

GCSE (9–1)

F

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

J260/01: 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).

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 Combined Science 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)	(i)	<table border="1"> <thead> <tr> <th>Organism</th> <th>Role</th> </tr> </thead> <tbody> <tr> <td>Herring</td> <td>1st consumer</td> </tr> <tr> <td>Phytoplankton</td> <td>2nd consumer</td> </tr> <tr> <td>Zooplankton</td> <td>Producer</td> </tr> </tbody> </table>	Organism	Role	Herring	1 st consumer	Phytoplankton	2 nd consumer	Zooplankton	Producer	2	2x3.2a	All three correct = two marks One or two correct = one mark
Organism	Role													
Herring	1 st consumer													
Phytoplankton	2 nd consumer													
Zooplankton	Producer													
		(ii)	Salmon ✓ Seal ✓ Human ✓	2	2x2.1	All three correct = two marks One or two correct = one mark Answers can be in any order								
	(b)	(i)	Water ✓ Glucose ✓	2	2x1.1	ALLOW correct formula ALLOW correct formula								
		(ii)	First ✓ Endothermic ✓	2	2x1.1									

Question		Answer	Marks	AO element	Guidance												
1	(c)	<table border="1"> <thead> <tr> <th>Statement</th> <th>True</th> <th>False</th> </tr> </thead> <tbody> <tr> <td>Catches of over 0.8 million tonnes are recorded for 4 years</td> <td>✓</td> <td></td> </tr> <tr> <td>No herring were caught between 1978 and 1983.</td> <td>✓</td> <td></td> </tr> <tr> <td>Recorded catches are always between 0.2 and 1.0 million tonnes.</td> <td></td> <td>✓</td> </tr> </tbody> </table>	Statement	True	False	Catches of over 0.8 million tonnes are recorded for 4 years	✓		No herring were caught between 1978 and 1983.	✓		Recorded catches are always between 0.2 and 1.0 million tonnes.		✓	3	3x2.2	
Statement	True	False															
Catches of over 0.8 million tonnes are recorded for 4 years	✓																
No herring were caught between 1978 and 1983.	✓																
Recorded catches are always between 0.2 and 1.0 million tonnes.		✓															
	(d)	<p>Future generations could continue fishing without wiping out the herring population ✓</p> <p>The herring reproduce fast enough to replace all the herring that are caught ✓</p>	2	2x2.1													

Question		Answer	Marks	AO element	Guidance
2	(a)	3 ✓	1	1.2	
	(b)	(i) Eyepiece lens = x15 and Objective lens = x40 ✓	1	1.2	ALLOW any x15 from the left column and any x40 in the right column circled
		(ii) Eyepiece lens = x10 and Objective lens = x20 ✓	1	1.2	ALLOW any x10 from the left column and any x20 in the right column circled
		(iii) to stain/make visible the nucleus/chromosomes/DNA/genetic material ✓	1	1.2	
	(c)	(i) Any two from: rich/good blood supply/ it has lots of blood vessels ✓ large surface area ✓ idea that it/the gas exchange surface/the membrane is partially-permeable/thin/single ✓	2	2x2.1	
		(ii) Ben ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance												
3	(a)	(i)	<p>mother</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">gametes</td> <td style="padding: 5px; background-color: #cccccc;">A</td> <td style="padding: 5px; background-color: #cccccc;">a</td> </tr> <tr> <td style="padding: 5px;">gametes</td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">A</td> <td style="padding: 5px;">AA</td> <td style="padding: 5px;">Aa</td> </tr> <tr> <td style="padding: 5px;">a</td> <td style="padding: 5px;">Aa</td> <td style="padding: 5px;">aa</td> </tr> </table> <p style="text-align: center;">✓</p>	gametes	A	a	gametes			A	AA	Aa	a	Aa	aa	2	2x2.1	<p>Mother Aa ALLOW aA DO NOT ALLOW any other letters</p> <p>Correct genotypes for fertilised eggs ALLOW ECF from incorrect mother's genotype/incorrect letters</p>
gametes	A	a																
gametes																		
A	AA	Aa																
a	Aa	aa																
		(ii)	Ring round either or both Aa fertilised eggs in the punnet square ✓	1	1.1													
		(iii)	0.25 ✓	1	1.2													
	(b)	(i)	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Detailed explanation of the adaptations of red blood cells. AND Differences between sickle cell disease blood and normal blood AND Suggests how these differences are related to need for extra oxygen.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p>	6	3 x 1.1 2 x 3.1a 1 x 2.1	<p>AO1.1 – demonstrating understanding of how red blood cells are adapted to their function</p> <ul style="list-style-type: none"> • Red blood cells contain protein / haemoglobin • Haemoglobin binds to oxygen • Red blood cells have no nucleus to give more room (for haemoglobin/oxygen) • Biconcave shape gives a large surface area for rapid diffusion of oxygen • Lots of RBCs to carry lots of oxygen <p>AO3.1a – interpreting the images to identify differences in RBCs from person with sickle cell disease</p> <ul style="list-style-type: none"> • Fewer red blood cells in people with sickle cell disease/more RBCs in normal blood • Some sickle shaped /misshapen cells 												

