u> / may not be as pure / may cause a reaction ✓			IGNORE safer / just pig insulin is different to human insulin / references to cost
			humans could catch diseases (from the insulin) if pig insulin used ✓			IGNORE just the pig might have a disease / the insulin could contain diseases / pig insulin is harmful
	(d)		Amino acids ✓	1	1 x 1.1	

C	Question		Answer	Marks	AO element	Guidance
10	(a)		A sensory neuron ✓ B motor neuron ✓ C relay neuron ✓	3	3x 1.1	Max one mark for correct order without neuron, award two marks if order correct and neuron stated in 1/2 If no marks awarded but only neuron is in every box award one mark
	(b)		(so the impulse/response) is fast(er) ✓ prevents damage/stops you getting hurt ✓	1	1 x 1.1	IGNORE involuntary
	(c)	(i)	(results/data) not affected by the reaction times of the person stopping the stop clock ✓	1	1 x 3.1b	ALLOW description of reaction time DO NOT ALLOW 'results/data more accurate' without explanation of why IGNORE ref to human error
		(ii)	Any two from: (same) height / position of ruler/hand/fingers ✓ (same length/mass/size) ruler ✓ (use the same) hand/person (to catch with) / participant ✓ (use the same) force to drop the ruler/same person dropping the ruler ✓ (same) stopwatch ✓ (same) angle ✓	2	2 x 3.3a	ALLOW correct description
		(iii)	Any one from: to identify any outliers/anomalies ✓ to calculate a (more accurate) mean ✓ idea of repeatability (to check precision) ✓	1	1 x 3.3a	IGNORE accurate and precise unqualified IGNORE average IGNORE reliability
	(d)	(i)	1.19 x 10 ² ✓	1	1 x 1.2	
		(ii)	fatty sheath ✓	1	1 x 1.1	

Q	Question		Answer	Marks	AO element	Guidance
11	(a)		greater than/more than (19,000) ✓	1	1 x 1.2	
	(b)		Any two from: the number of cases has increased over 3 years/2013- 2016/since 2013/ 2014-2016/ each year ✓ idea of a large increase initially/2013 – 2014 ✓ idea that the increase from 2014 to 2016 is small ✓	2	2 x 3.1a	
	(c)		233% ✓	1	1 x 2.2	
	(d)	(i)	Any two from: use antibiotics ✓ idea of isolating infected individuals / avoid physical/direct contact✓ idea of barrier to prevent exchange of body fluids/face masks/use of tissues/wear gloves ✓ idea of hygiene ✓ vaccinate ✓	2	2 x 2.1	IGNORE medical checks ALLOW example of physical contact
		(ii)	Any one from: whether the person is allergic to it/side effects of drug / risks to patient ✓ issues with developing bacterial resistance ✓ how effective the drug is / what type of antibiotic ✓ dose ✓ idea of genetic differences ✓ is the patient taking other drugs ✓ pre-existing conditions ✓ age ✓ is the infection bad enough to justify their use ✓	1	1 x 2.1	IGNORE safety ALLOW named example for pre-existing condition IGNORE confirm infection is bacterial
		(iii)	Salmonella food poisoning ✓	1	1 x 1.1	

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