

GCE

Biology B (Advancing Biology

Unit **H022/02**: Biology in depth

Advanced Subsidiary GCE

Mark Scheme for June 2016

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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1. Annotations

| Annotation | Meaning |
|---------------------|--|
| 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 |

2. 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.

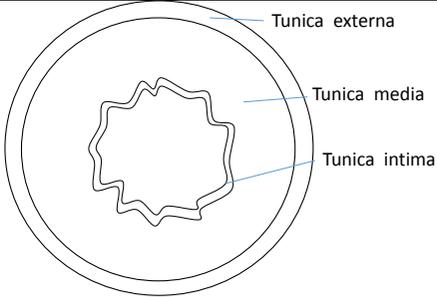
| Question | | Answer | Marks | AO element | Guidance |
|----------|-----|---|-------|------------|---|
| 1 | (a) | <p>A (nucleolus) manufactures ribosomes ✓</p> <p>B (cell wall) prevents the cell from bursting ✓</p> <p>C (chloroplast) (site of) photosynthesis ✓</p> | 3 | AO1.1 | <p>ACCEPT synthesises rRNA</p> <p>ACCEPT maintains shape / allows turgidity</p> <p>IGNORE structure / stability / strengthens</p> <p>ACCEPT description</p> |
| | (b) | (i) | 2 | AO2.8 | <p>Correct answer = 2 marks</p> <p>ACCEPT 0.23 - 0.28</p> <p>1/36 - 44 = 1 mark</p> <p>x 10 = 1 mark</p> |
| | | (ii) | 2 | AO2.8 | <p>Correct answer = 2 marks</p> <p>ACCEPT 4.6 - 5.6</p> <p>20 (eye piece graticule units) = 1 mark</p> <p>x (b)(i) = 1 mark</p> <p>If answer given is incorrect allow 1 mark for ECF</p> |

| Question | | Answer | Marks | AO element | Guidance |
|----------|-----|--------|-------|------------|---|
| | (c) | (i) | 1 | AO3.4 | <p>ACCEPT water uptake</p> <p>IGNORE references to transpiration</p> |
| | | (ii) | 1 | AO3.4 | <p>IGNORE light intensity as this is the independent variable or temperature as this is stated in the question</p> <p>IGNORE references to time / water</p> <p>ACCEPT movement of air e.g. either by setting the fan to constant speed or by placing the plant shoot and potometer at set distances from the fan or methods used to prevent draughts</p> <p>e.g. use the same size leaves or same number of leaves</p> |
| | | | | | <p>wind (speed) and suitable control</p> <p>or</p> <p>surface area of leaves and suitable control</p> <p>or</p> <p>humidity and suitable control ✓</p> |

| Question | | Answer | Marks | AO element | Guidance |
|----------|-----|---|--------------------|----------------------------|---|
| 2 | (a) | add, biuret solution ✓ observe a colour change (from blue) to lilac ✓ | 2 | AO3.1 | ACCEPT add, NaOH and copper sulphate solution ACCEPT purple, mauve for end colour |
| | (b) | <u>hydrolysis</u> ✓ | 1 | AO1.1 | |
| | (c) | (i) distance travelled by amino acid = 52 - 58mm and distance travelled by solvent front = 125 - 127mm ✓ 0.42 - 0.46 calculated ✓ tyrosine ✓ | 2 1 | AO2.8 AO3.1 | |
| | | (ii) use longer chromatography paper ✓ <i>idea of longer paper gives better resolution</i> ✓ | 2 | AO3.4 | CREDIT alternative methods suitably justified e.g. two-way chromatography / different solvent |

| Question | Answer | Marks | AO element | Guidance |
|----------|---|-------|------------|---|
| (d)* | <p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>In summary: <i>Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)</i> <i>Using a 'best-fit' approach based on the science content of the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.</i> <i>Then, award the higher or lower mark, according to the communication statement (in italics).</i></p> <ul style="list-style-type: none"> • The science content determines the level. • The communication statement determines the mark within a level. <p>Level 3 (5–6 marks) Provides a comprehensive explanation of the transport of proteins into the intestinal cells / transport in the plasma, and the formation of proteins including reference to both transcription and translation and RNA structure. <i>There is a well-developed line of reasoning which is clear and logically structured and flows. All the information presented is relevant.</i></p> <p>Level 2 (3–4 marks) A partial explanation of both the transport of proteins into the intestinal cells / transport in the plasma, and the formation of proteins including reference to both transcription and translation and RNA structure. <i>There is a line of reasoning presented with some structure. The information presented is mostly relevant.</i></p> | 6 | AO2.1 | <p>scientific points may include</p> <p>transport</p> <ul style="list-style-type: none"> • dissolves / soluble in plasma • polar molecule • contraction of heart • details of facilitated diffusion • details of action of channel / carrier proteins • passive process • high to low concentration <p>formation of proteins</p> <ul style="list-style-type: none"> • 4 nucleotide bases • adenine, thymine, cytosine and guanine • codon and anti-codon • hydrogen bonding between bases • unzipping / breaking of hydrogen bonds • production of mRNA • formation of phosphodiester bonds between nucleotides, condensation reactions • role of tRNA • formation of peptide bonds between amino acids • complementary base pairing • details of protein structures |

