



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

Biology

BIO6T

(Specification 2410)

Unit 6T: Practical and Investigative Skills

Report on the Examination

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Comments on marking

Administration

It is pleasing to be able to report that most schools and colleges have an effective strategy in place which ensures that students are appropriately supported and maintains confidentiality at all stages of the assessment process. Schools and colleges are reminded that *Instructions for the Administration of the ISA* are published on the AQA website in the Teacher Resource Bank/ Investigative Skills Assessment <http://www.aqa.org.uk/qualifications/a-level/science/biology/biology-key-materials> These give detailed instruction about how to maintain confidentiality of these assessments.

Most schools and colleges had clearly worked extremely hard to ensure that the required sample of work and the accompanying documentation arrived with the moderator in good time. This was much appreciated. As was reported last year, there were significant errors involving the addition and transfer of marks which were found by the moderating team. Moderation is based on a sample of work, so errors involving the work of other students could go unnoticed. If not already in place, schools and colleges are strongly advised to establish a system of checks to prevent individual students from being seriously disadvantaged by errors of this nature. Schools and colleges should also ensure that students' names and numbers appear on all additional sheets. Such sheets can easily be separated during the moderating procedure and, without a means of identification, are extremely difficult to relocate.

The mechanics of marking

Members of the moderating team are instructed to support the centre's marking where possible. They do not change the marks awarded by the centre unless the work fails to meet the marking guidelines. It is much easier for a moderator to support the centre's marking when the instructions in the initial *Guidelines for Teachers marking Biology ISAs* have been followed. Please ensure that you read this section carefully before marking any work. The following points, in particular, should be noted.

- Work should be marked in red ink. Blue ink, black ink and pencil were all used and resulted in ticks being very difficult to distinguish from the candidate's own writing.
- For each mark awarded, a tick should be placed on the work as near as possible to the point awarded. In all cases, a tick should represent a single mark. The total number of marks for each part answer should be written in the right hand margin. The practice of ringing the mark allocation leads to difficulties in interpretation and is not acceptable.
- Schools and colleges are requested to number the marking points with the marking point number against the tick thus ¹✓. This proves helpful both to the centre in ensuring that the same marking point is only awarded once, and to the moderator.
- The work submitted by many schools and colleges showed evidence of internal standardisation. Although this process is essential, it must be clear where dual marking has taken place which set of marks have been accepted as final. In all cases the marks in red ink should be taken as final and these should be altered in line with the marks agreed during standardisation.

Applying the marking guidelines

Where marking fell outside AQA's tolerance limits, differences between the marks awarded by the centre and those given by the moderator often resulted from a failure to apply the general principles of marking outlined in the initial *Guidelines for Teachers marking Biology*

ISAs or a failure to apply the marking guidelines with sufficient rigour. Schools and colleges should note the following points in particular.

- The guidelines are presented in two columns. The first is headed *Marking Guidance* and the other is headed *Comments*. Both must be considered in determining whether a mark should be awarded or withheld. Many moderators reported that mandatory points made in the *Comments* column were not always considered in marking the work.
- The points made in the *Marking Guidance* represent the minimum acceptable as an answer. More detailed answers should clearly gain credit but those in which the detail is less than that stipulated should not be given credit. For example, in ISA Q, question 14 (a), the marking points stipulate named substances such as glucose. The response, “Nutrients”, is clearly not acceptable as it is not expressed in the required detail.
- Some marking points need more than one feature to be identified before the mark can be awarded. Thus the *Marking Guidance* for ISA Q required students in question 10(a) to describe the rate of respiration as increasing then decreasing. The mark can only be awarded if both of these points are made. A reference to either increasing or decreasing alone should not gain credit.

ISA P An investigation of pigments present in leaves

Stage 1

Question 2

Most students were able to formulate an appropriate null hypothesis.

Question 3

The correct statistical test was selected by almost all students and the choice appropriately supported by a reference to mean values.

Question 4

Calculations were generally accurate and presented methodically. There were, however, instances where the final step in determining 95% confidence limits had not been taken.

