A-level

Biology

Investigative and Practical Skills in A2 Biology - BIO6T/P14
Final Marking Guidelines

Specification 2410
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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 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 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.

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.

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/P14 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 tables of raw data collected during implementation are 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	Correct calculation of all 10 reaction times;	1	Do not award mark if less than 10 values *or* Trial 3 values not used *or* reaction times given to fewer or more than 3 decimal places

Total	**1**	

Stage 2 – Assessment of statistical analysis

Question	Marking Guidance	Mark	Comments
2	Null hypothesis clearly stated; eg temperature/exposure to cold has no effect on reaction time eg there is no difference in reaction time before and after exposure to cold	1	Allow other expressions of the hypothesis but there must be a reference to reaction time
3(a)	Standard error / 95% confidence limits;	1	
3(b)	Valid explanation for choice of statistical test; eg looking for differences between mean values (of samples)	1	Do not credit if the 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 probability of the results being due to chance; *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/P14 Written Test
Section A

Question	Marking Guidance	Mark	Comments
6	No movement of arm / no grabbing (of stick) / only hand/fingers move;	1	Reject ideas about discomfort or tiring
7	Easier to catch / falls between (index) finger and thumb / not touching finger and thumb (until caught) / dropped at same angle (each time);	1	Reject references to gravity or amount of scale covered up
8	Can compare results of different people / standardised method;	1	'Compare/comparison' alone is insufficient. 'Standardised' could be expressed (simply) as "everybody does the same thing" Reject suggestion of 'so method understood'
9	1. (Person) cannot learn/cannot anticipate release / has to wait for release / don't know when it is going to be released; 2. Learning/anticipation would change reaction time/distance stick fell/speed of catching stick; 3. Only react when seeing stick fall/seeing movement of stick;	2 max	2. Need idea of reaction time/distance fell being different (than otherwise) Reject 'results' will not be the same
10	1. Position of arm/hand and wrist (relative to work surface); 2. Starting distance/7 cm between thumb and index finger; 3. Starting position of stick (between thumb and index finger/at 0); 4. The point to read off on the stick once caught; 5. Time/1 minute for immersion (of hand); 6. (Each person uses) same hand throughout/in all 6 trials; 7. Reading of instructions each time; 8. **One named** environmental factor, eg temperature of room, level of light; 9. Time/angle of release of stick / use of same stick;	2 max	Reject any other suggestions 4. This was a personal decision to make so position must be stated eg top/bottom of finger(s) (in all trials) 6. Eg only right hand used

11	More representative (of reaction time) / gives a more reliable reaction time / fell shortest distance / quickest reaction / first two trials are (like) practice / get improvement with 'practice';	1	Reject idea that Trial(s) 1 or 2 are anomalous Reject any ideas that relate to the experimenter
12	1. Age changes reaction time/muscle movements/eyesight/(muscle/nervous) coordination; 2. Similar genetic make up / similar alleles; 3. Same length neurones / same length nerve pathway(s) / same distance for nerve impulses to travel / same (degree of) insulation; 4. Reference to effect on synapses/synaptic transmission/reaction times;	4	Accept converse for marking point 1, marking point 2 and marking point 3 1. Accept **named** age-associated medical condition that may affect reactions 2. Reject '*same* alleles'. Reject same/similar genes'. Accept 'same gene pool' 3. Last alternative needs the idea of insulation (of hands or neurones) and not just 'same amount of fat' 4. It is sufficient to recognise that synapses/reaction times are affected in some way. Ignore suggestions of what the effect may be 4. Accept 'caffeine is a stimulant'
13	1. Involves conscious thought / brain is used / does not start with skin receptors; 2. Not just spinal cord involved; 3. (Reaction is) not automatic / not innate / not inborn / is learned; 4. (Reaction) is not protective / does not prevent damage;	2 max	Accept converse statements Ignore references to speed or number of neurones involved 2. This needs stating for credit 3. Accept 'not autonomic'

