

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

**Biology**

**BIO3T/Q13**

**(Specification 2410)**

**Unit 3T: Investigative Skills Assignment**

**Final**

***Marking Guidelines***

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

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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/Q13 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**

<b>Marking Guidance</b>	<b>Mark</b>	<b>Comments</b>
Student's own raw data presented clearly with full description of dependent variable, e.g. 'Number of stomata in field of view';	1	This may be recorded either by full heading or in the title to the table. 'Number of stomata' is insufficient
Data from different leaves clearly identified;	1	Do not award if data for 3 leaves not included or if data for only one field of view has been recorded
<b>Total</b>	<b>2</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**

<b>Marking Guidance</b>	<b>Mark</b>	<b>Comments</b>
1. Mean values for all 3 leaves calculated correctly;	1	Do not credit if only one field of view recorded for each leaf
2. Standard deviations for all 3 leaves calculated correctly;	1	Do not credit if only one field of view recorded for each leaf
3. Graph has leaf (number) on x-axis and mean number of stomata on y-axis;	1	Accept other ways of showing there are 3 leaves
4. Appropriate scale selected for y-axis;	1	Scale should allow for both accurate plotting and reading the graph
5. x-axis and y-axis appropriately labelled as 'Leaf' and 'Mean number of stomata';	1	'Mean number of stomata' is minimum requirement for y-axis
6. Data presented as a bar chart with 3 bars of same width and not touching;	1	Reject if more than or fewer than 3 bars shown
7. Mean values plotted accurately;	1	Accept plotting of student values even if calculated incorrectly If ICT has been used, it should be possible to read the height of the bars with appropriate precision
8. Standard deviation bars plotted accurately both above and below the bar height;	1	Accept plotting of student values even if calculated incorrectly
<b>Total</b>	<b>8</b>	

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

## BIO3T/Q13 Section A

Question	Marking Guidance	Mark	Comments
1	Genetically identical / same growing conditions;	1	Accept different plants have different DNA/ alleles/genes/genotypes Accept named growing condition
2	Enough to get a representative mean / so anomalies can be identified / until concordant readings;	1	'To calculate a mean' is insufficient Reject the idea of discounting or ignoring anomalies Accept reference to running mean to see when mean stabilises
3	Eyepiece x objective (lenses);	1	Accept as a minimum 'multiply the two lenses together'
4	Use of a tally / repeated the count / change depth of focus to check all stomata are counted / avoid areas with air bubbles / avoid areas where epidermis is folded / precaution which accounts for stomata that are only partly in field of view;	1	
5	1. Density/number of stomata may not be uniform; 2. To get results representative of the whole leaf/epidermis;	1 max	1. Accept there could be more/fewer stomata at the edges 2. Reject reference to observer bias
6	1. Appropriate statement that compares means; 2. Appropriate statement that uses standard deviations;	2	1. E.g. the mean number of stomata per field of view varies in different leaves 2. E.g. comparison of variation about the means
7(a)	1. Use graph paper/grid; 2. Count squares; <b>OR</b> 3. Use ruler/micrometer/graticule/measure radius/measure diameter; 4. Use $\pi r^2$ ;	2 max	Mark as a pair

7(b)	<ol style="list-style-type: none"> <li>1. Measure leaf area;</li> <li>2. Detail e.g. draw around leaf on graph paper and count squares;</li> <li>3. Use mean number of stomata per field of view;</li> <li>4. Multiply this (mean number of stomata per field of view) by leaf area divided by area of field of view;</li> </ol>	4	<p>2. An alternative is to find the mass of a piece of paper the same size as the leaf. Only credit this idea if, in point 4, the mass of a piece of paper equivalent to the field of view is also found</p> <p>If given, the formula of</p> $\frac{\text{Mean no. of stomata} \times \text{leaf area}}{\text{Area of field of view}}$ <p>achieves points 3, 1 and 4</p>
8	<ol style="list-style-type: none"> <li>1. Less water loss / less transpiration / less evaporation / more water conserved;</li> <li>2. (Beneficial because) xerophytes are adapted to areas where water is scarce / xerophytes live in areas where water is scarce;</li> </ol>	2	
<b>Total marks for Section A</b>		<b>15</b>	



## BIO3T/Q13 Section B

Question	Marking Guidance	Mark	Comments
9	Any <b>three</b> from: 1. Light; 2. Carbon dioxide; 3. Type of soil; 4. Minerals / nutrients; 5. Water (in soil); 6. Humidity (of air); 7. pH (of soil) 8. Planting density;	3 max	4. Accept named example  8. Idea of equally spaced
10	Already levelled out (before 20 °C);	1	
11	Young leaves (may) have different number of stomata (per mm <sup>2</sup> ) / number of stomata (per mm <sup>2</sup> ) changes during development (of leaf);	1	Accept reference to density of stomata
12	Any <b>two</b> from: 1. Molecules have more <u>kinetic</u> energy; 2. Faster diffusion of water / more evaporation of water (as temperature increases in leaf); 3. Steeper water potential/diffusion gradient;	2 max	Points 1 and 2 need context of 'more' 1. Accept <u>KE</u> 2. For this point, diffusion must relate to movement of water
13	1. The more recent the sample the greater the concentration; 2. Increases most in last 5000 years / more or less constant/slight increase between 30 000 and 15 000 years ago;	2	Accept converse 1. This could be expressed by reference to time e.g. 'concentration has increased since 25 000 years ago'
14	1. Variation in data / spread of data; 2. Around the mean;	2	1. Reject references to range e.g. 'range of data' Both marks are possible in the context of using the data
15	1. Yes as pine leaves not in organic matter of the same age; 2. No as organic matter would be the same age as the pine leaves;	1 max	Accept either approach

16	Can get more CO <sub>2</sub> for <u>photosynthesis</u> ;	1	More CO <sub>2</sub> enters leaf is insufficient. Accept light-independent (reaction) as equivalent
17	Any <b>three</b> from: 1. (Overall data show) negative correlation; 2. Little change in number of stomata in last 10 000 years; 3. Small sample size; 4. Only one species studied; 5. Other factors/named factor may have affected number of stomata; 6. Evidence does not support the conclusion between 30 000 and 25 000 years ago/between 5000 years ago and present day; 7. Appropriate reference to standard deviations (in comparing means);	3 max	1. Do not allow description of correlation because in question stem  6. Accept reference to either one of these age ranges  7. E.g. no overlap between 15 000 and 10 000 years ago
18	Any <b>three</b> from : 1. Thick cuticle; 2. Small leaves/low surface area; 3. Hairy leaves; 4. Sunken stomata; 5. Rolled leaves;	3 max	2. Accept other ways of describing 'small', e.g. 'needle-like'
<b>Total marks for Section B</b>		<b>19</b>	