# GCSE Science – Investigative Skills Assignment – Marking Guidelines

## **Biology 2.2 – Photosynthesis**

#### For use until May 2009

### Last date for submission for moderation May 2010

Please mark in red ink, and use one tick for one mark. Each part of each question must show some red ink to indicate that it has been seen.

Subtotals for each part of each question should be written in the right hand margin.

Please add annotations where necessary to explain why marks have or have not been awarded.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

The teacher must sign and date the front cover of the ISA.

The papers must be kept in a secure place and must **not** be returned to candidates.

The marking guidelines show examples of typical responses that candidates may make. However, teachers should use their professional judgement in deciding whether or not to award marks. If, in the judgement of the teacher, the candidate has provided a response which correctly answers the question, then a mark should be awarded even if this response is not shown in the mark guidance. If necessary, the teacher should annotate the script and/or mark guidance to justify the decision.

In the mark guidance:

- the use of a solidus (/) indicates an alternative answer
- the use of brackets () indicates wording that is not essential in the candidate's answer, but makes the guidance more clear.

|              | Answer   | Additional Guidance                                   |        |
|--------------|--|---|--------|
| 1            | Statement referring to <b>change</b> in the dependent variable                       | Dependent variable must be identified                 | 1 mark |
|              | eg to see if photosynthesis / the<br>number of bubbles changes                       | Just 'the number of bubbles' is <b>not</b> sufficient |        |
|              | Independent variable correctly<br>identified and correctly linked to<br>dependent    |   | 1 mark |
|              | egwhen I change the light intensity<br>/ distance between lamp and plant<br>variable |   |        |
| <b>2</b> (a) | Mark dependent upon particular investigation performed                               |   | 1 mark |
|              | eg light intensity / distance between lamp and plant                                 |   |        |
| (b)(i)       | By inspection of the candidate's results table / graph                               |   | 1 mark |

#### **SECTION 1**

|              | Answer  | Additional Guidance   |         |
|--------------|---|---|---------|
| (ii)         | Sensible value chosen<br>Suitable reason given<br>eg because the pattern is not clear at<br>this value / to check the shape of<br>the curve at this value   | Note 1 mark for <b>both</b> value and reason<br>Accept an extension of range if no clear<br>reason for one within range   | 1 mark  |
| 3            | One factor stated<br>eg time / distance / number of bubbles<br>/ temperature  | Answers should relate to variables in candidate's own investigation   | 1 mark  |
| 4            | <ul> <li>Any one from: eg</li> <li>to allow stabilisation</li> <li>rate to become constant</li> <li>so rate of bubbling at new value of variable is not affected by previous one</li> </ul>   | Accept alternative ideas based on particular investigation carried out  | 1 mark  |
| 5            | <ul> <li>Any one from: eg</li> <li>carry out (more) repeats</li> <li>collect bubbles and measure volume of gas</li> <li>control temperature more carefully</li> </ul>   | Accept alternative ideas based on particular investigation carried out  | 1 mark  |
| <b>6</b> (a) | Check candidate's results table and/or<br>graph to establish whether answer is<br>reasonable  | Look for at least a 10% variation from any trend / pattern  | 1 mark  |
| (b)          | Answer should relate to divergence<br>from the pattern established by the<br>results.   | If the candidate identifies that no<br>repeats are necessary this should be<br>borne out by the results, if so, then the<br>response should indicate that all the<br>results fall on / near a smooth curve /<br>line or expected values | 1 mark  |
| 7            | Amplified statement for 2 marks<br>eg light intensity / distance between<br>lamp and plant affects the rate of<br>bubbling / photosynthesis<br>for 1 mark<br>plus<br>the rate of photosynthesis /<br>bubbling increases as the light<br>intensity increases / distance<br>decreases for 2 marks<br>or<br>eg there is no relationship between<br>light intensity and the rate of the<br>bubbling / photosynthesis<br>for 1 mark<br>plus<br>the results do not show a trend / are<br>random for 2 marks | NB statement <b>must</b> relate to candidate's<br>own results<br>Simple correct statement, stating<br>whether or not there is a relationship<br>between the two variables, for 1 mark<br>only   | 2 marks |

