

**Science A**

General Certificate of Secondary Education

Unit **A211/02**: Unit 1: Modules B1, C1, P1 (Higher Tier)

**Mark Scheme for January 2011**

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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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## Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, e.g. mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

|                     |   |
|---------------------|---|
| /                   | = 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            | = alternative wording   |
| ORA                 | = or reverse argument   |

*e.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)*

*"work done" = 0 marks*

*"work done lifting" = 1 mark*

*"change in potential energy" = 0 marks*

*"gravitational potential energy" = 1 mark*

5. If a candidate alters his/her response, examiners should accept the alteration.
6. 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.

The example below illustrates how to apply this principle to an objective question.

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.

|   |
|---|
|   |
|   |
| ✓ |
| ✗ |
|   |

This would be worth zero marks.

Put ticks (✓) in the two correct boxes.

|   |
|---|
|   |
|   |
| ✗ |
| ✗ |
|   |

This would be worth one mark.

Put ticks (✓) in the two correct boxes.

|   |
|---|
| ✗ |
| ✗ |
| ✓ |
| ✓ |
|   |

This would be worth one mark.

7. 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.

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

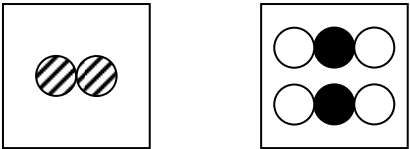
|               |          |          |          |          |          |          |          |          |          |           |
|---------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Edinburgh     |          |          | ✓        |          |          | ✓        | ✓        | ✓        | ✓        |           |
| 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     |         | Expected Answers  | Marks      | Additional Guidance  |
|--------------|---------|---|------------|--|
| 1            | (a) (i) | nucleus (1)   | [1]        | accept phonetically correct spelling   |
|              | (ii)    | DNA (1)   | [1]        |  |
|              | (b)     | X and Y (either order) <b>and</b> Y (1)<br>testes / male sex organs (1)   | [2]        |  |
|              | (c) (i) | <b>any two from:</b><br>embryos produced/fertilisation occurs outside body/by IVF/in dish/in laboratory (1)<br>genetic/gender testing of embryo (1)<br>select gender/ select embryo (1) | [2]        | maximum 2 marks<br>do not accept reference to fetus in place of embryo<br>do not accept fertilisation outside the uterus |
|              | (ii)    | it is not ethical / not treating a disease / not checking for genetic disorder/ it is illegal (1)   | [1]        | allow correct ethical example e.g. discarding of unused embryos  |
| <b>Total</b> |         |   | <b>[7]</b> |  |

| Question     |     | Expected Answers   | Marks      | Additional Guidance  |   |  |                                  |
|--------------|-----|--|------------|--|---|--|----------------------------------|
| 2            | (a) | <b>combination of alleles present in</b>   | [2]        | one mark for each correct row<br>case of the letter must be correct unlike Q1b |   |  |                                  |
|              |     | <b>disorder</b>  |            |  | <b>an individual without the disorder</b> | <b>an individual with the disorder</b> | <b>a carrier of the disorder</b> |
|              |     | <b>HD</b>  |            |  | hh  | or HH                                  | no carriers                      |
|              |     | <b>CF</b>  |            |  | or BB                                     | bb                                     | Bb / bB                          |
|              | (b) | <b>any three from:</b><br><b>Work context</b><br>difficulty in getting a job;<br>difficulty in keeping job / being promoted;<br>elaboration or explanation i.e. time off work (for treatment);<br><b>Insurance context</b><br>difficulty in getting insurance;<br>high insurance premiums; | [3]        | if no marks awarded, allow one mark max for unqualified ref to discrimination  |   |  |                                  |
| <b>Total</b> |     |  | <b>[5]</b> |  |   |  |                                  |

| Question     |     | Expected Answers  | Marks | Additional Guidance |
|--------------|-----|---|-------|---------------------|
| 3            | (a) | <p style="text-align: center;"> <input type="checkbox"/><br/> <input type="checkbox"/><br/> <input type="checkbox"/><br/> each other <input checked="" type="checkbox"/> (1) </p>                   | [1]   |                     |
|              | (b) | <p style="text-align: center;"> <input type="checkbox"/><br/> <input type="checkbox"/><br/> <input type="checkbox"/><br/> an unspecialised cell in ... <input checked="" type="checkbox"/> (1) </p> | [1]   |                     |
| <b>Total</b> |     |   | [2]   |                     |

