

**Biology A**

General Certificate of Secondary Education

Unit **A221/02**: Modules B1, B2, B3 (Higher Tier)

**Mark Scheme for June 2011**

---

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

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

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.

© OCR 2011

Any enquiries about publications should be addressed to:

OCR Publications  
PO Box 5050  
Annesley  
NOTTINGHAM  
NG15 0DL

Telephone: 0870 770 6622  
Facsimile: 01223 552610  
E-mail: [publications@ocr.org](mailto:publications@ocr.org)

## MARKING INSTRUCTIONS

## 1. Annotations

Used in the detailed Mark Scheme:

| Annotation          | Meaning   |
|---------------------|---|
| /                   | alternative and acceptable answers for the same marking point |
| (1)                 | separates marking points                                      |
| <b>not/reject</b>   | answers which are not worthy of credit                        |
| <b>ignore</b>       | statements which are irrelevant - applies to neutral answers  |
| <b>allow/accept</b> | answers that can be accepted                                  |
| (words)             | words which are not essential to gain credit                  |
| <u>words</u>        | 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   |

## 2. Subject-specific Marking Instructions

- Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- If a candidate alters his/her response, examiners should accept the alteration.
- 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 and fourth boxes are required for the mark:*

|                                     |
|-------------------------------------|
| <input type="checkbox"/>            |
| <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> |
| <input type="checkbox"/>            |

*This would be worth  
1 mark.*

|                                     |
|-------------------------------------|
| <input type="checkbox"/>            |
| <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> |
| <input type="checkbox"/>            |

*This would be worth  
0 marks.*

|                                     |
|-------------------------------------|
| <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> |
| <input type="checkbox"/>            |

*This would be worth  
1 mark.*

- d. 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.

- e. 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 should be blank (or have indication of choice crossed out).

|               |          |          |          |          |          |          |          |          |          |           |
|---------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Edinburgh     |          |          | ✓        |          |          | ✓        | ✓        | ✓        | ✓        |           |
| Manchester    | ✓        | x        | ✓        | ✓        | ✓        |          |          |          | ✓        |           |
| Paris         |          |          |          | ✓        | ✓        |          | ✓        | ✓        | ✓        |           |
| Southampton   | ✓        | x        |          | ✓        |          | ✓        | ✓        |          | ✓        |           |
| <b>Score:</b> | <b>2</b> | <b>2</b> | <b>1</b> | <b>1</b> | <b>1</b> | <b>1</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>NR</b> |

| Question     |   | Answer   | Mark       | Guidance   |
|--------------|---|--|------------|--|
| 1            | a | <input type="checkbox"/><br><input type="checkbox"/><br>protein <input checked="" type="checkbox"/> (1)<br><input type="checkbox"/><br>enzyme <input checked="" type="checkbox"/> (1)<br><input type="checkbox"/><br><input type="checkbox"/>          | 2          |  |
|              | b | <input type="checkbox"/><br>sections of DNA <input checked="" type="checkbox"/><br><input type="checkbox"/><br>only one copy <input checked="" type="checkbox"/><br>different versions <input checked="" type="checkbox"/><br><input type="checkbox"/> | 2          | 3 correct = 2 marks<br>2 or 1 correct = 1 mark             |
|              | c | i  | 1          | reject Y gene or SRY                                       |
|              |   | ii   | 2          | accept TDF testes determining factor as example of hormone |
| <b>Total</b> |   |  | <b>[7]</b> |  |

| Question     |   | Answer  | Mark       | Guidance  |
|--------------|---|---|------------|---|
| 2            | a | <p><b>any two from:</b><br/> height several genes;<br/> Huntington's single gene;<br/> Huntington's is dominant;<br/> Height affected by environment;</p>   | 2          | <p>several and single genes must be explicit<br/> <b>accept</b> alleles</p> <p>Huntington's is caused by 1 dominant allele = 2 marks<br/> OWTTE</p> |
|              | b | whether or not to have children (1)   | 1          |   |
|              | c | i   | 1          |   |
|              |   | ii  | 1          |   |
|              |   | <p>seriousness/severity of the disorder /<br/> age of parents /</p> <p>idea of treatments or drugs / help available /<br/> moral / ethical / religious issues /</p> <p>financial implications /<br/> stress / could they cope (1)</p> |            |   |
| <b>Total</b> |   |   | <b>[5]</b> |   |

