



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

Biology

BIO3T

(Specification 2410)

Unit 3T: Practical and Investigative Skills

Report on the Examination

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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.

Schools and colleges should be aware that the substitution of graph paper with a 1 mm grid for that supplied by AQA can lead to students being disadvantaged. It is considerably more difficult to plot points accurately on such grids.

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 school's/college's marking where possible. They do not change the marks awarded by the school/college unless the work fails to meet the marking guidelines. It is much easier for a moderator to support the school's/college'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 student'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.
- Marking points awarded for graphs or tables need to be clearly identified. The simplest approach is to indicate each marking point with either a tick or a cross in a column or in a row at the side of the graph.
- 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 school/college 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 schools and colleges 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 8 (a), the marking point stipulates "Different amounts of fungus added / fungus is different size at start". The response, "The fungus is a different size", is clearly not acceptable as it does not relate to the initial size.
- 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 5 (a) to describe the shape of a curve on a graph as rising then remaining constant. The mark can only be awarded if both of these points are made. A reference to either rising or levelling out alone should not gain credit.

ISA P The effect of sucrose concentration on cells from a plant stalk

Stage 1

Tables were generally of a very high standard with most students clearly familiar with the conventions that should be adopted in constructing a table. The dependent variable in this particular case, however, was the distance between the two ends of the stalk, not its length.

Stage 2

The standard of graph drawing by students who submitted this ISA was high although some experienced difficulties in writing an appropriate title that specified both independent and dependent variables. Less able students frequently did no more than copy out the title of the investigation from the cover sheet.

Written test: Section A

Question 1

Although there were students who described the function of the lids as preventing osmosis to the air, most correctly linked their role to evaporation and a potential change in the concentration of the sucrose solution. The key point, that it is the water rather than the sucrose solution that evaporates, was identified by the more able.

Question 2

The many students who understand the concept of water potential produced sound answers to this question.

Question 3

There was a variety of ways in which the answer to this question might have been expressed. Most students chose to comment on the outer layer being waterproof.

Question 4

- (a) There were many students who fell back on a general response to what they considered to be a “How Science Works” question and stopped short with the mention of reliable. They should be aware that, at A-level, the use of such terms in isolation is not likely to gain credit. Amplification is essential.
- (b) Few students appeared to have appreciated that measurement errors would have a relatively larger effect on shorter strips of stalk. Many merely suggested that such strips of stalk would be “too short to measure”.

Question 5

This question evoked some excellent responses reflecting a sound understanding of the principles underlying the concept of water potential.

Question 6

Although there were many sound responses, some students encountered difficulties in expressing their ideas with sufficient clarity. Such responses as that the measurement required was “the point where the two ends of the strip were the same” clearly failed to establish the idea that it was the distance nearest to the original length.

Question 7

This question challenged many students. Quality of written communication again presented problems and answers describing what would happen to the strip frequently lacked the clarity necessary for the mark to be awarded. Explanations often foundered over confusion between evaporation and osmosis, or because of attempts to explain evaporation of water from the cells on the inner surface in terms of water potential and osmosis.

Written test: Section B

Question 8

- (a) The first part of this question was answered well by the many students who appreciated that the resulting increase in surface area would result in greater water loss.
- (b) It was relatively uncommon to see full credit awarded for answers to this part of the question. Although most students appreciated that the solution would add to the mass of the strawberry slices, few appeared to appreciate that the quantity involved would be variable.

Question 9

Good responses were generated to this question and most students were aware that this was the initial mass.

Question 10

The table showed that the length of time in the sucrose solution affected both percentage loss in mass and texture. Despite the mark allocation and spacing suggesting that a response of some length or detail was required, many students confined their answers to comment on percentage loss in mass. Many of those who did refer to the change in texture failed to note the levelling out in values.

Question 11

Most answers to this question focused on the use of a graph but, not infrequently, neglected to indicate what should have been plotted or, in some cases, incorrectly suggested plotting time against texture. A curve of best fit was usually suggested but relatively few students suggested that the point where there was no further change in mass should be determined. It was not uncommon to find answers suggesting that the time should be taken at which the mass of the strawberries fell to zero.

Question 12

- (a) The advantage of using a percentage in the context of this question was widely appreciated, and many students gained full credit.
- (b) Many students failed to appreciate the specific aspects of experimental design implicit in cooking the turkey pieces until the temperature in the centre of each reached a specific value. As with question 4 (a), they frequently fell back on answers based on “fair” and “reliable” and failed to offer the necessary amplification. Occasional students were more concerned about the health issues associated with eating undercooked poultry.
- (c) Use of the command word “Evaluate” should have suggested that there were two sides to this statement. Most students attempted with some degree of success to link loss in mass with water loss, but very few appeared to appreciate that heating might remove other substances that contributed to the mass of the turkey pieces.

