

**GCSE (9–1)**

**Biology B (Twenty First Century Science)**

**J257/01: Breadth in Biology (Foundation Tier)**

General Certificate of Secondary Education

**Mark Scheme for Autumn 2021**

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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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## 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).

<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
<u>—</u>	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

### 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:

	<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)	(i)	<table border="1"> <thead> <tr> <th>Substance</th> <th>Used by cells for aerobic cellular respiration</th> <th>Made by cells for aerobic cellular respiration</th> <th>Helps to maintain the volume of the cell's cytoplasm</th> </tr> </thead> <tbody> <tr> <td>Carbon dioxide</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>Oxygen</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Water</td> <td></td> <td>✓</td> <td>✓</td> </tr> </tbody> </table> <p>✓✓✓✓</p>	Substance	Used by cells for aerobic cellular respiration	Made by cells for aerobic cellular respiration	Helps to maintain the volume of the cell's cytoplasm	Carbon dioxide		✓		Oxygen	✓			Water		✓	✓	4	1.1	
		Substance	Used by cells for aerobic cellular respiration	Made by cells for aerobic cellular respiration	Helps to maintain the volume of the cell's cytoplasm																	
		Carbon dioxide		✓																		
		Oxygen	✓																			
Water		✓	✓																			
(ii)	surface area ✓ slow ✓	2	2.1 1.1																			
(b)	(i)	Heart <u>Kidney</u> Skin      Stomach  ✓	1	1.1																		
(ii)	<b>Any two from:</b> faeces ✓ urine ✓ sweat ✓ breathing out ✓	2	1.1	<b>ALLOW</b> any sensible suggestion e.g. crying, vomiting																		
(c)	(i)	Active transport      Diffusion      Excretion <u>Osmosis</u>  ✓	1	1.1																		

Question			Answer	Marks	AO element	Guidance
		(ii)	It could burst <input checked="" type="checkbox"/>	1	1.1	
			It could shrink <input type="checkbox"/>			
			There would be no change <input type="checkbox"/>			

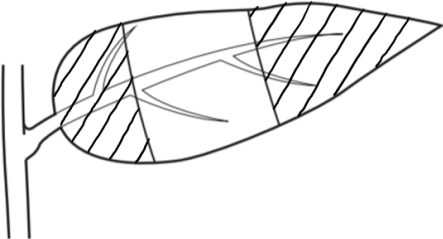


Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> ✓	1	1.1	
		(ii)	A <input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> ✓	1	1.1	
	(b)			2	1.1	Two correct = 1 mark Three correct = 2 marks
	(c)	(i)	Antibiotics ✓	1	2.1	
		(ii)	<b>Any one from:</b> wash hands ✓ avoid touching eyes ✓ don't share towels/makeup/pillows ✓	1	2.1	<b>IGNORE</b> ideas about isolating or staying at home

Question		Answer	Marks	AO element	Guidance
	(d)	<p>It does <sup>✓</sup>not use glucose <input type="checkbox"/></p> <p>It does <b>not</b> use oxygen <input checked="" type="checkbox"/></p> <p>It produces oxygen <input type="checkbox"/></p> <p>It produces water <input type="checkbox"/></p> <p style="text-align: right;">✓</p>	1	1.1	

Question		Answer	Marks	AO element	Guidance
3	(a)	auxin ✓	1	1.1	
	(b)	gravitropism ✓	1	1.1	
	(c)	phototropism ✓	1	1.1	
	(d)	meristem ✓	1	1.1	
	(e)	meiosis ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	Skin / mucus ✓	1	1.1	
		(ii)	saliva / (enzymes in) tears / acid / (enzymes in) mucus ✓	1	1.1	
	(b)	(i)	<b>Any two from:</b> (eating contaminated) food ✓  (drinking contaminated) water ✓ (touching contaminated) surfaces or utensils ✓	2	1.1	<b>ALLOW</b> any sensible suggestion <b>ALLOW</b> qualified examples of named foods e.g. raw chicken  <b>ALLOW</b> (contact with) infected animals ✓
		(ii)	<b>Any two from:</b> (increased) sweating ✓ hairs lie flat ✓ increased blood flow (to the skin) ✓	2	1.1	<b>ALLOW</b> vasodilation
	(c)	(i)	<b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> <b>If answer = 5.8 award 2 marks</b>  (5.45 + 5.52 + 8.82 + 3.38 = ) 23.17 ÷ 4 ✓  = 5.7925 = 5.8 (% to 2sf) ✓	2	1.2	<b>ALLOW</b> 1 mark for any number to 2 sig figs where no working or value is incorrect
		(ii)	Scotland ✓	1	3.2b	<b>ALLOW</b> ECF
	(d)		<b>Any two from:</b> Thailand has the lowest percentage of positive samples ✓  Germany/France have the highest percentage of positive samples ✓ Brazil sample was the same as UK ✓ France sample was the same as Germany ✓ Denmark/France/Germany/Netherlands and Republic of Ireland have higher (average) percentages than the UK average ✓	2	3.2b	<b>ALLOW</b> any correct conclusion drawn from the data

