

GCSE (9–1)

Combined Science A (Biology) A (Gateway Science)

J250/08: Paper 8 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

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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

| 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 | 2.1 | |
| 2 | | D✓ | 1 | 1.1 | |
| 3 | | B✓ | 1 | 1.1 | |
| 4 | | B✓ | 1 | 1.1 | |
| 5 | | C✓ | 1 | 1.1 | |
| 6 | | A✓ | 1 | 1.1 | |
| 7 | | D✓ | 1 | 2.1 | |
| 8 | | C✓ | 1 | 2.1 | |
| 9 | | C✓ | 1 | 1.1 | |
| 10 | | B✓ | 1 | 1.1 | |

BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

| Question | | | Answer | Marks | AO element | Guidance |
|----------|-----|-----|--|-------|------------|---|
| 11 | (a) | (i) | <p>Any two from:</p> <p>higher levels of blood cholesterol result in more deaths / lower levels of blood cholesterol result in less deaths ✓</p> <p>blood cholesterol level of 6.5 - 7.99 (mol/dm³) has the highest percentage of deaths ✓</p> <p>blood cholesterol level of <5 (mol/dm³) has the least percentage of deaths ✓</p> <p>5.0 – 6.49 (mol/dm³) the most common cholesterol level / <5 (mol/dm³) least common cholesterol level ✓</p> <p><5 (mol/dm³) or 5-6.49 (mol/dm³) percentage population was higher than deaths ✓</p> <p>6.5 - 7.99(mol/dm³) or >8 (mol/dm³) deaths higher than percentage population ✓</p> | 2 | 2 x 3.2b | <p>ALLOW heart disease for deaths</p> <p>IGNORE just quoting data e.g. men with blood cholesterol level less than 5 (mol/dm³) had 4% deaths</p> <p>ALLOW as blood cholesterol level decreases the number of deaths decrease</p> <p>IGNORE smallest percentage of population has less deaths</p> <p>ALLOW those with 6.5 - 7.99 (mol/dm³) are more likely to die</p> <p>ALLOW those with <5 (mol/dm³) are less likely to die</p> <p>ALLOW for two marks: idea that there were few men with >8.0 (mol/dm³) blood cholesterol levels yet they had the second highest percentage of deaths ✓✓ or idea that the percentage deaths in high cholesterol group is very high relative to the percentage of people in that group ✓✓</p> |

| Question | | Answer | Marks | AO element | Guidance |
|----------|-------|--|-------|------------|---|
| | (ii) | <p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 1:24 award 2 marks</p> <p>4:96 / 4 in 96 / $96 \div 4$ ✓</p> <p>1:24 ✓</p> | 2 | 2 x 2.2 | <p>DO NOT ALLOW 96:4</p> <p>DO NOT ALLOW 24:1</p> |
| | (iii) | <p>only 1 in 25/4% die from heart disease (with levels $<5 \text{ mol/dm}^3$) ✓</p> <p>levels above (5 mol/dm^3) account for 96% of the deaths ✓</p> <p>Or any one of these for 2 marks: 10% of people have levels $<5 \text{ (mol/dm}^3)$ but account for 4%/less than 5% of deaths ✓✓</p> <p>12% of people have levels $>8 \text{ (mol/dm}^3)$ but account for more than 25% of deaths ✓✓</p> | 2 | 2 x 3.2a | <p>ALLOW idea it reduces your chance of getting heart disease/heart attack/dying</p> <p>ALLOW ($<5 \text{ mol/dm}^3$) had the least number of deaths</p> <p>ALLOW higher blood cholesterol levels result in more deaths/increase risk of heart disease</p> |
| (b) | (i) | <p>reducing (the build-up of) cholesterol reduces (risk of) heart disease. ✓</p> <p>(therefore) blood flows more freely through arteries / less blockages in arteries / less risk of heart attack / heart <u>muscle</u> gets more oxygen/glucose ✓</p> | 2 | 2 x 2.1 | <p>ALLOW build-up of cholesterol (in arteries) causes heart disease</p> <p>IGNORE HRT reduces the build-up of cholesterol/decreases blood cholesterol</p> <p>IGNORE less risk of heart disease</p> <p>ALLOW arteries will not get clogged up (with cholesterol)</p> <p>ALLOW increased blood flow to heart <u>muscle</u></p> |