Question 13

It was encouraging to note that a substantial number of students appreciated that the data in the graph could not be explained in terms of loss of water by osmosis. Less able students experienced difficulties, frequently because they were determined to fly in the face of the data provided and explain what they thought ought to have happened.

ISA Q The effect of competition for oxygen on the growth of yeast

Stage 1

Tables were of an almost universally high standard and most students gained full credit.

Stage 2

Problems arose in calculating the mean values in this question because of the practice of labelling certain values as “anomalies” and discounting these from the calculation. The grounds for identifying these so-called anomalies were often deeply flawed and founded on differences of a few seconds in what must, by its very nature, be an imprecise technique. There was also a persistent idea that carrying out an investigation three times was sufficient to identify such anomalies. Variation is inherent in biological investigations and is usually a much more plausible explanation of a range in values than branding certain figures as anomalies.

Students were required to write a suitable title for their graphs. Many experienced difficulties in writing an appropriate title that specified the dependent variable whose values they had plotted, and there were frequent references to rate when the feature plotted was time. Although the general standard of graph drawing was good, some students ignored points that failed to conform to their anticipated curve of best fit, often labelling these as anomalies.

Written test: Section A

Question 1

There were many sound answers to this question, although some students failed to make it clear that the surplus liquid would contain catalase.

Question 2

Students showed, in their answers to part (a), a sound understanding of the way in which temperature should be kept constant. Part (b) was also well understood.

Question 3

Many students failed to appreciate the specific aspects of experimental design involved in this situation and offered general answers based on “fair” and “reliable”, failing to give the necessary amplification. Such frequent answers as “to make the results reliable” and “so that it is a fair test” did not gain credit. A large number of repeats makes it easier to determine values which might be anomalous. This was accepted but, reference to the subsequent treatment of these anomalies was not credited.

Question 4

There was evidence of a clear understanding that bubbles of oxygen forming on the card caused it to rise to the surface. Only the better students, however, were able to link the time taken to rise to the surface with rate of reaction sufficiently coherently to gain full credit.

Question 5

- (a) Description of data presented in graphs falls within the performance descriptors for a student at the E/U boundary. In the light of this, it was surprising to note the large number of students who failed to comment on the rate remaining constant after the initial rise.
- (b) Although there were many excellent answers to this question, there were students who failed to interpret it correctly. They offered explanations for the shape of the curve rather than evidence that rate was limited by the concentration of hydrogen peroxide.

Question 6

Although most students appeared to appreciate that there would be less enzyme on the card, poor expression occasionally led to a failure to gain full credit. It was not unusual to encounter the fundamentally incorrect idea of the enzyme being “used up”.

Section B

Question 7

Students were provided with “kinetic energy” as a starting point for their answers to this question and therefore should not have expected credit merely for stating that it decreased. They were expected to go beyond this and link the decrease in kinetic energy to the slower speed of molecular movement and, if they approached the question from an enzyme standpoint, fewer collisions between enzymes and substrates. In general, there was a clear understanding of principles but responses often lacked the necessary detail to secure full credit.

Question 8

- (a) While it was widely appreciated that the use of ratios allowed comparisons to be made, fewer students could explain why their use was important in the context of this investigation. The key feature was that it took into account differences in the initial amount of fungus, not just the amount of fungus.
- (b) The majority of students used the model provided and expressed the results of their calculations appropriately.

Question 9

It was again clear from the responses to this question that many of the less able students experienced difficulties with a question that required explanation. It was apparent to the moderating team that while most understood the relatively simple idea underpinning the question only the better students were able to explain this logically and unambiguously.

Question 10

- (a) The many students who understood the concept of water potential were able to gain maximum credit here.
- (b) Many students appeared of the opinion that this was another question centred on water potential. Others sought, more appropriately, to link this to enzyme action and growth. Not all of these students, however, appeared to understand that cooling an enzyme does not lead to its denaturation.

Question 11

Those students who could identify a chemical element as such and understood the protein nature of enzymes generally answered this question well. Some, who clearly appreciated the underlying principle, were handicapped by poor expression. Thus, it was not unusual to read such statements as “enzymes contain protein” or “proteins are turned into enzymes”.

Question 12

Most answers centred round the idea of contamination but relatively few students amplified this basic statement with a reference to other microorganisms.

Question 13

Most students gave appropriate values from the graph although there were occasional errors involving units. It was not unusual to find the time given in seconds rather than hours.

Question 14

One of the key ideas in answering questions in examinations is that of adding value. Students were provided with the information that “intracellular enzymes stay inside the cells that produce them” and “intracellular enzymes are more expensive to produce”. The many students who took four or more lines to write that because intracellular enzymes stay inside the cells that produce them they are more expensive to purify therefore gained no credit.

Mark Ranges and Award of Grades

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