

**F****GCSE (9–1)****Combined Science B (Twenty First Century Science)****J260/01: Biology (Foundation Tier)**

General Certificate of Secondary Education

**Mark Scheme for November 2020**

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It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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

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.

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The breakdown of Assessment Objectives for GCSE (9-1) in Combined Science 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)	nucleotides✓ polymer ✓ double✓	3	1.1	
	(b) (i)	(C) B E D A ✓✓✓	3	1.2	B before E = 1 mark E before D = 1 mark D before A = 1 mark
	(ii)	4✓	1	2.1	
	(ii)	Animal cells are <b>one</b> order of magnitude bigger than bacterial cells ✓	1	1.2	

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Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	Mia ✓	1	3.2a	
		(ii)	Alex ✓	1	3.2a	
		(iii)	Kai ✓	1	3.2a	
		(iv)	Any named example of either adult or foetus being tested/Preimplantation genetic diagnosis (PGD) test ✓	1	1.1	<b>ALLOW</b> named genetic diseases such as Down's syndrome/diabetes/muscular dystrophy/cystic fibrosis <b>ALLOW</b> paternity test
	(b)		<b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> <b>If answer = 340 award 2 marks</b>  679106 ÷ 2000 = 339.5 ✓ = 340 ✓	2	2.2	
	(c)		More people read newspapers than scientific journals ✓  The research could affect people's lives so they should know about it. ✓	2	3.2a	



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Question		Answer	Marks	AO element	Guidance
3	(a)	<b>Any three from:</b> Alcohol ✓ Exercise ✓ Diet ✓ Smoking ✓	3	1.1	<b>ALLOW</b> examples or narrative which clearly identifies any of the four possible lifestyle factors <b>ALLOW</b> other reasonable answers such as drugs/stress <b>IGNORE</b> not drinking enough water
	(b) (i)	Mucus ✓  Acid in stomach ✓	2	2.1	<b>ALLOW</b> lysozymes instead of or in addition to either of the two main answers
	(ii)	<b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> <b>If answer = 256 award 2 marks</b>  $1 \times 2^8$ ✓ $= 256$ ✓	2	2.2	<b>ALLOW</b> one mark for sight of eight 30 minute intervals in 4 hours.
	(iii)	Antibiotic use increases the chances of antibiotic-resistant bacteria surviving ✓  The body's immune system will usually kill all the <i>Salmonella</i> bacteria ✓	2	2.1	
	(c) (i)	C ✓	1	2.2	
	(ii)	<b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> <b>If answer = 314 (mm<sup>2</sup>) award 3 marks</b>  Calculation of correct radius from C(i)/10 ✓ $3.14 \times 100$ ✓ $= 314 \text{ (mm}^2\text{)}$ ✓	3	2.2	<b>ALLOW</b> ECF if wrong concentration chosen in C(i)  <b>ALLOW</b> ECF if diameter used for max 2 marks e.g $3.14 \times 20^2 = 1256$ for 2 marks
	(d)	Human cells do not have a cell wall ✓	1	2.1	
	(e) (i)	CABD ✓✓✓	3	1.2	C before A scores 1 mark A before B scores 1 mark

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Question			Answer	Marks	AO element	Guidance
						B before D scores 1 mark
		(ii)	B ✓	1	2.1	

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Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	<p><b>Any three from:</b>            Idea that there will be genetic variation within cattle population/Idea that there is variation in meat and milk production between individuals/within the population ✓</p> <p>Choose bull and cow with good quality/large amount of meat to breed ✓</p> <p>Choose best (large quantity/good quality meat) from offspring to breed ✓</p> <p>Over many generations ✓</p>	3	2.1	<b>ALLOW</b> choose large/big shorthorn cattle to breed
		(ii)	<p><b>Any two from:</b>            More food/better quality food can be produced ✓</p> <p>The growing human population can be fed ✓</p> <p>Drought-resistant crops ✓</p> <p>Producing organisms for particular jobs ✓</p>	2	1.1	<b>ALLOW</b> organisms such as the shire horse/sheep dog
	(b)	(i)	Red cow bb <b>AND</b> Black bull BB ✓	1	3.1a	