Question 5

Many students interpreted the results of their calculations appropriately and presented their answers with commendable clarity. To gain maximum credit there should have been a statement referring to the probability of the result being due to chance supported with a reference to the results of the calculation. There should have been a second statement explaining the consequences of this on acceptance or rejection of the null hypothesis. Answers that did not gain full credit usually confused probability and chance.

Written test: Section A

Question 6

Although most students appreciated the reason why it would be unsuitable to use a pen, there was some very weak expression. Responses such as the “pen would dissolve” and the “pen would go up the filter paper” were not worthy of, and should not have gained, credit.

Question 7

There were many good answers to this question.

Question 8

This question evoked some excellent responses reflecting a sound understanding of the principles involved in this investigation.

Question 9

Most students stated the obvious and gained credit for explaining that the solvent would move different distances and Rf values would enable comparison. Some attempted to amplify this with a reference to Rf being a ratio but did not always express the ideas involved with sufficient clarity.

Question 10

Although many students appeared aware that movement of the tube might result in the solvent failing to run straight or moving above the origin, others equated movement with shaking the tube or other improbable action. They should have been aware that this question related to the instruction in step 5 of the method, "Put the tube carefully back into the rack and do not move it again."

Question 11

The marking guidelines allowed credit for various approaches to this question but responses were occasionally marred by inappropriate references to accuracy.

Question 12

Most students were able to suggest a xerophytic feature, although not all successfully linked this with an appropriate explanation.

Question 13

As with answers to some of the questions in the AS written test, a considerable number of students of more modest ability experienced difficulties in putting together a coherent explanation linking the marking points. As a result they failed to progress significantly beyond identifying the need to carry out chromatography on the leaves at different times of the year.

Question 14

Most students appreciated the reason for slower growth in yellow-leaved cultivars, although some failed to gain full credit as they missed points by attempting to explain why green varieties had a higher growth rate.

Section B

Question 15

Most students correctly identified the relevant wavelength of light.

Question 16

It was relatively uncommon to encounter errors in the answers to this question, but there were occasional references to inappropriate substances.

Question 17

- (a) Very few students appeared to appreciate that rate required a unit of volume and a unit of time, while the comparison meant that, additionally, there should have been a unit of area or mass. In addition, students are expected either to write units out in full or to use the correct symbols for the units concerned. Given the specification

requirement that “students should be encouraged to carry out practical and investigative work throughout the course” the poor standard of the answers to this question was most disappointing.

- (b) Responses to this question frequently lacked appropriate detail, offering little more than a passing reference to the need for light for photosynthesis. A mark allocation of three should have indicated that rather more was required.

Question 18

This question required students to evaluate the suggestion and, as such, should have evoked responses that both supported and negated the idea. The more able students appreciated that photolysis, or the light-dependent reaction, was not directly controlled by enzymes but frequently failed to consider the role of temperature on respiration and its effect on oxygen release.

Question 19

- (a) Less able students identified this question as inviting a repetition of the conclusions they reached as a result of the statistical test that they had carried out earlier, and failed to make use of data relating to standard deviation in Figure 2.
- (b) Most students commented appropriately about the difference in light emitted by the two lamps but were less successful in explaining how this influenced the rate of photosynthesis in *Ulva pertusa*.

Question 20

Students should have been able to draw on their experience of ecological investigations to suggest a suitable technique. The better responses made appropriate reference to a transect and the placing of quadrats at regular intervals. Less able students were often inaccurate in their descriptions of placing the transect. References to both across and along the shore figured frequently in their answers. Another common error was to suggest randomly placing quadrats, an approach that would not have generated the required data.

Question 21

Most students were able to point out that *U. pertusa* would be uncovered by water for most of the day, although they did not always express this idea with sufficient clarity to gain credit. They were usually able to progress to link this to the ability to withstand desiccation.