14(a)	*Relating to trend* 1. Gradual increase and then steep increase; 2. Steep increase begins at 50 (years); *Relating to Graph* 3. Linear scale shown on *x*-axis **and** *x*-axis labelled as 'age/age group' **with** units given as 'years'; 4. Line drawn only between 20 and 75 years with no extrapolation;	4	1. Credit for overall trend. This point is not dependent on showing values on the *x*-axis 2. Reject this point if no values are shown on *x*-axis 3. All **three** aspects required. Check particularly where the position of 65 and 75 would occur within the chosen scale or are shown on the chosen scale. Ignore any values that might be shown on *y*-axis 4. Ignore points – they do not have to be shown Note: where a bar chart is shown in error, marking points 1 and 2 are still available
14(b)	More variation/more spread (about mean);	1	Reject answers in the context of 'range'
	Total marks for section A	**19**	

BIO6T/P14 Written Test
Section B

Question	Marking Guidance	Mark	Comments
15	1. Reference to <u>receptors</u> (for temperature detection); 2. Reference to hypothalamus/autonomic nervous system; 3. Reference to nerve/electrical impulses (to or from hypothalamus/ANS); 4. Reference to effectors in <u>wall of arterioles</u> / reference to muscles in <u>wall of arterioles</u> / reference to sweat glands; 5. Vasoconstriction (of arterioles) / stop sweating;	3 max	All points should only be awarded if they are in the correct context 1. Receptors could be in skin or blood system 2. Ignore 'thermoregulatory centre' 3. Credit once only. Accept 'action potentials' 4. Reject 'signals' or 'messages' 5. Question requires mechanisms to reduce heat loss and not generate heat. Ignore reference to hair 'movements'. Reject shivering/increase in metabolic rate/reference to skeletal muscles 5. Accept appropriate reference to shunt vessels. Reject where wrong blood vessels are constricted
16(a)	1. Slower <u>diffusion</u>; 2. (Of) ions/Na^+/K^+;	2	1. Accept description of diffusion eg 'movement *down* concentration gradient' but concept of slower is required 2. Reference to ions is required. Reject other named ions, eg calcium ions Ignore references to synaptic transmission or rates of respiration
16(b)	1. Myelination / saltatory conduction; 2. Axon diameter;	2	1. Accept reference to presence of nodes of Ranvier

17	Keep everything the same but not in bath / at room temperature / same clothing as for immersion / sitting in empty bath / sitting in water at room temperature;	1	Accept 'normal' or 'comfortable' as equivalent to room temperature Ignore reference to body temperature
18(a)	(Find) the most common result/time / the result/time that occurs the most;	1	
18(b)	Highest and lowest result/time;	1	Accept 'difference between highest and lowest results/times'
19	1. (Which is based on) <u>mean</u> of 20 people/large (enough) sample; 2. (But) SE bars/confidence limits overlap; 3. Reference to 0.297 ± 0.0424 / 0.326 ± 0.0366 / confidence limits = 2 × SE; 4. (So) difference is **not** significant;	3 max	1. This point is possible for students that suggest the difference *is* significant 2. This point applies whether 1 × SE or 2 × SE is used 3. This point rewards knowledge of use of 2 × SE (as per Students' Statistics Sheet) 4. This point is only awarded after marking point 2 or marking point 3 has been given
20	1. People swimming 100 m/group1 had higher heart rates than people swimming for 30 minutes/group 2; 2. (Trend is) as temperature increases heart rate increases for swimming 100 m/group 1; 3. No trend for swimming for 30 minutes/ group 2; 4. (SD values show that) each set of results has little variation;	1 max	Four approaches but only 1 mark available

21	1. Assumes that an increased HR is beneficial (whatever the temperature of the water); 2. (But) haven't measured the 'benefits' to health / increased heart rate may not be 'better'; 3. No definition of better/flat out / better/flat out is subjective/based on opinion; 4. Only know the highest heart rate / time at highest heart rate not known; 5. Swimmers only tested once / only a short-term effect (on heart rate) / long-term effects are not known; 6. Distance covered in 30 minutes not known/might vary / time to complete 100 m not known/might vary / swimming ability might vary (among volunteers/between groups); 7. Groups may not be representative (of population);	4 max	

Total marks for Section B	**18**	