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Biology BIO6T

(Specification 2410)

Unit 6T: Investigative Skills Assignment

Report on the Examination

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Comments on 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 *Guidance 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 ammonium hydroxide on the time taken to decolourise DCPIP

BIO6T/P11: Stage 2

Question 1

Most candidates were able to formulate an appropriate null hypothesis, usually couched in terms of there being no difference in the time taken to decolourise DCPIP.

Question 2

The correct statistical test was selected by almost all candidates 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 candidates 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 failed to refer appropriately to probability or chance.

BIO6T/P11: Written test Section A

Question 5

Almost all candidates responded correctly to part (a) and commented on the reduced number of chloroplasts in the stem. There was also good understanding in part (b) of why a blender had been used.

Question 6

In part (a), most candidates appreciated the damaging effect of enzymes released during the blending process. In part (b), answers were usually linked to osmosis or water potential but many candidates appeared to be of the opinion that the maintenance of a constant water potential prevented damage to the cells rather than to the chloroplasts.

Question 7

This question evoked some excellent responses reflecting a sound understanding of the principles underlying differential centrifugation. Marks were most commonly missed through failure to refer to centrifuging at different speeds, or because the terms pellet and supernatant had been confused.

Question 8

Most candidates stated the obvious and gained credit for this simple statement. Some discussed the need for a control experiment but failed to explain the purpose of the aluminium foil.

Question 9

Although many candidates failed to refer to the results of Tube **B**, they were aware of the importance of a control experiment, usually explaining that this tube would show that chloroplasts were needed to decolourise the indicator. A few went further and explained that it also would show that the isolation medium by itself did not produce decolourisation.

Question 10

Most candidates correctly identified the thylakoids.

Question 11

There was much evidence that the point underlying this question had been understood. Where errors occurred they were normally associated with attempts to explain the observation in terms of a change in pH. It was not infrequent to find inappropriate references to enzyme denaturation.

Question 12

Part (a) was very well answered and most candidates revealed a sound understanding of the relevant principles of photosynthesis. Answers to part (b), however, seldom reflected the detail required. Although candidates usually commented on the weed killer not being selective and, therefore, reducing crop yield, they seldom indicated that the crop would absorb the weed killer or that there might be toxic effects on other organisms or on respiration.

BIO6T/P11: Written Test Section B

Question 13

The Harvest Index was calculated correctly by most candidates.

Question 14

It was relatively uncommon to encounter convincing answers to this question. Although most candidates implied that a greater proportion of the crop would be grain, they did not always make the point with sufficient clarity. Problems arose over use of the word “crop” which was variously used to mean anything from grain to the entire plant.

Question 15

This question generated some good responses and most candidates were able to suggest that a named abiotic factor varied. Many, however, failed to complete their answers by referring to sampling taking place in different parts of the field.

Question 16

Most candidates were able to gain full credit for their answers to this question although some failed to mention that content would vary.

Question 17

There were many excellent and clearly focused answers to this question.

Question 18

Most candidates were able to point out that the herbicide would reduce the number of weeds and suggest that this would lead to reduced competition for a specified resource.

Question 19

Candidates found this question challenging. In discussing advantages, arguments were often based inappropriately on the rate of growth of the crop rather than that of the weeds. Acceptable disadvantages were seldom suggested and many answers were based on incorrect climatic generalisations.

Question 20

Many candidates wrote lengthy answers that focused on experimental design in general terms rather than on the design of this particular investigation. Such responses usually identified the lack of a control, small sample size and the possibility of confounding variables. Those who followed the procedure through, and considered each step carefully, were often able to make further points.

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

BIO6T/Q11: Stage 2

Question 1

Most candidates were able to formulate an appropriate null hypothesis, usually couched in terms of there being no difference in the number of yeast colonies.

Question 2

The correct statistical test was selected by almost all candidates 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 candidates 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 failed to refer appropriately to probability or chance.

BIO6T/Q11: Written test Section A

Question 5

While the use of previous questions provides good preparation for the ISA test, there was some evidence that candidates can place too much emphasis on learning previous mark schemes at the expense of gaining an understanding of the underlying principles. Thus although there were many sound answers to this question, others wrote about the yeast, and even the enzymes, reaching equilibrium or being at the same temperature as the water bath.

Question 6

Candidates showed, in their answers to part (a), a sound understanding of the need to stopper the flasks. However, some indicated that the flasks were stoppered to prevent contamination and offered no further qualification. Part (b) was well understood.

Question 7

Candidates clearly understood the need for adding the water and expressed this in terms of dilution. Most progressed beyond this point to suggest that dilution would make colonies easier to count**.**

Question 8

The importance of stirring was widely understood.

Question 9

Most candidates described the method they used to select the squares at random with sufficient clarity to gain the maximum mark. Some responses lacked precision however. Unqualified references to “random number generators” did not therefore gain credit.

Question 10

Although most candidates appreciated that the 250 cm^3 flask had the larger surface area, they were not always convincing in relating this to the interface with the culture and the diffusion of oxygen. There were frequent answers where surface area was incorrectly linked to entry into the flask or to the yeast cells. References to diffusion were relatively uncommon.

Question 11

This question produced many excellent responses in which candidates linked respiration with the ATP requirements of increased metabolism.

Question 12

Although many candidates were able to describe the trends shown in the graph they were unable to use their knowledge of limiting factors to interpret this information in such a way as to gain credit. Members of the moderating team were of the impression that many candidates attempted to adapt poor recall of existing mark schemes to the requirements of the question. Those who appreciated however that, over the first part of the range, flask volume was limiting growth were usually able to explain the evidence for this and indicate that at higher volumes something else must be limiting.

BIO6T/Q11: Written Test Section B

Question 13

The general purpose of a control experiment was understood well and many expressed the idea that a control would allow comparison with wheat plants grown on their own. Candidates were less inclined however to point out that a control was necessary in order to determine the dry mass as the relevant percentage.

Question 14

Most candidates were able to suggest that interspecific competition occurred and extract the relevant data from **Resource A** to support this. They experienced considerably more difficulty, however, in explaining the effects of the plastic covers in terms of competition between the roots or the shoots.

Question 15

The marking guidelines allowed for full credit for less than comprehensive answers to this question. This was perhaps fortunate because few suggested that temperature might have affected wheat and ryegrass seedlings differently.

Question 16

Almost all candidates referred to carrying out the procedure using distilled water but very few indicated that the same number of ryegrass seedlings would be required.

Question 17

Maximum credit was usually scored in part (a) with candidates correctly choosing the Spearman rank correlation test and indicating either that they would use this to test a null hypothesis or determine the probability of obtaining results by chance. Part (b) was, almost without exception, answered correctly.

Question 18

Most candidates scored at least one of the two available marks for part (a) by identifying either the reduced germination of ryegrass or the reduced root growth. There were few convincing answers to part (b), however, and most candidates approached this question by unjustified criticism of the experimental approach.

Question 19

Many candidates were able to suggest, in their answers to part (a), that less herbicide would be needed in order to produce a higher crop yield but encountered difficulties when attempting to offer further detail. The most frequent comment referred to bioaccumulation but this was seldom expressed in appropriate terms. Some candidates failed to appreciate that environmental, not economic, benefits were required. Many of the answers to part (b) foundered over the lack of a clear idea of the meanings of the terms *species* and *variety*. Consequently there was much inappropriate discussion of species diversity as opposed to genetic diversity. Many approached the question by indicating that the crop would be "wiped out" but failed to couch their arguments in the context of either adaptation or resistance.

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