OCR
Oxford Cambridge and RSA

# GCSE

# Biology A

Unit **A161/02**: Modules B1, B2, B3 (Higher Tier)

General Certificate of Secondary Education

# Mark Scheme for June 2015

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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.

**Annotations**

Used in the detailed Mark Scheme:

| Annotation | Meaning |
|---|---|
| / | alternative and acceptable answers for the same marking point |
| (1) | separates marking points |
| **not/reject** | answers which are not worthy of credit |
| **ignore** | statements which are irrelevant - applies to neutral answers |
| **allow/accept** | answers that can be accepted |
| (words) | words which are not essential to gain credit |
| words | underlined words must be present in answer to score a mark |
| ecf | error carried forward |
| AW/owtte | alternative wording |
| ORA | or reverse argument |

Available in scoris to annotate scripts

| | |
|---|---|
|  | indicate uncertainty or ambiguity |
|  | benefit of doubt |
|  | contradiction |
|  | incorrect response |
|  | error carried forward |
|  | draw attention to particular part of candidate's response |
|  | draw attention to particular part of candidate's response |
|  | draw attention to particular part of candidate's response |
|  | no benefit of doubt |

| | |
|---|---|
| R | reject |
| ✓ | correct response |
| ≈ | draw attention to particular part of candidate's response |
| ^ | information omitted |

**Subject-specific Marking Instructions**

a. If a candidate alters his/her response, examiners should accept the alteration.

b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

E.g.

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

| Put ticks (✓) in the two correct boxes. | Put ticks (✓) in the two correct boxes. | Put ticks (✓) in the two correct boxes. |
|---|---|---|
| ☐ | ☐ | ≈ |
| ☐ | ☐ | ≈ |
| ≈ | ✓ | ✓ |
| ≈ | ≈ | ✓ |
| ☐ | ☐ | ☐ |
| This would be worth 1 mark. | This would be worth 0 marks. | This would be worth 1 mark. |

c. The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

d. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.
Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

E.g. If a question requires candidates to identify a city in England, then in the boxes

| | |
|---|---|
| **Edinburgh** | |
| **Manchester** | |
| **Paris** | |
| **Southampton** | |

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Edinburgh** | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | |
| **Manchester** | ✓ | × | ✓ | ✓ | ✓ | | | | ✓ | |
| **Paris** | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| **Southampton** | ✓ | × | | ✓ | | ✓ | ✓ | | ✓ | |
| **Score:** | **2** | **2** | **1** | **1** | **1** | **1** | **0** | **0** | **0** | **NR** |

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>1</td><td>a</td><td>i</td><td>Harold: ff Hilda: Ff</td><td>1</td><td>need both for the mark<br>allow fF for Hilda<br>do not credit if the distinction between the capital letter and the small letter is not clear.</td></tr>
<tr><td></td><td>a</td><td>ii</td><td><table><tr><th>Harold</th><th>Hilda</th><th></th></tr><tr><td>heterozygous</td><td>homozygous dominant</td><td></td></tr><tr><td>heterozygous</td><td>homozygous recessive</td><td></td></tr><tr><td>homozygous dominant</td><td>heterozygous</td><td></td></tr><tr><td>homozygous dominant</td><td>homozygous recessive</td><td></td></tr><tr><td>homozygous recessive</td><td>homozygous dominant</td><td></td></tr><tr><td>homozygous recessive</td><td>heterozygous</td><td>✓</td></tr></table></td><td>1</td><td>no ecf from ai<br><br>If more than 1 box is ticked, no mark awarded..</td></tr>
<tr><td></td><td>b</td><td></td><td>Any two from<br>idea of F/dominant allele being inherited from Hilda / Harold will only pass on one f allele (1)<br>so child might be heterozygous/carrier/ Ff (1)<br>there is a 50% chance (1)<br>need 2 recessive alleles to have cystic fibrosis/homozygous recessive/ ff (1)</td><td>2</td><td>Ignore Hilda is a carrier<br><br>Points could be awarded from a correctly annotated diagram.<br><br>Do not credit gene instead of allele</td></tr>
<tr><td></td><td>c</td><td></td><td>Any three from<br>risk of miscarriage/ harm (the foetus/mother)/risk of infection (1)<br>termination/abortion (1)<br>false positive / negatives/not accurate/reliable (1)<br>who should be told (1)<br>religious/ethical concerns (1)<br>insurance/job implications (1)</td><td>3</td><td>Ignore damage unless qualified<br>ignore reference to safety<br>ignore ‘don’t want to know’</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
</table>

