



## **General Certificate of Education**

# **Biology 2410**

**BIO3T      Investigative Skills Assignment  
(ISA)**

# **Report on the Examination**

*2010 examination - June series*

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## General Comments

Most centres had made great efforts to implement the ISA investigations suitably and to mark their candidates' scripts in accordance with the marking guidelines. Useful annotation was often included by centres to justify their marking. The marking of many centres was very accurate, but many more centres had marked more leniently this year than last year. Incorrect, partial or implied answers were sometimes credited, and centres gave marks for answers that were not on the marking guidelines. Marking was sometimes erratic within a centre with some scripts accurately marked and others leniently marked.

Many centres only submitted one ISA; P being submitted more often than Q. ISA P also tended to be more accurately marked than Q.

It was good to see evidence of internal standardisation, but it was sometimes difficult to determine which of the marks had been used in the final submission. Internal standardisation should be carried out in a different colour to the prime marking. The red ticks should then be modified to agree with the moderated mark.

Centres are reminded that ticks should be placed in red ink on the script at the point at which the mark is awarded. Some centres did not use ticks at all, simply ringing a sub total or presenting a number next to the question. This made the moderation process rather more difficult than it needed to be.

There was a significant number of administrative problems such as addition errors, incorrect marks on the CRF and lack of a centre declaration sheet. A small number of centres failed to include the PSA mark when submitting the final mark. The most common problem was the lack of centre number and candidate number. These should be on every sheet submitted for moderation.

### **Stage 1**

Tables of data were usually marked accurately, showing a significant improvement from last year. A small number of centres incorrectly gave credit when units were included in the body of the table or when full descriptions of the independent and dependent variable were not present. A significant number of candidates are still using mixed units of minutes and seconds.

### **Stage 2**

Graphs were usually well marked. Some centres failed to penalise selection of the inappropriate graph. This was more evident in ISA P which required a bar chart. Some centres still awarded full credit when a histogram was presented. Other errors which were not penalised included the omission of, or incorrect, units, inappropriate extrapolation or omission of points when plotting lines.

The most significant error of candidates in ISA P was calculating a value for rate of decolourisation of phenolphthalein in reaction tubes which did not decolourise after 15 minutes. Often centres incorrectly awarded a mark when candidate had done this.

The most common errors of candidates in ISA Q were extrapolating the graph beyond the 20% value when no data had been obtained, and ignoring points when drawing a curve of best fit.

## **BIO3T/P10**

### **ISA Written Test**

#### ***Question 1***

This was well answered by the majority of candidates.

#### ***Question 2***

Many candidates qualified their responses appropriately, using the term equilibrate in the correct context or giving an appropriate description. However, many just mentioned an increase in temperature. Some centres incorrectly awarded a mark when there was only a reference to the same temperature being reached. Many candidates failed to appreciate what would happen to the reaction rate if the lipase and water had been pre-heated. A significant number stated that the lipase would be denatured.

#### ***Question 3***

The addition of sodium carbonate solution to each tube was correctly explained by the majority of candidates. However, some centres incorrectly rewarded responses that included no reference to the pink colour or suggested that sodium carbonate provided the correct pH conditions for the activity of the lipase.

#### ***Question 4***

The purpose of tube 4 was understood by the majority, although many just mentioned a control. Both correct alternative responses were seen.

#### ***Question 5***

Many candidates gave full and accurate explanations, scoring three marks regularly. Responses were usually assessed correctly by centres.

#### ***Question 6***

Many candidates had good knowledge of the purpose of a buffer and two marks were awarded regularly. Some centres awarded the second mark when the candidate had not clearly explained what would happen if a buffer had been added. Implications were sometimes marked generously.

#### ***Question 7***

- (a) Many candidates scored three marks, providing effective explanations of denaturation. Less successful responses failed to indicate that the active site had changed shape. These candidates were however, still able to gain the third marking point about the

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inability of the lipase to form a complex with the substrate. Centre marking was usually accurate, but occasionally the same marking point was awarded more than once.

- (b) The instruction in the question to give evidence from the table was loosely interpreted by candidates and in turn by the centres. Many described the roles of lipase and bile salts but made no reference to the tubes. Some candidates experienced difficulty providing concise responses.

It was pleasing to see reference to tube numbers or descriptions of the contents in many responses. Some candidates compared incorrect tubes or included reference to tubes that were not necessary. Correct responses were regularly seen for tube 2, but very often reference was made to tube 4 at the same time.

Many candidates were able to indicate that the inclusion of bile salts speeded up the action of lipase. However, some failed to make any reference to the experiment or tubes, relying solely on theoretical knowledge. These candidates sometimes provided extensive accounts of emulsification.

### **Question 8**

This was often generously marked. For the first marking point candidates were required to state that the pH decreased and then levelled off. Centres often gave credit for the second point for any mention of pH 6.5 or 30 minutes, even when there was no reference to levelling.

### **Question 9**

This was well answered by the majority of candidates. Some candidates misinterpreted this question and responded by explaining what would happen if the enzyme concentration changed during the investigation.

### **Question 10**

Some centres credited responses that referred to rate, rather than to the gradient or 'steepness' of the curve. Many candidates experienced difficulty in expressing this simply. In some centres, candidates who had difficulty describing the difference drew the curve on the resource material. This was sometimes not credited by the centre, despite the curve being shallower than curve Z.

### **Question 11**

This presented major difficulty to the vast majority of candidates, despite its inclusion as a required procedure in the specification (Section 3.3.2). Nevertheless most candidates made an attempt but this usually involved the incorrect use of magnification and observed size.

