General Certificate of Education

Biology
Investigative Skills Assignment

BIO3T/P09/MG

Marking Guidelines
2009 examination – June series

Marking Guidelines 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

General principles

In general, you are looking for evidence that the candidate knows and understands the fact, principle or concept required by the Marking Guidelines.

It is important to mark what the candidate 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
  Eg anaphase, the term must appear
  Eg ...... and ...., both items must be present for a mark
  Eg 'active site and substrate have complementary shape', the concept must be clearly stated
- Brackets are used to indicate contexts for which a marking point is valid. This context may be implied by a candidate's answer
- 'Accept' and 'reject' show answers which should be allowed or not allowed.
- Additional instructions are shown in *italics*
- '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 fact, term, principle or concept.

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 higher in the cell' is an acceptable converse of 'the water potential is lower in the solution'.

Occasionally, a candidate will give a biologically correct answer that is not present 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 candidate has written.

For each mark awarded, put a tick close to the key fact, term, principle or concept. In all cases, a tick should equal one mark and the total number of ticks should match the mark totals in the margins.

Put a cross against incorrect points. It is helpful to indicate omissions of key words or incomplete answers with a Λ 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 candidate's response in the order 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 again makes moderation much easier. It also helps the teacher to avoid awarding the same point twice.

Disqualifiers A correct point should be disqualified when the candidate 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 candidate 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 candidates from gaining full marks from a list of right and wrong answers.
For example, if in answer to 'Name **two** products of photosynthesis' a candidate gives: 'Oxygen, carbon dioxide, glucose', 1 mark would be awarded.
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 between 'mitosis' and 'meiosis', should result in the relevant marking point being withheld. Spellings like this will be underlined in the Marking Guidelines to show that misspellings must not be credited.

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Stage 1

Assessment of presentation of raw data table

Candidates should be assessed on their ability to present raw data in an appropriate way.

The following criteria should be used to mark this skill.

Data presented clearly with full descriptions of both the independent and dependent variable i.e. 'temperature' and 'time taken for solution to clear'; This may be recorded either by a full title or by complete headings at the top of the table. (e.g. If 'time' only recorded in the table, the title should give more detail by referring to clearing of the solution.)	1
Independent variable (temperature) in first column;	1
Units clearly stated and only in the heading to the appropriate columns; *Although AQA uses the IOB convention of separating the units by a solidus (/), credit should not be awarded or withheld for the way in which units are presented, provided they are clear. (Time must be measured in appropriate units e.g. minutes or seconds, not a combination of both.)*	1
	Total 3

The table of raw data collected during implementation is required for moderation and must be attached to the ISA test.

Stage 2

Assessment of Processing

The following criteria should be used to assess the processing of the data.

Rate of reaction calculated correctly (1/time taken for solution to clear);	1
Mean values of either rate of reaction or time taken for solution to clear calculated correctly;	1
Graph has independent variable (temperature) on x axis and dependent variable (rate of reaction or time taken for solution to clear) on y axis;	1
Appropriate scales selected for the x and y axes; *(These scales should allow or both accurate plotting and reading of the graph)*	1
Both axes correctly labelled with appropriate units;	1
Mean values plotted. All points plotted accurately. If ICT has been used to plot the graph, it should be possible to read the points with appropriate precision;	1
Data presented as a line graph; *Depending on the data obtained by the student,* • *points should be joined with a curve of best fit if it is felt that intermediate values are likely to fall on such a curve* • *alternatively, all points should be joined with straight lines if it is felt that the position of intermediate points cannot be predicted reliably.*	1
	Total 7

The graph produced is required for moderation and must be attached to the ISA test.

SECTION A

Question 1

Maintain constant pH;   1

Question 2

To equilibrate/reach temperature at which reaction will take place;   1

Question 3

Credit 'yes' only together with valid reason – temperature variation greater in
air than in water/room air temperature may fluctuate/water bath keeps test
tubes at constant temperature;   1

Question 4

Measure temperature of water bath at beginning and end of reaction period
(as a minimum number of times);
To assess the effect of any temperature changes during the reaction/to show
that there was no/little variation in temperature;

OR

Measure temperature (several times) and add hot or cold water as appropriate;
To try to keep the temperature close to that required;   2

Question 5

Enables calculation of a more reliable mean;
So that anomalous data can be identified;   2

Question 6

Controls show that the casein digested was due to the action of enzyme /
not due to temperature changes;   1

Question 7

(a) 1   As temperature increases there is an increase in kinetic energy /
          speed of molecules;
     2   More/greater probability of collisions between active site
          and substrate / greater number of E-S complexes formed;
     3   Above optimum/40 °C denaturation of enzyme occurs;
     4   Change in tertiary structure/shape of active site;
     5   Due to breaking of hydrogen bonds;
     6   So lower probability of E-S complex being formed / fewer
          E-S complexes formed;   5 max

(b) Conclusion not valid as 40 °C was the only temperature investigated
     / peak could be between 31 °C and 52 °C;   1

Question 8

Use a colorimeter;
Record time taken to reach constant/set value (of absorbance / transmission);

OR

Set up a standard / solution where complete digestion has occurred for
comparison;
Measure the time taken to reach same colour/transparency as standard;   2

Total 16

SECTION B

Question 9

(Most of) bromelain is digested/not absorbed/broken down in blood;   1

Question 10

Total volume of blood;   1

Question 11

Keep control and experimental group same in terms of a specified factor
e.g. age, sex, mass / divide randomly;   1

Question 12

Placebo / dummy tablet;
To eliminate any improvement effect not due to treatment/explanation of
placebo / to make sure any improvement due to drug / ensure only one variable;   2

Question 13

Possible to compare means with different sample sizes / could determine
percentage/proportion;   1

Question 14

Small sample size;
Not possible to control amount/extent of dental surgery;
Variation in perception of pain;   2 max

Question 15

To ensure the colour is the same at the start;   1

Question 16

Yes – curve on graph with bromelain present remains approximately constant/rises
very slightly;
Would decrease if killing of cells occurred / would increase if cells still dividing;   2

Question 17

Use of mouse cells (rather than human);
(Carried out) *in vitro*/not in living organisms;
Only tested on one type of cancer;
Not possible to predict effect on humans (as no data collected);   3 max

Question 18

The faster the rate of division the faster the cancer would grow;
By measuring rate of cell division you could see how effective the
treatment was;   2

Question 19

Not ethical to replace conventional treatment;
As life of patient is at risk (if bromelain not effective);   2

Total 18