OCR
Oxford Cambridge and RSA

# GCSE

# Biology A

Unit **A162/02**: Modules B4, B5, B6 (Higher Tier)

General Certificate of Secondary Education

## Mark Scheme for June 2014

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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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 | credit alternative wording / or words to that effect |
| ORA | or reverse argument |

Available in scoris to annotate scripts:

| | |
|---|---|
| BP | Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response. |
|  | correct response |
|  | incorrect response |
| BOD | benefit of doubt |
| NBOD | no benefit of doubt |
| ECF | error carried forward |
| 0 , L1 , L2 , L3 | indicate level awarded for a question marked by level of response |
| ^ | information omitted |
| CON | contradiction |

| | |
|---|---|
| R | reject |
|  | indicate uncertainty or ambiguity |
|  | draw attention to particular part of candidate's response |

**ADDITIONAL OBJECTS:** You **must** assess and annotate the additional objects for each script you mark. Where credit is awarded, appropriate annotation must be used. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU.

**Subject-specific Marking Instructions**

a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).

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 the third <u>and</u> fourth boxes are required for the mark:*

*This would be worth 1 mark.*

*This would be worth 0 marks.*

*This would be worth 1 mark.*

c. Marking method for tick-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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 cities in England:*

| | |
|---|---|
| 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** |

d. For answers marked by levels of response:

i. **Read through the whole answer from start to finish**

ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor

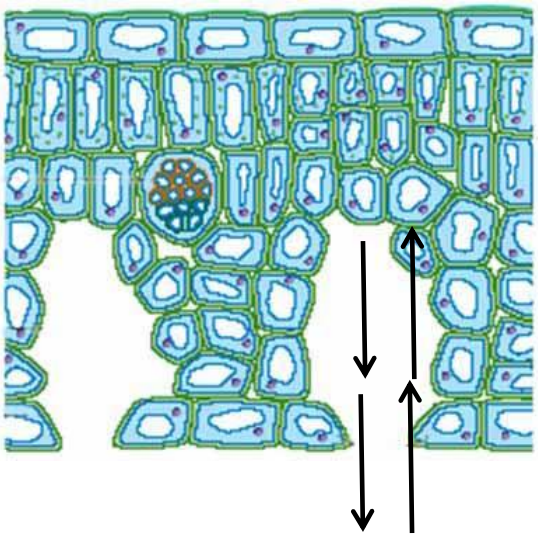
iii. **To determine the mark within the level**, consider the following:

| Descriptor | Award mark |
|---|---|
| A good match to the level descriptor | The higher mark in the level |
| Just matches the level descriptor | The lower mark in the level |

iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>a</td><td></td><td> 
</td><td>1</td><td>Either stoma<br><br>Direction of arrow must be clear<br><br>Must have arrow heads and labels<br><br>Accept correct formula</td></tr>
<tr><td></td><td>b</td><td></td><td><table>
<tr><td>The leaf only photosynthesises during the day.</td><td></td></tr>
<tr><td>Rolled up leaves are much stronger.</td><td></td></tr>
<tr><td>Hairs reduce air movement around the lower surface of the leaf.</td><td>✓</td></tr>
<tr><td>Water vapour builds up inside the rolled up leaf.</td><td>✓</td></tr>
<tr><td>Some cells contain the green pigment chlorophyll.</td><td></td></tr>
<tr><td>Light intensity is a limiting factor.</td><td></td></tr>
<tr><td>The stomata are at the bottom of pits.</td><td>✓</td></tr>
<tr><td>The leaf only respires at night.</td><td></td></tr>
</table></td><td>3</td><td>One tick one mark<br><br>Each extra tick negates one correct tick</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[4]</td><td></td></tr>
</table>

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 2 | | | **[Level 3]**<br>Gives good detailed description **linked to** an explanation of the complete shape of the graph.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Gives at least one descriptive point AND some explanation of how enzyme works<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Gives basic description of shape of graph OR how enzymes work<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 explanation points may include:**<br>• lock and key<br>• active sites<br>• ref to substrate fits into active site<br>• ref to enzyme-substrate complex<br>• denaturing / change of shape of active site (in correct context)<br>• ref. to bonds breaking<br>• substrate no longer fits<br>• reversibility<br><br>**Indicative scientific description points may include**<br>• no reaction at 3 and below<br>• as pH increases (from 3-6) / acidity decreases, rate increases ora<br>• works best /optimum at pH 6<br><br>• as pH increases (from 6) / alkalinity increases, rate decreases<br>• no reaction at 9 and above<br><br>• works over a range of 3 to 9<br>• rate of reaction increases and then decreases<br><br>**Use the L1, L2, L3 annotations in Scoris; do not use ticks.** |
| | | | **Total** | **[6]** | |