| Question | | Answer | Marks | AO element | Guidance |
|----------|-------|---|-------|----------------|---|
| | (ii) | longer period for study (to see if reduction of cholesterol reduces heart disease) ✓ | 1 | 3.3a | ALLOW takes longer than 5 years for cholesterol build-up to lead to heart disease ALLOW perform tests of heart function ALLOW record the number of women in the study with heart disease / died of heart disease ALLOW increase the dose of HRT IGNORE do more tests / increase number of women in study / check on them more often than 5 years |
| | (iii) | (HRT might) increase the rate of cell division ✓ (increase the risk of) uncontrolled cell division / (increase the risk of) tumour formation ✓ | 2 | 2.1 1.1 | IGNORE reference to cell growth / increased mitosis ALLOW (increase the risk) of uncontrolled cell replication ALLOW as extra marking point increased rate of mitosis (increases) risk of mutation |
| (c) | | (more) exercise / reduced (saturated) fat diet / less alcohol / stop smoking / less salt in diet / less stress ✓ | 1 | 1.1 | ALLOW example of type of exercise IGNORE healthier diet |

| Question | | | Answer | Marks | AO element | Guidance |
|----------|-----|------|---|-------|---------------------------|---|
| 12 | (a) | (i) | (plastic) is flammable / gives off toxic fumes / will melt in flame / ORA ✓ | 1 | 2.2 | ALLOW glass bottles can be reused/ORA ALLOW glass has a higher melting point ALLOW plastic might burn IGNORE plastic cannot be recycled |
| | | (ii) | heating will sterilise the bottle ✓ prevents microbe transferring to agar ✓ | 2 | 2 x 2.2 | ALLOW will kill the bacteria/microbes (on bottle) ALLOW prevents (microbial) contamination |
| | (b) | (i) | FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 380 (mm²) award 3 marks radius is 11(mm) ✓ 11 x 11 x 3.14 ✓ = 379.94 = 380 (mm ²) (rounded to 3 sig figs) ✓ | 3 | 2.2 2.2 1.2 | M1 measurement of 11mm M2 = M1 ² x 3.14 M3 = M2 correctly converted to three SF Only award M3 if clear evidence they have used πr^2 ALLOW subtraction of antibiotic disc area resulting in a final answer of 342 (mm ²) = 3 marks |

| Question | | Answer | Marks | AO element | Guidance |
|----------|------|--|-------|------------|--|
| | (ii) | <p>(antibiotic) A no mark</p> <p>larger area (of clear agar jelly) / C has smaller area ✓</p> <p>therefore A is more effective / could be used in lower concentrations / ora ✓</p> | 2 | 2 x 3.2a | <p>ALLOW ECF - if answer to (b)(i) is less than 177mm² then answer is C no mark – reasons are the same</p> <p>ALLOW bigger zone of inhibition</p> <p>ALLOW A kills more bacteria / C kills fewer bacteria</p> <p>ALLOW could be used in lower doses</p> <p>IGNORE stronger / more potent / fights more bacteria</p> <p>ALLOW A is 1.75 -1.85 times more effective = 2 marks</p> |
| | (c) | <p>Any two from:</p> <p>bacteria are able to mutate ✓</p> <p>resistance is passed on (in DNA) ✓</p> <p>increase percentage of population with resistance overtime ✓</p> <p>as new antibiotics developed bacteria become resistant ✓</p> | 2 | 2 x 1.1 | <p>ALLOW resistance is inherited</p> <p>ALLOW idea that those bacteria without resistance die / those with resistance survive</p> <p>IGNORE unsuccessful bacteria die / successful bacteria survive</p> |