Question		Answer	Marks	AO element	Guidance
5	(a)	Benedict's <input type="checkbox"/> Biuret <input type="checkbox"/> Iodine <input checked="" type="checkbox"/>	1	1.2	
	(b)	correctly shaded leaf ✓ ✓	1	2.2	 <p><b>ALLOW</b> any type of shading in the hatched areas</p>
	(c)	The plant was placed in the dark so that it would not grow <del>photosynthesise</del> respire. In the dark it will use up all of its existing stores of carbon dioxide <del>starch</del> water. ✓✓	2	1.2	
	(d)	light ✓	1	2.2	

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	unspecialised (cell) / (a cell that has) not yet specialised / undifferentiated (cell) ✓	1	1.1	
		(ii)	idea that embryos are destroyed in the process ✓	1	1.1	<b>IGNORE</b> embryos are harmed
	(b)		<p><b>Benefit - Any one from:</b>  improvement of symptoms ✓  idea of helping improve future treatment for others ✓  idea that as there is no cure for MS, patients may will be willing to take any risk (as the benefit outweighs the risk) ✓  payment ✓</p> <p><b>Risk - Any one from:</b>  unknown/unintended side effects ✓  (idea of) rejection of transplanted stem cells ✓</p>	2	2.1	<b>ALLOW</b> trial could make condition worse
	(c)	(i)	(the research is reviewed by) other scientists / experts in that field ✓ check/evaluate method / result / conclusions / originality of work ✓	2	1.1	<b>IGNORE</b> peer unqualified <b>IGNORE</b> just check work
		(ii)	<p><b>Any one from:</b>  the public ✓  people with the disease ✓  doctors ✓  politicians ✓</p>	1	1.1	<b>ALLOW</b> any other valid person

Question		Answer	Marks	AO element	Guidance
7	(a)	DNA/genome ✓	1	2.1	<b>ALLOW</b> genetic material
	(b)	(i) 140,000 ✓	1	1.2	
		(ii) <b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> <b>If answer = 90,000 award 2 marks</b>  (140,000 -) 50,000 ✓ = 90,000 ✓	2	1.2	
	(c)	(i) <b>Any two from:</b> the number (of Tasmanian devils) has dropped rapidly / number has fallen over a short period of time ✓ the population/number of Tasmanian Devils is continuing to drop ✓ idea that the numbers are so low the species could become extinct ✓	2	3.2a	<b>IGNORE</b> just the number of Tasmanian Devils has dropped/fallen/decreased  <b>IGNORE</b> unqualified use of data
		(ii) <b>Any two from:</b>  Devil Facial Tumour Disease (DFTD) is communicable / (human) cancer is non-communicable ✓ Devil Facial Tumour Disease (DFTD) is not caused by a mutation / (human) cancer is caused by a mutation ✓ some human cancers can be caused by lifestyle factors e.g. smoking, alcohol ✓ ref to genetic cause in humans ✓	2	2.2	Assume "it" refers to Devil Facial Tumour Disease  <b>ALLOW</b> DFTD is transmissible / (human) cancer is not transmissible/not spread from one person to another/not spread by biting
		(iii)  Immunity <input type="checkbox"/>  Infection <input type="checkbox"/>  Natural selection <input checked="" type="checkbox"/> ✓	1	2.1	

Question		Answer	Marks	AO element	Guidance
8	(a)	<p><b>Any three from:</b>                      select (two individuals with) desired characteristic ✓                       (individuals are allowed to) breed ✓                       idea of choosing offspring with the (same) desired characteristic (for breeding) ✓                      repeat process for many generations ✓</p>	3	2.1	<p><b>ALLOW</b> example of relevant desired characteristic e.g. more muscle/greater size   <b>IGNORE</b> individuals are allowed to mate   <b>IGNORE</b> just repeat process</p>
	(b)	<p>✓✓</p>	2	2.1	<p>Two correct = 1 mark                      Three correct = 2 marks</p>
	(c)	<p><b>Any one from:</b>                      cause (unintended) death of other species ✓                      cause death of pollinators ✓                      idea of bioaccumulation ✓</p>	1	2.1	
	(d)	<p>idea that plants use/absorb carbon dioxide (during photosynthesis/growth) ✓                      idea that this balances/offsets/is the same amount as is released when the biofuel is burnt/used ✓</p>	2	2.1	



