

**GCSE (9–1)**

**Combined Science (Biology) A**

**(Gateway Science)**

**J250/01: Paper 1 (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                                      |
| <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 Combined Science A:

|              | <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.                                                                                     |

For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

| Question |  |  | Answer | Marks | AO element | Guidance |
|----------|--|--|--------|-------|------------|----------|
| 1        |  |  | D      | 1     | 1.1        |          |
| 2        |  |  | B      | 1     | 2.2        |          |
| 3        |  |  | D      | 1     | 1.2        |          |
| 4        |  |  | A      | 1     | 1.1        |          |
| 5        |  |  | A      | 1     | 2.2        |          |
| 6        |  |  | C      | 1     | 2.2        |          |
| 7        |  |  | D      | 1     | 2.2        |          |
| 8        |  |  | C      | 1     | 1.1        |          |
| 9        |  |  | C      | 1     | 2.1        |          |
| 10       |  |  | C      | 1     | 1.1        |          |

| Question |     |     | Answer                                                                                                                                                                       | Marks | AO element | Guidance                                                                     |
|----------|-----|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|------------------------------------------------------------------------------|
| 11       | (a) | (i) | surface area = 384✓<br>volume = 512✓                                                                                                                                         | 2     | 2.2        |                                                                              |
|          | (b) |     | increases<br>decreases                                                                                                                                                       | 1     | 3.1a       | both correct for mark                                                        |
|          | (c) |     | increase the surface area (for gas exchange) ✓<br><br>increase the surface area to volume ratio (for gas exchange) ✓<br><br>reduce the distance (for diffusion into blood) ✓ | 3     | 3 x 2.1    | <b>ALLOW</b> without gills distance (for diffusion into blood) is too large. |

| Question |     |      | Answer                                                                                                                                                                                                                                                                     | Marks | AO element         | Guidance                                                                                                                                       |
|----------|-----|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 12       | (a) | (i)  | 66 (%)✓                                                                                                                                                                                                                                                                    | 1     | 2.2                |                                                                                                                                                |
|          |     | (ii) | muscle requires oxygen/glucose ✓<br><b>OR</b><br>removal of carbon dioxide/water/heat from muscle✓<br><br>oxygen/glucose/carbon dioxide/water/heat is transported in the blood ✓                                                                                           | 2     | 2.2<br><br><br>2.1 | <b>IGNORE</b> references to lactic acid.<br><br><b>IGNORE</b> references to lactic acid.                                                       |
|          | (b) | (i)  | <b>Any two from:</b><br><br>arteries have thicker wall / ORA ✓<br><br>arteries have muscle in walls ✓<br><br>arteries have collagen in walls✓<br><br>arteries have elastic tissue ✓<br><br>capillary wall only one cell thick ✓<br><br>capillary wall is permeable / ORA ✓ | 2     | 1.1                | Wall is in stem of question, assume references to artery or capillary are in context of wall.<br><br><b>IGNORE</b> references to overall size. |
|          |     | (ii) | idea of higher pressure (of blood) in artery ✓<br><b>OR</b><br>idea of need for exchange / diffusion of materials through capillary wall ✓                                                                                                                                 | 1     | 1.1                |                                                                                                                                                |

| Question |     |                                | Answer                                                                                                                                                                                                                                                                                                                                                                  |   |   | Marks | AO element | Guidance                                                                                      |
|----------|-----|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|-------|------------|-----------------------------------------------------------------------------------------------|
| 13       | (a) | (i)                            | Chloroplast                                                                                                                                                                                                                                                                                                                                                             |   |   | 1     | 1.1        |                                                                                               |
|          |     |                                | Cell membrane                                                                                                                                                                                                                                                                                                                                                           | ✓ |   |       |            |                                                                                               |
|          |     |                                | Mitochondria                                                                                                                                                                                                                                                                                                                                                            |   |   |       |            |                                                                                               |
|          |     |                                | Nucleus                                                                                                                                                                                                                                                                                                                                                                 |   |   |       |            |                                                                                               |
|          |     | (ii)                           | contains receptor molecules / surface markers✓<br><b>AND</b><br>allows cells to stick together / recognise other molecules✓<br><br><b>OR</b><br><br>(membrane) is selective (barrier) ✓<br><b>AND</b><br>Controls which substances enter or leave ✓<br><br><b>OR</b><br><br>(membrane) is thin ✓<br><b>AND</b><br>allows short diffusion pathway / allows flexibility ✓ |   |   | 2     | 1.1        | <b>IGNORE</b> incorrect answer from 13(a)(i)                                                  |
| (b)      | (i) | mitosis ✓<br><br>replication ✓ |                                                                                                                                                                                                                                                                                                                                                                         |   | 2 | 1.1   |            |                                                                                               |
|          |     | (ii)                           | to provide <b>different</b> cells or <b>specialised</b> cells ✓<br><br>for development / growth / repair ✓                                                                                                                                                                                                                                                              |   |   | 2     | 1.1        | <b>ALLOW</b> can differentiate<br><br><b>ALLOW</b> (cell) replacement as equivalent to repair |

