

# Higher

## GCSE

### Combined Science Biology A Gateway Science

#### J250/08: Paper 8 (Higher Tier)

General Certificate of Secondary Education

### Mark Scheme for June 2025

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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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## MARKING INSTRUCTIONS

### PREPARATION FOR MARKING

#### RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor.
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

#### MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

## 5. Crossed-Out Responses

Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

### Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

### Multiple-Choice Question Responses

When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate). *When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

### Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

### Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

### Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

### Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add the annotation SEEN to confirm that the work has been seen.
7. There is a NR (No Response) option. Award NR (No Response)
  - if there is nothing written at all in the answer space
  - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
  - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

If you have any questions or comments for your Team Leader, use the phone, the RM Assessor messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

**The higher mark** should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

**The lower mark** should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

**In summary:**

**The skills and science content determines the level.**

**The communication statement determines the mark within a level.**

Level of response question on this paper is **Q14(a)\***

## 11. 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                                 |
|                                                                                     |                                        |

12. 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                                           |

### 13. 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        | B      | 1     | 2.1        |          |
| 2        | A      | 1     | 1.1        |          |
| 3        | B      | 1     | 1.1        |          |
| 4        | D      | 1     | 1.1        |          |
| 5        | B      | 1     | 1.1        |          |
| 6        | C      | 1     | 2.1        |          |
| 7        | D      | 1     | 1.1        |          |
| 8        | D      | 1     | 1.2        |          |
| 9        | B      | 1     | 1.2        |          |
| 10       | D      | 1     | 1.2        |          |

| Question |     |      | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Marks | AO element       | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|-----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11       | (a) | (i)  | Most effective antibiotic = C<br><b>AND</b><br>Least effective antibiotic = A ✓<br><br>C has the largest zone of inhibition/clear area (around disc with no bacterial growth) ✓                                                                                                                                                                                                                                                                                                                        | 2     | 2 × 3.2b         | <b>ALLOW ORA</b> for antibiotic A e.g. A doesn't have any clear area / zone of inhibition of A = 0cm                                                                                                                                                                                                                                                                                                                                                          |
|          |     | (ii) | <b>Any two from:</b><br><br>(Repeat) use different bacteria ✓<br><br>Spread the bacteria evenly ✓<br><br>Leave for a shorter time ✓<br><br>Same diameter/thickness of the antibiotic disc ✓<br><br>Same concentration of antibiotic ✓<br><br>Same temperature of incubation ✓<br><br>Incubate for the same time ✓<br><br>Idea of ensuring there are no contaminating bacteria ✓<br><br>Control should be used ✓<br><br>Use different plates for different antibiotics (to avoid cross contamination) ✓ | 2     | 3.3b<br><br>3.3a | <b>ALLOW</b> same concentration of bacteria<br><b>IGNORE</b> just 'repeat'<br><br><b>DO NOT ALLOW</b> leave for longer time<br><br><b>ALLOW</b> same size disc<br><br><b>ALLOW</b> soak the discs for the same length/amount of time<br><b>ALLOW</b> same volume of antibiotic<br><b>IGNORE</b> same amount of antibiotic<br><br><b>ALLOW</b> description of an aseptic technique<br><br><b>ALLOW</b> disc with no antibiotics/disc with just distilled water |

| Question |     |      | Answer                                                                                                                                                                                                                                      | Marks | AO element | Guidance                                                                                                                                                                                                           |
|----------|-----|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (b) |      | <b>Any two from:</b><br>White blood cells ✓<br>Antibodies produced ✓<br>Antitoxins produced ✓<br>Antibodies attach to antigens ✓<br>Antibodies cause pathogens to stick together ✓<br>Phagocytosis ✓<br>Correct reference to memory cells ✓ | 2     | 2 × 1.1    | <b>ALLOW</b> lymphocytes or phagocytes<br><b>DO NOT ALLOW</b> produce antigens<br><br><b>ALLOW</b> correct description of phagocytosis<br>e.g. enveloping/engulfing bacteria<br><b>IGNORE</b> bacteria being eaten |
|          | (c) | (i)  | <b>First check the answer on the answer line</b><br><b>If answer = 13 (%) award 2 marks</b><br><br>1.1 (million) / 8.7 (million) × 100 ✓<br>= 13 (%) ✓                                                                                      | 2     | 2 × 2.2    | <b>ALLOW</b> evidence of another correct method<br><br><b>ALLOW</b> any correct rounding 12.64367816 for 2 marks                                                                                                   |
|          |     | (ii) | (HIV/AIDS) damages/weakens the immune system /<br>targets/destroys white blood cells ✓                                                                                                                                                      | 1     | 3.1a       | <b>ALLOW</b> immunocompromised/<br>immunosuppressed / immune system<br>compromised/weakened<br><b>IGNORE</b> body is weakened by HIV                                                                               |