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| 2 | | | **[Level 3]**<br>Explanation of how A & B are produced AND explains why C is different to the other two using some level 3 responses.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Explanation of how A & B are produced AND recognises that C must be from a different sperm/egg (combination).<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Explanation of how A & B are produced OR recognises that C must be from different sperm/egg (combination).<br>Quality of written communication impedes communication of the science at this level.<br>(1 – 2 marks)<br><br>**[Level 0]**<br>Insufficient or irrelevant science. Answer not worthy of credit.<br>(0 marks) | 6 | **This question is targeted at grades up to A***<br><br>**Indicative scientific points may include:**<br><br>A and B<br>Level 1/2 responses<br>• formed from one sperm and one egg/from the same fertilised egg<br>• embryo/zygote/**fertilised** egg splits/cells separate<br>• same genes/genetic information<br><br>Level 3 responses<br>• identical DNA/chromosomes/alleles/genotype<br>• cell division/mitosis<br>• creates identical twins/natural clones<br><br>C<br>Level 1/2 responses<br>• formed from different sperm / egg/embryo<br>• genes from both parents come together<br><br>Level 3 responses<br>• variation in offspring<br>• inherit different combinations of alleles<br>• some genes/DNA/chromosomes will be the same/some different<br><br>ignore reference to egg or sperm splitting |
| | | | **Total** | **6** | |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| **3** | a | i | 0.79 (2)<br><br>0.5 x 0.5 x 3.14 (1) | 2 | two marks for correct answer<br>**0.785 1 mark maximum**<br>if answer is incorrect, accept correct working for one mark<br>must specify 3.14 in working out |
| | a | ii | A/artery needs thick muscle/wall to withstand high pressure (1)<br>B/vein only need thin muscle /wall to carry low pressure of blood (1) | 2 | Artery with thick**er** muscle walls to withstand high**er** pressure = 2 marks<br>ORA for veins |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| 3 | b | | **[Level 3]**<br>Describes several factors (lifestyle/genetic) that may increase/decrease the risk of heart disease AND gives a **logical sequence of events** that lead to a heart attack.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Describes several factors (lifestyle/genetic) that may increase/decrease the risk of heart disease AND shows some understanding of how a heart attack occurs.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Describes several factors (lifestyle/ genetic) that may increase/decrease the risk of heart disease.<br>OR<br>Partial explanation of a heart attack<br>Quality of written communication impedes communication of the science at this level.<br>(1 – 2 marks)<br><br>**[Level 0]**<br>Insufficient or irrelevant science. Answer not worthy of credit.<br>(0 marks) | 6 | **This question is targeted at grades up to A***<br><br>Throughout this question, credit must not be given for vague statements that do not suggest an increase or decrease in risk.<br><br>**Indicative scientific points may include:**<br><br>what causes a heart attack:<br>• increased fatty deposits/blood clots/plaques/atheroma<br>• narrowing/blocking<br>• of arteries **supplying the heart or coronary arteries**<br>• less/no oxygen/glucose reaches heart muscle<br>• cells in the heart die<br><br>increased risk for Leo due to:<br>• poor diet / diet high in salt / diet high in fat/obesity<br>• stress<br>• smoking<br>• misuse of drugs<br>• less exercise<br>• high blood pressure<br>• drinking alcohol<br>• diabetes<br><br>**ignore age as implied in stem of question**<br><br>• idea that risk factors do not always lead to a heart attack<br><br>• ref to genetic influence / idea it may run in the family / may have inherited different genes |