| Question | | | Answer | Marks | AO element | Guidance |
|----------|--|--|--|-----------|------------|----------|
| | | | <p>Level 1 (1–2 marks) An explanation of either the transport of proteins into the intestinal cells / transport in the plasma, or the formation of proteins. <i>The information is communicated with little structure.</i> <i>Communication is hampered by the inappropriate use of technical terms.</i></p> <p>0 marks No response or no response worthy of credit.</p> | | | |
| | | | Total | 14 | | |

| Question | | Answer | Marks | AO element | Guidance | |
|--------------|-----|--------|---|------------|----------|--|
| 3 | (a) | (i) | chamber M (right) ventricle ✓ valve N bicuspid valve / (left) AV valve ✓ | 2 | AO1.2 | ACCEPT mitral valve |
| | | (ii) | no shading ✓ use a sharp pencil ✓ continuous lines ✓ add label(s) / title / description(s) ✓ add scale ✓ | 2 Max | AO3.4 | |
| | (b) | (i) | increased stroke volume / described ✓ | 1 | AO2.1 | |
| | | (ii) | less blood (supplied to muscles) ✓ less oxygen / glucose (supplied to muscles) ✓ less (aerobic) respiration ✓ | 2 Max | AO2.1 | ACCEPT less oxygenated blood |
| | (c) | | tunica media thicker than tunica externa and endothelium ✓ two of the following labels, lumen / tunica intima / endothelium / tunica media / smooth muscle / elastic fibres / squamous cells ✓ | 2 | AO1.1 |  |
| Total | | | 9 | | | |

| Question | | Answer | Marks | AO element | Guidance |
|----------|-----|--|-------|------------|---|
| 4 | (a) | Gram-negative (bacteria are) more resistant / less sensitive, to ampicillin (than gram-positive) ✓ (because) Gram-negative have an outer, membrane / cell wall, present ✓ <i>idea that</i> antibiotic does not reach (inner) cell wall/ description of effect ✓ | 2 Max | AO3.1 | ACCEPT ORA for each MP ACCEPT ampicillin is less effective against Gram-negative ACCEPT <i>idea of</i> outer layer e.g. inhibition of cell wall synthesis, protein synthesis, DNA synthesis |
| | (b) | (i) communicable / transmissible ✓ | 1 | AO1.1 | ACCEPT infectious / contagious |
| | | (ii) example of general lab hygiene ✓ <i>idea of</i> work close to, a Bunsen burner / UV light ✓ only lift lid slightly ✓ flame the, spreader / loop ✓ safe disposal of, slides / agar plates ✓ <i>idea of</i> prevention of anaerobic conditions ✓ | 3 Max | AO3.4 | e.g. use of disinfectant to wash hands / bench, use sterilised slide, use of lab coats, gloves, goggles ACCEPT use lid as umbrella e.g. hypochlorite / autoclaving / bleach |

| Question | | Answer | Marks | AO element | Guidance |
|----------|-----|---|-------|------------|---|
| | (c) | (tuberculin) antigen is recognised by the immune system / named immune cell ✓ <u>histamine</u> released ✓ (histamine) causes capillaries to become leaky / AW ✓ (histamine) causes the formation of the oedema / swelling ✓ inflammatory response ✓ | 3 Max | AO2.5 | e.g. causes more tissue fluid to form |
| | (d) | (i) | 2 | A02.2 | $((150-120)/150) \times 100 = 20$ $20/10 = 2\%$ decrease per year Correct answer = 2 marks If answer given is not 'per year' allow 1 mark for $((150-120)/150) \times 100 = 20$ |