| Question |     | Answer                                                                                                                                                                                                                                                                                                                     | Marks | AO element | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (d) | <p><b>Any three from:</b></p> <p>(Resistance first produced) by a mutation ✓</p> <p>Resistant bacteria less likely/not killed by antibiotic /survive / <b>ORA</b> ✓</p> <p>(Resistant bacteria) reproduce / <b>ORA</b> ✓</p> <p>Pass on allele (for resistance) / <b>ORA</b> ✓</p> <p>Repeated over many generations ✓</p> | 3     | 3 × 2.1    | <p>If selective breeding described award no marks<br/>If their answer refers to antibodies throughout rather than antibiotics maximum 2 marks</p> <p><b>DO NOT ALLOW</b> idea that mutation happens in humans</p> <p><b>IGNORE</b> just some of them survive/some of them are killed<br/><b>IGNORE</b> survival of the fittest unless qualified<br/><b>IGNORE</b> ideas of being immune to antibiotics</p> <p><b>ALLOW</b> produce offspring/multiply/divide<br/><b>IGNORE</b> breed</p> <p><b>ALLOW</b> gene<br/><b>IGNORE</b> pass on traits/characteristics/mutation</p> <p><b>IGNORE</b> takes a long time</p> <p><b>ALLOW</b> pass on allele / gene (for resistance) to offspring for 2 marks = MP3 and MP4</p> |

J250/08

Mark Scheme

June 2025

| Question |     |       | Answer                                                                                                                    | Marks | AO element | Guidance                                                                                                                                                                                |
|----------|-----|-------|---------------------------------------------------------------------------------------------------------------------------|-------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12       | (a) | (i)   | <p>Characteristic                      Influence                      Classified</p> <p style="text-align: right;">✓✓</p> | 2     | 2 × 1.1    | All 6 correct = 2 marks<br>4 or 5 correct = 1 mark                                                                                                                                      |
|          | (b) | (i)   | <p>Genome<br/>Allele<br/>Mutation</p> <p style="text-align: right;">✓✓</p>                                                | 2     | 2 × 1.1    | 3 correct answers = 2 marks<br>1 or 2 correct answers = 1 mark                                                                                                                          |
|          |     | (ii)  | <p>Male/boy/man<br/><b>and</b><br/>has (an X and) Y (chromosome) ✓</p>                                                    | 1     | 2.1        | Mark answer as a whole<br><b>ALLOW</b> it would be XX if female                                                                                                                         |
|          |     | (iii) | <p>Extra chromosome on pair 21 ✓</p>                                                                                      | 1     | 3.1a       | <b>ALLOW</b> trisomy 21<br><b>ALLOW</b> identification on diagram such as circling chromosomes<br><b>IGNORE</b> has 47 chromosomes / has an extra chromosome / has too many chromosomes |

| Question |     |  | Answer                                                                                                                                                                                                                                      | Marks | AO element | Guidance                                                                                                                                                                                                                                  |
|----------|-----|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13       | (a) |  | <p><b>Any two from:</b></p> <p>(Less oestrogen so) less growth/division of (breast) cells ✓</p> <p>Less cell division means less chance of cancer/tumour ✓</p> <p>Less chance of mutations (due to less division of the breast cells) ✓</p> | 2     | 2 × 2.1    | <p><b>ALLOW</b> less growth of (breast) tissue</p> <p><b>IGNORE</b> growth of breast tissue will be less stimulated</p>                                                                                                                   |
|          | (b) |  | <p><b>Any one from:</b></p> <p>(Mapping of the) human genome had not been complete ✓</p> <p>Mutation/genetic testing/screening technology hadn't been available before ✓</p>                                                                | 1     | 2.1        | <p><b>ALLOW</b> we only now know the location/structure of (different) human genes</p> <p><b>ALLOW</b> only now have the technology/did not have the technology (needed) then</p> <p><b>IGNORE</b> did not have the correct equipment</p> |
|          | (c) |  | Non-communicable (diseases) ✓                                                                                                                                                                                                               | 1     | 1.1        | <p><b>IGNORE</b> uncommunicable</p> <p><b>IGNORE</b> cancer/type 2</p> <p>diabetes/cardiovascular disease</p> <p><b>DO NOT ALLOW</b> additional responses e.g. genetic</p>                                                                |

