



**General Certificate of Secondary Education  
January 2013**

**Science A**

**SCA1FP**

**(Specification 4406)**

**Unit 5: Science A1**

**Final**

***Mark Scheme***

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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## Marking Guidance for Examiners

### GCSE Science Papers

#### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:

where consequential marking needs to be considered in a calculation;

or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

#### 2. Emboldening

- 2.1** In a list of acceptable answers where more than one mark is available ‘any **two** from’ is used, with the number of marks emboldened. Each of the following lines is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

#### 3. Marking points

##### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that ‘right + wrong = wrong’.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as \* in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

| Candidate | Response | Marks awarded |
|-----------|----------|---------------|
| 1         | 4,8      | 0             |
| 2         | green, 5 | 0             |
| 3         | red*, 5  | 1             |
| 4         | red*, 8  | 0             |

Example 2: Name two planets in the solar system. (2 marks)

| Candidate | Response                 | Marks awarded |
|-----------|--------------------------|---------------|
| 1         | Neptune, Mars, Moon      | 1             |
| 2         | Neptune, Sun, Mars, Moon | 0             |

### 3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

### **Quality of Written Communication and levels marking**

In Question 14 candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

#### **Level 1: basic**

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

#### **Level 2: clear**

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

#### **Level 3: detailed**

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately
- The answer shows almost faultless spelling, punctuation and grammar.

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### Question 1

| question     | answers                     | extra information  | mark     |
|--------------|-----------------------------|--|----------|
| <b>1(a)</b>  | a stimulus                  |  | 1        |
| <b>1(b)</b>  | light                       | ignore names of senses   | 1        |
|              | sound / changes in position | allow balance<br>allow noise   | 1        |
|              | pressure                    | allow touch<br>ignore movement / balance<br>do <b>not</b> accept pain or temperature | 1        |
| <b>Total</b> |                             |  | <b>4</b> |

### Question 2

| question     | answers  | extra information              | mark     |
|--------------|----------|--------------------------------|----------|
| <b>2</b>     | hormones | words must be in correct order | 1        |
|              | glands   |                                | 1        |
|              | blood    |                                | 1        |
|              | LH       |                                | 1        |
| <b>Total</b> |          |                                | <b>4</b> |

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**Question 3**

| question     | answers             | extra information  | mark     |
|--------------|---------------------|--|----------|
| <b>3</b>     | sleeping pill       | allow sleeping drug / medicine   | 1        |
|              | (morning) sickness  |  | 1        |
|              | limbs / legs / arms | allow bodies / bones / body parts /<br>thumb / fingers / toes / hands /<br>feet                            | 1        |
|              | leprosy             | accept correct alternatives eg<br>cancer, leukaemia, skin disorders,<br>inflammatory diseases eg arthritis | 1        |
| <b>Total</b> |                     |  | <b>4</b> |

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**Question 4**

| question | answers  |           | extra information  |          | mark |
|----------|--|-----------|--|----------|------|
| 4(a)     |  | Light     | Force of gravity   | Moisture | 3    |
|          | Roots grow   | away from | towards  | towards  |      |
|          | Shoots grow  | towards   | away from  |          |      |
|          | 3 marks for all correct<br>2 marks for 3 or 4 correct<br>1 mark for 1 or 2 correct |           |  |          |      |
|          |  |           |  |          |      |
| 4(b)(i)  | smooth curve through all points  |           | curve must start at 0,0<br>do <b>not</b> accept sketchy line allow $\pm$ 1 square  |          | 1    |
| 4(b)(ii) | value between 21.5 and 25.0  |           | if answer given is in range, mark correct irrespective of their line<br>if answer not in range, look at their line and allow ecf only if a <b>straight line is</b> drawn |          | 1    |
| Total    |  |           |  |          | 5    |



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**Question 5**

| question         | answers  | extra information  | mark     |
|------------------|--|--|----------|
| <b>5(a)</b>      | any <b>one</b> from:<br><ul style="list-style-type: none"> <li>• <u>amount / concentration</u> of antibiotic</li> <li>• size of discs</li> <li>• (incubation) temperature</li> <li>• incubated for same time / 3 days</li> <li>• type of agar</li> </ul> | do <b>not</b> allow type of antibiotic<br>ignore number of antibiotics<br>allow type of paper<br>ignore number / position of discs<br><br>allow left / kept for same time<br><br>ignore references to bacteria or petri dishes | 1        |
| <b>5(b)(i)</b>   | D  |  | 1        |
| <b>5(b)(ii)</b>  | C  |  | 1        |
| <b>5(b)(iii)</b> | B<br><u>both</u> had a large clear area around the disc<br><b>or</b><br>killed a lot of <u>both</u> bacteria   | no marks if wrong antibiotic<br>allow a description of this, eg B had the 2 <sup>nd</sup> largest clear area with E.coli and the largest clear area on S.aureus  | 1<br>1   |
| <b>5(c)</b>      | resistant  |  | 1        |
| <b>Total</b>     |  |  | <b>6</b> |