| Question | | Answer | Marks | AO element | Guidance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|------------------------|---|--------------|------------|--|------|------------------------|-----------------------------------|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|
| | (ii) | <p>Supports between 2000 and 2002 antibiotic resistant MDR-TB increases as prescriptions increase ✓ decrease in number of prescriptions from 2003 to, 2008 / 2009 / 2010, results in, slight decrease / no, change in MDR TB cases ✓ 1 Max</p> <p>Undermines between 2002 and 2003 antibiotic resistance decreases even though prescription number increases ✓ between 2004 to 2005 an increase in prescriptions but MDR-TB cases decrease ✓ 1 Max</p> <p>comparative data quoted ✓</p> | 3 Max | AO3.2 | <table border="1"> <thead> <tr> <th>Year</th> <th>Number of MDR TB cases</th> <th>Antibiotic prescription per 1,000</th> </tr> </thead> <tbody> <tr><td>2000</td><td>150</td><td>380</td></tr> <tr><td>2001</td><td>151</td><td>415</td></tr> <tr><td>2002</td><td>160</td><td>410</td></tr> <tr><td>2003</td><td>120</td><td>450</td></tr> <tr><td>2004</td><td>128</td><td>420</td></tr> <tr><td>2005</td><td>120</td><td>440</td></tr> <tr><td>2006</td><td>124</td><td>420</td></tr> <tr><td>2007</td><td>124</td><td>390</td></tr> <tr><td>2008</td><td>107</td><td>400</td></tr> <tr><td>2009</td><td>112</td><td>405</td></tr> <tr><td>2010</td><td>120</td><td>380</td></tr> </tbody> </table> <p>Note must include years, number of cases and number of prescriptions per 1000 for either supports or undermines</p> | Year | Number of MDR TB cases | Antibiotic prescription per 1,000 | 2000 | 150 | 380 | 2001 | 151 | 415 | 2002 | 160 | 410 | 2003 | 120 | 450 | 2004 | 128 | 420 | 2005 | 120 | 440 | 2006 | 124 | 420 | 2007 | 124 | 390 | 2008 | 107 | 400 | 2009 | 112 | 405 | 2010 | 120 | 380 |
| Year | Number of MDR TB cases | Antibiotic prescription per 1,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2000 | 150 | 380 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2001 | 151 | 415 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2002 | 160 | 410 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2003 | 120 | 450 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2004 | 128 | 420 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2005 | 120 | 440 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2006 | 124 | 420 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2007 | 124 | 390 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2008 | 107 | 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2009 | 112 | 405 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2010 | 120 | 380 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Total | 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Question | | Answer | Marks | AO element | Guidance |
|----------|-----|---|-------|------------|---|
| 5 | (a) | no response to / detection of, DNA damage / AW ✓ cells division / mitosis, continues ✓ apoptosis not triggered ✓ | 2 Max | AO2.5 | ACCEPT DNA replication not checked |
| | (b) | X-ray / mammogram / CT / computerized tomography ✓ MRI scan ✓ PET scan ✓ thermography ✓ ultrasound / sonography ✓ | 3 Max | AO1.2 | IGNORE screening programmes |

| Question | Answer | Marks | AO element | Guidance |
|----------|---|-------|----------------|---|
| (c)* | <p><i>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</i></p> <p><i>In summary:</i> <i>Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)</i> <i>Using a 'best-fit' approach based on the science content of the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.</i> <i>Then, award the higher or lower mark, according to the communication statement (in italics).</i></p> <ul style="list-style-type: none"> • <i>The science content determines the level.</i> • <i>The communication statement determines the mark within a level.</i> <p>Level 3 (5–6 marks) <i>Provides a comprehensive explanation of both the ethical and economic considerations when screening. There is a well-developed line of reasoning which is clear and logically structured and flows. All the information presented is relevant.</i></p> <p>Level 2 (3–4 marks) <i>Provides a partial explanation of both the ethical and economic considerations when screening. There is a line of reasoning presented with some structure. The information presented is mostly relevant.</i></p> | 6 | AO1.2 AO2.1 | <p>scientific points may include</p> <p>Ethical</p> <ul style="list-style-type: none"> • rights of babies • may give false result • religious / cultural reasons • may cause an immune response in patient • telling someone they may develop a disease which might never happen • consequences of results to families • discrimination qualified e.g. insurance, employment <p>Economic</p> <ul style="list-style-type: none"> • expensive to test all babies • other services would have to be cut / money would have to be found from elsewhere • unnecessary cost as most babies don't carry the gene • money could be better spent • money could be invested in treatments / research |

| Question | | | Answer | Marks | AO element | Guidance |
|----------|--|--|---|-----------|------------|----------|
| | | | <p>Level 1 (1–2 marks) Provides an explanation of either the ethical and economic considerations when screening. <i>The information is communicated with little structure.</i> <i>The answer does not flow and detracts from communicating the information.</i></p> <p>0 marks No response or no response worthy of credit.</p> | | | |
| | | | Total | 12 | | |

| Question | | Answer | | | | Marks | AO element | Guidance | |
|----------|-----|--|---------|-----------|------------|-------|----------------|----------|---|
| 6 | (a) | Event | Mitosis | Meiosis I | Meiosis II | 4 | AO1.2 AO2.5 | | |
| | | Chromosomes condense in prophase | ✓ | ✓ | ✗ | | | | |
| | | Nuclear envelope breaks down in prophase | ✓ | ✓ | ✓ | | | | ✓ |
| | | Bivalent pairs line up in Metaphase | ✗ | ✓ | ✗ | | | | ✓ |
| | | Centromere splits during Anaphase | ✓ | ✗ | ✓ | | | | ✓ |
| | | Centrioles move to opposite poles of the cell during prophase | ✗ | ✗ | ✗ | | | | ✓ |
| (b) | | forms, <u>haploid</u> cells / gametes ✓ gametes that are <u>genetically</u> different / allows <u>variation</u> ✓ prevents doubling of the chromosome number ✓ | | | | 2 | AO1.1 | | |
| (c) | (i) | chloroplast / plastids / mitochondria ✓ | | | | 1 | AO1.2 | | |

| Question | Answer | Marks | AO element | Guidance |
|----------|---|----------|------------|--|
| | <p>(ii) Advantages accurate method of classification or quick to conduct or can be done at any stage of development or similarities can be seen between species easily ✓</p> <p>Disadvantages recently diverged species are often too similar or expensive, qualified ✓</p> | 2 | AO3.2 | e.g. expensive to train laboratory technicians / expensive equipment |
| | Total | 9 | | |

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