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**General Certificate of Education (A-level)**
**June 2012**

# Human Biology HBI3T/Q12

# (Specification 2405)

# Unit 3T: Investigative and Practical Skills

# Final

# *Marking Guidelines*

These 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 Human Biology ISAs

## General principles

In general, you are looking for evidence that the student knows and understands the fact, principle or concept 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
  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 student's answer
- 'Accept' and 'reject' show answers which should be allowed or not allowed.
- '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 student will give a biologically correct answer that is not present in the Marking Guidelines. If it is equivalent in standard to the Marking Guideline answer, 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 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 student'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 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. For example, if in answer to 'Name **two** products of photosynthesis' a student 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.

**HBI3T/Q12 TASK**

**The effect of surface area and volume of cells on the absorption of substances**

**Stage 1: Assessment of the presentation of raw data table**

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

The following criteria should be used to mark this skill.

| Marking Guidelines | Mark | Comments |
|---|---|---|
| Data presented clearly with full descriptions of both the independent variable, 'surface area divided by volume' or 'block', and dependent variable, 'time taken for colour to change'; | 1 | This may be recorded either by a full title for the table or by complete headings at the top of each of the columns in the table. |
| Independent variable, surface area divided by volume or block in first column; | 1 | This may be the calculated surface area to volume ratio. If student has recorded size of the block, or surface area, or the volume they should be given credit. |
| Appropriate units clearly stated for time, i.e. second/s or minutes, and only in the heading to the appropriate column; | 1 | Accept sec/min but not m.<br>Units may be separated from the variable by a solidus or brackets. If the blocks are identified by letter there is no need for units.<br>Credit should not be given for mixed units. Time should be recorded only in minutes or seconds, e.g. not 1 minute 15s. |
| **Total** | **3** | |

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

**Stage 2: Assessment of data processing and the graph**

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

| Marking Guidelines | Mark | Comments |
|---|---|---|
| Mean times/rates calculated correctly; | 1 | Rate may be recorded as $\frac{1}{\text{time}}$ or cm per second or minute. |
| Graph with independent variable *(surface area divided by volume)* on x axis, and dependent (variable *time taken to change colour* or *rate of absorption)* on y axis; | 1 | This rewards the axes being the right way round.<br>Accept references to surface area to volume ratios. |
| Appropriate scales selected for both the x and y axes; | 1 | Scales should be linear and of a size that allows for both accurate plotting and reading of the graph. |
| Both axes correctly labelled and with appropriate units;<br>i.e. surface area divided by volume on x axis and time taken to change colour/seconds or rate of absorption/per second or minute/cm per second or minute on y axis; | 1 | 'surface area divided by volume' requires no units. If 'size' is used then mm or cm are credit worthy.<br>Credit should not be given for mixed units.<br>Note previous comment about expressing units. Do not penalise 'm' twice. |
| All points plotted accurately; | 1 | If ICT has been used to plot the graph it should be possible to read the points with appropriate precision. |
| Data presented as a line graph and not extrapolated beyond the range of the data; | 1 | Points joined with ruled lines unless the student's data are such that it is felt intermediate points could be predicted reliably, in which case a line of best fit may be drawn and given credit. |
| **Total** | **6** | |

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

**HBI3T/Q12: SECTION A (17 marks)**

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **1** | 1. To make sure blocks are the right dimensions/shape/size;<br>2. If mistake in first/previous block, this affects the rest (of the blocks);<br>3. This will affect the surface area/volume/surface area divided by volume value/(rate of) diffusion; | **1 max** | Accept abbreviations e.g. SA, VOL.<br>Give credit for statements like 'so that the top and the bottom of the block are the same'. |
| **2** | (If blocks stick to each other) reduces surface (in contact with acid);<br>Slow/less diffusion / entry of acid / colour change / reaction; | **2** | |
| **3** | (Acid) diffuses into blocks / reacts with indicator/dye; | **1** | Accept acid moves from higher to lower concentration.<br>Accept acid donates $H^+$/hydrogen ions/reduces dye. |
| **4** | 1. Temperature;<br>2. Concentration of acid;<br>3. Concentration of indicator;<br>4. Density of gel/gelatine;<br>5. Movement of/speed of rotation (of tube); | **2 max** | Accept 'strength'. |
| **5** | 1. Reduce chance of random error/anomaly affecting results;<br>2. Allows identification of anomalies;<br>3. Lets you find/calculate mean/average/SD/mode/ median; | **2 max** | Do not credit answers which suggest the number of anomalies is reduced.<br>Accept 'outliers' for anomalies.<br>Accept allows statistical test. |