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>3</td><td>c</td><td>i</td><td>
<table>
<tr><td>Each drug works in the same way in every person.</td><td></td></tr>
<tr><td>Less money is wasted prescribing drugs that don’t work.</td><td>✓</td></tr>
<tr><td>Doctors don’t have to learn about as many drugs.</td><td></td></tr>
<tr><td>People won’t have to visit the doctor anymore.</td><td></td></tr>
<tr><td>The drugs will always cure the patient from the disease.</td><td></td></tr>
<tr><td>It may reduce the number of people who suffer from dangerous side effects.</td><td>✓</td></tr>
<tr><td>The doctor can adjust the dose of the drug to suit the patient.</td><td>✓</td></tr>
</table>
</td><td>3</td><td>All three correct for three marks<br>Two correct for two marks<br>One correct for one mark<br><br>More than 3 boxes ticked, negate 1 mark for each additional tick.</td></tr>
<tr><td></td><td></td><td>ii</td><td>
<table>
<tr><td>Some people might be discriminated against when the test result is known.</td><td>✓</td></tr>
<tr><td>Some people might find the test painful.</td><td></td></tr>
<tr><td>It will cost too much money to test everyone.</td><td></td></tr>
<tr><td>The results of the test might be inaccurate.</td><td></td></tr>
<tr><td>Everyone should have the right to choose whether they are tested or not</td><td>✓</td></tr>
</table>
</td><td>2</td><td>More than 2 boxes ticked, negate 1 mark for each additional tick.</td></tr>
<tr><td></td><td>d</td><td></td><td>Any three from:<br>genes code for proteins /enzymes(1)<br>enzymes are protein (1)<br>different people have different alleles/versions<br>of genes/genetic variation (1)<br>so different people have different enzymes (1)<br>idea that genes may code for a less effective enzyme/no enzyme (which affects metabolism of drug) (1)</td><td>3</td><td>Ignore ‘genes make proteins/enzymes’</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>18</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>4</td><td>a</td><td>i</td><td>Ref to 140 (1)<br>700 (2)</td><td>2</td><td>140 refers to increase</td></tr>
<tr><td></td><td></td><td>ii</td><td>Any three from:<br>Rapid/big increase( in a very short time) (1)<br>risk of an epidemic/outbreak/spreads quickly (1)<br>risk of death/serious illness is great (1)<br>harder to control the more it spreads (1)<br>cannot be treated by antibiotics (1)<br>more people need to be vaccinated/ fewer people have been vaccinated (1)<br>vaccination is not working/ virus mutated/become resistant (1)</td><td>3</td><td></td></tr>
<tr><td></td><td>b</td><td></td><td><table><tr><td>There is more chance…</td><td>✓</td></tr><tr><td>Measles is a potentially deadly disease.</td><td></td></tr><tr><td>More people will have the antibodies for measles.</td><td></td></tr><tr><td>A very high uptake of the MMR…</td><td></td></tr><tr><td>There are more people with the measles virus.</td><td>✓</td></tr><tr><td>Measles can be treated by antibiotics.</td><td></td></tr></table></td><td>2</td><td>More than 2 boxes ticked, negate 1 mark for each additional tick.</td></tr>
<tr><td></td><td>c</td><td></td><td>Any two from<br>perception of risk can be different to actual risk (1)<br>perception of risk is personal/different for all / personal opinion(1)<br>lack of scientific evidence for the friend’s claim (1)<br>idea that actual risk is scientifically calculated/ estimated(1)<br>consult a doctor/medical professional (1)<br>risk from vaccination is smaller than effects of disease (1)</td><td>2</td><td>ignore benefits outweigh risk unqualified</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>9</td><td></td></tr>
</table>