| Question |     |       | Answer                                                                                                                | Marks | AO element | Guidance                                                                                                                                    |
|----------|-----|-------|-----------------------------------------------------------------------------------------------------------------------|-------|------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 14       | (a) | (i)   | D ✓                                                                                                                   | 1     | 2.1        |                                                                                                                                             |
|          |     | (ii)  | peaks <b>after</b> ovulation ✓                                                                                        | 1     | 2.1        | <b>ALLOW</b> peaks <b>after</b> day 14<br><b>IGNORE</b> levels off                                                                          |
|          |     | (iii) | maintains uterus lining ✓                                                                                             | 1     | 1.1        | <b>IGNORE</b> thickens                                                                                                                      |
|          | (b) |       | prevents ovulation ✓<br><br>thickens mucus from cervix ✓<br><br>prevents implantation of (fertilised) ovum / zygote ✓ | 2     | 1.1        | <b>ALLOW</b> higher level responses that are linked to negative feedback<br><br><b>ALLOW</b> idea of mucus preventing sperm entering uterus |

| Question |     |      | Answer                                                | Marks | AO element | Guidance                                                                                                     |
|----------|-----|------|-------------------------------------------------------|-------|------------|--------------------------------------------------------------------------------------------------------------|
| 15       | (a) | (i)  | phloem ✓                                              | 1     | 2.1        |                                                                                                              |
|          |     | (ii) | xylem ✓                                               | 1     | 2.1        |                                                                                                              |
|          | (b) | (i)  | sucrose / sugar / amino acids / proteins / hormones ✓ | 1     | 1.1        |                                                                                                              |
|          |     | (ii) | downwards because substances collect above the cut ✓  | 1     | 3.2b       | <b>ALLOW</b> because swollen area is above cut<br><b>ALLOW</b> “at the top” as equivalent to “above the cut” |

| Question |     |      | Answer                                                                               | Marks | AO element | Guidance |
|----------|-----|------|--------------------------------------------------------------------------------------|-------|------------|----------|
| 16       | (a) |      | eye ✓                                                                                | 1     | 1.1        |          |
|          | (b) | (i)  | 46(s) ✓                                                                              | 1     | 1.2        |          |
|          |     | (ii) | idea of more attempts fewer errors ✓<br>idea of more attempts the quicker they are ✓ | 2     | 3.2a       |          |