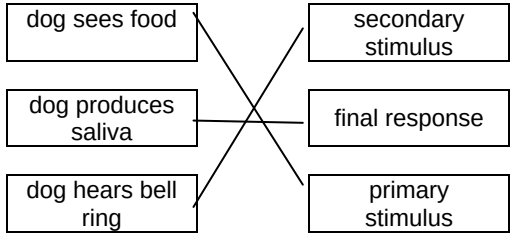
<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>3</td><td>a</td><td></td><td>2880 / 150 ;<br><br>19.2 / 19 / 19.2:1 / 19:1 / 96:5 ;</td><td>2</td><td>Accept 1440/75 or 960/50 or 288/15 or 96/5 or 480/25 for first MP<br><br>Correct answer = 2 marks<br>Ignore units</td></tr>
<tr><td></td><td>b</td><td></td><td>Type A provides a lot of energy / type B provides little energy;<br><br>To prevent / reduce production of lactic acid / type B produces lactic acid ;</td><td>2</td><td><br><br>Accept prevent cramp / pain</td></tr>
<tr><td></td><td>c</td><td>i</td><td>A no correlation or description ;<br><br>B positive correlation or description ;<br><br>C negative correlation or description ;<br><br>D positive correlation or description ;</td><td>4</td><td>e.g. In A / 1st section / 0 – 30 mins, one goes up and one stays the same<br><br>e.g. In B / 2nd section / 30 – 60 mins, both go up<br><br>e.g. In C / 3rd section / 60 – 75 mins, one goes up , the other goes down<br><br>e.g. In D /4th section /75 – end, both go down</td></tr>
<tr><td></td><td></td><td>ii</td><td><table><tr><td>Repeat the same training a number of times.</td><td>✓</td></tr><tr><td>Repeat her training but only run for 60 minutes.</td><td></td></tr><tr><td>Run more slowly so that her heart rate does not rise too much.</td><td></td></tr><tr><td>Repeat the same experiment on other runners.</td><td></td></tr></table></td><td>1</td><td>One tick one mark<br><br>Each extra tick negates one correct tick</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[9]</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>4</td><td>a</td><td></td><td>
<table>
<tr><td>Genes to control temperature.</td><td></td></tr>
<tr><td>Genes to make chlorophyll.</td><td>✓</td></tr>
<tr><td>Genes to make a neurotransmitter.</td><td></td></tr>
<tr><td>Genes to make a cell membrane</td><td>✓</td></tr>
<tr><td>Genes to make carbon dioxide.</td><td></td></tr>
<tr><td>Genes to control diffusion.</td><td></td></tr>
<tr><td>Genes to make enzymes.</td><td>✓</td></tr>
</table>
</td><td>3</td><td>One tick one mark<br><br>Each extra tick negates one correct tick</td></tr>
<tr><td></td><td>b</td><td></td><td>
<table>
<tr><td>Embryos are livings things.</td><td>✓</td></tr>
<tr><td>Embryos have some genes switched off.</td><td></td></tr>
<tr><td>Embryos can develop into human beings.</td><td>✓</td></tr>
<tr><td>Embryo cells contain DNA.</td><td></td></tr>
<tr><td>Embryos have some genes switched on.</td><td></td></tr>
</table>
</td><td>2</td><td>One tick one mark<br><br>Each extra tick negates one correct tick</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[5]</td><td></td></tr>
</table>

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 5 | | | **[Level 3]**<br>A good description of coding AND enzyme being made.<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Incomplete description of coding AND enzyme being made.<br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Simple description of DNA code OR how enzyme is made<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 for coding may include:**<br>• DNA contains bases<br>• bases are A T C G<br>• the order of bases (in a gene) is the code for building up amino acids in the correct order<br>• 3 bases needed to code for 1 amino acid<br>• triplet code<br>• DNA unzips<br>• mRNA / codon / a copy (of the gene) is made<br><br>**Indicative scientific points for making an enzyme may include:**<br>• mRNA / codon / a copy leaves the nucleus<br>• mRNA / codon / a copy goes to cytoplasm / ribosome<br>• cytoplasm / ribosome where enzyme / protein is made<br>• amino acids are added in the correct sequence<br>• proteins/ enzymes are made from amino acids<br><br>**Use the L1, L2, L3 annotations in Scoris; do not use ticks.** |
| | | | **Total** | **[6]** | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 6 | a | | 1000 000 000 or $10^9$;;<br><br>*If no correct answer allow working for 1 mark*<br>Understand that $10^{-6}$ is one millionth / 0.000001 / $\frac{1}{1\,000\,000}$ OR 1000 is $10^3$ | 2 | Correct answer = 2 marks |
| | b | | Any three from: | 3 | **Ignore** units<br>**Accept** growth for % stimulation throughout the answer |
| | | 1 | % stimulation occurs from concentrations of $10^{-4}$ / $10^{-3}$<br>OR no % stimulation below $10^{-4}$ /$10^{-3}$; | | |
| | | 2 | % stimulation occurs between $10^{-4}$ / $10^{-3}$ - 80 ; | | **Accept** 70 – 90 (ppm) for 80 throughout |
| | | 3 | % stimulation increases in range from $10^{-4}$ – 8 ; | | **Accept** 6 – 10 (ppm) for 8 throughout |
| | | 4 | % stimulation decreases from 8 ; | | |
| | | 5 | Maximum / peak /optimum, % stimulation at 8 ; | | |
| | | 6 | Above 80 (ppm) shoot growth inhibited / 100% OR maximum inhibition at 1000 ; | | **Accept** 70 – 90 (ppm) for 80 |
| | | 7 | increasing auxin concentration **does not always** result in more growth ; | | |
| | c | | *Any four from:*<br>Auxin produced in tip;<br><br><u>diffuses</u> (downwards);<br><br>accumulates on dark side / away from light ;<br><br>(on dark side) more growth / cells elongate ;<br><br>plant / shoot, bends / grow towards light; | 4 | **Accept** made / released<br><br>**Ignore** moves / faces |
| | | | **Total** | **[9]** | |

