A-level

Biology

Investigative and Practical Skills in A2 Biology - BIO6T/Q14
Final Marking Guidelines

Specification 2410
June 2014

Version: 0.1 Final Marking Guidelines

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 <u>anaphase</u>, the term must appear
    - For example ...... <u>and</u> ...., 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 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 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.

<u>Disqualifiers</u> 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.

<u>The list rule</u> 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.

BIO6T/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

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

The following criteria should be used to mark the results of the students' calculations:

Question	Marking Guidance	Mark	Comments
1	All calculations correct and made as length divided by width;	1	Do not award mark if less than 20 calculations Ignore the number of decimal places

	Mark	
Total	**1**	

Stage 2 – Assessment of statistical analysis

Question	Marking Guidance	Mark	Comments
2	Null hypothesis clearly stated; eg there is no difference in the (mean) length divided by width value of north-facing and south-facing leaves (on the same plant) eg the dimensions of a leaf are **not** affected by the direction it faces	1	Allow other expressions of the hypothesis but there must be a reference to the direction leaves face eg there is no difference in the length to width ratio for leaves that face north or south
3(a)	Standard error / 95% confidence limits;	1	
3(b)	Valid explanation for choice of statistical test i.e. (used to) compare two <u>mean</u> values (of samples);	1	Do not credit if wrong test is chosen Do not award unless there is a reference to 'mean'
4	Test statistic calculated accurately;	1	Working **must** be shown. Do not penalise lack of evidence for standard deviation calculation Accept student's correct calculation of the test statistic from their data even if the wrong test has been chosen

5	1. Correct interpretation of statistical test result in terms of acceptance or rejection of null hypothesis;
	
	2. Interpretation involves appropriate reference to the <u>probability</u> of the results being due to <u>chance</u>;
	
	See comments for guidance
		2	Neither mark is possible if a calculation has not been completed.
			
			  1. Allow correct interpretation of calculated test statistic even if the calculation or the choice of test is incorrect
			
			  2. Do not credit suggestion that probability is 0.05% or 5
			
			Guidance for SE:
			
			If no overlap, then
			
			probability is less than 0.05/5% that (differences in) results are due to chance; reject the null hypothesis.

| | | | **If overlap**, then |
| | | | probability is greater than 0.05/5% that (differences in) results are due to chance; accept the null hypothesis. |

| | Total | 6 | |

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

BIO6T/Q14 Written Test
Section A

Question	Marking Guidance	Mark	Comments
6	1. (So) genetically similar; 2. Different <u>species</u> have different shaped leaves / so all (of chosen species) have same shaped leaves; 3. (Idea of from) same population / would be a community otherwise;	2 max	1. In this case, as 1 or more plants may have been used, accept other ways of expressing this idea eg genetically identical/same DNA/same genes/same alleles 2. It is not sufficient to only refer to 'different plants' in first alternative. Reject 'all plants have same shaped leaves' in second alternative 3. Definition of population would meet this point
7	1. (More) ethical / plant not damaged; 2. Habitat/ecosystem not disturbed/damaged; 3. Idea of changing dimensions (before measuring);	1 max	Three possible approaches for only 1 mark 1. Idea of ethics in fieldwork 2. Reject 'environment' as too vague 3. Eg due to drying out or shrinking Reject potential human errors, eg forgetting from which facing side leaves were obtained
8	(Leaf flattened so) maximum length/maximum width measured / curved leaves are difficult to measure (accurately);	1	The idea of measuring 'maximum' length or width required in first alternative Accept other ways of expressing 'curved' but must be related to difficulty of measuring the leaf
9(a)	1. Scatter diagram / scattergram / scattergraph; 2. Both variables are continuous / two dependent variables / measurements are in pairs / two measurements from the same sample;	2	2. Variables can be named

9(b)	As one variable increases so does the other / as length increases width increases / as width increases length increases;	1	Allow a general description or use of named variables
9(c)	There is no association/link/relationship/correlation between the length of a leaf and its mass;	1	Credit other ways of expressing this idea, eg length of a leaf does not affect its mass Reject references to direction leaf faces
9(d)	1. Remove/cut 1 cm^2 piece of leaf; 2. Weigh square; **OR** 3. Determine surface area of piece of leaf; 4. Weigh piece of leaf **and** divide by surface area;	2	Accept either approach but only mark one pair Ignore references to wet or dry mass 3. The method is not required for determining surface area but if given, accept any suitable method to meet this point 4. Both aspects are required
9(e)	Spearman rank/Spearman's;	1	
10(a)	1. True size/mean is found within (SE) bars; 2. Reference to distance from mean/confidence limits calculated using <u>2 × SE</u>;	2	1. Accept the idea that the true size is found within limits that extend above the mean and below the mean 2. Accept 1.96 × SE
10(b)	1. (With a greater SE, there is) greater variability of the sample (mean); 2. (With a greater SE, there is) lower confidence in the (population) estimate/calculated mean (as a true mean); 3. Reference to changes in the distribution of the woodlice (in the garden);	1 max	Allow any approach but only 1 mark

