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Human Biology HBI6X

(Specification 2405)

Unit 6X: Externally Marked Practical Assignment

Report on the Examination

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General comments

This was the third examination of this component. Examiners noted further improvement in performance with statistical analysis in Task 2, and with the use of the Resources in Section B of the Written Test. Assessment Advisers reported that few centres had experienced any difficulties with the investigation.

On this occasion, students did appear to have spent more time understanding what the investigation was about and this was reflected in the way that many questions were answered. Key words were recognised, so responses in questions where there was a requirement to describe, explain or suggest were usually approached appropriately.
It is to be expected that students at A2 should produce almost flawless tables and this was mostly the case. Performance with statistical methods was very good and many achieved full credit with the analysis of their own data. Where questions relating to statistical tests were included in the Written Test, there was some improvement but students still fair less well than with the statistics in Task 2. On this occasion, more students appeared to find the resource material accessible and, thus, use it appropriately when answering particular questions.

The examiners greatly appreciated the use of treasury tags to hold the components together. Most centres included a signed Centre Declaration Sheet, as required, but not all teachers remembered to tick the practical skills verification and sign the front of the Written Test paper.

The commentary that follows focuses on the key ideas that were expected for all questions and whether students met the expectations.

Task 1

Question 1

This was a simple opening question for those who appreciated the basis of Task 1. Starch was used as an indicator and, thus, the actual volume did not matter. Despite this, many students described what they imagined the effect of different drop size and, thus, volume of starch used, would have on the results.

Question 2

As with question 1, success or otherwise depended on whether students had spent sufficient time appreciating what the investigation involved. Expression also affected whether credit was possible or not. The question asked for why the colour disappeared and not why it remained. Some students were able to explain that, after an initial reaction between iodine and starch, iodine leaves starch to react with vitamin C (and, hence, colour is lost) because vitamin C is still present.

Question 3

Most approached this question from the viewpoint that the reaction was not enzyme controlled and, thus, there was no requirement to maintain temperature. It was equally relevant to explain that the rate of reaching the endpoint was not important but the volume of iodine required to reach this point was.

Question 4

Most were able to complete the calculation accurately. This was undone by excessive rounding in some cases.

Question 5

The common response was to identify that the student's method did not involve the use of iodine. Few students recognised that the indicator was placed in the syringe in the student's method, as opposed to in the flask in their own method; or the converse, that vitamin C was in the flask instead of in the syringe. Many did not use the information provided in the question stem. Those who did appreciated that the end point in this reaction would be shown by the DCPIP remaining blue.

A common weakness in students' answers is to describe the quantity of a variable in terms of 'amount'. Depending on the context, this could be interpreted as volume or mass. A distinction was required here. The *volume* of DCPIP used should be recorded and this could then be used to calculate the *mass* or concentration of vitamin C present.

Task 2

Question 6 – presenting data

The table at A2 includes potential credit for the quality of the data collected. The method required that students obtained and presented 5 sets of data for each of their potato solutions. Some failed to do so. Students were also told that they required the value provided by their teacher to help them process their data. Some ignored this and did not convert their results of volume of iodine solution used into the mass of vitamin C present in their solutions.

Question 7 – statistical analysis

Errors of processing were not further penalised in the statistical analysis. In general, students were well prepared for this part of the investigation and many achieved full credit for all parts of the question. The null hypothesis was expressed in several acceptable ways and an appropriate statistical test was invariably identified correctly as either the t-test or standard error (and 95% confidence limits). Where standard error was chosen, many elected to produce a graph as well. The graph does not receive any credit but it helped students identify whether the error bars overlapped or not and produce a suitable explanation of how this should be interpreted. Although there was direction to refer to both probability and chance, some students still did not do so. Most students calculated their test statistic accurately but, on the few occasions where this was not the case, it was the explanation of the value obtained that was assessed.

Written Test: Section A

Question 8

Few students approached the peeling of the potato from the perspective of making the potato easier to blend. Many recognised that the peel might contain a different mass of vitamin C or that peeling would mean that only the same type of tissue was used throughout.