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**Question 6**

| question         | answers           | extra information   | mark     |
|------------------|-------------------|---|----------|
| <b>6(a)</b>      | hydrogen          | allow H <sub>2</sub><br>H must be uppercase and number a subscript  | 1        |
| <b>6(b)(i)</b>   | carbon dioxide    | allow CO <sub>2</sub><br>letters must be uppercase and number a subscript   | 1        |
| <b>6(b)(ii)</b>  | water             | allow H <sub>2</sub> O<br>letters must be uppercase and number a subscript<br>ignore steam                                    | 1        |
| <b>6(c)(i)</b>   | petrol            | allow petroleum / refinery gases  | 1        |
| <b>6(c)(ii)</b>  | fuel (oil)        | allow bitumen   | 1        |
| <b>6(c)(iii)</b> | fuels             |   | 1        |
| <b>6(d)</b>      | A → E → C → B → D | 2 if in correct order<br>any of following gains 1 mark if overall order is incorrect<br>E before C<br><b>or</b><br>C before B | 2        |
| <b>Total</b>     |                   |   | <b>8</b> |

**SCA1FP**
**Question 7**

| question        | answers                                 | extra information  | mark |
|-----------------|---|--|------|
| <b>7(a)</b>     | (Cobalt) 1                              |  | 1    |
|                 | (Oxygen) 2                              |  | 1    |
| <b>7(b)(i)</b>  | the lithium compound / $\text{LiCoO}_2$ | allow from air / atmosphere / water (vapour)<br>allow the battery<br>ignore cracks, fan, gaps, surroundings and computer   | 1    |
| <b>7(b)(ii)</b> | lithium oxide                           | if correctly named, ignore at attempts at formula<br>allow $\text{Li}_2\text{O}$<br>the letters L and O must be uppercase, and the letter i lowercase and the number a subscript<br><br>ignore references to di, tri etc<br><br>do <b>not</b> accept lithium hydroxide | 1    |
| <b>7(c)</b>     | A = proton                              |  | 1    |
|                 | B = electron                            |  | 1    |
|                 | C = neutron                             |  | 1    |
| <b>7(d)(i)</b>  | losing                                  |  | 1    |
| <b>7(d)(ii)</b> | positive                                |  | 1    |

**Question 7 continues on the next page**

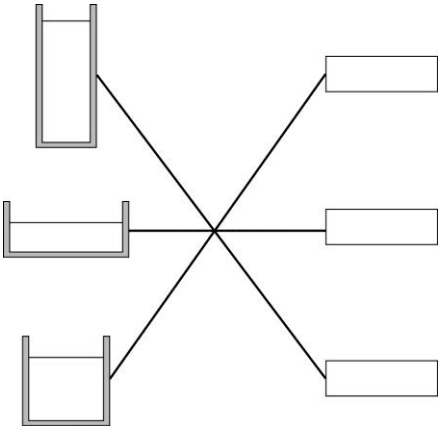
**SCA1FP**
**Question 7 cont'd**

| question        | answers   | extra information  | mark      |
|-----------------|---|--|-----------|
| <b>7(e)(i)</b>  | any <b>two</b> from:<br><ul style="list-style-type: none"> <li>• lithium moves (about on surface)</li> </ul> or<br>lithium floats<br><ul style="list-style-type: none"> <li>• lithium gets smaller</li> </ul><br><ul style="list-style-type: none"> <li>• bubbles (of gas)</li> </ul> | allow lithium dissolves<br>ignore lithium melts<br>allow fizzing / smoke<br>ignore flame, sparks, cloudy water,<br>any colours   | 2         |
| <b>7(e)(ii)</b> | lithium hydroxide + hydrogen  | in either order<br>allow LiOH for lithium hydroxide<br>allow H <sub>2</sub> for hydrogen<br>the letters L, O and H must be<br>uppercase, and the letter i<br>lowercase and the number a<br>subscript | 1         |
| <b>Total</b>    |   |  | <b>12</b> |