Question			Answer	Marks	AO element	Guidance
9	(a)	(i)	measuring cylinder/ syringe/ graduated pipette/burette/volumetric flask ✓ <b>AND any one from:</b> more precise measurement ✓ (would allow an) accurate volume (to be measured) ✓	2	3.3b	
		(ii)	idea of selecting at least three different enzyme concentrations ✓ <b>AND any one from:</b> reaction to run over a set/stated period of time / measurements taken at regular/stated intervals ✓ measure/record/find the volume of oxygen/gas produced (over time) ✓	2	3.3a	
	(b)		<b>Any two from:</b> volume of enzyme/catalase ✓ volume of hydrogen peroxide ✓ concentration of hydrogen peroxide ✓ pH ✓ time ✓	2	3.3a	<b>IGNORE</b> concentration of enzyme <b>IGNORE</b> amount of enzyme <b>IGNORE</b> amount of hydrogen peroxide
	(c)	(i)	34 °C ✓	1	3.2a	
		(ii)	idea of investigating more intermediate temperatures around the optimum/ suggested intermediates around the optimum ✓	1	3.3b	
	(d)		0 °C <input type="checkbox"/> 40 °C <input type="checkbox"/> 68 °C <input checked="" type="checkbox"/> 80 °C <input type="checkbox"/> ✓	1	3.2b	

Question		Answer	Marks	AO element	Guidance
10	(a)	<p>A diagram with four boxes on the left: 'Amino acids', 'Fatty acids', 'Glycerol', and 'Sugar'. On the right are three boxes: 'Fats', 'Long-chain carbohydrates', and 'Proteins'. Lines connect 'Amino acids' to 'Fats' and 'Proteins'. 'Fatty acids' connects to 'Fats'. 'Glycerol' connects to 'Fats'. 'Sugar' connects to 'Long-chain carbohydrates'.</p> <p>✓✓</p>	2	1.1	4 correct lines = 2 marks 2/3 correct lines = 1 mark
	(b)	<p>Carbon, hydrogen, and oxygen <input type="checkbox"/></p> <p>Carbon, hydrogen, nitrogen, and oxygen <input checked="" type="checkbox"/></p> <p>Nitrogen and carbon <input type="checkbox"/></p> <p>Only carbon <input type="checkbox"/></p> <p>✓</p>	1	1.1	

Question		Answer	Marks	AO element	Guidance									
11	(a)	<p><b>Any two from:</b>                      take blood sample ✓                      (to perform) genetic test (of DNA or genome) ✓                      idea of looking for the recessive/faulty/Tay Sachs allele ✓</p>	2	2.1	<p><b>ALLOW</b> saliva  <b>ALLOW</b> genetic screening  <b>ALLOW</b> faulty gene</p>									
	(b)	Heterozygous ✓	1	2.1										
	(c)	<table border="1" style="margin-left: auto; margin-right: auto;"> <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> <p>✓✓                      probability = 25% / 0.25 / 1/4 ✓</p>		T	t	T	TT	Tt	t	Tt	tt	3	2.1	<p>1 mark for the gametes transferred correctly                      1 mark for the completion of the punnet square  <b>ECF</b> for punnet square if gametes incorrect  <b>ALLOW</b> correct use of other letters to represent alleles/genotypes  <b>ECF</b> for %  <b>DO NOT ALLOW</b> ratio</p>
	T	t												
T	TT	Tt												
t	Tt	tt												
	(d)	<p><b>Any two from:</b>                      (genetic) testing of embryos (only allow pregnancy to continue if result is negative) ✓                      testing amniotic fluid ✓                      gamete/egg/sperm donation ✓                      adoption/fostering ✓</p>	2	2.1	<p><b>ALLOW</b> description of IVF and screening process  <b>ALLOW</b> PGD  <b>ALLOW</b> amniocentesis/description of procedure  <b>ALLOW</b> surrogacy if qualified</p>									

Question		Answer	Marks	AO element	Guidance
12	(a)	Tree ✓	1	2.1	IGNORE producer
	(b)	biomass decreases as trophic level increases/along the food chain ✓  <b>AND any two from:</b> uneaten ✓  egestion / undigested parts ✓  (cellular) respiration ✓  movement ✓  excretion ✓	3	3.1a  2.1 x 2	<b>ALLOW</b> up the pyramid  <b>ALLOW</b> correct named examples of uneaten parts  <b>ALLOW</b> faeces <b>IGNORE</b> waste  <b>ALLOW</b> correct named examples of movement  <b>ALLOW</b> correct named examples of excretion <b>IGNORE</b> waste products  <b>ALLOW</b> correct reference to heat
	(c)	<b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> <b>If answer = 30% award 3 marks</b> Uses only figures 11 and 37 from diagram ✓ $11 \div 37 \times 100$ ✓ $= 29.729 = 30$ (%) (to 1sf) ✓	3	2.2 x 2  1.2	$29.729 / 29.73 / 29.7 = 2$ marks  <b>ALLOW</b> 1 mark for any number to 1 sig fig where no working or value is incorrect

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