The majority appreciated that using two halves of the same potato would ensure that the starting concentration of vitamin C should be the same. Credit was given where this was implied but the quality of expression was limited in many cases. Weaker answers offered "to control a variable" with no further clarification.
Not many identified that blending would break cell walls or release vitamin C from cells. Responses were non-specific and only a few related the blending of potato tissue to what was under investigation.

Question 9

Mass of potato tissue, volume of water added or time length for blending were anticipated responses. It was surprising how many did not achieve both marks. In this context, 'amount' of potato or water was again insufficient.

Question 10

It was enough to identify that dehydroxyascorbic acid is colourless. A 'clear colour' does not convey the same meaning and did not gain credit.

Question 11

All types of graph were proposed but the majority correctly identified the bar chart as appropriate. Generally, this was supported by the appreciation that the two potato solutions represented discrete data but other appropriate explanations were also worthy of credit.

Question 12

This proved to be a challenging question for most students even though either of two possible approaches was possible. Students who took time to understand the investigation were at an advantage. Those who didn't produced speculative responses. A more dilute iodine solution would mean that more iodine solution would be required to reach the end-point and bring about the colour change, or, the reaction would take longer. Increasing the number of drops of starch used would have no effect (because it is only an indicator) although identifying a more intense blue-black colour was also a valid response. The alternative was that this would have no effect on the reaction time length. Using a reduced volume of water to make the raw potato solution would mean that more iodine solution would be required to reach the end-point, because the potato sample used would then be a more concentrated vitamin C solution. Alternatively, it could be identified that the reaction would take longer.

Question 13

Where students correctly identified storage time and vitamin C concentration as the two variables, they were mostly able to produce an appropriate null hypothesis. All the statistical tests that students are expected to be familiar with were seen as suggestions of which would apply. About half correctly identified the correlation coefficient as appropriate in this case. Few students were completely successful with part (c). Better answers appreciated that, whatever the starting concentration of vitamin C, it was the effect of storage time on this starting concentration that was being investigated and not the effect of age on how much vitamin C a potato possessed in the first place.

Written Test: Section B

Question 14

Most students gave two valid reasons such as that excess vitamin C is not stored, or it is lost from the body in urine, or it might lead to diarrhoea. It was also appropriate to note that 250 mg [Rabina, a half space again between 250 and mg if we can] was closer to the recommended daily intake than 500 mg [Rabina, and again here].

Question 15

Those able to express themselves clearly were more likely to achieve full credit with this question. It was appropriate to suggest that vitamin C has a similar shape to histamine, can bind to the receptor and might cause a change in the shape of the receptor. Weaker responses suggested that vitamin C and histamine were complementary or that vitamin C is the same shape as the receptor.

Question 16

This question was worth two marks and therefore two points were required. The majority of students failed to answer the entire question. Most identified that adult males are generally larger than adult females, or simply that they are different sizes (in some way), but this was not related to a difference in daily intake of vitamin C. A recognition that intake is based on per unit size, such as per kg of body mass, would explain why adult males require a greater daily intake. Few expressed this idea to complete the response to the question.

Question 17

Many used the information to note that an excess of vitamin C can lead to diarrhoea. Equally appropriate was to note that the dose suggested could exceed the safe upper limit for intake.

Question 18

Most students approached this question from the view that variation in losses of vitamin C in urine is related to the intake in the diet. It was rare to see references to losses related to variation in the use of vitamin C in cell processes or reactions.

Question 19

Some students found it difficult to distinguish the difference in these questions. The description can be deemed appropriate because it provides some evidence that vitamin C does improve symptoms. However, it is a subjective assessment and the perception of the benefit can vary from person to person. Better answers expressed these ideas coherently.

Question 20

Many students used the data analytically and critically to explain why the statement given could not be supported. It was not uncommon for the maximum mark to be achieved. Students frequently drew attention to the research being based on a small sample, the unknown control of other variables, the incomplete reporting of data, the different perceptions of improvement, lack of a control group and the incompleteness of all under treatment showing an improvement.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results statistics page of the AQA Website.