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>7</td><td>a</td><td></td><td>Any two from:<br>A / flashing lights OR C /hearing music, is <u>sensory</u> ;<br><br>B / movement / muscle / effector is <u>motor</u> ;<br><br>C is not lower back / B is not upper front ora ;<br><br>Not enough information to be certain / AW ;</td><td>2</td><td></td></tr>
<tr><td></td><td>b</td><td></td><td><table>
<tr><td>SSRIs break down serotonin molecules.</td><td></td></tr>
<tr><td>SSRIs stop serotonin from being produced.</td><td></td></tr>
<tr><td>SSRIs block sites where serotonin is removed from the synapse.</td><td>✓</td></tr>
<tr><td>SSRIs stimulate the serotonin receptor sites on the second neuron.</td><td>✓</td></tr>
<tr><td>SSRIs slow down the production of serotonin.</td><td></td></tr>
<tr><td>SSRIs have a similar effect to serotonin.</td><td>✓</td></tr>
<tr><td>SSRIs are rapidly broken down in the synapse.</td><td></td></tr>
<tr><td>SSRIs effects are due to an increased serotonin concentration in the synapse.</td><td>✓</td></tr>
</table></td><td>3</td><td>4 correct = 3 marks<br>3 correct = 2 marks<br>2 correct = 1 mark<br><br>Each extra tick negates one correct tick</td></tr>
<tr><td></td><td>c</td><td></td><td>Any two from:<br>Idea that patient may not benefit directly;<br><br>Patient may be harmed ;<br><br>Idea of informed consent / patient cannot give consent ;</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[7]</td><td></td></tr>
</table>

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 8 | a | | <table><tr><td>An insect flies away when it see a sudden movement.</td><td></td></tr><tr><td>Steve is frightened of the dentist and starts to sweat when he goes for a check-up.</td><td>C</td></tr><tr><td>A baby jumps when there is a loud noise.</td><td></td></tr><tr><td>A baby who was frightened by a clown cries when given a clown doll.</td><td>C</td></tr><tr><td>Jane's pupils get smaller in bright light.</td><td></td></tr></table> | 2 | One C = one mark<br>Each extra C negates one correct C<br><br>Accept ticks or other notation |
| | b | |  | 2 | Two / three correct = 2 marks<br>One correct = one mark |
| | c | | Example of conditioned reflex / response;<br><br>Explanation of how it is useful ; | 2 | **Ignore** ref. to human example / Pavlov's dog |
| | d | | Nerve impulse sent from brain;<br><br>(impulse) to motor neurone / muscle / effector (in arm) ; | 2 | **Ignore** messages / signals |
| | | | **Total** | [8] | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|---|---|---|---|---|---|
| 9 | | | **[Level 3]**<br>Some detail of nervous pathway involved and may include description of squirrel behaviour<br>Quality of written communication does not impede communication of the science at this level.<br>(5 – 6 marks)<br><br>**[Level 2]**<br>Ref. to sense organ / receptor / brain / nerves /muscles and may include some description of squirrel behaviour<br><br>Quality of written communication partly impedes communication of the science at this level.<br>(3 – 4 marks)<br><br>**[Level 1]**<br>Description of squirrel behaviour OR why it does it<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><br>**Indicative scientific points may include:**<br>• receptors<br>• sensory neuron<br>• processing centre<br>• coordination<br>• motor neuron<br>• effector / muscle /adrenaline (epinephrine)<br><br>• impulses are electrical<br>• impulses are fast<br>• impulses are short lived<br>• reference to synapses<br><br>• relevant suggestion of what squirrel does<br>• explanation of why squirrel does it / idea of increased survival.<br><br>**Use the L1, L2, L3 annotations in Scoris; do not use ticks.** |
| | | | **Total** | **[6]** | |

| | | | | | |
|---|---|---|---|---|---|
| | | | **Paper total** | **60** | |

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