ISA Q The effect of temperature on respiration in yeast

Stage 2

Question 1

Although most students were able to formulate an appropriate null hypothesis, there were occasional inappropriate references to correlation between temperature and the time taken to go colourless. It was also not infrequent to see the incorrect statement that there would be no difference between temperature and the time taken to go colourless.

Question 2

The correct statistical test was selected by almost all students and the choice appropriately supported by a reference to mean values.

Question 3

Calculations were generally accurate and presented methodically. There were, however, instances where the final step in determining 95% confidence limits had not been taken.

Question 4

Many students interpreted the results of their calculations appropriately and presented their answers with commendable clarity. To gain maximum credit there should have been a statement referring to the probability of the result being due to chance supported with a reference to the results of the calculation. There should have been a second statement explaining the consequences of this on acceptance or rejection of the null hypothesis. Answers that did not gain full credit usually confused probability and chance.

Written test: Section A

Question 5

Although there were many sound answers to this question, some students spoiled their responses by a lack of precision. They wrote imprecisely about reaching the same temperature rather than reaching the required temperature or the temperature of the water bath.

Question 6

Students showed a sound understanding of use of a water bath to maintain a constant temperature.

Question 7

It was hoped that students would appreciate that factors other than the respiratory activity of yeast might have led to decolourisation of the methylene blue. The more able students based their answers on this point but many of the less able opted for using another temperature, often loosely referred to as “room temperature”.

Question 8

Students showed a good understanding of the points involved.

Question 9

The introduction to this investigation provided information relating to the acceptance of electrons by the methylene blue and students were expected to build on this information in answering this question. There were many inappropriate responses to hydrogen and hydrogen ions that did not gain credit.

Question 10

- (a) Some students failed to note that although the y-axis of the graph was labelled as “Time taken” the question required them to describe the effect of temperature on the rate of respiration.
- (b) Most students could recall their earlier work on the effect of temperature on the rate of enzyme activity and produced convincing answers to this question.

Written Test: Section B

Question 11

This question produced many excellent responses in which students identified appropriate types of nutrient. Where marks were not awarded it was generally for duplication as in suggesting both glucose and sugars or nitrates and phosphates, or for lack of precision with answers such as nitrogen and carbon.

Question 12

Answers based on bias, accuracy and reliability suggested to the members of the moderating team that many students attempted to adapt poor recall of existing marking guidelines to the requirements of the question. Those who thought about this particular investigation appreciated, however, that a suspension of yeast cells would be inclined to settle and would therefore need to be stirred.

Question 13

Although most students calculated the percentage increase in yeast cells correctly, working was not infrequently poorly set out and extremely difficult to follow. If there had been errors, it would have been very difficult on such scripts to have awarded credit for demonstrating the principles involved.

Question 14

The commonest reason for failing to gain full credit here was because of insufficiently detailed responses. As Question 11 asked for two types of nutrients present in the apple juice, rather more than “lack of nutrients” was required by way of response.

Question 15

Those students who chose to write about limiting the entry of oxygen or preventing the escape of carbon dioxide or ethanol were generally able to gain substantial credit for their responses to this question. Answers were occasionally marred, however, by confusion between substances taken up and those released. More problems arose where students chose to discuss contamination, frequently failing to identify the contaminants as other microorganisms.

Question 16

Most students identified the significance of respiration and usually qualified this as being aerobic. Few, however, provided the required supporting evidence and mentioned that the volume of oxygen taken up was identical to the volume of carbon dioxide released over this time period.

Question 17

Students generally produced correct answers to this question.

Question 18

- (a) The wording of this question should have made it clear to students that they were required to offer suggestions for further work. Thus, although it was appropriate to suggest further trials, marks were not awarded for commenting on supposed inadequacies in the experimental approach. A significant number of students rely on stock answers to *How Science Works* questions.
- (b) There were many excellent answers to this question with students appreciating the cost-effectiveness of halting the process before production levelled out.

- (c) Many students offered appropriate explanations, although answers were sometimes expressed in emotive language with references, for example, to cheating and lying.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results statistics](#) page of the AQA Website.