Version 1.0

General Certificate of Education (A-level)
June 2011

Biology BIO3T

(Specification 2410)

Unit 3T: Investigative Skills Assignment

Report on the Examination

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General Comments

Marking: Administration

Most centres had clearly worked extremely hard in ensuring that the required sample of work and the accompanying documentation arrived with the moderator in good time. This was much appreciated. It is, however, disturbing to be writing about the number of errors involving the addition and transfer of marks which were found by the moderating team. As moderation is based on a sample of work, errors involving the work of other candidates could go unnoticed. If not already in place, centres are strongly advised to establish a system of checks to prevent individual candidates from being seriously disadvantaged by errors of this nature. Centres should also ensure that candidates' 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.

It was good to see evidence of internal standardisation on the work submitted by many centres. Standardisation is essential, particularly where the centre is large or where a consortium is involved. The presence of a single errant marker in such situations can result in all the work from that particular centre or consortium being adjusted. There were cases where inadequate standardisation led to centres coming perilously close to exceeding the tolerance limits for the unit.

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 *Guidance for teachers marking Biology ISAs* has been followed. This is published at the front of the Marking Guidelines. 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.

- Comments on the work are extremely useful and frequently enable the moderator to support the centre's decision. To make the task of annotation more straightforward in future, marking points will be numbered for all questions were the total mark is more than one.

- Where there are longer questions or where it is anticipated that it might prove more challenging to apply the marking guidelines, centres are requested to number the marking points with the marking point number against the tick thus $^{1}\checkmark$. This should prove helpful to both the centre and to the moderator.

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 *Guideance for teachers marking Biology ISAs* or a failure to apply the marking guidelines with sufficient rigour. Centres should note the following points in particular.

- The marking guidelines themselves 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 members of the moderating team 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, where the marking point stipulates "Volume of enzyme", the response "Amount of enzyme" is clearly not acceptable. "Amount" fails to meet the minimum detail required by "volume".

- Some marking points need more than one feature to be identified before the mark can be awarded. Thus the *Marking Guidance* may require candidates to describe the shape of a curve on a graph as rising then levelling out. 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 different enzymes on apple juice production

Stage 1

Tables were generally constructed to a high standard and followed the required Institute of Biology conventions. In this particular case, the moderating team upheld the marking of centres that considered the independent variable was the type of enzyme which should, therefore, be in the first column.

Stage 2

There were many excellent graphs and it was not uncommon to find all candidates within a centre gaining maximum credit for accurately drawn and appropriately labelled graphs. Some candidates, however, encountered problems with scale, particularly where the axes were broken, or the origin was other than 0,0. The moderating team adopted the view that the origin of the graph was always 0.0 unless another value was given.

BIO3T/P11 Written test: Section A

Question 1

There was a range of possible answers from which candidates could select and most had some idea of the variables controlled. Responses, however, often lacked precision and were expressed rather vaguely as the amount of enzyme or apple pulp. Such answers were not acceptable.

Question 2

Most candidates gained the mark awarded for this question. Those who failed to do so usually neglected to indicate that temperature had to be measured more than once.

Question 3

Most answers reflected an awareness of the importance of buffers in maintaining pH, although there were some who were of the opinion that the use of litmus paper would prove adequate. Rather fewer were able to develop this idea further and indicate that different buffers would be required for each enzyme.

Question 4

The most frequent answer was the valid response that a control experiment was unnecessary as the investigation compared the results of using two different enzymes in releasing juice. Relatively few candidates considered that a control would show that the enzyme was responsible for juice production.

Question 5

As is frequently the case with questions that are linked to issues of reliability, many candidates responded in terms of anomalies. It was quite acceptable to suggest that repetition would allow anomalous data to be identified or that the effects of such data would be minimised. It was not acceptable, however, to suggest that a large number of repeats allows such data to be discarded.

Question 6

In part (a), most candidates provided some description of the graph, and gained at least one mark. Many went on to describe the pattern for pectinase, linking their description to appropriate figures from the graph. The third point, describing the cellulose curve, frequently lacked the detailed response required and failed to refer to the constant rate of increase. 'Slowly' was not considered to be an equivalent answer. Many candidates were able to explain that the use of 1 cm^3 of each enzyme gave the same total volume as before in their answers to part (b). Relatively few scored further marks.

Question 7

The relatively few candidates who had considered the information given in the question and appreciated the fundamental point that pectinase and cellulose had different roles were often able to apply this information in sufficient detail to gain full credit. Others failed to follow the required argument and often did little more than to suggest that two enzymes would be better than one.

BIO3T/P11: Written Test Section B

Question 8

Many candidates gave excellent answers which offered all of the required detail. They often provided additional information as well. There was, however, a lack of precision in describing the location of the accumulating cholesterol in arteries rather than in their walls and in explaining that the blood flow to the heart rather than to theheart muscle was reduced. There was also much vague use of terminology rather than the precise scientific language used in the specification.

Question 9

Many candidates realised that if the cranberry juice was diluted with water its composition may be changed and the subject might identify the solution as being diluted.

Question 10

Candidates tended to comment on the small sample size and occasionally referred to the lack of a control experiment. They also found many valid ways of suggesting that the increase in high density lipoproteins could be due to another factor. It was, however, disappointing that relatively few commented on the overlap of standard deviations. Candidates should be aware that, if standard deviations are included in data, examiners will inevitably give credit for an appropriate reference.

Question 11

Almost all candidates were able to identify two relevant reasons for deciding that the trial was ethically acceptable.

Question 12

Relatively few candidates appeared to be aware that points on a graph should be joined with straight lines if it is felt that the position of intermediate points cannot be predicted reliably. Given that this decision had been made by candidates in drawing their graphs in stage 2, this was somewhat surprising.