| Question | | | Answer | Marks | AO element | Guidance | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|--|---------|--|-------|------------|--|-------------|--|--|---------|---------|---|------|------|---|------|------|----|------|------|----|------|------|----|------|------|----|------|------|
| 13 | (a) | (i) | <p>axes correctly labelled, including units of days and g/litre ✓</p> <p>axes even scales occupying more than half of the grid ✓</p> <p>all points correctly plotted ✓</p> <p>lines labelled or a key ✓</p> <p>two straight lines of best fit starting at day 0 and 0.15 g/litre ✓</p> | 5 | 4 x 2.2 | <p>MAX 4 for a bar chart</p> <p>ALLOW either order of axis</p> <p>1.2 ALLOW +/- half a square at least 8 points correctly plotted ✓</p> <p>IGNORE extrapolations</p> <table border="1"> <thead> <tr> <th rowspan="2">Time (days)</th> <th colspan="2">Dry mass at different temperatures (g/litre)</th> </tr> <tr> <th>25 (°C)</th> <th>35 (°C)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0.15</td> <td>0.15</td> </tr> <tr> <td>5</td> <td>0.21</td> <td>0.28</td> </tr> <tr> <td>10</td> <td>0.30</td> <td>0.42</td> </tr> <tr> <td>15</td> <td>0.36</td> <td>0.52</td> </tr> <tr> <td>20</td> <td>0.45</td> <td>0.63</td> </tr> <tr> <td>25</td> <td>0.50</td> <td>0.74</td> </tr> </tbody> </table> | Time (days) | Dry mass at different temperatures (g/litre) | | 25 (°C) | 35 (°C) | 0 | 0.15 | 0.15 | 5 | 0.21 | 0.28 | 10 | 0.30 | 0.42 | 15 | 0.36 | 0.52 | 20 | 0.45 | 0.63 | 25 | 0.50 | 0.74 |
| Time (days) | Dry mass at different temperatures (g/litre) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 25 (°C) | 35 (°C) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0.15 | 0.15 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 0.21 | 0.28 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 0.30 | 0.42 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | 0.36 | 0.52 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | 0.45 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | 0.50 | 0.74 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Question | | Answer | Marks | AO element | Guidance |
|----------|------|--|-------|------------------------|--|
| | (ii) | <p>increase in dry mass over time ✓</p> <p>increase in dry mass is greater at 35°C ✓</p> | 2 | 2 x 3.1a | <p>increase in dry mass must be seen at least once</p> <p>IGNORE just 'as days increase both temperatures increase'</p> <p>ALLOW higher temperature/35°C has higher dry mass</p> <p>IGNORE just 'it is higher at higher temperature'</p> |
| | (b) | <p>Any three from:</p> <p>slower rate of photosynthesis ✓</p> <p>less (growth of) algae ✓</p> <p>less food (for other organisms) ✓</p> <p>less oxygen available for animals ✓</p> <p>ideas about reduce populations / decrease biodiversity ✓</p> | 3 | 3 x 2.1 | <p>ALLOW less photosynthesis</p> <p>IGNORE not enough heat for photosynthesis</p> <p>ALLOW not enough algae</p> <p>IGNORE no algae</p> <p>IGNORE not enough dry mass</p> <p>ALLOW no food (for other organisms) / more competition for food / not enough to eat / not enough dry mass to eat</p> <p>ALLOW not enough oxygen for respiration</p> <p>ALLOW less organisms</p> <p>IGNORE animals and plants die / no organisms</p> |
| | (c) | <p>increase (in mass of) algae in lakes/ivers ✓</p> <p>increase in toxic products will kill (more) animals/humans ✓</p> | 2 | <p>2.1</p> <p>3.2a</p> | <p>ALLOW faster growth of algae</p> <p>ALLOW more toxin so (more) fish are killed / more toxin so decrease in fish numbers</p> |