|  |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | (c)* | <p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p><b>Level 3 (5–6 marks)</b><br/>Detailed description of the nervous system, in an appropriate order, and how the parts they work together to coordinate the response given in the question.</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> <p><b>Level 2 (3–4 marks)</b><br/>Limited description of the nervous system listed, in an appropriate order.<br/><b>AND</b><br/>Describes the role of one part.</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><b>Level 1 (1–2 marks)</b><br/>Limited description of the nervous system, in an appropriate order.<br/><b>OR</b><br/>Describes the role of one part.</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><br/>No response or no response worthy of credit.</p> | 6 | <b>2x 1.1</b><br><b>4x 2.1</b> | <p><b>AO1.1 Demonstrates knowledge and understanding of scientific ideas</b><br/>Parts identified in the correct order for the response</p> <ul style="list-style-type: none"> <li>• receptors</li> <li>• sensory neurone</li> <li>• relay neurone</li> <li>• spinal cord</li> <li>• brain</li> <li>• motor neurone</li> <li>• muscles / effectors</li> </ul> <p><b>AO2.1 Applies knowledge and understanding of scientific ideas</b><br/>Links parts to job in this specific example</p> <ul style="list-style-type: none"> <li>• image in mirror detected by receptors</li> <li>• receptors are in the eye</li> <li>• sensory neurone take impulses to the CNS/brain</li> <li>• relay neurone in the brain or spinal cord</li> <li>• CNS/brain coordinates the response</li> <li>• impulses sent down spinal cord</li> <li>• motor neurone takes impulse from spinal cord down the arm</li> <li>• muscles in the hands bring about the response</li> </ul> <p>continued</p> |
|--|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Question |     |      | Answer                                                                                                                                                                              | Marks | AO element | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|-----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17       | (a) | (i)  | 7 ✓                                                                                                                                                                                 | 1     | 1.2        | If answer line is blank open up the whole script to check for answer in table.<br><b>IGNORE</b> units                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|          |     | (ii) | <p><b>Any two from:</b></p> <p>it is an anomaly / does not fit the pattern ✓</p> <p>much lower/faster than the other two results ✓</p> <p>makes the <b>mean</b> more accurate ✓</p> | 2     | 3.1b       | <p><b>ALLOW</b> (considerably) different to the other results / too far away from the rest of the results / outlier<br/><b>IGNORE</b> incorrect result</p> <p><b>ALLOW</b> is <b>only/just</b> 8<br/><b>ALLOW</b> it is small compared to other results / should take longer / should be 17-19</p> <p><b>IGNORE</b> just 'it is small' / 'it is 8'</p> <p><b>ALLOW</b> not using it brings mean closer to true value<br/><b>ALLOW</b> using it would lower the mean</p> <p><b>IGNORE</b> not fair test / they measured it wrongly</p> |
|          | (b) |      | 10 - spread (of data) is least / smallest range ✓                                                                                                                                   | 1     | 3.2a       | <p><b>ALLOW only</b> two minutes between highest and lowest / all within one (minute) of each other<br/><b>ALLOW</b> numbers are <b>closer</b> (than the others)</p> <p><b>IGNORE</b> results are similar to each other / mean is close to the other numbers / no anomalies / highest values</p>                                                                                                                                                                                                                                      |

|  |     |                                                                                                                                                                                                                                                                                                                                          |   |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | (c) | to show that the algae/algal/beads was causing the effect / as a control ✓                                                                                                                                                                                                                                                               | 1 | 2.2                                      | <p><b>ALLOW</b> to see if the indicator changes colour without algae/algal/beads present</p> <p><b>ALLOW</b> examples of being used as a control e.g.<br/> to see if carbon dioxide is used up without any algae/algal/beads present<br/> make sure the hydrogen carbonate does not react with anything else (other than the algal beads)<br/> to see if anything changes without the algae (beads)<br/> to make sure indicator does not change on its own</p> <p><b>ALLOW</b> as a comparison (to the normal)</p> |
|  | (d) | <p><b>Max two from:</b><br/> idea that (more algae beads there are) the more chlorophyll/chloroplasts ✓</p> <p>(more algae beads) absorbs more light ✓</p> <p>larger surface area to take up more carbon dioxide ✓</p> <p><b>Max one from:</b><br/> the more algae/algal/beads present the faster the rate of photosynthesis / ORA ✓</p> | 3 | <p><b>2x 3.2b</b></p> <p><b>3.1a</b></p> | <p><b>ALLOW</b> more enzymes available (that are involved in photosynthesis)</p> <p><b>ALLOW</b> (more algae beads) absorb more energy</p> <p><b>ALLOW</b> the more algae beads the more photosynthesis / ORA<br/> <b>ALLOW</b> the more algae/algal/beads present the faster carbon dioxide is used / ORA</p> <p><b>IGNORE</b> faster rate of reaction</p> <p><b>IGNORE</b> carbon dioxide is a limiting factor / needed for photosynthesis</p>                                                                   |

|  |     |      |                                                                                                                                                                                                                                                                             |   |                   |                                                                                                                                                                                                                                                                                                                            |
|--|-----|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | (e) | (i)  | idea of water bath to maintain the temperature ✓                                                                                                                                                                                                                            | 1 | 2.2               | <b>ALLOW</b> change the temperature /<br>idea of using it as a water bath /<br>control the temperature                                                                                                                                                                                                                     |
|  |     | (ii) | put the algae beads at different temperatures ✓<br><br><b>Max two from:</b><br>states the need for controlling <b>other</b> variables ✓<br><br>identifies at least one variable they need to control ✓<br><br><br>measure time to turn purple (at different temperatures) ✓ | 3 | 2.2<br><br>2x3.3a | <b>ALLOW</b> keep everything else the same<br>e.g. keeping the number of beads the same each<br>time / always use 20 beads / same concentration<br>of hydrogen carbonate indicator solution / control<br>light intensity<br><br><b>ALLOW</b> time how long it takes<br><br><b>IGNORE</b> find the rate (of photosynthesis) |

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