Question	Answer	Marks	AO element	Guidance												
(ii)	<p>Correct punnet square</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="background-color: #cccccc;">B</td> <td style="background-color: #cccccc;">b</td> <td></td> </tr> <tr> <td style="background-color: #cccccc;">B</td> <td>BB</td> <td>Bb</td> <td>✓</td> </tr> <tr> <td style="background-color: #cccccc;">b</td> <td>Bb</td> <td>bb</td> <td>✓</td> </tr> </table> <p>Percentage of black cattle = 75 (%)                      Percentage of red cattle 25 = (%)                      ✓</p>		B	b		B	BB	Bb	✓	b	Bb	bb	✓	3	2.2	<p><b>ALLOW</b> ECF for correct percentages from incorrect offspring</p>
	B	b														
B	BB	Bb	✓													
b	Bb	bb	✓													
(iii)	30 ✓	1	2.1													
(c)	<p>✓✓✓</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><b>Cow behaviour</b></p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Cow excretes faeces and urine, which are a form of organic fertiliser.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Cows eat large fast-growing bracken plants.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Grazing produces patches of bare earth</div> <div style="border: 1px solid black; padding: 5px;">Hooves tread seeds into the soil.</div> </td> <td style="width: 50%; vertical-align: top;"> <p><b>How behaviour...</b></p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Allows new plants to start to grow</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Increases the amount of nitrates in the soil.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Reduces competition, so smaller plants can grow.</div> <div style="border: 1px solid black; padding: 5px;">Seeds are less likely to be eaten by birds.</div> </td> </tr> </table>	<p><b>Cow behaviour</b></p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Cow excretes faeces and urine, which are a form of organic fertiliser.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Cows eat large fast-growing bracken plants.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Grazing produces patches of bare earth</div> <div style="border: 1px solid black; padding: 5px;">Hooves tread seeds into the soil.</div>	<p><b>How behaviour...</b></p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Allows new plants to start to grow</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Increases the amount of nitrates in the soil.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Reduces competition, so smaller plants can grow.</div> <div style="border: 1px solid black; padding: 5px;">Seeds are less likely to be eaten by birds.</div>	3	2.1	<p>All four correct = 3 marks                      Any three correct = 2 marks                      Any one or two correct = 1 mark</p>										
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Question		Answer	Marks	AO element	Guidance
5	(a)	B ✓ C ✓ A ✓ D ✓	4	1.1	
	(b)	<b>Any three from:</b> (valves make sure) blood flows in only one direction ✓  (Cardiac muscle) to allow contractions ✓  oxygenated blood and deoxygenated blood are separated ✓  Idea of double circulation ✓  Left wall thicker to pump blood around the body ✓	3	1.1	
	(c)*	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.  <b>Level 3 (5–6 marks)</b> Suggests, in detail, how the hole in the heart will change the circulation of blood. <b>AND</b> How this will affect the cellular activity in the baby.  <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i>  <b>Level 2 (3–4 marks)</b> Suggests, in detail, how the hole in the heart will change the circulation of blood.  <b>OR</b> How this will affect the cellular activity in the baby.	6	2.1	<b>AO2.1 – Application of knowledge of understanding to describe the effect of a hole in heart on circulation</b> <ul style="list-style-type: none"> <li>• Blood can flow directly between ventricles.</li> <li>• Oxygenated and deoxygenated blood can mix</li> <li>• Reduces blood flow to the lungs/left atrium bypassed</li> <li>• Blood can flow backwards/from left to right ventricle.</li> <li>• Less oxygenated blood in circulation.</li> <li>• Carbon dioxide not excreted affect blood pH.</li> </ul> <b>AO2.1 – Application of knowledge of understanding to describe the effect on cellular activity</b> <ul style="list-style-type: none"> <li>• Babies cells will receive less oxygen.</li> </ul>

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Question	Answer	Marks	AO element	Guidance
	<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><b>Level 1 (1–2 marks)</b> Suggests, in outline, how the hole in the heart will change the circulation of blood.</p> <p><b>OR</b> Suggests, in outline, how the hole in the heart will affect the cellular activity in the baby.</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><b>0 marks</b> <i>No response or no response worthy of credit.</i></p>			<ul style="list-style-type: none"> <li>• Baby's cells will not be able to respire as well.</li> <li>• Baby will be tired/lack energy/unable to move well.</li> <li>• Baby will have low blood pressure</li> <li>• Baby will have an increase in breathing rate</li> </ul>