| Question |      |  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Marks | AO element                    | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14       | (a)* |  | <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/>Thorough discussion of selective breeding including:</p> <p>A detailed description of the process with reference to alleles/genes<br/><b>And</b><br/>A benefit to humans in breeding <b>both</b> dogs listed and examples given for both dogs</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/>Partial discussion of selective breeding including:</p> <p>A detailed description of the process<br/><b>And</b><br/>A benefit to humans in breeding <b>one</b> of these dogs and an example given</p> <p><b>Or</b></p> <p>A limited description of selective breeding<br/><b>And</b><br/>A benefit to humans in breeding <b>both</b> dogs and an example given for both dogs</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> | 6     | <p>3 × 1.1</p> <p>3 × 2.1</p> | <p>Please note: indicative content indicates possible points candidates might make, but this is not an exhaustive account. Any valid response should be rewarded.</p> <p><b>AO1.1 Demonstrate knowledge and understanding of the process of selective breeding:</b></p> <ul style="list-style-type: none"> <li>• select desired characteristic</li> <li>• breed these together</li> <li>• look at the offspring</li> <li>• select those with the desired characteristic</li> <li>• breed again</li> <li>• repeat over several generations</li> <li>• offspring will have desired characteristics</li> <li>• reference to alleles/genes for useful characteristic being inherited/passed down to offspring</li> </ul> <p><b>AO2.1 Apply knowledge and understanding to identify benefits of the dog breeds:</b></p> <p>American hairless terrier examples:</p> <ul style="list-style-type: none"> <li>• hairless dogs will not cause an allergic reaction / keeps house clean idea / won't need grooming</li> <li>• friendly nature will be more suitable as a pet / safe for children/visitors/elderly /</li> </ul> |

| Question |     |  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                     | Marks | AO element                                            | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|-----|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |     |  | <p><b>Level 1 (1–2 marks)</b><br/>Attempt at a discussion of selective breeding including:</p> <p>Description of the process<br/><b>Or</b><br/>A benefit to humans in breeding <b>one</b> of these dogs with an example</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/><i>No response or no response worthy of credit.</i></p> |       |                                                       | <p>provides companionship idea</p> <p>German Shepherd examples:</p> <ul style="list-style-type: none"> <li>• strong sense of smell can detect drugs and scents of people/ search and rescue / explosives</li> <li>• powerful can help overpower humans/ guard dogs / intimidating for criminals/can bring a person down</li> <li>• intelligence can be trained easily - use as guide dog/police dog/herding dog</li> <li>• the thick fur of a GSD ensures it can do outdoor jobs in workplaces</li> </ul> |
|          | (b) |  | <p><b>First check the answer on the answer line</b><br/><b>If answer = (+) 44 (%) award 3 marks</b></p> <p><math>35.83 - 24.95 / 24.95 \times 100</math></p> <p><b>Or</b></p> <p><math>10.88 / 24.95 \times 100 \checkmark</math></p> <p><math>= 43.6072144 (\%) \checkmark</math></p> <p><math>= 44 (\%) \checkmark</math></p>                                                                                                            | 3     | <p><b>2.2</b></p> <p><b>1.2</b></p> <p><b>1.2</b></p> | <p><b>ALLOW</b> evidence of another correct method</p> <p><b>ALLOW</b> any correct rounding</p> <p><b>ALLOW</b> one mark for an incorrectly calculated answer if it is clearly shown that it has been correctly rounded to 2 significant figures</p>                                                                                                                                                                                                                                                      |