| | | | |
|---|---|---|---|
| **6(a)** | The larger the surface area divided by volume (value), the faster the change/the shorter the time; | **1** | The smaller the surface area divided by volume (value) the slower the colour change / inversely proportional / negative correlation.<br>If students refer to it/ratio, then assume they mean surface area divided by volume (value).<br>Do not credit answers which refer solely to the 'size' of the cube. |
| **6(b)** | Plot a graph;<br>Read off value y axis corresponding to 1.1 on x axis; | **2 max** | Accept diagrams to show. |
| **7** | Standard deviation; | **1** | Accept 'variance'/SE/Standard error with confidence limits. |
| **8** | 1. Tumours made of cells/living;<br>2. Cells have a plasma/cell membrane;<br>3. Membranes control what goes in/out (of cell) / are selectively/ partially permeable;<br>4. Membrane has protein/receptors/carriers/ channels/pumps;<br>5. Cells may use active uptake / facilitated diffusion;<br>6. Gelatine <u>only</u> has diffusion;<br>7. Size/lipid solubility of drug affects passage through membrane; | **4 max** | Accept converse statements for points 1 to 6. |
| | **Section A Total** | **17** | |

**HBI3T/Q12 - SECTION B (18 marks)**

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **9(a)** | (Concentration of)nicotine/higher with cigarettes/slower/lower with gum;<br>(Concentration of) nicotine continues to rise with gum / then falls with cigarette; | **2** | Accept relevant quoted figures as alternatives.<br>Ignore reference to events after 10 minutes. |
| **9(b)** | (In lungs) larger surface area / better blood supply / more capillaries / shorter diffusion pathway / higher concentration of nicotine in cigarette smoke / steeper diffusion gradient;<br>When the cigarette goes out no more nicotine (is absorbed); | **2** | The reasons given must relate to the difference given in (a).<br>Accept converse of any answer for mouth.<br>Accept gum continues to deliver nicotine. |
| **10** | 14 (minutes); | **1** | Accept 13 to 15. |
| **11(a)** | 400;; | **2** | Accept $\frac{15 - 3}{3}$ for 1 mark.<br>Ignore references to the unit |
| **11(b)** | For comparison/different body sizes/blood volumes; | **1** | Accept used in order to get concentration values in whole numbers. |
| **12(a)** | 1. (Can calculate) a reliable mean/average;<br>2. Reduces effect of anomalies;<br>3. Reduces effect of other factors/relevant named factor; | **1 max** | Accept 'can carry out statistical tests / named tests'.<br>Accept 'outliers' for anomalies.<br>Do not credit answers which suggest the number of anomalies is reduced. |
| **12(b)** | Had similar intake of nicotine; | **1** | Ignore references to any other named variable.<br>Accept same intake of nicotine. |

| | | | |
|---|---|---|---|
| **13** | 1. Record number of cigarettes smoked (each day) at the start of the investigation;<br>2. Use the spray/gum for a time;<br>3. Record how many smoked (after using spray);<br>4. Compare two groups;<br>5. See if drop/change (in number of cigarettes) clear with spray (compared with other group);<br>6. Check to see how many were smoking again later; | **4 max** | Accept reference to statistical test for significance. |
| **14(a)** | 1. Do not know what 'success' means;<br>2. Do not know what the 81% is measuring;<br>3. No idea how long the volunteers stopped for;<br>4. No comparison with other methods / other methods might be better;<br>5. Don't know if all new cases of lung cancer caused by smoking;<br>6. Gum/spray may cause side-effects; | **3 max** | Accept 'there is no definition of success'. |
| **14(b)** | 1. So other scientists can check the validity of method/data analysis/conclusions/bias/ conflict of interest;<br>2. Check that experiment results can be reproduced; | **1 max** | |
| | **Section B Total** | **18** | |