

# A-level **BIOLOGY**

Investigative and Practical Skills in AS Biology - BI03T/Q14  
Final Marking Guidelines

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

## Guidance for teachers marking Biology ISAs

These are the final **Marking Guidelines**, which provide guidance on the marking of the ISA.

### 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  $\Lambda$  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/Q14 TASK**

Before you mark any work, please make sure that you have read **Guidance for teachers marking Biology ISAs** on pages 3 to 5 of these Marking Guidelines.

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

Marking Guidance	Mark	Comments
<p>Marking points 1 to 3 can be awarded whatever the 'quality' of data shown. Where data are shown in rows instead of columns, the same principles apply.</p>		
<p>1. Data presented clearly <b>and</b> with independent variable, i.e. concentration of glucose or glucose solution <b>and</b> dependent variable, i.e. time for (pink) colour to disappear/potassium manganate to go clear/solution to go clear;</p>	1	A reference to both time and change in colour/go clear is required to describe the dependent variable
<p>2. (Concentration of) glucose in first column;</p>	1	Ignore additional information that is neutral, eg 'tube number' even if this is given as the first column
<p>3. Units only shown in the column heading and not anywhere in the body of the table. Glucose (concentration) written as 'percentage' or given as '%' and time shown as seconds/s;</p>	1	Allow the use of '%' as a unit. Reject 'sec(s)' as a unit
<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
1. Graph has (concentration of) glucose on $x$ -axis and time taken (for loss of colour) on $y$ -axis;	1	
2. Both axes labelled correctly with percentage (concentration) of glucose and time for loss of colour in seconds;	1	Accept other ways of expressing loss of colour, eg for pink colour to disappear/solution to go clear but all must be linked to time, to complete the label  Percentage can be written or shown as ‘%’  Ignore the use of ‘sec(s)’ here as graph skills are being rewarded
3. Appropriate scales selected for $x$ and $y$ axes;	1	To enable points to be plotted accurately  Check the scale is linear (the differences between concentrations are not all the same)
4. All points plotted correctly;	1	Reject if less than the 5 concentrations shown or if any one plot is inaccurate. Do not penalise for a non-linear scale again
5. Points joined correctly or line of best fit;	1	In this case, a line of best fit should be used but accept a point-to-point graph. Reject extrapolation of the line beyond the plotted points
6. Correct values for concentration of glucose in solution <b>A</b> and solution <b>B</b> given;	1	Both must be correctly read from the student’s graph. This point is to reward the correct reading off from the graph whatever line is drawn
<b>Total</b>	<b>6</b>	

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

**BIO3T/Q14 Section A**

Question	Marking Guidance	Mark	Comments
1	Colourless / no colour / none;	1	Reject clear or transparent
2	<ol style="list-style-type: none"> <li>1. Compared with a tube completed earlier/standard;</li> <li>2. Recorded time when colour 'gone' and waited to see if any further change;</li> <li>3. Used (white) paper/card behind tube to see colour change;</li> </ol>	1 max	Accept any one of the 3 approaches for 1 mark only
3	<ol style="list-style-type: none"> <li>1. To calculate a reliable/representative <u>mean</u>;</li> <li>2. To identify anomalies;</li> </ol>	1 max	<ol style="list-style-type: none"> <li>1. 'Mean' unqualified is insufficient. Accept an idea of a 'better' mean</li> <li>2. Accept idea of results being repeatable</li> <li>2. Do not award the mark if the idea of removing/eliminating anomalies is also given</li> </ol>
4	<p>No (no mark)</p> <p>Enzymes not involved / no living organism/cell involved / reaction is rapid/reaction released little energy/ room temperature would not change (significantly);</p> <p><b>OR</b></p> <p>Yes (no mark)</p> <p>Temperature rise increases kinetic energy/number of collisions / reaction released (significant) energy / room temperature did change (significantly);</p>	1	Accept converse for decrease in temperature
5	Uniform mixture of chemicals / so chemicals do not separate / colour is uniform / temperature is uniform;	1	
6	Cannot judge (colour change) with that level of accuracy;	1	Accept reference to human reaction time to stop the timer is too slow



7	<u>Quantitative</u> because data are numbers/measurements;	1	Accept other ways of describing 'numbers'
8(a)	<ol style="list-style-type: none"> <li>Points joined with straight lines/point-to-point / not a curve of best fit;</li> <li>No intermediate values / no values between 4% and 8% / no value for 6%;</li> <li>True value more likely to lie on curve of best fit / true value not likely to lie on the point-to-point 'curve';</li> </ol>	2 max	1. This marking point is required as a statement and is not to be inferred by marking point 3
8(b)	1. Use concentrations (of glucose) between 4% and 8%/around 6%;	1	Allow reference to use of different concentrations within this range
9	<ol style="list-style-type: none"> <li>Use a fixed/constant volume of Benedict's;</li> <li>Use a fixed/constant volume of glucose solutions <b>and</b> solution <b>A</b>;</li> <li>Fixed/constant time in 'hot' water bath;</li> <li>Set up set of tubes with different colours from known concentrations of glucose;</li> <li>Compare colour of solution <b>A</b> against these colours;</li> </ol>	4 max	<ol style="list-style-type: none"> <li>Both aspects are required</li> <li>Water must be hot or heated, do not reward 'use a water bath' without this qualification</li> </ol> <p>Alternative for marking point 4 and marking point 5:</p> <ol style="list-style-type: none"> <li>Get colorimeter readings for known concentrations of glucose/produce a reference curve</li> <li>Compare colorimeter reading of solution <b>A</b> against readings/reference curve</li> </ol>
<b>Total marks for Section A</b>		<b>14</b>	