| Question     |   | Answer   | Mark       | Guidance   |
|--------------|---|--|------------|--|
| 3            | a | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>sweat <input checked="" type="checkbox"/></p> <p>skin <input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>tears <input checked="" type="checkbox"/></p> <p>stomach acid <input checked="" type="checkbox"/></p> </div> <div style="width: 45%; text-align: center;"> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> </div> </div> | 2          | 4 correct = 2 marks<br>3 or 2 correct = 1 mark                   |
|              | b | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>toxins;</p> <p>white cells;</p> <p>engulf;</p> </div> <div style="width: 45%;"> <p>antibodies;</p> </div> </div>   | 3          | 4 correct = 3 marks<br>3 correct = 2 marks<br>2 correct = 1 mark |
|              | c | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>2 hours and 40 minutes <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> </div> <div style="width: 45%; text-align: center;"> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> </div> </div>   | 1          |  |
| <b>Total</b> |   |  | <b>[6]</b> |  |

| Question     |   | Answer   | Mark  | Guidance  |   |
|--------------|---|--|---|---|---|
| 4            |   | heart needs oxygen/glucose (1)<br>idea of <b>thick</b> walls not getting sufficient oxygen/glucose (1)<br>by diffusion (1) | 3   | <b>accept</b> sugar = glucose   |   |
| <b>Total</b> |   |  | <b>[3]</b>  |   |   |
| 5            | a | fungi/fungus AND bacteria/bacterium;   | 1   | <b>accept</b> either way round<br><b>accept</b> mould = fungi   |   |
|              | b | <b>mutations</b> cause some to be resistant (1)<br><br>more likely to survive (1)<br>pass on resistant gene (1)            | 3   | <b>allow</b> obtain genes via plasmids via conjugation instead of mutations<br><b>ignore</b> some bacteria are more resistant<br><b>ignore</b> multiply or reproduce <b>BUT accept</b> reproduces more resistant bacteria |   |
|              | c | idea about safety/side effects (1)   | 1   | <b>ignore</b> to see if it works.   |   |
| <b>Total</b> |   |  | <b>[5]</b>  |   |   |
| 6            | a | i  | idea of removal of a food supply (1)  | 1   | <b>accept</b> no food left  |
|              |   | ii   | could be a predator /<br>could compete (for food space etc) /<br>could be a pathogen / disease causing (1)  | 1   | <b>accept</b><br>they could eat other living things/them<br>they compete with others <b>or implication of competition</b><br>they give others a disease   |
|              |   | iii  | idea that not enough time (1)<br><br>to evolve/adapt/change/become suited/get used to (1)   | 2   | cannot adapt fast enough = 2 marks<br>cannot change fast enough = 2 marks   |
|              | b |  | example must <b>directly</b> involve humans eg hunting tortoises (for food) / hunting of Dodo for food (1)<br><br>example must be <b>indirect</b> eg global warming raising sea levels that will kill coral reefs / rats from ships ate Dodo eggs (1) | 2   | <b>if candidate gives direct and indirect in same section then answer scores zero</b><br>there must be a credible example for each section <b>that is not living today</b><br>multiple examples must all be correct<br>if candidate correctly explains <b>both direct and indirect with no examples</b> given, then scores 1 mark |
| <b>Total</b> |   |  | <b>[6]</b>  |   |   |



| Question     | Answer  | Mark       | Guidance |
|--------------|---|------------|----------|
| 7            | Peter (1)<br>Mary or Peter (1)<br>Angela (1)<br>Robin (1) | 4          |          |
| <b>Total</b> |   | <b>[4]</b> |          |

