



General Certificate of Education (A-level)
June 2013

Human Biology

HBI6T/Q13

(Specification 2405)

Unit 6T: 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
Egand....., 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 student 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.

HBI6T Q13 The effect of surface area to volume ratio on the rate of heat loss

Stage 1: Assessment of the 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.

| Marking Guidelines | Mark | Comments |
|---|----------|--|
| Candidate's own data presented clearly with full descriptions of both the independent variable, "Volume of water" and dependent variable, "Fall in temperature"; | 1 | This may be recorded either by a full title for the table or by complete headings at the top of columns in the table. Do not credit 'amount' of water. Ignore columns for initial and final temperatures. Accept 'change in temperature'. |
| Independent variable, volume of water, in first column; | 1 | If table is presented horizontally allow mark if independent variable is in top row |
| Appropriate units, cm ³ for independent variable and °C for the dependent variable, clearly stated and <u>only</u> in the headings to the appropriate columns, separated from the variable by a solidus; | 1 | Accept brackets in place of a solidus |
| Stage 1 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 statistical analysis of data collected by the candidate

| Question | Marking Guidelines | Mark | Comments |
|----------------------|---|----------|---|
| 1 | Clear statement of the null hypothesis e.g. there is no difference in the temperature fall between different volumes of water; | 1 | Both variables must be specifically mentioned |
| 2 (a) | Choice of statistical test appropriate to the data collected i.e. (Pearson's) correlation coefficient ; | 1 | Accept Spearman's rank correlation test. |
| 2 (b) | Justification of test with a clear explanation of why the specific test was chosen i.e. looking for associations between measurements of two variables ; | 1 | |
| 3 | Test statistic calculated correctly; | 1 | Accept candidate's correct calculation even if the test chosen is not appropriate |
| 4 | <ol style="list-style-type: none"> 1. Correct interpretation of calculated test statistic, in terms of acceptance or rejection of null hypothesis; 2. Interpretation involves appropriate reference to <u>probability</u> of difference being due to <u>chance</u>; | 2 | Accept candidate's interpretation of calculated test statistic, if correct, even if there is an error in calculation. |
| Stage 2 Total | | 6 | |

The statistical analysis is required for moderation and must be attached to the ISA written test

HBI6T Q13 Written Test: Section A

| Question | Marking Guidance | Mark | Comments |
|----------|---|-------|--|
| 5 | <ol style="list-style-type: none"> 1. So top and side of tube in contact with same temperature; 2. If temperature (of insulating material) was higher (than room temperature) cooling would be slowed; 3. If temperature (of insulating material) was lower (than room temperature) cooling would be faster; | 2 max | Ignore references to 'controlling a variable' |
| 6 | <ol style="list-style-type: none"> 1. So most heat lost through (upper) surface of water / so little heat lost through side of tubes; 2. <u>Same</u> (surface) area for heat loss in all tubes; | 2 | Accept : all heat lost through surface of water / no heat lost through side of tubes |
| 7 | <ol style="list-style-type: none"> 1. Need to know starting temperature; 2. To compare with final temperature; 3. (Tube/water) may have cooled / may have lost heat to air (during transfer from water bath); | 2 max | Ignore answers such as "following instructions" |
| 8 | To prevent heat passing between tubes / to prevent heat transfer / so each (tube) was surrounded by enough insulating material; | 1 | |
| 9 | <ol style="list-style-type: none"> 1. (Yes) it would affect the rate of cooling/heat loss/temperature fall (of water in the boiling tubes) / as didn't put tubes in at the same time; <p>OR</p> <ol style="list-style-type: none"> 2. (No) all tubes would be affected in the same way; | 1 | |

| | | | |
|------------------------|---|-----------|-------------------------------|
| 10 (a) | Inverse(ly) proportion(al) / negative correlation; | 1 | |
| 10 (b) | <ol style="list-style-type: none"> 1. Measured the (internal) diameter of the tube; 2. (Used) πr^2 (to calculate surface area); 3. Divided surface area by volume; | 3 | 2. Accept $\frac{\pi d^2}{4}$ |
| 10 (c) | <ol style="list-style-type: none"> 1. In P most/all heat lost through upper surface / little/no heat lost through sides; 2. P and R have the same/similar (surface) area for losing heat; 3. (But) R has a larger volume of water / has more heat to lose; 4. Surface area to volume ratio is larger for tube P / smaller for tube R; | 2 max | |
| 11 | <ol style="list-style-type: none"> 1. Not same temperature (as human body); 2. Not same shape (as human body); 3. No heat generation by <u>respiration</u>; 4. No homeostatic mechanism / no mechanism for controlling heat loss; 5. No vasodilation / no vasoconstriction / no sweating; | 3 max | |
| Section A Total | | 17 | |

HBI6T Q13 Written Test: Section B

| Question | Marking Guidance | Mark | Comments |
|----------|--|-------|--|
| 12 (a) | Accept answers in range 1.5 to 1.7(°C); | 1 | |
| 12 (b) | <ol style="list-style-type: none"> 1. Muscles contracting (more); 2. (More) respiration / hydrolysis of ATP; 3. (More) Heat / energy released during respiration/hydrolysis of ATP; | 2 max | <ol style="list-style-type: none"> 2. Do not respiration / hydrolysis unqualified. 3. Do not accept energy produced. |
| 13 (a) | <ol style="list-style-type: none"> 1. Internal temperature always higher than skin temperature; 2. Internal temperature rises immediately / skin temperature rises later; 3. Heat generated internally / heat generated by muscle (takes time to be) transferred to skin / transferred via blood; | 2 max | <ol style="list-style-type: none"> 2. Accept any correct statement of times that makes this point. |
| 13 (b) | <ol style="list-style-type: none"> 1. Internal temperature (starts) falling sooner / skin temperature falls later; 2. (Extra) heat no longer released/produced internally/by muscles but heat continues to pass to skin / to blood; | 2 | Accept any correct statement of times that makes this point. |
| 14 | Standard Deviation / Standard Error/ 95% confidence interval/ limits; | 1 | Accept SD / SE / 95% CI. |
| 15 (a) | 22.4;; | 2 | <p>Award 2 marks for correct answer whether or not working shown.</p> <p>Award one mark for correct working $\frac{70.9}{(1.78)^2}$</p> |

| | | | |
|------------------------|---|-----------|---|
| 15 (b) | <ol style="list-style-type: none"> 1. Y (mean) body mass is a lot more but height is only slightly more (than X); 2. Y has higher percentage/more body fat; | 1 max | <p>Accept converse statement for X for either point.</p> <p>Accept correct use of values from table that makes either point.</p> |
| 15 (c) | <ol style="list-style-type: none"> 1. Short(er); 2. (So) Smaller surface area; OR 3. More body fat / more fat under skin; 4. (So) Higher body mass; | 2 | |
| 16 | <ol style="list-style-type: none"> 1. Group X lower (mean) body mass / lighter; 2. Group X lower percentage/less (body) fat; 3. Results <u>do not prove</u> (regular) exercise causes loss/prevents gain of body mass; 4. Results give no indication of fitness; 5. Do not know composition of groups / do not know if matched groups / may be factors that differ between groups; 6. Do not know if differences significant / no statistical test / do not know group sizes; 7. Peer review (of article in fitness club magazine) unlikely / results should be peer reviewed before claim made; 8. Manager may be biased / manager may have vested interest; | 5 max | <ol style="list-style-type: none"> 1. Accept weight for body mass. 1&2 Accept converse statements for Y. 5. Accept any relevant unknown differences there may be between groups e.g. age composition, lifestyle, diet (but not sex/gender) |
| Section B Total | | 18 | |