**SCA1FP**
**Question 8**

| question     | answers                                  | extra information  | mark        |
|--------------|--|--------------------|-------------|
| <b>8(a)</b>  | MP3 / player<br>halogen / lamp<br>heater | allow MP3 / player | 1<br>1<br>1 |
| <b>8(b)</b>  | heater                                   |                    | 1           |
| <b>Total</b> |  |                    | <b>4</b>    |

**SCA1FP**
**Question 9**

| question         | answers   | extra information  | mark        |
|------------------|---|--|-------------|
| <b>9(a)(i)</b>   | shape of container  |  | 1           |
| <b>9(a)(ii)</b>  |  | 3 correct for <b>2</b> marks<br>1 or 2 correct for <b>1</b> mark | 2           |
| <b>9(b)(i)</b>   | energy  |  | 1           |
| <b>9(b)(ii)</b>  | large surface area  |  | 1           |
| <b>9(b)(iii)</b> | dense<br>cool(er) / cold(er)<br>convection  | <b>not</b> heavy   | 1<br>1<br>1 |
| <b>Total</b>     |   |  | <b>8</b>    |

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### Question 10

| question     | answers  | extra information                                       | mark     |
|--------------|--|---|----------|
| <b>10(a)</b> | energy efficient means a small proportion of wasted energy |   | 1        |
| <b>10(b)</b> | plasma (TV)  |   | 1        |
| <b>10(c)</b> | 1.8  | allow 1 mark for correct substitution eg $0.3 \times 6$ | 2        |
|              | kWh  | box takes precedent                                     | 1        |
| <b>Total</b> |  |   | <b>5</b> |

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### Question 11

| question     | answers                             | extra information | mark     |
|--------------|-------------------------------------|-------------------|----------|
| <b>11(a)</b> | balls are far apart from each other |                   | 1        |
|              | balls move randomly                 |                   | 1        |
| <b>11(b)</b> | solid                               |                   | 1        |
|              | gas                                 |                   | 1        |
| <b>Total</b> |                                     |                   | <b>4</b> |

**SCA1FP**

**Question 12**

| question          | answers  | extra information   | mark   |
|-------------------|--|---|--------|
| <b>12(a)</b>      | speed / how fast chemical reactions in the body take place   | allow rate of<br>ignore rate of metabolism<br>ignore rates of individual reactions<br>eg digestion  | 1      |
| <b>12(b)(i)</b>   | falls rapidly at first<br>(then) falls more slowly / levels off  | ignore levelled off / stayed the same<br>allow <b>1</b> mark for (metabolic rate) decreases with age if no other mark gained<br>ignore references to gender | 1<br>1 |
| <b>12(b)(ii)</b>  | any <b>one</b> from:<br><ul style="list-style-type: none"> <li>put on weight / mass</li> <li>loss of appetite</li> <li>less active / have less energy</li> </ul> | ignore consequences of becoming overweight<br>allow eat less<br>ignore less fit / unhealthy   | 1      |
| <b>12(b)(iii)</b> | women have a lower / slower metabolic rate than men  | allow converse<br>ignore men have better / more metabolic rate<br>ignore reference to rate of change of metabolic rate                                      | 1      |

**Question 12 continues on the next page**

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**Question 12 cont'd..**

| <b>question</b> | <b>answers</b>  | <b>extra information</b>   | <b>mark</b> |
|-----------------|---|--|-------------|
| <b>12(a)</b>    | <p>any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>• most / more active</li> <li>• inherited factors / genes</li> <li>• more muscle</li> <li>• greater proportion of muscle to fat</li> </ul> | <p>ignore references to age, mass and gender</p> <p>allow does a lot of exercise / physical activity</p> <p>allow has a lot of</p> <p>ignore stronger</p> <p>allow has a high proportion</p> <p>do not credit 2 marks for more fat to muscle</p> | <b>2</b>    |
| <b>Total</b>    |   |  | <b>7</b>    |



**SCA1FP**
**Question 13**

| question     | answers                          | extra information   | mark     |
|--------------|----------------------------------|---|----------|
| <b>13(a)</b> | blast furnace iron is brittle    | allow converse responses<br>allow steel is stronger<br>ignore iron is soft / weak(er) / can be bent or moulded<br>ignore steel is tough / hardwearing / hard  | 1        |
|              | (so) limited uses                | allow references to uses of steels<br>eg used as a structural material<br>ignore references to rust / corrosion / reactivity  | 1        |
| <b>13(b)</b> | stainless steel                  | independent marks but for 2 marks the property has to relate to the type of steel<br>no marks if say low - carbon steel   | 1        |
|              | (because) resistant to corrosion | allow is less reactive<br>allow does not rust / tarnish / react with water or oxygen / air<br>allow hard / won't bend<br>ignore aesthetic answers<br>ignore strong<br>allow high-carbon steel for 1 mark<br><br>allow high-carbon steel (because) steel is hard / won't bend for 2 marks<br><br>If no steel mentioned allow 1 mark for a correct property | 1        |
| <b>Total</b> |                                  |   | <b>4</b> |