| 8                            | a        | <table border="1"> <thead> <tr> <th></th> <th>environ-<br/>ment</th> <th>genes</th> <th>mutations<br/>in body<br/>cells</th> <th>mutations<br/>in sex<br/>cells</th> </tr> </thead> <tbody> <tr> <td>caused</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>passed<br/>on</td> <td></td> <td>✓</td> <td></td> <td>✓</td> </tr> </tbody> </table>                   |       | environ-<br>ment              | genes                        | mutations<br>in body<br>cells | mutations<br>in sex<br>cells | caused | ✓                       | ✓ | ✓ |                   | passed<br>on |  | ✓                            |  | ✓ | 2 | 1 mark for each correct row               |
|------------------------------|----------|---|-------|-------------------------------|------------------------------|-------------------------------|------------------------------|--------|-------------------------|---|---|-------------------|--------------|--|------------------------------|--|---|---|---|
|                              |          | environ-<br>ment  | genes | mutations<br>in body<br>cells | mutations<br>in sex<br>cells |                               |                              |        |                         |   |   |                   |              |  |                              |  |   |   |   |
| caused                       | ✓        | ✓   | ✓     |                               |                              |                               |                              |        |                         |   |   |                   |              |  |                              |  |   |   |   |
| passed<br>on                 |          | ✓   |       | ✓                             |                              |                               |                              |        |                         |   |   |                   |              |  |                              |  |   |   |   |
|                              | b        | <table border="1"> <thead> <tr> <th></th> <th>involved</th> <th>not involved</th> </tr> </thead> <tbody> <tr> <td>mutations</td> <td>✓</td> <td></td> </tr> <tr> <td>environmental<br/>change</td> <td>✓</td> <td></td> </tr> <tr> <td>natural selection</td> <td>✓</td> <td></td> </tr> <tr> <td>number of<br/>species present</td> <td></td> <td>✓</td> </tr> </tbody> </table> |       | involved                      | not involved                 | mutations                     | ✓                            |        | environmental<br>change | ✓ |   | natural selection | ✓            |  | number of<br>species present |  | ✓ | 2 | 4 correct = 2 marks<br>3 correct = 1 mark |
|                              | involved | not involved  |       |                               |                              |                               |                              |        |                         |   |   |                   |              |  |                              |  |   |   |   |
| mutations                    | ✓        |   |       |                               |                              |                               |                              |        |                         |   |   |                   |              |  |                              |  |   |   |   |
| environmental<br>change      | ✓        |   |       |                               |                              |                               |                              |        |                         |   |   |                   |              |  |                              |  |   |   |   |
| natural selection            | ✓        |   |       |                               |                              |                               |                              |        |                         |   |   |                   |              |  |                              |  |   |   |   |
| number of<br>species present |          | ✓   |       |                               |                              |                               |                              |        |                         |   |   |                   |              |  |                              |  |   |   |   |
| <b>Total</b>                 |          | <b>[4]</b>  |       |                               |                              |                               |                              |        |                         |   |   |                   |              |  |                              |  |   |   |   |

| Question | Answer   | Mark       | Guidance |
|----------|--|------------|----------|
| 9        | <p>... an observation that agreed ... <input type="checkbox"/></p> <p>... increased the confidence ... <input checked="" type="checkbox"/> (1)</p> <p>... increased the confidence ... <input checked="" type="checkbox"/> (1)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> | 2          |          |
|          | <b>Total</b>   | <b>[2]</b> |          |

**OCR (Oxford Cambridge and RSA Examinations)**  
**1 Hills Road**  
**Cambridge**  
**CB1 2EU**

**OCR Customer Contact Centre**

**14 – 19 Qualifications (General)**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://www.ocr.org.uk)**

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

**Oxford Cambridge and RSA Examinations**  
is a Company Limited by Guarantee  
Registered in England  
Registered Office; 1 Hills Road, Cambridge, CB1 2EU  
Registered Company Number: 3484466  
OCR is an exempt Charity



**OCR (Oxford Cambridge and RSA Examinations)**  
Head office  
Telephone: 01223 552552  
Facsimile: 01223 552553