



**General Certificate of Education (A-level)**  
**June 2013**

**Biology**

**BIO3T/P13**

**(Specification 2410)**

**Unit 3T: Investigative Skills Assignment**

**Final**

***Marking Guidelines***

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Mark schemes are prepared by the Principal Moderator and considered, together with the relevant questions, by a panel of subject teachers.

Further copies of these Marking Guidelines are available from: [aqa.org.uk](http://aqa.org.uk)

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## Guidance for teachers marking Biology ISAs

**Final Marking Guidelines** must be used to mark students' work.

### General principles

In general, you are looking for evidence that the student knows and understands the point required by the Marking Guidelines.

It is important to mark what the student has written, not to assume what may have been intended. It is also important to make sure that a valid point is in the correct context. Individual words or phrases where the overall answer does not apply to the question asked should not be credited.

### Conventions

The following conventions are used in the Marking Guidelines.

- A semicolon (;) separates each marking point
- An oblique stroke (/) separates alternatives within a marking point
- Underlining of a word or phrase means that the term must be used  
For example anaphase, the term must appear  
For example ..... and ....., both items must be present for a mark
- Brackets are used to indicate contexts for which a marking point is valid. This context may be implied by a student's answer
- 'Accept' and 'reject' show answers which should be allowed or not allowed
- Additional instructions are shown in the comments column
- 'Max' refers to the maximum mark that can be awarded for a particular question or part question.

The Marking Guidelines show the minimum acceptable answer(s) for each marking point. A better, more detailed, or more advanced answer should always be accepted, provided that it covers the same key point.

Marking Guidelines cannot give every possible alternative wording - equivalent phrasing of answers should be accepted. For example, 'the water potential is higher in the cells' is equivalent to 'the water potential is less negative in the cells'. It is, however, important to be sure that the minimum requirement of the Marking Guidelines is met and that the point is made unambiguously.

Converse answers are normally acceptable, unless the wording of the question rules this out. For example, 'the water potential is lower in the solution' is an acceptable converse of 'the water potential is higher in the cell'.

Very occasionally, a student will give a biologically correct answer that is not covered in the Marking Guidelines. If it is equivalent in standard to the Marking Guideline answers, it should be credited. In this case, write the word 'valid'.

All marking points are awarded independently, unless a link between points is specified in the Marking Guidelines.

## The mechanics of marking

Always mark in red ink. Make sure that some red ink appears on every page on which the student has written.

For each mark awarded, put a tick close to the marking point. In all cases, a tick should equal one mark and the total number of ticks should match the mark totals in the margins. The total mark for each part answer should be written in the right hand margin.

Put a cross against incorrect points. It is helpful to indicate omissions of key words or incomplete answers with a  $\wedge$  symbol, and to highlight irrelevancies or contradictions by underlining. It is also helpful to write brief comments to explain the reason for awarding or withholding a mark when the answer does not obviously match the Marking Guidelines.

When marking answers with many marking points, the points will be numbered. The points do not have to appear in the student's response in the order in which they appear in the Marking Guidelines. The appropriate number must be placed alongside the tick. This helps to clarify where a specific point has been awarded and makes moderation much easier. It also helps to avoid awarding the same point twice.

Disqualifiers A correct point should be disqualified when the student contradicts it in the same answer. Indicate this on the script by 'dq'. If a tick has already been placed against a valid point, ensure that it is clearly deleted. Note that there is no penalty for incorrect points which are not contradictory, or for surplus or neutral information.

The list rule When a question asks for a specific number of points, and the student gives more, the general rule is that any wrong answer cancels a correct answer. For example, if a question asks for two points and three answers are given, two correct and one clearly wrong, the mark awarded is one, whatever the order of the answers. This prevents students from gaining full marks from a list of right and wrong answers.

Example:

Name two substances that are produced in photosynthesis. (2 marks)

Answer	Marks	Comment
Oxygen, glucose	2	Both correct
Oxygen, carbon dioxide	1	One correct, one incorrect
Carbon dioxide, oxygen, glucose	1	Carbon dioxide is clearly incorrect and cancels one of the marks
Oxygen, glucose, water	2	Regard water as a neutral point. It is not worth a mark but it is not incorrect

Two or more correct points on the same answer line should be credited.

'Neutral' points, i.e. ones which are not creditworthy but not actually incorrect, should not negate a correct answer.