| Question |     | Expected Answers   | Marks | Additional Guidance  |
|----------|-----|--|-------|--|
| 4        | (a) | nitrogen and oxygen from the air (1)<br>react at high temperatures of engine (1)<br>nitrogen and oxygen make nitrogen monoxide (1)<br>nitrogen monoxide is oxidised/reacts with oxygen<br>(to make nitrogen dioxide) (1) | [3]   | Maximum 3 marks<br>accept heat/hot if clearly linked to engine |

| Question                                |     | Expected Answers  | Marks                    | Additional Guidance  |   |                          |                          |                           |                                 |
|---|-----|---|--------------------------|--|---|--------------------------|--------------------------|---------------------------|---------------------------------|
|   | (b) |    | [3]                      | one mark for correct representation of nitrogen molecule<br>one mark for correct representation of carbon dioxide molecule<br>one mark for 1 correct nitrogen molecule and 2 correct carbon dioxide molecules.<br><br><b>ignore</b> whether circles are joined in line or at an angle<br>circles must be joined in correct order e.g. OOC is wrong for carbon dioxide<br>the blank circles, oxygen, must not be touching |   |                          |                          |                           |                                 |
|   | (c) | (i) 44 (1)  | [1]                      | <b>allow</b> 41 to 46. ignore units  |   |                          |                          |                           |                                 |
|   |     | (ii)<br><br>As the percentage ... .. air decrease. <table style="margin-left: auto; margin-right: 0;"> <tr><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td></tr> <tr><td><input checked="" type="checkbox"/> (1)</td></tr> <tr><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td></tr> </table> | <input type="checkbox"/> | <input type="checkbox"/>   | <input checked="" type="checkbox"/> (1) | <input type="checkbox"/> | <input type="checkbox"/> | [1]                       | tick in any other box = 0 marks |
| <input type="checkbox"/>                |     |   |                          |  |   |                          |                          |                           |                                 |
| <input type="checkbox"/>                |     |   |                          |  |   |                          |                          |                           |                                 |
| <input checked="" type="checkbox"/> (1) |     |   |                          |  |   |                          |                          |                           |                                 |
| <input type="checkbox"/>                |     |   |                          |  |   |                          |                          |                           |                                 |
| <input type="checkbox"/>                |     |   |                          |  |   |                          |                          |                           |                                 |
|   |     | (iii)<br><br>Factories, power stations ... <table style="margin-left: auto; margin-right: 0;"> <tr><td><input type="checkbox"/></td></tr> <tr><td><input type="checkbox"/></td></tr> <tr><td><input checked="" type="checkbox"/> (1)</td></tr> <tr><td><input type="checkbox"/></td></tr> </table>  | <input type="checkbox"/> | <input type="checkbox"/>   | <input checked="" type="checkbox"/> (1) | <input type="checkbox"/> | [1]                      | tick in any other box = 0 |                                 |
| <input type="checkbox"/>                |     |   |                          |  |   |                          |                          |                           |                                 |
| <input type="checkbox"/>                |     |   |                          |  |   |                          |                          |                           |                                 |
| <input checked="" type="checkbox"/> (1) |     |   |                          |  |   |                          |                          |                           |                                 |
| <input type="checkbox"/>                |     |   |                          |  |   |                          |                          |                           |                                 |
| <b>Total</b>                            |     |   | <b>[9]</b>               |  |   |                          |                          |                           |                                 |

| Question     |         | Expected Answers  | Marks | Additional Guidance   |
|--------------|---------|---|-------|---|
| 5            | (a)     | carbon monoxide (1)   | [1]   | allow CO  |
|              | (b) (i) | on each day,<br>there is little variation in the results/all the results<br>are similar/all the results are close together/ only a<br>small range<br>or<br>there are no outliers (1)  | [1]   |   |
|              | (ii)    | 133 (1)   | [1]   | ring around any other number(s) = 0   |
|              | (iii)   | <p style="text-align: right;"><input type="checkbox"/></p> <p>The ranges of the values ... <input checked="" type="checkbox"/> (1)</p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p>There is a real difference... <input checked="" type="checkbox"/> (1)</p> | [2]   | one mark for each tick in correct box<br>if three ticks deduct one mark<br>four or five ticks = 0 marks |
| <b>Total</b> |         |   | [5]   |   |