|   | Answer  |                                     | Additional Guidance  |           |
|---|---|-------------------------------------|--|-----------|
| 8 | Table:Correct headings AND units allfor all measured variables    | l correct                           | Table with incomplete headings or units<br>for the measured variables gains 1 mark<br>eg all headings present = 1<br>eg all units present = 1  | 2 marks   |
|   | Graph/chart:  |                                     |  |           |
|   | X axis: suitable scales chosen a labelled with quantity and units | and                                 | Accept axes reversed   | 1 mark    |
|   | Y axis: suitable scales chosen a labelled with quantity and units | and                                 |  | 1 mark    |
|   | Points or bars plotted correctly ± 1mm                            | to within                           | Allow <b>one</b> plotting error out of every 5 points plotted.   | 1 mark    |
|   |   |                                     | Allow error carried forward from incorrect plots   |           |
|   | Suitable line drawn on graph or correctly labelled on bar chart   | bars                                |  | 1 mark    |
|   | If wrong type of graph / chart, maximum <b>3</b> marks            |                                     |  |           |
|   | If the independent variable is:                                   | continuou:<br>categoric<br>discrete | s should draw a <i>best fit line graph</i><br>should draw a <i>bar chart</i><br>may draw either a <i>best fit line graph</i><br>or a <i>bar chart</i> (but allow dot-to-dot<br>joining of points in this case) |           |
|   |   |                                     | N <i>1</i>   | 10 maul-a |

Max 18 marks

#### **SECTION 2**

|               | Answer  | Additional Guidance   |        |
|---------------|---|---|--------|
| 9             | Lettuces grow faster / ready to sell sooner at higher temperatures  |   | 1 mark |
|               | As temperature rises effect decreases   |   | 1 mark |
| 10            | The time for the lettuces to be ready to sell   |   | 1 mark |
| 11            | <ul> <li>Any one from: eg</li> <li>random errors / variations more easily spotted</li> <li>some (lettuces) may die</li> </ul> |   | 1 mark |
| <b>12</b> (a) | Lettuces grow faster / ready to sell sooner   |   | 1 mark |
| (b)           | Greater cost at 26°C (not compensated for by improved growth)   |   | 1 mark |
| 13            | It is a control variable / to ensure<br>different water availability does not<br>affect growth or results                     | Do <b>not</b> accept vague statements such as to make it a fair test unless explained | 1 mark |

|               | Answer  | Additional Guidance  |          |
|---------------|---|--|----------|
| 14            | Experimental control / a baseline / to compare other results with   | Do <b>not</b> accept 'as a control <b>variable</b> '   | 1 mark   |
| 15            | (The higher the concentration,) the sooner the plants are ready to sell   | Accept different phrasing conveying this idea  | 1 mark   |
| 16            | <ul> <li>Any one from: eg</li> <li>(genetic) variation between plants</li> <li>another variable not accounted for</li> <li>mathematical / recording / plotting error</li> </ul>   | Do <b>not</b> accept statement without an explanation as to cause eg it is an anomaly  | 1 mark   |
| 17            | Bar chart has visual effect with better impact / easier to understand   |  | 1 mark   |
| <b>18</b> (a) | Fertiliser <b>B</b>   |  | 1 mark   |
|               | Faster growth / ready to sell sooner (at all concentrations)  |  | 1 mark   |
| (b)           | Any <b>two</b> from: eg   | No mark for <b>Yes</b> or <b>No</b> .  | 2 marks  |
|               | <ul> <li>there is a 4 day decrease when<br/>100% concentration is used</li> <li>but not at concentrations below<br/>100%</li> <li>can't guarantee because of natural<br/>variation in plants</li> <li>data only relates to lettuces, other<br/>plants may respond differently</li> <li>data only refers to 24°C/using<br/>paraffin heater</li> <li>other factors may affect growth of<br/>plants</li> <li>Quality of written communication</li> </ul> | Mark is for the reason and the rest of<br>response must correctly relate to <b>Yes</b> or<br><b>No</b> otherwise a maximum of <b>1</b> mark<br>should be awarded for scientific<br>content.                            |          |
|               | <ul> <li>Candidates should use at least one<br/>technical term from: eg</li> <li>reliable</li> <li>repeat</li> <li>concentration</li> <li>accurate</li> <li>photosynthesis</li> <li>variation</li> </ul>  | The mark is to be awarded for the <b>correct</b> use of technical terms<br>The marker should circle these terms<br>Annotate below candidate's answer<br>with $Q \checkmark$ for mark given or QX for mark<br>not given | 1 mark   |
|               |   | Max  | 16 marks |

ISA Total 34 Marks

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