| Question            |              |      | Answer                                                                                                                                                | Marks | AO element | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |              |    |   |    |    |    |    |    |    |    |    |
|---------------------|--------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------|----|---|----|----|----|----|----|----|----|----|
| 15                  | (a)          |      | Mutualistic ✓                                                                                                                                         | 1     | 2.1        | <b>ALLOW</b> symbiotic/mutualism/mutual reliance/mutual relationship                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |              |    |   |    |    |    |    |    |    |    |    |
|                     | (b)          | (i)  | <p><b>Independent:</b> temperature</p> <p><b>Dependent:</b> rise in dough (after 1 hr)</p> <p><b>Control:</b> initial pH/mass of dough/starter ✓✓</p> | 2     | 2 × 2.2    | <p>3 correct = 2<br/>1 or 2 correct = 1</p> <p><b>ALLOW</b> increase in height/volume of dough<br/><b>ALLOW</b> height of dough after 1 hour</p> <p><b>ALLOW</b> time/mass of yeast/type of bacteria/<br/>type of dough/ mass of bacterial culture/same<br/>size measuring cylinder/same initial height of<br/>dough<br/><b>IGNORE</b> amount</p>                                                                                                                                                                                                                                                   |                     |              |    |   |    |    |    |    |    |    |    |    |
|                     |              | (ii) | <p>Suitable scale on both axes ✓</p> <p>All points correctly plotted ✓✓</p>                                                                           | 3     | 3 × 2.2    | <p>Place ticks on right hand side of grid<br/><b>NOTE</b> bar chart scores maximum 2 marks<br/>(MP1: correct bars, MP2: discontinuous bars)<br/>Minimum 50% of grid used scale must be in<br/>ascending order and start from 0</p> <p><b>ALLOW</b> +/- half a square</p> <p>5 correct points plotted = 2 marks<br/>3 or 4 correct points plotted = 1 mark</p> <table><tr><th>Temperature<br/>(°C)</th><th>Mean<br/>(mm)</th></tr><tr><td>10</td><td>3</td></tr><tr><td>20</td><td>13</td></tr><tr><td>30</td><td>26</td></tr><tr><td>40</td><td>38</td></tr><tr><td>50</td><td>29</td></tr></table> | Temperature<br>(°C) | Mean<br>(mm) | 10 | 3 | 20 | 13 | 30 | 26 | 40 | 38 | 50 | 29 |
| Temperature<br>(°C) | Mean<br>(mm) |      |                                                                                                                                                       |       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |              |    |   |    |    |    |    |    |    |    |    |
| 10                  | 3            |      |                                                                                                                                                       |       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |              |    |   |    |    |    |    |    |    |    |    |
| 20                  | 13           |      |                                                                                                                                                       |       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |              |    |   |    |    |    |    |    |    |    |    |
| 30                  | 26           |      |                                                                                                                                                       |       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |              |    |   |    |    |    |    |    |    |    |    |
| 40                  | 38           |      |                                                                                                                                                       |       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |              |    |   |    |    |    |    |    |    |    |    |
| 50                  | 29           |      |                                                                                                                                                       |       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |              |    |   |    |    |    |    |    |    |    |    |

| Question |     |       | Answer                                                                                                                                                                                                                                                                                                                                                     | Marks | AO element | Guidance                                                                                                                                                                                                                                                                                                                                                                  |
|----------|-----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |     | (iii) | Curve of best fit through the points ✓                                                                                                                                                                                                                                                                                                                     | 1     | 2.2        | <b>ALLOW</b> line of best fit for their plotting<br><b>IGNORE</b> any extrapolation of line that still fits the pattern<br><b>DO NOT ALLOW</b> dot to dot line<br><b>DO NOT ALLOW</b> any extrapolation of the line that does not fit the pattern of points<br><b>DO NOT ALLOW</b> line of best fit drawn from a bar chart                                                |
|          | (c) | (i)   | <b>Any two from:</b><br><br>The dough rose the most at 40°C ✓<br><br>(The dough rose the most at 40°C) at all trials ✓<br><br>No overlap of results for each temperature ✓                                                                                                                                                                                 | 2     | 2 × 3.2a   | <b>ALLOW</b> after 40°C the height decreases / 40°C is the peak/maximum height                                                                                                                                                                                                                                                                                            |
|          |     | (ii)  | <b>Any two from:</b><br><br>Idea that they did not test narrower temperature range ✓<br><br>There are only results for 5 temperatures ✓<br><br>No control (is included in the results) ✓<br><br>Only one type of sour dough was tested ✓<br><br>Idea that different sour dough has different bacteria/yeast/enzymes (with different optimum temperature) ✓ | 2     | 2 × 3.1b   | <b>ALLOW</b> they did not test at 38°C or 42°C<br><b>ALLOW</b> they used big jumps in temperature<br><br><b>ALLOW</b> small sample size<br><b>ALLOW</b> example of more than 5 temperatures suggested within the range<br><b>IGNORE</b> they have not tried other temperatures<br><br><b>ALLOW</b> test 32°C, 34°C, 36°C, 38°C, 40°C and 42°C for 2 marks for MP1 and MP2 |

| Question |     |  | Answer                                                                                                                                                                                                                                             | Marks | AO element | Guidance                                                                                                                                                            |
|----------|-----|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (d) |  | <p><b>Any two from:</b></p> <p>Lower pH/acid will denature pathogen enzymes ✓</p> <p>Lower pH/acid will change the shape of the active site ✓</p> <p>Less enzyme substrate complexes ✓</p> <p>Less respiration ✓</p> <p>Less/no reproduction ✓</p> | 2     | 2 × 3.2b   | <p><b>ALLOW</b> multiply/divide/ replicate for reproduction</p> <p><b>IGNORE</b> growth</p> <p><b>If no marks awarded ALLOW</b> lactic acid is toxic for 1 mark</p> |

