H

# GCSE (9–1)

# Combined Science (Biology) A (Gateway Science)

## J250/07: Paper 7 (Higher Tier)

General Certificate of Secondary Education

# Mark Scheme for Autumn 2021

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

## Annotations available in RM Assessor

| Annotation | Meaning |
|---|---|
|  | Correct response |
|  | Incorrect response |
|  | Omission mark |
|  | Benefit of doubt given |
|  | Contradiction |
|  | Rounding error |
|  | Error in number of significant figures |
|  | Error carried forward |
|  | Level 1 |
|  | Level 2 |
|  | Level 3 |
|  | Benefit of doubt not given |
|  | Noted but no credit given |
|  | Ignore |

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

| Annotation | Meaning |
|---|---|
| / | alternative and acceptable answers for the same marking point |
| ✓ | Separates marking points |
| **DO NOT ALLOW** | Answers which are not worthy of credit |
| **IGNORE** | Statements which are irrelevant |
| **ALLOW** | Answers that can be accepted |
| **( )** | Words which are not essential to gain credit |
| __ | Underlined words must be present in answer to score a mark |
| **ECF** | Error carried forward |
| **AW** | Alternative wording |
| **ORA** | Or reverse argument |

**Subject-specific Marking Instructions**

## INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Combined Science A:

| | Assessment Objective |
|---|---|
| **AO1** | **Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.** |
| AO1.1 | Demonstrate knowledge and understanding of scientific ideas. |
| AO1.2 | Demonstrate knowledge and understanding of scientific techniques and procedures. |
| **AO2** | **Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.** |
| AO2.1 | Apply knowledge and understanding of scientific ideas. |
| AO2.2 | Apply knowledge and understanding of scientific enquiry, techniques and procedures. |
| **AO3** | **Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.** |
| **AO3.1** | Analyse information and ideas to interpret and evaluate. |
| AO3.1a | Analyse information and ideas to interpret. |
| AO3.1b | Analyse information and ideas to evaluate. |
| **AO3.2** | Analyse information and ideas to make judgements and draw conclusions. |
| AO3.2a | Analyse information and ideas to make judgements. |
| AO3.2b | Analyse information and ideas to draw conclusions. |
| **AO3.3** | Analyse information and ideas to develop and improve experimental procedures. |
| AO3.3a | Analyse information and ideas to develop experimental procedures. |
| AO3.3b | Analyse information and ideas to improve experimental procedures. |

**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 | | | A✓ | 1 | 2.2 | |
| 2 | | | D✓ | 1 | 1.1 | |
| 3 | | | D✓ | 1 | 1.2 | |
| 4 | | | B✓ | 1 | 1.1 | |
| 5 | | | D✓ | 1 | 1.1 | |
| 6 | | | B✓ | 1 | 1.1 | |
| 7 | | | B✓ | 1 | 1.1 | |
| 8 | | | B✓ | 1 | 2.2 | |
| 9 | | | C✓ | 1 | 1.1 | |
| 10 | | | C✓ | 1 | 1.1 | |

**BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN**

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 11 | (a) | (i) | idea that hydrogen peroxide is used up in the experiment ✓<br><br>need to maintain the concentration of hydrogen peroxide each time they repeat ✓ | 2 | 2 x 2.2 | **ALLOW** hydrogen peroxide has reacted |
| | (a) | (ii) | idea that enzymes are not used up (in the reaction) ✓ | 1 | 2.2 | **ALLOW** catalase is not used up (in the reaction) |
| | (b) | (ii) | <br><br>suitable scale on correctly chosen axes ✓<br><br>both axis labelled with units ✓<br><br>plotting accurate ✓<br><br>suitable line of best fit through most points ✓ | 4 | 3 x 2.2<br><br>1.2 | **place ticks and crosses on right hand side of grid**<br><br>minimum 50% of grid used<br>scale must be in ascending order with volume on **Y** axis<br><br>labels are:<br>number of pieces of potato<br>volume of gas (collected) $cm^3$<br><br>**ALLOW** +or – half square<br><br>**ALLOW** line of best fit for candidate's plotting<br><br>**IGNORE** any extrapolation of line |
| | (b) | (ii) | answer matches candidate graph ✓ | 1 | 3.2a | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(b)** | **(iii)** | **FIRST CHECK ANSWER ON THE ANSWER LINE**<br>**If answer = 0.25 ($cm^3$/min) award 3 marks**<br><br>$\frac{3.8}{15}$ ✓<br><br>0.253333 ✓<br><br>= 0.25 ($cm^3$/min) ✓ | **3** | **3 x 2.2** | **ALLOW** incorrect rounding/number of significant figures for two marks<br>**ALLOW** evidence of rounding numbers to 2SF for one mark |
| | **(c)** | | use a water bath ✓ | **1** | **3.3b** | **IGNORE** use a thermometer / heat regulator |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 12 | (a) | | idea that it will prevent heat from warming up the contents of the beaker ✓ | 1 | 2.2 | **ALLOW** acts as a heat sink<br>**ALLOW** absorb heat from the lamp<br><br>**IGNORE** just maintain temperature |
| | (b) | (i) | **FIRST CHECK ANSWER ON THE ANSWER LINE**<br>**If answer = 6.3 award 2 marks**<br><br>$\frac{1}{0.16}$ ✓<br><br>= 6.3 ✓ (to 1 d.p.) | 2 | <br><br>2.2<br><br>1.2 | <br><br>**ALLOW** $\frac{1}{0.4^2}$ or 6.25<br><br>**ALLOW** evidence of rounding numbers to 1DP for one mark |
| | (b) | (ii) | **Any two from:**<br><br>as light intensity decreases number of bubbles decrease/ora ✓<br><br>as light intensity decreases rate of photosynthesis decreases /ora✓<br><br>less light energy available/chloroplasts can absorb less light energy (when lamp is further away)/ora✓<br><br>**THEN**<br><br>(after 0.2 levels off because) idea that light intensity is not the limiting factor / some other limiting factor is affecting rate other than light intensity ✓ | 3 | 2 x1.1<br><br><br><br><br><br><br><br>1 x 3.2b | <br><br>**ALLOW** as distance increases number of bubbles decrease/ora ✓<br><br>**ALLOW** as distance increases rate of photosynthesis decreases/ora ✓ |