**BIO3T/Q14 Section B**

Question	Marking Guidance	Mark	Comments
10	Answer of 9.09 / 9.1;; = 2 marks Calculation of the difference in mean time (2) divided by original time (22); = 1 mark	2	Ignore number of decimal places as long as they are correct
11	(Yes) 1. Faster running time after sports drink;  (No) 2. Mean times given <b>so</b> there will be variation in the group; 3. No standard deviations to know the spread of the data (about the mean)/whether they overlap; 4. Improvement in running time only small in both groups / both groups improved in Race 2; 5. Did not drink the same volumes;	3 max	Can mix and match yes or no approach, all 5 responses are available  1. 'Faster running time in group Q' is insufficient but accept 'faster running time in group Q in Race 2'  3. Accept 'no stats analysis'
12	1. Age; 2. Gender/sex; 3. Ethnicity; 4. Food/fluid intake before the race; 5. Amount of sleep/rest/exercise before the race; 6. Reference to one <u>named</u> health factor eg diabetic or non-diabetic, smoker or non-smoker;	3 max	4. Any fluid/food is included here eg coffee, alcohol  6. Reference to medication is included here

13	<ol style="list-style-type: none"> <li>1. Sodium ions and glucose absorbed by <u>co-transport</u>;</li> <li>2. (Co-transport) via carrier/channel protein;</li> <li>3. Sodium ions removed (from epithelial cell) by <u>active transport</u> into blood;</li> <li>4. Maintains low concentration of sodium ions (in epithelial cell) / maintains sodium ion concentration gradient (between small intestine and epithelial cell);</li> <li>5. Sodium ions enter epithelial cells by <u>facilitated diffusion</u> taking glucose with them (from small intestine);</li> <li>6. Glucose moved by <u>facilitated diffusion</u> into blood (from epithelial cells);</li> </ol>	4 max	<p>Only penalise omission of 'ions' once in marking points 1, 3, 4 and 5</p> <ol style="list-style-type: none"> <li>2. Accept via symport</li> <li>2. Only reward reference to carrier/channel proteins in the context of co-transport</li> </ol> <p>Principle: marking points 3, 5, and 6 require consideration of 'what moves', 'where it moves to' and 'how it moves' to achieve credit</p> <ol style="list-style-type: none"> <li>5. Reference to diffuse/diffusion for movement is required. Accept facilitated diffusion</li> </ol>
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14	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: left;">High GI foods</th> <th style="width: 50%; text-align: left;">Low GI foods</th> </tr> </thead> <tbody> <tr> <td>1. Rapid rise</td> <td>Slow rise</td> </tr> <tr> <td>2. Higher rise</td> <td>Lower rise</td> </tr> <tr> <td>3. Falls early/quickly</td> <td>Falls later/slowly</td> </tr> <tr> <td>4. Falls below normal</td> <td>Does not fall below normal</td> </tr> </tbody> </table> <p>..... .....</p>	High GI foods	Low GI foods	1. Rapid rise	Slow rise	2. Higher rise	Lower rise	3. Falls early/quickly	Falls later/slowly	4. Falls below normal	Does not fall below normal	4	<p>1 mark per row</p> <p>A pair of correct statements is required for each mark. They can be presented in any order</p> <p>Accept use of figures derived from the graph to illustrate difference, eg marking point 2, High GI foods rise to (about)155 whereas Low GI foods rise only to about 125</p> <p>NB There is no grid so exact values are not expected</p>
High GI foods	Low GI foods												
1. Rapid rise	Slow rise												
2. Higher rise	Lower rise												
3. Falls early/quickly	Falls later/slowly												
4. Falls below normal	Does not fall below normal												

15	<p><b>EITHER</b></p> <ol style="list-style-type: none"> <li>White bread has sugars;</li> <li>(So) less digestion required/sugars rapidly absorbed;</li> </ol> <p><b>OR</b></p> <ol style="list-style-type: none"> <li>Wholegrain bread has more fibre;</li> <li>Fibre slows digestion/reduces absorption/speeds up movement in gut;</li> </ol> <p><b>OR</b></p> <ol style="list-style-type: none"> <li>White bread contains more salt/sodium (ions);</li> <li>(So) more rapid absorption of glucose;</li> </ol>	2	<p>Mark as a pair. Do not mix and match</p> <ol style="list-style-type: none"> <li>Accept a named example of a sugar</li> </ol>
16	<ol style="list-style-type: none"> <li>(Drink) contains carbohydrates/sugars <b>so</b> High GI / (drink) contains carbohydrates/sugars <b>so</b> raises blood glucose concentration quickly;</li> <li>Contains salt so glucose more rapidly absorbed;</li> <li>Increases glucose to muscles for respiration;</li> <li>More/faster respiration so more/faster energy release;</li> </ol>	3 max	<ol style="list-style-type: none"> <li>Each alternative requires both aspects for credit</li> <li>The second alternative requires a reference to speed eg 'quickly' or 'immediately'</li> <li>Reject reference to energy production</li> <li>Accept more ATP produced</li> </ol>
<b>Total marks for Section B</b>		<b>21</b>	