## SCA1FP

## Question 14

| question  | answers  | extra information   | mark  |
|---|--|---|---|
| 14  | Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking. |   | 6   |
| 0 marks   | Level 1 (1-2 marks)  | Level 2 (3-4 marks)   | Level 3 (5-6 marks)   |
| No relevant content.  | A brief reason is given against extraction or for recycling. There is little scientific terminology used.  | Some reasons are given with clear statements against extraction and or for recycling. Some scientific terminology is used   | Several reasons are given with a detailed explanation against extraction and for recycling. Scientific terminology is used accurately |
| <b>examples of chemistry points made in the response</b><br><br>extraction:<br><ul style="list-style-type: none"> <li>• limited resources of aluminium oxide</li> <li>• higher temperatures required</li> <li>• large amount of energy required</li> <li>• expensive</li> <li>• requires mining / quarrying</li> <li>• process takes longer / has more stages</li> <li>• produces more carbon dioxide / greenhouse gases</li> </ul> recycling:<br><ul style="list-style-type: none"> <li>• saves resources</li> <li>• cheaper to recycle</li> <li>• uses less energy</li> <li>• only needs to be melted</li> <li>• less electricity needs to be <i>used</i></li> <li>• less effect on environment</li> <li>• <i>example of effect on environment</i></li> <li>• avoids need for disposal / use of landfill</li> <li>• no need for quarrying</li> <li>• sustainable</li> </ul> |  | <b>extra information</b><br><br>ignore uses and properties of aluminium. Comparative statements count for both methods<br><br>allow quoted temperatures eg extracted at 950°C<br><br>allow quoted temperatures eg melted / recycled at 700°C<br><br>eg less destruction of habitats |   |
| <b>Total</b>  |  |   | <b>6</b>  |

**SCA1FP**
**Question 15**

| question   | answers   | extra information  | mark              |
|------------|---|--|-------------------|
| 15(a)(i)   | 80(°C)  |  | 1                 |
| 15(a)(ii)  | <p>material C</p> <p>temperature increase is slowest / heats up over a longer time period<br/> <b>or</b><br/> the temperature (after 10 minutes) was the lowest / coolest</p> | <p>second marking point scores only if correct material named</p> <p>allow lower / cooler<br/> accept smaller temperature change / rise<br/> ignore keeps most heat in<br/> if figures quoted need to compare all 3 temperatures</p>   | <p>1</p> <p>1</p> |
| 15(a)(iii) | <p>material A</p> <p>worst insulator / best conductor</p> <p><b>or</b><br/> the temperature (after 10 minutes) was the highest</p>  | <p>second marking point scores only if correct material named</p> <p>allow worse insulator<br/> allow better conductor</p> <p>allow higher<br/> allow lets most / more heat / energy through<br/> allow biggest / bigger temperature change<br/> allow fastest / faster temperature rise</p> | <p>1</p> <p>1</p> |

**Question 15 continues on the next page**

**SCA1FP**
**Question 15 continued**

| question     | answer                   | extra information   | mark     |
|--------------|--------------------------|---|----------|
| <b>15(b)</b> |                          | all net saving calculations required for 4 marks  |          |
|              | £4400 (double glazing)   |   | 1        |
|              | £210 (draught excluders) | allow double glazing not paid for itself (after 10 years)   | 1        |
|              | £1150 (loft insulation)  |   | 1        |
|              | loft insulation          | <p>if no calculation or only 1 calculation of net savings over 10 years, allow <b>2</b> marks for 3 calculations; <b>1</b> mark for 1 or 2 calculations of savings over 10 years:</p> <p>£600 (double glazing)<br/>£300 (draught excluders)<br/>£1500 (loft insulation)</p> <p>If no other correct calculations, allow 1 mark for 3 correct payback calculations (83.3 yrs, 3 yrs and 2.3 yrs).</p> <p>2 marks for answer of loft insulation has shortest payback time</p> <p>3 marks for answer of loft insulation justified by correct payback figures</p> <p>If no other calculations allow 1 mark for calculation of savings / cost</p> <p>Eg 0.12, 0.33, 0.42<br/>or 12%, 33%, 42%</p> | 1        |
| <b>Total</b> |                          |   | <b>9</b> |

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