| Question | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|
| * (c) | Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.<br><br>**Level 3 (5–6 marks)**<br>Detailed evaluation of method to suggest improvements in the investigation with explanations that cover accuracy **AND** precision.<br><br>*There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.*<br><br>**Level 2 (3–4 marks)**<br>Simply evaluation of method to suggest improvements in the investigation with explanations that cover accuracy **OR** precision.<br><br>*There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*<br><br>**Level 1 (1–2 marks)**<br>Simply evaluation of method to suggest improvements in the investigation.<br>**OR**<br>Attempts explanations that cover accuracy **OR** precision.<br><br>*There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant***.**<br><br>**0 marks**<br>*No response or no response worthy of credit.* | **6** | **2 x 3.1b**<br>**4 x 3.3b** | **AO3.1b Analyse information and ideas to evaluate the method.**<br>• no repeats / needs to repeat each distance<br>• counting bubbles is not accurate way to measure<br>/ idea of collecting volume rather than counting bubbles<br><br>**ALLOW** get a second person or instrument to count bubbles<br><br>**AO3.3b Analyse information and ideas to develop investigation to improve the investigation**<br>• collect the gas in a measuring cylinder or gas syringe to measure volume and obtain more **accurate** measurements<br>• idea of need to obtain at least three sets of results to see if they are **precise** or to eliminate any anomalies<br><br>**IGNORE** references to calculating means |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 13 | (a) | | less light available / plant stops photosynthesising ✓<br><br>stomata close ✓ | 2 | 2 x 2.1 | **ALLOW** idea that light affects transpiration<br>**ALLOW** increased humidity around the leaves.<br><br>**ALLOW** idea of reduced intake of carbon dioxide<br>**IGNORE** less water needed for photosynthesis |
| | (b) | | **Any three from:**<br>water taken in by root hairs ✓<br><br>water enters roots by osmosis ✓<br><br>movement of water through the xylem ✓<br><br>water moves up the stem / idea of transpiration stream ✓<br><br>water evaporates from the leaf cells / water evaporates into air spaces ✓<br><br>water lost through stomata ✓<br><br>water (vapour) lost from leaves by diffusion ✓ | 3 | 3 x 1.1 | **IGNORE** references to gas exchange<br><br>**ALLOW** correct reference to transpiration pull<br><br>**ALLOW** water lost by diffusion through stomata = 2 marks |
| | (c) | | **Any two from:**<br>sieve plates allow (dissolved) sugar to pass through ✓<br><br>idea of less cytoplasm or no organelles so more room for transport ✓<br><br>companion cells provide energy/keep the phloem cell alive ✓ | 2 | 2 x 1.1 | **ALLOW** absence of named organelle e.g. no nucleus |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 14 | (a) | (i) | **Any two from:**<br>idea does not close correctly or open as wide ✓<br><br>blood pressure reduced / less blood flow (to the lungs) ✓<br><br>less oxygenation in the lungs ✓<br><br>less oxygen will be transported around the body ✓ | 2 | 2 x 2.1 | **ALLOW** backflow will not be prevented<br><br>**ALLOW** less oxygen enters blood (in lungs)<br><br>**ALLOW** organs/cells do not receive enough oxygen |
| | (b) | (i) | differentiate to form different types of cells<br><br>**OR**<br><br>become specialised cells ✓ | 1 | 1.1 | **ALLOW** undifferentiated cells that can turn into any cell in the body |
| | (b) | (ii) | **Any two from:**<br>less chance of rejection ✓<br><br>will have the same DNA ✓<br><br>less ethical objections ✓ | 2 | 2 x 2.1 | **ALLOW** not attacked by white blood cells<br><br>**ALLOW** embryo not destroyed |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 15 | (a) | | **Any two from:**<br>allow metabolic reactions to take place at an appropriate rate ✓<br><br>idea of optimum temperature for enzymes ✓<br><br>idea of high temperatures denaturing enzymes ✓<br><br>idea of low temperatures may decrease enzyme action ✓ | **2** | **2 x 1.1** | <br><br><br><br>**ALLOW** enzymes do not work at optimum if temperature is too high/low<br><br>**ALLOW** so enzymes do not denature<br>**DO NOT ALLOW** cells denature<br><br><br>**ALLOW** idea of low temperatures may reduce diffusion rates |
| | (b) | | **Any four from:**<br>receptors (in the skin) detect the change in temperature ✓<br><br>impulse is sent along neurones ✓<br><br>correct pathway of neurones - sensory, relay, motor ✓<br><br>effector/muscle brings about response of lifting hand away ✓<br><br>mention of synapse between neurones ✓ | **4** | **4 x 1.1** | <br>**ALLOW** receptors (in the skin) are stimulated<br>**IGNORE** receptors detect pain<br><br><br>**ALLOW** interneuron/intermediate for relay<br>**ALLOW** correct pathway labelled on diagram<br><br>**ALLOW** muscle (in hand) contracts<br><br><br><br>**ALLOW as extra marking point**<br>idea of impulse reaching brain after response to register the pain |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(c)** | **(i)** | idea that the small groups sizes may result in insufficient data ✓ | **1** | **3.1b** | **IGNORE** people have different reaction times |
| | **(c)** | **(ii)** | **Any two from:**<br><br>reaction time before the drink is faster/less/lower for Group **A** /ora ✓<br><br>Group **B** have a great**er** decrease in reaction time (for 10 and 20min) /ora ✓<br><br>reaction time after 10 minutes is faster/less/lower for Group **A** /ora ✓<br><br>reaction time after 20 minutes is the same for both Groups ✓<br><br>reaction time for Group **A** only decreases in the first 10 min but Group **B** decreases over 20 min ✓ | **2** | **2 x 3.1a** | **ANSWERS MUST BE COMPARATIVE**<br>**IGNORE** just quoting data<br><br>**ALLOW** reaction time after drinking is faster/less/lower for Group **A** /ora<br><br>**ALLOW** (after drinking) both groups showed a decrease in reaction times / reaction times were faster for both groups |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 16 | (a) | | success rate increases <u>and</u> then decreases as woman gets older ✓<br><br>peak success rate is 27-28 years of age ✓ | 2 | 2 x 2.1 | **ALLOW** success rate increases as woman gets older till 27-28 years and then decreases = 2 marks |
| | (b) | (i) | (high levels) of FSH will cause (multiple) eggs to mature ✓<br><br>LH then causes ovulation ✓ | 2 | 2 x 1.1 | **ALLOW** stimulates the production of oestrogen which will help to build up the uterus wall<br><br>**ALLOW** LH then causes eggs to be released |
| | | (ii) | **Any one from:**<br>increased cost of bringing up more than one child ✓<br><br>high blood pressure ✓<br><br>premature birth ✓<br><br>anaemia ✓<br><br>(increased chance of) miscarriage ✓<br><br>complications with birth / preeclampsia / gestational diabetes ✓ | 1 | 2.1 | **IGNORE** stress on heart / ethical issues |

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