A minority of responses included the use of eyepiece graticules and stage micrometers or equivalent pieces of apparatus. Difficulty was experienced when trying to explain calibration.

Many candidates attempted to use a ruler directly for measurement of the drops rather than using it to estimate the field of view.

### **Question 12**

- (a) A large number gained both marks with ease. The calculation of the ratio of surface areas of the droplets proved difficult to others, many not gaining any marks at all. Some candidates gave the ratio in reverse.
- (b) There was a large variation in the responses of candidates in this part. Only a minority of candidates mentioned surface area to volume ratio for the first marking point. Many centres rewarded responses which made no reference to the volume.

Candidates who did not make reference to the surface area to volume ratio, but had realised that the surface area of the droplet was normally larger, were able to suggest that greater contact was possible with the lipase or enzyme. Most centres credited the fourth marking point too generously, awarding the mark when there was no reason for the fall in pH.

### **Question 13**

Few candidates scored high marks for this question. The majority recognised the pattern in the data and provided simple accurate descriptions of the relationship. It was pleasing to see some good answers about the overlapping standard deviation values, but some candidates experienced difficulty with this concept. In their attempt to express the idea of large variation between the groups, they inadvertently suggested that the standard deviation values were themselves large. Many centres gave credit for such comments.

### **Question 14**

A few centres marked this question severely while others marked it extremely leniently. The idea of the sex of an individual being a risk factor for high cholesterol was poorly expressed by the vast majority. Candidates had greater success with the idea of removing a variable so that a fair test was carried out.

### **Question 15**

To achieve the first mark, candidates had to imply that the two similar species were closely related to each other; therefore similar conclusions could be drawn. The third marking point required a reference to the two species responding differently to the same diet. A large number of centres marked this question with considerable leniency, especially in relation to marking point three.

**BIO3T/Q10**

**ISA Written Test**

**Question 1**

This question was correctly answered by the vast majority, although some centres awarded marks to vague references to impurities.

**Question 2**

- (a) About half the candidates scored a mark here. Some centres gave credit to candidates who indicated that they would perform the control experiment by just using water. It was essential that beetroot discs were also added to the water (or 0% alcohol).
- (b) There was evidence of good understanding of why a control experiment was necessary.

**Question 3**

- (a) Generally well answered by candidates. Sometimes candidates, who did little more than suggest that the shaking was carried out to distribute the pigment through the tube, were given the mark for maintaining a diffusion gradient.
- (b) Although many answers were correct, there were candidates who stated that the alcohol was poured into another tube to prevent evaporation. Some centres incorrectly credited this as a valid marking point.

**Question 4**

There was a lot of evidence of candidates having a good understanding of what would occur if a cooked beetroot had been used. Unfortunately, rather than discuss this at the level of the membrane, the explanation was sometimes based on destruction of the cell or the cell wall. Even so candidates still gained credit for suggesting that a lot of the pigment would have been lost during the heating or cooking.

**Question 5**

This question was answered correctly and marked accurately by the vast majority.

**Question 6**

This was marked accurately and all the alternatives were seen.

**Question 7**

- (a) This was answered correctly and marked accurately by the vast majority of centres.

- (b) The last two marking points were regularly scored. Some centres gave credit to lower grade responses when only the information in the stem of the question had been repeated.

### **Question 8**

Some candidates and centres did not appreciate the level of detail required in the answer. Some reference to repeating the 100% test was required. Many centres gave credit, incorrectly, for just a reference to repeats. Candidates also experienced difficulty describing what they would do with the new set of results. Some centres gave credit for little more than comparing the sets of results. This would not allow the student to check his or her data set. In order to decide if the result were anomalous it would be necessary to look for concordance or similarity. Some centres gave credit when candidates suggested comparing data from another student. This was inappropriate as this introduced other extraneous variables, such as judgement of colour.

### **Question 9**

Some excellent responses were seen. Candidates were able to establish a link between fatty acids and the phospholipid content of the membranes. Many candidates were aware that fatty acids could be respired and the energy released could be used appropriately. Some centres awarded credit when responses indicated that energy was for respiration or when energy was made during respiration. It was rare to see any evidence of the third marking point.

### **Question 10**

Many centres gave credit to descriptions which only indicated that the omega-3 concentration fell but made no reference to the rapidity of fall. Similarly credit was given to any answer which stated that the concentration reached 0.4% at 140 days, even if there was no mention of the concentration levelling out.

### **Question 11**

- (a) The calculation was carried out correctly by many, and two marks were scored. A large number gained one mark for correctly identifying a fall of 1.7.
- (b) It was rare to see more than one mark awarded. This was almost universally for the idea of being able to make comparisons between the cattle or milk. Often any reference to a comparison was awarded credit.
- (c) A large majority of candidates recognised that the graph showed the omega-3 concentration decreasing with time. A variety of suggestions was offered to account for the decrease, but few suggested that the concentration might have fallen anyway.

### **Question 12**

Many candidates pointed out that the standard deviations for the two samples were overlapping. Candidates who noted that the samples of fish were small often failed to indicate that samples this small wouldn't necessarily be representative of the populations. Some centres incorrectly gave credit



to any reference to standard deviation or small sample sizes. Many candidates appeared to believe that the different sizes of the groups were significant.

**Question 13**

Well answered and well marked by the majority of centres. Candidates often recognised that the farmed fish would receive more food or receive food more regularly. Many were also able to make a correct link with the activity and restricted movement of the caged fish. Most candidates scored at least one mark, with many scoring both marks.