OCR
Oxford Cambridge and RSA

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# GCSE (9–1)

# Combined Science B (Twenty First Century Science)

## J260/01: 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.

**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. |

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>Homeostasis ✓</td><td>1</td><td>1.1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>Enzymes in the human body work best at $37^0$C ✓</td><td>1</td><td>1.1</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td>
<table>
<tr><th>statement</th><th>Type 1 only</th><th>Type 2 only</th><th>Both</th></tr>
<tr><td>The body no longer responds to insulin produced.</td><td></td><td>✓</td><td></td></tr>
<tr><td>Treated using a combination of diet and exercise.</td><td></td><td>✓</td><td></td></tr>
<tr><td>Can be treated with insulin injections.</td><td></td><td></td><td>✓</td></tr>
<tr><td>Diet should not contain too much sugar.</td><td></td><td></td><td>✓</td></tr>
<tr><td>The pancreas stops producing insulin.</td><td>✓</td><td></td><td></td></tr>
</table>
✓✓✓✓✓
</td><td>5</td><td>1.1</td><td>One mark for each correct row</td></tr>
<tr><td></td><td>(d)</td><td></td><td>increases<br>increase<br>increases<br>✓ ✓</td><td>2</td><td>1.1</td><td>All three correct = 2 marks<br>One or two correct = 1 mark</td></tr>
</table>

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 2 | (a) | (i) | A ✓<br>D ✓ | 2 | 1.1 | Answers can be in either order<br>**ALLOW** written description rather than letter |
| | | (ii) | B ✓<br>E ✓ | 2 | 1.1 | Answers can be in either order<br>**ALLOW** written description rather than letter |
| | (b) | | less<br>less<br>less<br>✓✓ | 2 | 2.1 | All three correct = 2 marks<br>One or two correct = 1 mark |
| | (c) | (i) | **FIRST CHECK THE ANSWER ON THE ANSWER LINE**<br>**If answer = 31 000 award 2 marks**<br><br>150 000 – (69 000 + 50 000) ✓<br>= 31 000 ✓ | 2 | 2.2 | **ALLOW** for 31000 written in stroke cases box |
| | | (ii) | **FIRST CHECK THE ANSWER ON THE ANSWER LINE**<br>**If answer = 46 (%) award 2 marks**<br><br>69 000 ÷ 150 000 = 0.46✓<br>0.46 x 100 = 46 (%) ✓ | 2 | 2.2 | |
| | | (iii) | **FIRST CHECK THE ANSWER ON THE ANSWER LINE**<br>**If answer = 480 award 2 marks**<br><br>60 ÷ 3 = 20 ✓<br>**OR**<br>60 x 24 = 1440 ✓<br><br>20 x 24 = 480 ✓<br>**OR**<br>1440 ÷ 3 = 480 ✓ | 2 | 2.2 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 3 | (a) | (i) | 1 ✓ | 1 | 2.1 | |
| | | (ii) | 2 ✓<br>**OR**<br>5 ✓<br>**OR**<br>7 ✓ | 1 | 2.1 | |
| | (b) | | **Any two from:**<br>idea that enzymes catalyse/speed up the breakdown/digestion of food molecules/substances/chemicals ✓<br>idea that digestion/enzymes break down food molecules ✓<br><br>idea that smaller food molecules can be absorbed/cross the partially permeable membrane ✓ | 2 | 2.1 | **ALLOW** any correct named example e.g proteins broken down into amino acids |
| | (c) | | **FIRST CHECK THE ANSWER ON THE ANSWER LINE**<br>**If answer = 137.5 (billion tonnes) award 2 marks**<br><br>550 x 25 / 100 ✓<br>**OR**<br>550 / 100 x 25 ✓<br>**OR**<br>550 x 0.25 ✓<br><br>= 137.5 (billion tonnes) ✓ | 2 | 2.2 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 4 | (a) | (i) | <table><tr><td>2</td><td>4</td><td>6</td><td>3</td><td>5</td><td>1</td></tr><tr><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr></table> | 4 | 3.3a | 4 before 6<br>6 before 3<br>3 before 5<br>5 before 1 |
| | | (ii) | idea that less breakable/ if broken less likely to cut ✓ | 1 | 2.2 | |
| | | (iii) | The larvae could respond to the heat ✓ | 1 | 2.2 | |
| | (b) | | sensory neuron before relay neuron ✓<br>relay neuron before motor neuron ✓ | 2 | 1.1 | |
| | (c) | | diffuse ✓<br>receptors ✓ | 2 | 1.1 | Answers must be in the correct order |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 5 | (a) | (i) | plant(s) ✓ | 1 | 2.1 | |
| | | (ii) | fungi/springtails/mites ✓ | 1 | 2.1 | |
| | | (iii) | soil ✓ | 1 | 2.1 | |
| | (b) | | **Technical term** / **Description**<br>Ecosystem → All the species present.<br>Community → The number of individuals in a single species.<br>Population → All the species and all the abiotic components.<br>✓✓ | 2 | 1.1 | All three correct = 2 marks<br>One or two correct = 1 mark |
| | (c) | (i) | **FIRST CHECK THE ANSWER ON THE ANSWER LINE**<br>**If answer = 9 award 2 marks**<br>(6 + 12 + 9) = 27 ✓<br>27 ÷ 3 = 9 ✓ | 2 | 1.2 | **ALLOW** for 9 written in the mean box |
| | | (ii) | **Any two from:**<br>when there are 3 mites they have plenty of prey/springtails/food (so they breed and their number increases) ✓<br>when there are 15 mites there is not enough prey/springtails/food (so some starve, and the numbers decrease) ✓<br>they both have 60 springtails/the same number of prey ✓ | 2 | 2.1 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 6 | (a) | | 2 ✓ | 1 | 3.1a | |
| | (b) | (i) | It had three features of modern birds/It had a beak, feathers and wings/it had more features in common with modern birds ✓ | 1 | 3.2a | **IGNORE** it has the same boxes ticked as modern birds |
| | | (ii) | It had a long bony tail and teeth/It had 2 features not seen in modern birds ✓ | 1 | 2.1 | **IGNORE** it has the same boxes ticked as modern birds |
| | (c) | | There are periods of time for which we have no fossils. ✓ | 1 | 2.1 | |
| | (d) | | DNA (analysis) ✓ | 1 | 1.1 | |