10(c)	1. Reference to immigration or emigration / reference to people enter or leave town / population not closed; 2. Births/deaths occur; 3. No random mixing; 4. Not an equal chance of 'capture'; 5. Can't 'mark' people;	3 max	1. 'Migration' is insufficient 3. Credit other ways of expressing this point, eg people live/work/socialise in particular places 4. Credit the idea that people are not accessible. Accept other ways of expressing this point, eg some people are housebound / cannot enter houses to sample / may not agree to participate
Total marks for Section A		**17**	

BIO6T/Q14 Written Test
Section B

Question	Marking Guidance	Mark	Comments
11(a)	(Organisms that) can breed together/interbreed **and** produce fertile offspring;	1	Need both aspects. Reject 'inbreed' Reject viable offspring
11(b)	Same number (of organisms) in each region / (organisms) equally spread;	1	Allow other ways of expressing 'region' or 'equally spread', eg not clumped together, same number per unit area
12	$P = \dfrac{AS}{R}$;; Note: **P = A × S/R** or **P = A/R × S** are also correct.	2	2 marks for correct answer 1 mark for having **A** on top of equation (recognises that total population related to total area) Allow 1 mark for $\dfrac{S}{P} = \dfrac{R}{A}$
13(a)	*In mark–release-recapture (technique)* 1. No assumption that organisms are uniformly distributed; 2. Size of total area/size of sampled region not required;	2	Accept converse by considering assumptions of proportional sampling Marking point 1 or marking point 2 do not have to start with the same technique In this case, allow difference by implication i.e. do not penalise if the two techniques are not compared
13(b)	Animals are from/all part of the same population;	1	
14	1. Can compare different populations/countries; 2. Can compare different years; 3. Allows for variation at different times of year;	2 max	Marking point 1 and marking point 2 – 'compare' without qualification is insufficient 3. Idea of balancing out highs and lows within a year

15	1. Death rate/number of deaths per 1000 people; 2. Number (in population) at start of that year/2007;	2	1. 'Number of deaths' is insufficient 2. Must be clear that if the year is not given, 2007 is implied Reject immigration/emigration, the question is about world population
16	1. Birth rate and death rate are the same / death rate is also low/8 per 1000; 2. Immigration/emigration keeps population size the same;	2	Statement of : BR/birth rate + I/immigration = DR/death rate + E/emigration gets 2 marks
17	(Can) determine population size / use for future planning/resourcing;	1	Accept named examples of planning such as schools, care/nursing homes required etc
18	Fewer people in bottom age group(s) than in group(s) above / birth rate lower in bottom age group(s) than in group(s) above / base of the pyramid is narrower (than above);	1	A comparison is required, eg to a group above, is narrow<u>er</u>
19(a)	1. Find number of people with (type II) diabetes in the practice area; 2. Multiply by total area of UK; **OR** 3. Find proportion/percentage/ratio of people with (type II) diabetes in the practice population; 4. Apply this proportion/percentage/ratio to the total population of UK;	2	Accept either approach but only mark one pair 2. Idea of 'multiply' required or can be shown by an equation 2. Accept alternative of 'multiply by the number of practices' 2. This point requires that marking point 1 has been made first 4. This point requires that marking point 3 has been made first

19(b)	NO (no mark)	3 max	Marks available from any combination of answers
	1. (Population) pyramid in the UK may not be the same / this is not the UK pyramid;		
	2. (Possible) genetic differences between populations;		
	3. Any increase might be short-term / lower birth rate will work through population (so eventually reduce proportion of elderly);		
	4. Cure/prevention might become possible;		
	5. Assumes all 'middle-aged' will reach old age;		Marking point 5 and 7: The idea of 'middle-aged' may be expressed in different ways
	6. Percentage/proportion of elderly might increase but may not affect actual number;		
	YES (no mark)		
	7. Large numbers in 'middle-aged' will become elderly (and increase number of sufferers);		
	8. As life expectancy increases/as people live longer **so** risk (of disease) increases;		8. Both aspects required

Total marks for Section B	**20**	