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| **5** | a | | **Any two from**<br>Idea that Fred eliminates the outlier / Joe does not eliminate the outlier (1)<br>Both can be correct – as it may (or may not be) appropriate to remove the outlier (1)<br>Whether sample 5 is counted as an outlier or not (1) | 2 | |
| | b | | **Any two from**<br>sewage kills mayfly (nymphs) /AW (1)<br><br>idea of trend e.g. sewage concentration reduces further downstream/water quality improves (1)<br><br>idea of correlation between amount of sewage and the number of mayfly (1) | 2 | **Ignore observations as the question is asking for conclusions**<br><br>the more sewage there is, the more the mayfly (nymphs) die scores 2 as it covers mp1 and mp3 |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| | c | | **[Level 3]**<br>Candidates include a detailed explanation of all 3 stages<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Candidates include a detailed explanation of two stages<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Candidates include a detailed explanation of one stage<br>Quality of written communication impedes communication of the science at this level.<br>(1 – 2 marks)<br><br>**[Level 0]**<br>Insufficient or irrelevant science. Answer not worthy of credit.<br>(0 marks) | 6 | **This question is targeted at grades up to C**<br>**Indicative scientific points may include:**<br><br>stage A:<br>• uptake of/absorption of/taking in/takes up/taking (nitrates into plants)<br>**ignore** "passes into" / "goes in"<br>• via roots/root hairs<br>• active transport<br>• (nitrates) used to make protein<br><br>stage B:<br>• plants eaten by animals<br>• digestion/assimilation<br>• transfer of nitrogen (compounds)/protein along food chain<br>(ignore transfer of **nitrate** from plant to animal)<br><br>stage C:<br>• excretion/egestion/urine/faeces/waste<br>• death<br>• decay/decomposition/ decomposers/fungi/bacteria<br>• break down waste into nitrates<br>• returns to the soil<br>ignore denitrification/nitrogen fixation |
| | | | **Total** | **10** | |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| **6** | a | i | label: (number /amount/ butterflies) genetic changes / mutations<br>any line that starts higher on the left and ends lower on the right | 2 | do not allow horizontal or vertical lines |
| | | ii | a (causal) <u>mechanism</u> (1)<br><br>**example** of more evidence (1) | 2 | **Ignore** 'do more research' unless qualified<br>e.g. take a larger sample size, weather conditions at the time, use secondary data, find/observe changes to DNA |
| | b | | *Matt because:*<br>new characteristics will only be seen if they are passed down to the offspring (via sex cells)<br>OR<br>*Claire because:*<br>there could still be background radiation causing mutation effects in the butterflies | 1 | |
| | | | **Total** | **5** | |

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>7</td><td>a</td><td></td><td>meeting the needs of the people today (1)<br>without damaging the Earth for future generations (1)</td><td>2</td><td></td></tr>
<tr><td></td><td>b</td><td></td><td><table>
<tr><td>The size and shape of the bag.</td><td></td></tr>
<tr><td>The cost of making the bag</td><td></td></tr>
<tr><td>The materials used to make the bag.</td><td>✓</td></tr>
<tr><td>The colour of the bag.</td><td></td></tr>
<tr><td>The energy used to make the bag.</td><td>✓</td></tr>
<tr><td>The pollution created when the bag is made.</td><td>✓</td></tr>
</table></td><td>2</td><td>all 3 correct = two marks<br>2 correct = one mark<br>More than 3 boxes ticked, negate 1 mark for each additional tick.</td></tr>
<tr><td></td><td>c</td><td></td><td><table>
<tr><td>Biodegradable bags need energy to be transported to the shops.</td><td>✓</td></tr>
<tr><td>Biodegradable bags don’t look as good as standard plastic bags.</td><td></td></tr>
<tr><td>Biodegradable bags need oxygen to break down.</td><td></td></tr>
<tr><td>Biodegradable bags are not expensive to make.</td><td></td></tr>
</table></td><td>1</td><td>If more than 1 box is ticked, no mark awarded.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>5</td><td></td></tr>
</table>

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