

**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
	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).

<b>Annotation</b>	<b>Meaning</b>
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
<b>DO NOT ALLOW</b>	Answers which are not worthy of credit
<b>IGNORE</b>	Statements which are irrelevant
<b>ALLOW</b>	Answers that can be accepted
( )	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
<b>ECF</b>	Error carried forward
<b>AW</b>	Alternative wording
<b>ORA</b>	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.

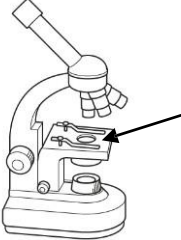
You should ensure that you have copies of these materials.

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:

	<b>Assessment Objective</b>
<b>AO1</b>	<b>Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.</b>
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
<b>AO2</b>	<b>Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.</b>
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
<b>AO3</b>	<b>Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.</b>
<b>AO3.1</b>	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
<b>AO3.2</b>	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.
<b>AO3.3</b>	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)	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	<b>ALLOW</b> descriptions of focussing process  <b>DO NOT ALLOW</b> 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	<b>ALLOW</b> objective lens x eyepiece lens / times them together
	(d)	Nucleus ✓	1	1.1	

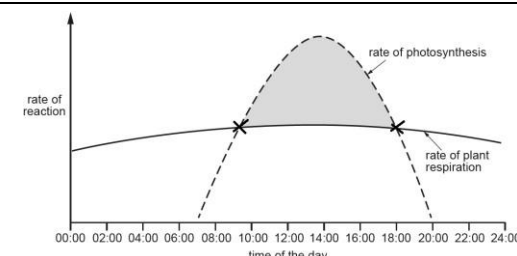
Question		Answer	Marks	AO element	Guidance															
2	(a)	cytoplasm ✓ mitochondria ✓	2	2 x 1.1																
	(b)	energy/heat is released ✓	1	1.1	<b>ALLOW</b> warms/transfers energy to surroundings / temperature of surroundings increases  <b>DO NOT ALLOW</b> energy/heat is created															
	(c)	<table border="0"> <tr> <td>Produces ethanol</td> <td>False</td> <td></td> </tr> <tr> <td>Produces lactic acid</td> <td>True</td> <td></td> </tr> <tr> <td>Does not produce ATP</td> <td>False</td> <td></td> </tr> <tr> <td>Uses glucose</td> <td>True</td> <td></td> </tr> <tr> <td>Uses oxygen</td> <td>False</td> <td>✓✓✓</td> </tr> </table>	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
Produces ethanol	False																			
Produces lactic acid	True																			
Does not produce ATP	False																			
Uses glucose	True																			
Uses oxygen	False	✓✓✓																		
	(d)	They have a higher resolution ✓	1	1.2																

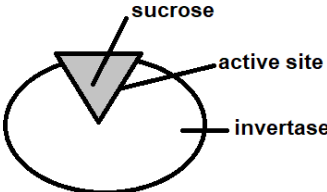


Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	James ✓	1	2.1	
		(ii)	Mia ✓	1	2.1	
		(iii)	Amir ✓	1	2.1	
		(iv)	Beth ✓	1	2.1	
	(b)		Unspecialised cells ✓	1	2.1	
	(c)		DNA ✓ Physical similarities/differences ✓	2	2 x 1.1	

Question			Answer	Marks	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	<b>ALLOW</b> 2 - 30 (hours)
		(ii)	<b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> If answer = 8 (hours) award 2 marks  64 ÷ 8 ✓ = 8 (hours) ✓	2	2 x 1.2	
	(d)		Hormones ✓	1	1 x 1.1	

Question		Answer	Marks	AO element	Guidance
5	(a)	there will be fewer sand eels ✓ because there will be more Minke whales (to eat them) ✓	2	1 x 3.1a 1 x 3.2b	<b>IGNORE</b> sand eels will die out
	(b) (i)	bioaccumulation ✓	1	1 x 1.1	
	(ii)	<b>Any two from:</b> 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	<b>DO NOT ALLOW</b> reference to microorganisms/decomposers/bacteria/fungi unless in the correct context of decomposition <b>ALLOW</b> returns minerals/elements/compounds to the ground/soil/environment
	(iii)	increases ✓ enzymes ✓	2	2 x 1.1	