Spelling Reasonably close phonetic spellings should be credited. However, any misspelling of technical terms which can easily be confused, such as intermediate between 'mitosis' and 'meiosis', should result in the relevant marking point being withheld. Terms like this will be indicated in the comments column in the Marking Guidelines to show that misspellings must not be credited.

## BIO3T/P13 TASK

Before you mark any work, please make sure that you have read **Guidance for teachers marking Biology ISAs** on pages 3 and 4 of these Marking Guidelines.

### Stage 1 – Marking of table showing raw data

Marking Guidance	Mark	Comments
Student's own data presented clearly with full description of independent variable [pH of amylase/buffer/solution/mixture] and dependent variable [time taken for (blue-black) colour to disappear];	1	Credit additional information given in a title  'pH' alone is insufficient. The pH must be of something. 'Time' alone is insufficient  Note: all 3 marks can be awarded irrespective of the quality of the data
Independent variable (pH) in first column;	1	Ignore columns providing additional but neutral information such as 'tube number'
Unit for time is seconds and only in column heading. No unit for pH;	1	Accept minutes as unit but reject mixed units, e.g. result of 1 min 20 seconds should only be accepted if shown as either 80 seconds or 1.33 minutes
<b>Total</b>	<b>3</b>	

**The Candidate Results Sheet: Stage 1 is required for moderation and must be attached to the ISA test.**

## Stage 2 – Marking of calculations and graph

Marking Guidance	Mark	Comments
All 5 calculations of $1000/t$ correct;	1	Reject if less than 5 results
Graph has independent variable (pH) on x-axis and 'rate' or $1000/t$ on y-axis;	1	Reject plotting of time taken for this marking point only
Both axes labelled correctly, with appropriate unit for y-axis;	1	Accept rate unit as $1000/t$ . Ignore any further detail If time taken has been plotted, unit is s/sec/seconds or min/minutes
Appropriate scales selected for x and y axes;	1	Ensure scale for pH is linear
All points plotted correctly;	1	For chosen y-axis label
Points joined correctly or line of best fit as appropriate;	1	Reject extrapolation beyond plotted points. The line of best fit must match the data plotted
<b>Stage 2 Total</b>	<b>6</b>	

**The Candidate Results Sheet: Stage 2 is required for moderation and must be attached to the ISA test.**

### BIO3T/P13 Section A

Question	Marking Guidance	Mark	Comments
1	<ol style="list-style-type: none"> <li>Outside this range reaction is slow/reaction doesn't work;</li> <li>(Because) enzyme is denatured outside this range;</li> <li>Optimum pH is within this range;</li> </ol>	2 max	<ol style="list-style-type: none"> <li>and 2. Accept converse</li> <li>and 2. Range could be expressed numerically i.e. pH 5 to 8</li> <li>Accept descriptions of denaturation or changes in shape</li> </ol>
2	<ol style="list-style-type: none"> <li>(Molecules at 30 °C) have more kinetic energy/move faster;</li> <li>So more collisions between enzyme and substrate / more enzyme-substrate complexes formed;</li> </ol>	2	<ol style="list-style-type: none"> <li>Accept answers that explain why reaction slower at room temperature</li> <li>'More collisions' is insufficient</li> </ol>
3	<ol style="list-style-type: none"> <li>Compared with the colour of iodine (solution);</li> <li>Compared to one already changed colour / 'gone';</li> <li>Checked the next (20 second) sample to see no further change;</li> </ol>	1 max	<ol style="list-style-type: none"> <li>Idea of using a previous test where the blue-black colour has been lost i.e. a standard</li> </ol>
4	<ol style="list-style-type: none"> <li>Volume of iodine not fixed/not controlled;</li> <li>Volume of mixture not fixed/not controlled;</li> <li>(End point is) qualitative / not quantitative;</li> <li>Only tested every 20 seconds / reaction could be completed between (20 second) samples;</li> <li>Temperature could fluctuate;</li> <li>No repeats;</li> </ol>	3 max	<ol style="list-style-type: none"> <li>Ignore any reference to human error</li> <li>Marking points 1 and 2 could be expressed by reference to variation in drop size</li> <li>Accept alternative ways of expressing the ideas e.g. subjective or based on opinion</li> <li>Accept why it might fluctuate e.g. not controlled, not monitored, water bath not 'electric'</li> </ol>
5(a)	<ol style="list-style-type: none"> <li>Change in charge (of enzyme);</li> <li>Change in shape (of enzyme);</li> <li>Less/fewer enzyme-substrate complexes formed (per second) at pH3 / more ES complexes (per second) at pH4;</li> </ol>	3	<ol style="list-style-type: none"> <li>Accept other ways of expressing charge e.g. reference to ionic groups</li> <li>Accept reference to denaturation for change in shape</li> <li>Must be in the correct pH context and with reference to ES complexes</li> </ol>