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>7</td><td>(a)</td><td></td><td>Underground mosquitoes can no longer breed with above-ground mosquitoes ✓</td><td>1</td><td>2.1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><td>1</td><td>The individual mosquitoes trapped underground had different characteristics.</td></tr><tr><td>3</td><td>Mosquitoes that could feed on mammals were more likely to survive.</td></tr><tr><td>2</td><td>There was a limited supply of food types underground, so the trapped mosquitoes had to compete.</td></tr><tr><td>5</td><td>Over a long period of time the characteristics of the underground mosquito population changed.</td></tr><tr><td>4</td><td>The mosquitoes that survived could breed and pass on their alleles.</td></tr></table>✓✓✓</td><td>3</td><td>2.1</td><td>1 before 3<br>3 before 5<br>5 before 4</td></tr>
</table>

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 8 | (a) | | FF ✓<br>Ff ✓ | 2 | 2.1 | Answer can be in either order |
| | (b) | | inherited ✓<br>phenotype ✓ | 2 | 1.1 | Answers must be in the correct order |
| | (c) | (i) | **Similarity**<br>both can produce specialised/differentiated cells ✓<br><br>**Difference**<br>idea that embryonic stem cells can produce any kind of specialised cell/adult stem cells can only produce a limited number of different types of specialised cell ✓ | 2 | 1.1 | |
| | | (ii) | **Advantage**: may lead to a cure/treatment/save lives ✓<br><br>**Disadvantage**: kills embryo/destroys a life/embryo cannot give consent/embryonic stem cells may be rejected ✓ | 2 | 2.1 | **IGNORE** ethical ideas without reference to killing embryos/destroying life |
| | (d) | (i) | <u>cancer</u> ✓ | 1 | 1.1 | **DO NOT ALLOW** named examples of cancers |
| | | (ii) | less oxygen can be carried (by the blood) ✓ | 1 | 2.1 | **IGNORE** less blood |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 9 | (a) | | 1.2 (ml) ✓ | 1 | 2.2 | |
| | (b) | | oxygen is still used by nongerminating corn seeds ✓<br><br>correct example of data from the graph for nongerminating corn seeds ✓ | 2 | 3.2b<br><br>2.2 | **ALLOW** any data point above 0 up to and including 0.2ml |
| | (c) | | 0.04 (ml/min) ✓ | 1 | 2.2 | |
| | (d) | | y = mx + c ✓ | 1 | 1.2 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 10* | | | Please refer to the marking instructions on page 5 of this mark scheme for guidance on how to mark this question.<br><br>**Level 3 (5–6 marks)**<br><br>Detailed description of how they would use a double-blind trial **AND** detailed description of some improvements to method to collect valid data.<br><br>*There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.*<br><br>**Level 2 (3–4 marks)**<br><br>Description of aspects of double-blind trial **AND** description of some improvements to method<br><br>*There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*<br><br>**Level 1 (1–2 marks)**<br><br>Description of aspects of double-blind trial **OR** Description of some improvements to method<br><br>*There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.*<br><br>**0 marks**<br>*No response or no response worthy of credit.* | **6** | **1.2 x 2**<br>**3.3a x 2**<br>**3.3b x 2** | **AO1.2 Demonstrating knowledge of double-blind trial**<br>• Description of placebo<br>• Investigator doesn't know who has taken placebo and who has taken active drug/caffeine<br>• Subject doesn't know if they have taken placebo or active drug/caffeine<br>• Idea that this eliminates bias/is more objective<br>• Idea that means results are more accurate<br><br>**AO3.3a Developing experimental procedures**<br>• Use decaffeinated cola as a placebo<br>• Amir will not know if fellow students have drunk caffeinated or decaffeinated cola<br>• Nina won't know if they have drunk caffeinated or decaffeinated cola<br>• Neither Amir nor Nina will have a bias/expectation<br>• Repeat each trial with more people<br><br>**AO3.3b Improving experimental procedures**<br>• Amir must drop the ruler from the same height<br>• Add a mechanism to drop ruler to remove Amir error<br>• Nina's fingers must be the same distance apart<br>• Wrist of Nina in the same place e.g. on edge of desktop<br>• Always measure to the same place e.g. top of fingers<br>• No distractions<br>• Repeat readings |