Question		Answer	Marks	AO element	Guidance
6	(a)	Carbon dioxide – diffusion ✓ Water – osmosis ✓	2	2 x 1.1	<b>DO NOT ALLOW</b> 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	 <p><b>ALLOW</b> only one point needing to be identified for the mark.</p>
	(c)	<b>Any three from:</b> makes less/not enough chlorophyll/chloroplasts ✓ <i>idea of</i> less photosynthesis ✓ less/not enough glucose produced ✓ glucose needed for growth ✓	3	3 x 2.1	<p><b>IGNORE</b> no chlorophyll/chloroplasts made</p> <p><b>ALLOW</b> less/not enough light absorbed</p> <p><b>IGNORE</b> no photosynthesis</p> <p><b>IGNORE</b> no glucose produced/less food produced</p> <p><b>If no other mark awarded:</b> <b>ALLOW</b> for one mark idea that chlorophyll is needed for photosynthesis</p>

Question		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	<b>ALLOW</b> males have less chromosomes (compared to the female/queen) <b>ALLOW</b> females/queens have more chromosomes (than males) <b>ALLOW</b> The queen has 32 but the male <u>only</u> has 16 (chromosomes) <b>IGNORE</b> references to genes				
	(b)	meiosis ✓	1	1 x 2.1	<b>DO NOT ALLOW</b> miosis				
	(c)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>32 ✓</td> <td>Female ✓</td> </tr> <tr> <td>16 ✓</td> <td>Male ✓</td> </tr> </table>	32 ✓	Female ✓	16 ✓	Male ✓	4	2 x 2.2 2 x 2.1	Left-hand column = AO2.2 Right-hand column = AO2.1
32 ✓	Female ✓								
16 ✓	Male ✓								
	(d) (i)	<p><b>Any three from:</b> invertase/enzyme has an active site ✓  invertase/enzyme is the lock AND sucrose is the key ✓  (active site) is complementary to sucrose / substrate/sucrose fits <u>into</u> the active site ✓  invertase/enzyme is specific/will only catalyse the reaction for sucrose / <u>only</u> sucrose can fit ✓  products are released from the enzyme/invertase/active site ✓</p>	3	3 x 2.1	<p><b>ALLOW</b> two marks for a fully labelled diagram e.g.</p>  <p><b>IGNORE</b> just sucrose/substrate goes in active site</p>				

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

Question		Answer	Marks	AO element	Guidance
8	(a)	<p>One mark for each one correct ✓✓✓✓</p>	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 ✓  has increased by 37% ✓	2	2 x 3.1a	Check graph for calculation

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



Question		Answer	Marks	AO element	Guidance
9	(a)	changing/modifying the genome/DNA/genetic material of an organism ✓  to introduce desirable characteristics / altering the characteristics ✓	2	2 x 1.1	<b>ALLOW</b> introduce a gene from another organism  <b>ALLOW</b> example of a desired characteristic
	(b)	Diabetes ✓ Type 1 ✓	2	2 x 2.1	<b>IGNORE</b> diabetics <b>ALLOW</b> Type 1 and Type 2
	(c)	<b>Any two from:</b> bacteria reproduce quickly / quicker process ✓  (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 ✓  humans could catch diseases (from the insulin) if pig insulin used ✓	2	2 x 3.2a	Assume "it" refers to bacteria <b>IGNORE</b> easier    <b>IGNORE</b> safer / just pig insulin is different to human insulin / references to cost  <b>IGNORE</b> just the pig might have a disease / the insulin could contain diseases / pig insulin is harmful
	(d)	Amino acids ✓	1	1 x 1.1	

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	<b>IGNORE</b> involuntary
	(c)	(i)	1	1 x 3.1b	<b>ALLOW</b> description of reaction time <b>DO NOT ALLOW</b> 'results/data more accurate' without explanation of why <b>IGNORE</b> ref to human error
		(ii)	2	2 x 3.3a	<b>ALLOW</b> correct description
		(iii)	1	1 x 3.3a	<b>IGNORE</b> accurate and precise unqualified <b>IGNORE</b> average <b>IGNORE</b> reliability
	(d)	(i)	1	1 x 1.2	
		(ii)	1	1 x 1.1	

Question		Answer	Marks	AO element	Guidance
11	(a)	greater than/more than (19,000) ✓	1	1 x 1.2	
	(b)	<b>Any two from:</b> 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)	<b>Any two from:</b> 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	<b>IGNORE</b> medical checks <b>ALLOW</b> example of physical contact
	(ii)	<b>Any one from:</b> 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	<b>IGNORE</b> safety  <b>ALLOW</b> named example for pre-existing condition <b>IGNORE</b> confirm infection is bacterial
	(iii)	<i>Salmonella</i> food poisoning ✓	1	1 x 1.1	

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