General Certificate of Education

Human Biology

Unit 6T A2 Investigative Skills Assignment

HBI6T/P11/MG

Final Marking Guidelines

2011 examination – June series

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

Final marking guidelines should be used to mark candidates' work.

General principles

In general, you are looking for evidence that the candidate knows and understands the point 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
  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 candidate's answer
- 'Accept' and 'reject' show answers which should be allowed or not allowed
- Additional instructions are shown in the final 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 candidate will give a biologically correct answer that is not covered 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 candidate 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 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 makes moderation much easier. It also helps 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.

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, ie, 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 final column in the Marking Guidelines to show that misspellings must not be credited.

The effect of temperature on the rate of respiration of microorganisms such as those found in probiotic foods

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.

Marking Guidelines	Mark	Comments
Data presented clearly with full descriptions of both the independent and dependent variables 'Temperature' and 'Time taken for tube **X** to change to the colour of tube **Z**' or 'time taken for tube **X** to decolourise';	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 (eg, if 'Time' only is recorded in the table, the title should / must give more detail by reference to the colour change)
Temperature in first column;	1	
Appropriate units (minutes °C) clearly stated and only in the heading to the appropriate columns separated from the variable by a solidus;	1	Accept brackets instead of solidus Time must be measured in appropriate units, eg, minutes. The use of mixed units is unacceptable Temperature should be measured in degrees Celsius
	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 statistical analysis of data collected by the candidate

Marking Guidelines	Mark	Comments
Clear statement of null hypothesis: There is no difference in the rate of respiration / time taken at different temperatures;	1	
Choice of statistical test appropriate to the data collected: Standard error or Student *t* test;	1	
Justification of test with a clear explanation of why specific test was chosen: data are continuous / it is used to compare two means / samples;	1	
Test statistic calculated correctly;	1	Accept candidate's correct calculation even if the test is not appropriate
Correct interpretation of candidate's calculated statistical test statistic, in terms of acceptance or rejection of null hypothesis; Interpretation involves correct reference to probability of results being due to chance / probability value of P = 0.05;	2	Accept candidate's interpretation, if correct, even if test choice inappropriate
	Total 6	

The statistical analysis must be attached to the ISA test.

Section A (14 marks)

Q	Part	Marking Guidelines	Mark	Comments
1		So that reaction starts at (about) the same temperature in each tube / to get all the contents to the temperature of the water bath / to equilibrate;	1	Accept 'to get all the contents to the same temperature'.
2		Yeast sink to bottom, (so stirred) to be sure to get some in sample / to (try to) make sample homogeneous / to make yeast more evenly distributed / to (try to) make all samples contain the same amount of yeast;	1	
3	a	Increased kinetic energy / increased number of collisions / denatured enzymes / denatured proteins / killed yeast;	1	Do not credit 'increased number of enzyme-substrate-complexes'. Do not credit 'kills enzymes'.
3	b	So that heat does not affect colour of methylene blue / temperature is a controlled variable / so it does not warm up the contents of the waterbath;	1	
3	c	(To act as control) to show living yeast required for colour change / to show that any colour change is due to the yeast; To show that temperature change does not cause colour change;	2	Do not credit 'to act as a control' on its own.
4		To act as a standard / for comparison with tube **X**; So that you could see the colour of the yeast with no trace of methylene blue affecting the colour;	Max 1	Do not credit reference to 'control' unless qualified by one of the points made in the box to the left.

Q	Part	Marking Guidelines	Mark	Comments
5		By checking / monitoring temperature of contents of tube / proceed when same temperature as waterbath;	1	
6		Number/amount of yeast in tube / activity of yeast in tube / density of yeast / pH / concentration of hydrogen ions / concentration of glucose / concentration of oxygen;	1	Do not credit any references to temperature.
7		To see if differences (in time) are due to chance / to determine probability that results due/not due to chance / to accept or reject null hypothesis / to see if there is a significant difference between data;	1	Do not credit 'because I was told to'.
8	a	(Boiling water) denatures enzymes; Yeast killed; Cannot colonise gut / act as a probiotic (if dead);	2 max	Do not credit 'denatures yeast'.
8	b	pH of stomach (very) low / (very) acidic / below optimum for yeast / denatures enzymes (in yeast); Pepsin / protease digests protein content (of yeast);	2	Do not credit 'denatures yeast' or 'kills enzymes'.

Section B (21 marks)

Q	Part	Marking Guidelines	Mark	Comments
9		(Any suitable method, such as) pull names from a hat, flip a coin, use calculator / computer;	1	Credit any suitable method which gives all patients an equal chance.
10		Conclusion 1 3.18 / 3.2 / 3 times as many patients got diarrhoea with no probiotic; Large enough sample (for scientific purposes) / not large enough sample to advise the whole population; (Infinitely/many) more patients avoided serious complications on probiotic / no patients on probiotic get serious complications; No statistical test results published / given; Conclusion 2 The company may have a vested interest in being proved right / that the drink / treatment is successful; No link made that diarrhoea is a breach of the body's natural defences; Any attempt at a link is not 'proof'; No statistical test results published / given;	Max 5	For credit a comment on sample size should justify whether the sample was thought large enough or not. Award once in either conclusion. This may be interpreted in financial terms. Award once in either conclusion

Q	Part	Marking Guidelines	Mark	Comments
11	a	Water enters by <u>osmosis</u>; Cells burst / lyse;	2	Credit only the movement of water. Do not credit any mechanical method of breaking open the cells. Do not credit 'nuclei burst'.
11	b	Increase amount of DNA / nucleic acid in sample; So that further tests could be carried out / as amounts of DNA in sample will be (very / too) small;	2	
11	c	Make a (DNA) probe; (That) will bind to <u>DNA</u> (of bacteria from yoghurt);	2	Credit finding base sequence of DNA/known gene; Compare to (known) base sequence of this bacteria.
12	a	Time needed between ingestion and egestion / transit time through intestines / the longer you have been eating it the more bacteria in the gut;	1	
12	b	Competition from other organisms / bacteria; Unsuitable pH; Effect of (digestive) enzymes; Lack of oxygen (for aerobic bacteria);	Max 1	

Q	Part	Marking Guidelines	Mark	Comments
13		Yes (no mark) Company would judge / test that product would not deteriorate before selling; Bacteria have more time to multiply / reproduce; Still enough food (for bacteria) / food not a limiting factor; No (no mark) More bacteria to produce lactate; As result of anaerobic respiration; pH changes; More competition for food; Or (no mark) Temperature (in fridge) would not allow bacteria to multiply; There may have been a different number of bacteria (in the pot) to start with;	Max 3	Marks may be awarded from either type of answer, ie, 'yes' or 'no', or a mixture from both. Marks may be awarded for a correct reference to temperature or different numbers of bacteria.
14		No idea what the term 'good' bacteria means; (Investigations) only tell about bacteria in faeces; Do not give evidence about other parts of intestinal tract / gut; No large scale trial evidence; Very few/about 4 volunteers showed evidence of experimental bacteria (in faeces); (Don't know whether) the company had a vested interest; No statistical tests;	Max 4	Credit may be given to any suitable comment which suggests a vested interest.