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>11</td><td>(a)</td><td></td><td>
<table>
<tr><th>Statement</th><th>Communicable diseases</th><th>Non-communicable diseases</th></tr>
<tr><td>They are caused by alleles</td><td></td><td>✓</td></tr>
<tr><td>They are caused by lifestyle choices</td><td></td><td>✓</td></tr>
<tr><td>They are caused by pathogens</td><td>✓</td><td></td></tr>
<tr><td>They are caused by trauma</td><td></td><td>✓</td></tr>
<tr><td></td><td>✓</td><td>✓</td></tr>
</table>
</td><td>2</td><td>1.1</td><td>Award one mark for each correct column</td></tr>
<tr><td></td><td>(b)</td><td></td><td>antibodies ✓<br>antigens ✓<br>digested ✓</td><td>3</td><td>1.1</td><td>Answers must be in the correct order</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Mia more information<br>Sam ethical decision<br>Ali ethical decision<br>Jamal more information<br>✓✓✓</td><td>3</td><td>3.1b</td><td>All 4 correct = three marks<br>3 correct = 2 marks<br>1 or 2 correct = 1 mark</td></tr>
</table>

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 12 | (a) | | **Any four from:**<br>select the lowest/lower objective lens/lowest power ✓<br><br>move the stage (towards the lens) up/until it reaches the top ✓<br><br>description of focussing the slide using the (coarse) focussing knob✓<br><br>change the objective lens to a higher objective lens/higher power✓<br><br>idea of the repeat of the focussing process/refocus/use (fine) focussing knob (to make the image clearer) ✓ | 4 | 1.2 | **ALLOW** smallest objective lens/smallest power/select the x4 lens<br><br>**ALLOW** move the stage up until it reaches the lens<br><br>**ALLOW** bigger objective lens/bigger power/select the x10 lens/select the x40 lens<br><br>**ALLOW** any sensible order |
| | (b) | | **Any two from:**<br>dead cells ✓<br>strengthened/lignified walls ✓<br>no end walls/continuous tube ✓<br>pits to allow water to enter and leave ✓ | 2 | 1.1 | **ALLOW** is one long tube/no cell contents or an example of cell content eg mitochondria |
| | (c) | (i) | provides large surface area/surface area to volume ratio ✓<br>idea that transport/uptake will be (more) rapid/faster ✓<br>**OR**<br>has many/lots of mitochondria ✓<br>to release energy/ATP/ to carry out active transport ✓ | 2 | 1.1 | |
| | | (ii) | **Any two from:**<br>respiration ✓<br>makes ATP/release energy ✓<br>ATP/energy is required for active transport ✓ | 2 | 2.1 | **DO NOT ALLOW** produce energy |
| | (d) | | Water ions can diffuse through the partially permeable membrane, but nitrate ions cannot. ✓ | 1 | 2.1 | |

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