| Question |     |  | Answer                                                                                                                     | Marks | AO element | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------|-----|--|----------------------------------------------------------------------------------------------------------------------------|-------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16       | (a) |  | <p><b>Any one from:</b></p> <p>Detect the antigen/antibody/protein ✓</p> <p>DNA testing ✓</p> <p>Electron microscope ✓</p> | 1     | 1.1        | <p><b>ALLOW</b> ELISA</p> <p><b>ALLOW</b> lateral flow test/ dye labelled antibodies/ antibody/antigen test</p> <p><b>IGNORE</b> antibiotic resistant markers</p>                                                                                                                                                                                                                                                                                                    |
|          | (b) |  | <p>Less oxygen carried (in blood) ✓</p> <p>Less (aerobic) respiration/energy release ✓</p>                                 | 2     | 2 × 2.1    | <p><b>ALLOW</b> insufficient oxygen carried (in blood)</p> <p><b>ALLOW</b> less oxygen can bind to the haemoglobin</p> <p><b>IGNORE</b> red blood cells carry oxygen/ haemoglobin binds to oxygen</p> <p><b>ALLOW</b> more likely to do anaerobic respiration/produce lactic acid</p> <p><b>ALLOW</b> less ATP produced</p> <p><b>DO NOT ALLOW</b> less energy is created/produced</p> <p><b>DO NOT ALLOW</b> references to problems with human digestive system</p> |

| Question                                                   |                                   |  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Marks   | AO element | Guidance           |                    |                               |                                 |                                                            |                                   |            |             |                       |                                   |   |         |                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------|-----------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------|--------------------|--------------------|-------------------------------|---------------------------------|------------------------------------------------------------|-----------------------------------|------------|-------------|-----------------------|-----------------------------------|---|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | (c)                               |  | <p><b>Any three from:</b></p> <table><tr><th>Mitosis</th><th>Meiosis</th></tr><tr><td>2 (daughter) cells</td><td>4 (daughter) cells</td></tr><tr><td>Genetically identical /clones</td><td>Genetically different/variation</td></tr><tr><td>Diploid / full set of chromosomes/<br/>pairs of chromosomes</td><td>Haploid / half set of chromosomes</td></tr><tr><td>1 division</td><td>2 divisions</td></tr><tr><td>For growth and repair</td><td>To produce gametes/eggs and sperm</td></tr></table> <p>✓✓✓</p> | Mitosis | Meiosis    | 2 (daughter) cells | 4 (daughter) cells | Genetically identical /clones | Genetically different/variation | Diploid / full set of chromosomes/<br>pairs of chromosomes | Haploid / half set of chromosomes | 1 division | 2 divisions | For growth and repair | To produce gametes/eggs and sperm | 3 | 3 × 1.1 | <p>Mark as a whole</p> <p><b>IGNORE</b> references to human chromosomes and location of division</p> <p><b>NOTE</b> genetically needs only to be seen once for this MP</p> <p><b>ALLOW</b> 46 chromosomes <b>and</b> 23 chromosomes in that order<br/><b>DO NOT ALLOW</b> halves of chromosomes</p> <p><b>IGNORE</b> meiosis produces cells for sexual reproduction</p> |
| Mitosis                                                    | Meiosis                           |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |            |                    |                    |                               |                                 |                                                            |                                   |            |             |                       |                                   |   |         |                                                                                                                                                                                                                                                                                                                                                                         |
| 2 (daughter) cells                                         | 4 (daughter) cells                |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |            |                    |                    |                               |                                 |                                                            |                                   |            |             |                       |                                   |   |         |                                                                                                                                                                                                                                                                                                                                                                         |
| Genetically identical /clones                              | Genetically different/variation   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |            |                    |                    |                               |                                 |                                                            |                                   |            |             |                       |                                   |   |         |                                                                                                                                                                                                                                                                                                                                                                         |
| Diploid / full set of chromosomes/<br>pairs of chromosomes | Haploid / half set of chromosomes |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |            |                    |                    |                               |                                 |                                                            |                                   |            |             |                       |                                   |   |         |                                                                                                                                                                                                                                                                                                                                                                         |
| 1 division                                                 | 2 divisions                       |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |            |                    |                    |                               |                                 |                                                            |                                   |            |             |                       |                                   |   |         |                                                                                                                                                                                                                                                                                                                                                                         |
| For growth and repair                                      | To produce gametes/eggs and sperm |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |            |                    |                    |                               |                                 |                                                            |                                   |            |             |                       |                                   |   |         |                                                                                                                                                                                                                                                                                                                                                                         |

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