Question 13

Although many candidates were able to describe how the curve rose to a maximum value at 180 units or a dose of 0.25 g per kg, a significant number missed the point plotted for a zero dose. Other candidates misread the second point as representing a dose of 0.5 g per kg.

Question 14

It remains disappointing that so few candidates can calculate percentage increase or decrease. There were many incorrect answers to this question, frequently from otherwise sound candidates.

Question 15

Most candidates appeared to appreciate that calculating the dose per unit mass allowed differences in mass to be considered and a comparison to be made. Many responses,

however, failed to gain credit because of the vague use of terms such as “bigger mice” and “size” rather than mass.

Question 16

It would appear that some candidates had been taught about the immune response in much greater detail than required by the specification. This additional detail tended to confuse rather than help the candidates and reduced their marks for this question. It was relatively uncommon to see three marks awarded for what should have been a straightforward account. Common errors made by less able candidates involved the confusion of antibody and antigen or failing to identify the antigens as being on the surface of the sheep red blood cells.

Question 17

Most candidates correctly pointed out that this investigation was carried out on mice and, therefore, the results might not apply to humans but only the better candidates were able to suggest a second valid reason.

ISA Q The effect of a named environmental variable on leaf size

Stage 1

Tables were generally constructed to a high standard and followed the required Institute of Biology conventions although many did not identify the species of plant involved.

Stage 2

Where there were problems with this section they tended to involve the frequency table. Candidates did not always divide their data into classes of equal width and the number of items shown did not always correspond to the raw data in the table drawn in Stage 1. There were many excellent histograms and it was not uncommon to find all candidates within a centre gaining maximum credit for accurately drawn and appropriately labelled work.

BIO3T/Q11 Written test: Section A

Question 1

Most candidates were able to suggest a quantitative method of measuring the environmental variable which they investigated. A few misunderstood the question and gave responses about measuring the leaf size.

Question 2

Although most candidates were able to suggest another environmental factor, some had difficulty linking this factor to leaf size via a physiological process.

Question 3

As was the case with the similar question in ISA **P**, many candidates responded in terms of anomalies. It was quite acceptable to suggest that repetition would allow anomalous data to be identified or that the effects of such data would be minimised. It was not acceptable, however, to suggest that a large number of repeats allows anomalies to be discarded. Unqualified references to greater reliability did not gain credit. Further explanation such as that a large sample would be more reliable because it was more representative should be encouraged.

Question 4

Almost all candidates correctly referred to avoiding bias.

Question 5

There were many excellent answers that defined standard deviation in terms of the spread of results about the mean. Others incorrectly equated standard deviation with range.

Question 6

In part (a), almost all candidates determined the modal value correctly. Part (b) required an explanation involving comparison with other data in the set, such as that the difference between 33 and 40 was larger than the difference between 74 and 80. Answers that simply stated that 80 and 74 were not very different were insufficient to gain credit. Candidates found part (c) quite demanding. Many did not appreciate that a mean or standard deviation can be calculated from any sample size and that the means could then be compared. In part (b), most candidates offered an appropriate comment about variation in the shape of the leaves.

BIO3T/Q11: Written Test Section B

Question 7

There was widespread recognition that tail band width would be likely to change with age.

Question 8

In part (a), many candidates lacked the mathematical understanding to appreciate that a mean which had a value with decimal places suggested that measurements of the same band must differ. Likewise, they did not appreciate that a standard deviation with a value other than zero indicated variation in the measurements of the same band. However in part (b), having read the description of the procedure, most recognised that viewing an animal's tail through binoculars from a moving vehicle was likely to give rise to inconsistent data.

Question 9

Most candidates correctly used the data about the width of bands from the left and right sides of the tail as evidence that rings of equal width were not found.

Question 10

The most frequently awarded mark was for showing an understanding that unrelated animals would be expected to show more variation than animals from the same family. It was less usual to find a link to the idea that members of one family are genetically closely related, or a reference to the animals' parentage.

Question 11

Candidates' knowledge of classification allowed many to make valid statements in their answers to part (a) about cats and cheetahs being from the same family or both being feline. Occasional candidates incorrectly referred to cats and cheetahs belonging to the same species. In part (b), some candidates were able to interpret the grafting of skin from one part of an animal to another as a test to see whether rejection would occur in these circumstances. The word 'reaction' was not considered to be synonymous with the specific biological meaning of rejection.

Question 12

Candidates could have taken one of two approaches in answering part (a). They could either have concentrated on the speed of rejection or on the closeness of the genetic relationship between relevant animals. Despite this, this part of the question was not answered well and responses tended to lack the necessary precision to gain credit. Most candidates responded to the word reliable in part (b) with a suitable comment about the size of sample, but there were a few responses that were correctly worded in terms of the duration of the observation. Although many of the answers to part (c) were correctly based on the inference that cheetahs must share similar antigens as skin grafts were tolerated between animals, responses to part (d) were often poor. There were many confused accounts that failed to reflect the fundamental idea that proteins such as antigens are coded for by DNA and so any variation in the amino acid sequence of the protein implied a variation in the DNA coding. Candidates rarely answered in these simple terms.

Question 13

In part (a), candidates appeared well-informed about genetic bottlenecks involving a fall in the numbers of individuals of one species. Many, but by no means all, were able to continue and link small numbers to a lack of variation in the gene pool. Most candidates chose to answer part (b) in terms of susceptibility to disease. A few candidates were able to write about the failure to adapt to a changed environment but almost none identified the breeding consequences of a lack of genetic diversity.

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