| Question                |                                     | Expected Answers   | Marks                               | Additional Guidance  |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
|-------------------------|-------------------------------------|--|-------------------------------------|--|---|---|-------------|--------------------------|--------------------------|-------------------------------------|------------------|-------------------------------------|--------------------------|--------------------------|-----------------------|--------------------------|--------------------------|-------------------------------------|-------------------------|-------------------------------------|--------------------------|--------------------------|---------------------|-------------------------------------|--------------------------|--------------------------|-----|--|
| 6                       | (a)                                 | <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="width: 10%; text-align: center;">S</th> <th style="width: 10%; text-align: center;">O</th> <th style="width: 10%; text-align: center;">N</th> </tr> </thead> <tbody> <tr> <td>Fossils ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Many African ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Older rock layers ...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Rock layers on some ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Some continents ...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table> |                                     | S  | O | N | Fossils ... | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Many African ... | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Older rock layers ... | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Rock layers on some ... | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Some continents ... | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | [2] | all correct ticks = 2 marks<br>four correct = 1 mark<br>three or fewer correct = 0 marks |
|                         | S                                   | O  | N                                   |  |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
| Fossils ...             | <input type="checkbox"/>            | <input type="checkbox"/>   | <input checked="" type="checkbox"/> |  |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
| Many African ...        | <input checked="" type="checkbox"/> | <input type="checkbox"/>   | <input type="checkbox"/>            |  |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
| Older rock layers ...   | <input type="checkbox"/>            | <input type="checkbox"/>   | <input checked="" type="checkbox"/> |  |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
| Rock layers on some ... | <input checked="" type="checkbox"/> | <input type="checkbox"/>   | <input type="checkbox"/>            |  |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
| Some continents ...     | <input checked="" type="checkbox"/> | <input type="checkbox"/>   | <input type="checkbox"/>            |  |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
|                         | (b)                                 | <p><b>any three from:</b><br/> continental movement not detectable (1);<br/> no known mechanism (1);<br/> Wegener an outsider/not a geologist/he was a meteorologist (weatherman) (1);<br/> (too big an idea on) limited evidence(1);<br/> other explanations e.g. land bridges did as well(1);</p>  | [3]                                 | <p><b>allow</b> tendency to stick with accepted ideas<br/> <b>allow</b> work not peer-reviewed / no-one could replicate findings</p> <p><b>reject</b> 'not a scientist'<br/> <b>reject</b> 'no evidence'</p> |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
|                         | (c) (i)                             | C and E (1)  | [1]                                 | either order   |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
|                         | (ii)                                | F and B (1)  | [1]                                 | either order   |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
|                         | (iii)                               | D (1)  | [1]                                 | <b>allow</b> A   |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |
| <b>Total</b>            |                                     |  | [8]                                 |  |   |   |             |                          |                          |                                     |                  |                                     |                          |                          |                       |                          |                          |                                     |                         |                                     |                          |                          |                     |                                     |                          |                          |     |  |

| Question     | Expected Answers  | Marks | Additional Guidance  |
|--------------|---|-------|--|
| 7            | beginning:<br>started at one point / 'Big Bang' /<br>galaxies/space moving outwards since /<br>about 14 000 million years ago (1)<br><br>unpredictable end:<br>observations not good enough yet /<br>mass of Universe not known (1) | [2]   | for two marks, should have one 'beginning' mark and one<br>'unpredictable' mark<br>do not give first mark if Big Bang theory described wrongly eg.<br>solar system formation<br>allow 13 000 million years to 15 000 million years<br><br>should refer to inadequate data/evidence or poor model |
| <b>Total</b> |   | [2]   |  |

| Question     | Expected Answers   | Marks      | Additional Guidance      |   |     |   |     |     |  |
|--------------|--|------------|--------------------------|---|-----|---|-----|-----|--|
| 8 (a)        | <p style="text-align: right;"><input type="checkbox"/></p> <p>Italy has active volcanoes. <input checked="" type="checkbox"/> (1)</p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p>  | [1]        |                          |   |     |   |     |     |  |
| (b)          | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 2px 5px;">D</td> <td style="padding: 2px 5px;">E</td> <td style="padding: 2px 5px;">B</td> <td style="padding: 2px 5px;">F</td> <td style="padding: 2px 5px; background-color: #cccccc;">A</td> <td style="padding: 2px 5px;">(1)</td> </tr> </table> | D          | E                        | B | F   | A | (1) | [1] |  |
| D            | E  | B          | F                        | A | (1) |   |     |     |  |
| (c)          | <p>2</p> <p>3</p>  | [1]        | must be in correct order |   |     |   |     |     |  |
| (d)          | <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p style="text-align: right;"><input type="checkbox"/></p> <p>A single observation ... <input checked="" type="checkbox"/> (1)</p>   | [1]        |                          |   |     |   |     |     |  |
| <b>Total</b> |  | <b>[4]</b> |                          |   |     |   |     |     |  |

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