| Question | | Answer | Marks | AO element | Guidance |
|----------|-----|--|-------|------------|---|
| 14 | (a) | <p>Any four from:</p> <p>(insulin) gene identified (in human DNA) ✓</p> <p>gene inserted into plasmid ✓</p> <p>restriction enzyme to cut open the plasmid or to cut out the gene ✓</p> <p>ligase enzyme to insert the gene ✓</p> <p>correct reference to sticky ends ✓</p> <p>correct reference to selection using antibiotic markers ✓</p> | 4 | 4 x 1.1 | <p>ALLOW gene is taken from a human cell</p> <p>ALLOW idea sticky ends are joined</p> |
| | (b) | <p>diet high in sugar/fat causes obesity ✓</p> <p>type 2 diabetes linked to obesity ✓</p> | 2 | 2 x 1.1 | <p>ALLOW diet high in sugar/fat causes type 2 diabetes</p> <p>ALLOW reducing sugar/fat in diet could help treat type 2 diabetes</p> <p>IGNORE healthy diet reduces obesity/type 2 diabetes</p> <p>ALLOW decrease weight can prevent or treat type 2 diabetes</p> |
| | (c) | <p>doctors will be able to predict which people are likely to suffer from type 2 diabetes ✓</p> <p>personalised/individual treatments can be developed / treatments more effective (because medicines tailored for specific medical needs) ✓</p> | 2 | 2 x 1.1 | <p>ALLOW idea that genes that prevent cells losing their sensitivity to insulin can be identified</p> <p>ALLOW idea of identifying carriers of type 2 diabetes</p> <p>IGNORE identify gene that causes type 2 diabetes</p> <p>ALLOW idea of developing more effective/personalised/specific medication</p> <p>IGNORE can identify which type of drug to produce</p> <p>IGNORE idea of just 'developing new or correct medication'</p> |

| Question | | | Answer | Marks | AO element | Guidance |
|----------|-----|--|----------------------------------|-------|------------|---|
| 15 | (a) | | growth ✓ division / mitosis ✓ | 2 | 2 x 1.1 | either order ALLOW multiplication / replication IGNORE mutation |

| Question | | Answer | Marks | AO element | Guidance |
|----------|-----|---|-------|--------------------------------|--|
| * | (b) | <p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Considered evaluation of benefits and risks of gene therapy on cancer treatment. AND Demonstrates and applies knowledge and understanding to explain why gene therapy could be used.</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>Level 2 (3–4 marks) Evaluates benefits and risks of gene therapy on cancer treatment. AND Demonstrates or applies knowledge and understanding to explain why gene therapy could be used.</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>Level 1 (1–2 marks) Attempts to evaluate benefits/risks of gene therapy on cancer treatment. OR Applies knowledge and understanding to explain why gene therapy could be used. OR Demonstrates knowledge and understanding of cancer.</p> | 6 | 2 x 1.1 2 x 2.1 2 x 3.1b | <p>AO1.1 Demonstrate knowledge and understanding of cancer and use of gene therapy</p> <ul style="list-style-type: none"> uncontrolled cell growth causes cancer gene therapy would involve replacing faulty p53 gene or replacing with a correct version of faulty gene gene therapy uses a vector to insert gene <p>AO2.1 Apply knowledge and understanding of to explain why gene therapy could be used</p> <ul style="list-style-type: none"> replacing (p53) gene will prevent replication of damaged DNA preventing replication of damaged DNA reduces effects of lung cancer/prevent further growth of cancer/stop cancer spreading <p>AO3.1b Analyse information and ideas to evaluate benefits and risks of gene therapy for example</p> <p>benefits:</p> <ul style="list-style-type: none"> if gene therapy saves lives, it can only be a good thing replacing a faulty (p53) gene could prevent years of (painful) cancer treatment current treatment is unreliable and gene therapy may improve on this reduce effects of lung cancer / prevent further growth of cancer / stop cancer spreading <p>risks:</p> <ul style="list-style-type: none"> long-term outcomes / effects not known ethically controversial to interfere with human genome idea of rejection <p>ALLOW gene therapy may be short lived / not effective</p> |

| Question | Answer | Marks | AO element | Guidance |
|----------|--|-------|------------|---|
| | <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>0 marks <i>No response or no response worthy of credit.</i></p> | | | <p>Level 3 consideration that benefits may outweigh risks as lung cancer is major cause of death in humans and current treatments are unreliable and painful</p> |

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