Question	Answer	Marks	AO element	Guidance
	<p>Level 2 (3–4 marks) Outline explanation of the adaptations of red blood cells. AND Differences between sickle cell disease blood and normal blood.</p> <p>OR</p> <p>Differences between sickle cell disease blood and normal blood. AND Suggests how these differences are related to need for extra oxygen.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Outline explanation of the adaptations of red blood cells. OR Differences between sickle cell disease blood and normal blood.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks <i>No response or no response worthy of credit.</i></p>			<ul style="list-style-type: none"> • Some cells have nuclei <p>AO2.1 – applying understanding to suggest why people with sickle cell disease need to be given extra oxygen</p> <ul style="list-style-type: none"> • Fewer RBCs/presence of nuclei/misshapen cells mean less oxygen can be carried. • Not enough oxygen for respiration (to provide (sufficient) ATP/energy for life processes)
(ii)	Protein ✓ Genes ✓ Amino acids ✓ Switched off ✓	4	4x1.1	

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	They are adult stem cells ✓	1	2.1	
		(ii)	Other scientists can copy the methods described to reproduce similar results ✓ Other scientists have checked the work before it is published ✓	2	2x2.1	

Question		Answer	Marks	AO element	Guidance
4	(a)	B(A)DC ✓✓	2	2x2.1	B before D or D before C for one mark
	(b)	1. oxygen ✓ 2. carbon dioxide ✓ 3. food ✓	3	3x1.1	
	(c) (i)	There is a pulse in the thumb ✓	1	1.2	
	(ii)	Multiply by 6 ✓	1	3.3a	
	(iii)	find the time taken to recover/return to the resting pulse rate ✓	1	3.3a	
	(d) (i)	All points correctly plotted ✓ Smooth curve through points ✓	2	2x2.2	Independent marking points ALLOW ± error of half a square
	(ii)	Fair ✓	1	3.2b	
	(iii)	(Not very confident): 90s is just under the time that would give her a poor rating ✓ OR repeats would increase confidence/they've only done it once ✓	1	3.1b	No mark for judgement; mark for explanation. ALLOW 90s sits below/on the boundary for poor

Question		Answer	Marks	AO element	Guidance												
5	(a)	inherited ✓ natural selection ✓	2	2x1.1													
	(b)	<p>Statement</p> <table border="0"> <tr> <td></td> <td style="text-align: center;">True</td> <td style="text-align: center;">False</td> </tr> <tr> <td>Evidence for the evolutionary relationships of dinosaurs...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>The common ancestor of all animals with backbones lived...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>The DNA of birds will be most similar to that of dinosaurs...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>		True	False	Evidence for the evolutionary relationships of dinosaurs...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The common ancestor of all animals with backbones lived...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The DNA of birds will be most similar to that of dinosaurs...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	2x3.1a	Three correct = two marks One or two correct = one mark
	True	False															
Evidence for the evolutionary relationships of dinosaurs...	<input checked="" type="checkbox"/>	<input type="checkbox"/>															
The common ancestor of all animals with backbones lived...	<input type="checkbox"/>	<input checked="" type="checkbox"/>															
The DNA of birds will be most similar to that of dinosaurs...	<input checked="" type="checkbox"/>	<input type="checkbox"/>															
	(c)	(mules) offspring are not fertile/cannot breed successfully ✓	1	1.1	IGNORE offspring cannot reproduce												