5(b)	No intermediate values / cannot predict between plotted values;	1	'Plotted values' could be expressed as 'pHs used'
6(a)	Maltose;	1	
6(b)	1. Benedict's solution <i>and</i> heat; 2. Orange/brick red/ brown/ orange/ yellow/green colour (indicates reducing sugar present);	2	1. Need both aspects. Do not credit this point if acid is also added. Do not credit 'place in a water bath' unless it is qualified as warm or hot  2. Mark independently of point 1 but reject if the colour change is related to the wrong biological molecule e.g. amino acid
<b>Total marks for Section A</b>		<b>15</b>	



### BIO3T/P13 Section B

Question	Marking Guidance	Mark	Comments
7(a)	For person with pancreatitis/blocked pancreatic duct:  1. At 0 h/start higher than healthy person / higher than healthy person throughout;  2. Rises then falls whereas healthy person falls then rises;  3. At 48 h/end, below the starting value whereas healthy person is the same (as at start);	2 max	Differences required for all points
7(b)	1. Little/less/no amylase can enter small intestine;  2. Little/less/no starch digested (in intestine);  3. Salivary amylase not affected / some starch digested by salivary amylase;	2 max	1. Accept gut or intestine but reject wrong locations e.g. stomach  3. Accept 'amylase from mouth'
8	1. Amylase is specific (to starch);  2. No starch in human blood/cells/tissues / starch only in plants;	2	
9	1. Could digest own body/own proteins;  2. Example of protein digested e.g. membrane protein, antibody, named protein in blood;	2	e.g. 'could digest carrier proteins in body cells' would score 2 marks  e.g. 'could digest antibodies in blood' would also score 2 marks  2. Do not credit unsuitable example such as muscle proteins
10	1. Enzyme hydrolyses/breaks down protein to amino acids;  2. Products are soluble/can be washed away;	2	

11	<p><b>Arguments for biological washing powder:</b></p> <ol style="list-style-type: none"> <li>1. More effective with all stains;</li> <li>2. Greater improvement with salad dressing/chocolate milkshake/chocolate pudding;</li> </ol> <p><b>Arguments against biological washing powder:</b></p> <ol style="list-style-type: none"> <li>3. Little/less improvement with raspberry sorbet/raspberry smoothie;</li> <li>4. Only tested 5/a small number of stains;</li> <li>5. Only chose stains that would work / didn't select stains that wouldn't work;</li> <li>6. Only included results that did work / didn't show results that didn't work;</li> <li>7. Only one set of results / not repeated;</li> <li>8. Only compared against one washing powder / may not be true for other washing powders;</li> </ol>	4 max	<p>3 max if only arguments against biological washing powder are referred to</p> <ol style="list-style-type: none"> <li>1. Accept different ways of expressing 'effective' e.g. higher % of stain removed</li> </ol> <p>Ignore references to unknown masses of powder, temperature of washes or other aspects of technique or different fabrics</p>
12	<ol style="list-style-type: none"> <li>1. Enzyme <b>S</b> effective across a wider range of temperatures;</li> <li>2. Enzyme <b>S</b> <i>more</i> active above 50 °C / active up to 80 °C / active above 60 °C;</li> <li>3. Enzyme <b>S</b> <i>more</i> active below (about) 37 °C temperature;</li> <li>4. (Although) Enzyme <b>P</b> has higher rate of reaction at optimum/40 – 50 °C;</li> <li>5. Enzyme <b>P</b> denatured above 50 °C;</li> </ol>	3 max	<p>Answers should be in the context of choosing enzyme <b>S</b> but, if <b>P</b> is chosen, points 4 and 5 may still be awarded, if described</p> <p>In points 2 and 3, a temperature must be stated. Allow <math>\pm 5</math> degrees of values shown</p>

13	<ol style="list-style-type: none"> <li>1. Stains caused by different substances;</li> <li>2. Enzymes are specific;</li> <li>3. <u>Active site</u> specific to substrate / other substrates cannot fit <u>active site</u>;</li> </ol>	3	<p>3. This could be expressed in other ways e.g. 'other substrates are not complementary to the active site'</p>
<b>Total marks for Section B</b>		<b>20</b>	