Question		Answer	Marks	AO element	Guidance															
6	(a)	<table border="1"> <thead> <tr> <th>Substance</th> <th>Plasma</th> <th>Red blood cells</th> </tr> </thead> <tbody> <tr> <td>Carbon dioxide</td> <td>✓</td> <td></td> </tr> <tr> <td>Dissolved food</td> <td>✓</td> <td></td> </tr> <tr> <td>Oxygen</td> <td></td> <td>✓</td> </tr> <tr> <td>Water</td> <td>✓</td> <td></td> </tr> </tbody> </table>	Substance	Plasma	Red blood cells	Carbon dioxide	✓		Dissolved food	✓		Oxygen		✓	Water	✓		2	1.1	All four correct = 2 marks Any two correct = 1 mark
		Substance	Plasma	Red blood cells																
		Carbon dioxide	✓																	
		Dissolved food	✓																	
		Oxygen		✓																
Water	✓																			
(b)	Any <b>four</b> from: Small size / curved shape ✓  allows them to fit through capillaries ✓  Biconcave disc ✓  Large surface area to volume ratio / rapid diffusion of oxygen in and or out of cell ✓  Flexible ✓	4	1.1																	
	(c)				0.0078 mm ✓	1	1.2													

Question		Answer	Marks	AO element	Guidance	
7	(a)	<p>Palisade layer is at the top of the plant so can absorb lots of light/light not absorbed by waxy cuticle or (transparent) upper epidermis ✓</p> <p>(Palisade layer has) lots of chloroplasts ✓</p> <p>(Chloroplasts) contain chlorophyll which is needed for photosynthesis ✓</p>	3	2.1 x 2  1.1 x 1		
	(b)	(i)	Xylem ✓	1	1.1	
		(ii)	Phloem ✓	1	1.1	
		(iii)	Active transport ✓	1	1.1	
		(iv)	11 ✓	1	1.2	Check the table for the answer
	(c)		Starch ✓	1	1.1	



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Question		Answer	Marks	AO element	Guidance
8	(a)	27 22 16 22 9 ✓✓	2	1.2	27 and 9 correct = 1 mark 22, 16 and 22 correct = 1 mark
	(b) (i)	Appropriate scale and labelled axes with units (graph drawn either way acceptable) ✓  All points plotted correctly ✓	2	2.2	<b>IGNORE</b> bird names  <b>ALLOW</b> 1/2 square margin of error in plotting <b>ALLOW ECF</b> from part 8 (a)
	(ii)	Line of best fit drawn ✓	1	2.2	<b>ALLOW ECF</b> <b>DO NOT ALLOW</b> extrapolation beyond 1 and 5
	(c) (i)	Yes because: there is a positive correlation ✓  <b>OR</b>  Partly supports / No: One result does not fit the trend/pattern ✓	1	3.1a	<b>ALLOW</b> negative correlation if the axes are transposed.  <b>ALLOW</b> 1 mark if outlier identified
	(ii)	A correlation does not prove cause ✓  there could be other factor(s) that affect dominance ranking ✓	2	3.1b	<b>IGNORE</b> identification of outlier  <b>ALLOW</b> any reasonable suggested factor e.g. aggression/different food preferences
	(d)	<b>Any two from:</b> <i>idea</i> that species rely on each other for many different resources ✓ example of resources species provides for other species or require from another species e.g. food, shelter, building materials, habitat etc ✓ <i>idea</i> that species keep the population of another species constant/affect the population of other species ✓	2	1.1	<b>ALLOW</b> 2 marks for named resources linked to the idea of interdependence.

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Question		Answer	Marks	AO element	Guidance
9	(a)	chlorophyll oxygen respiration glucose energy ✓✓✓	3	1.1	All five correct for 3 marks Any four or three correct for 2 marks Any two or one correct for 1 mark
	(b) (i)	B ✓  (The indicator turned purple showing that the carbon dioxide level decreased as) used by the pondweed/plant ✓	2	3.1a 3.2b	<b>ALLOW C</b> if explanation is correct e.g. carbon dioxide produced by snail is equal to carbon dioxide taken in by pondweed/plant.
	(ii)	A ✓  (The indicator turned yellow showing that the carbon dioxide level increased) the plant was not using carbon dioxide in photosynthesis/ was only carrying out respiration ✓	2	3.1a 3.2b	
	(iii)	Carbon dioxide produced by (respiration) snail (and plant) ✓  Is the same amount as carbon dioxide use (by plant /photosynthesis) ✓	2	2.1	
	(iv)	<b>Any one from:</b> Same length/ mass of pond weed ✓ Same type of pond weed ✓ Same size test tube ✓ Same light intensity ✓ Same temperature ✓ Same species of snail/ same size snail ✓ Same volume of bicarbonate indicator ✓ Same volume of water ✓ Same amount of indicator ✓	1	3.3b	<b>ALLOW</b> amount of pondweed

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