Question		Answer	Marks	AO element	Guidance
6	(a)		2	2x2.1	All three correct = two marks One or two correct = one mark
	(b) (i)	Release chemicals that break pathogens down ✓ Take in and digest pathogens ✓	2	2x1.1	
	(ii)	Only people ill with the flu virus can pass it on. ✓ Unvaccinated people are more likely to get flu ✓	2	2x1.1	
	(c)	Idea that the virus/surface proteins have changed/are different shapes ✓ idea that a person who had the vaccine would make the wrong (shape) antibodies ✓ the antibodies will not recognise/attach/stick/bind/fit to the surface proteins/virus ✓	3	3.1a 2.1 2.1	ALLOW virus has mutated ALLOW new/different antibodies would need to be made

Question			Answer	Marks	AO element	Guidance
6	(d)	(i)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.7(%) award 3 marks</p> <p>$170\ 000/25\ 000\ 000 = 0.0068 \checkmark$</p> <p>$0.0068 \times 100 = 0.68 \checkmark$</p> <p>$= 0.7\ (\%) (1dp) \checkmark$</p>	3	3x2.2	<p>ALLOW $170\ 000/25\ 000\ 000 \times 100$ for 1 mark</p> <p>ALLOW 0.68(%) for 2 marks</p>
		(ii)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 264 award 2 marks</p> <p>$4 \times 66 \checkmark$</p> <p>$= 264 \checkmark$</p>	2	2x2.2	<p>ALLOW $(4 \times 66\ 000\ 000) \div 1\ 000\ 000$</p> <p>OR $(4 \div 1\ 000\ 000) \times 66\ 000\ 000$</p>
	(e)	(i)	<p>A higher magnification is possible with electron microscopes \checkmark</p> <p>Electron microscopes have a very high resolution \checkmark</p>	2	2x1.1	
		(ii)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 500 award 2 marks</p> <p>$50/0.1 \checkmark$</p> <p>$= 500 \checkmark$</p>	2	2x2.2	ALLOW 50 000/100
	(f)	(i)	80 (people per 100000) \checkmark	1	2.2	ALLOW any number between 70 and 90 inclusive
		(ii)	C \checkmark	1	2.1	If answer box is not ticked, check diagrams.

Question			Answer	Marks	AO element	Guidance
		(iii)	No, correlation doesn't equal cause ✓ No mechanism/caused by different microorganisms ✓	2	2x1.1	ALLOW there could be other factors that cause pneumonia ALLOW not everyone that has pneumonia had the flu first/not everyone who has flu will get pneumonia

Question		Answer	Marks	AO element	Guidance
7	(a)	Cytoplasm ✓ Mitochondria ✓	2	2x1.1	
	(b)	Active transport ✓ Muscle contraction ✓	2	2x1.1	
	(c)	Any three from: comment on safety/hazards/ways to reduce risk ✓ how much mass of potato is used each time ✓ type/size/surface area of the paper ✓ how much/volume of water each time ✓ the volume/amount/concentration of H ₂ O ₂ /solution ✓ the temperature ✓ the size of the test tube ✓ start the timer at the same time e.g. when disc has sunk to the bottom of the test tube ✓	3	3x1.2	ALLOW weight/amount of potato used each time/how much potato extract / how much time to soak the disc in the potato extract
	(d)	Any two from: the reaction makes oxygen/gas ✓ more oxygen/bubbles formed when (rate of) reaction is faster ✓ more oxygen/bubbles means the disc will rise faster ✓	2	2x2.2	Candidates need to refer to more once for marking points 2 and 3

Question		Answer	Marks	AO element	Guidance
	(e)	(i)			
	(e)	(i)	3	3x2.2	Check for answer written in/beside the table
	(e)	(ii)	2	2x3.2b	
	(f)		1	3.3b	
	(g)		4	2.1 1.1 1.1 1.1	ALLOW labelled diagrams for mark points three and four.

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