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Paper 01 Practical Skills in Biology I

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Introduction

There were nine core practicals and five recommended additional practicals on the specification and these have all been examined at least once since its inception in June 2019.

This paper had highlighted a number of skills, and the one which took a centre stage on the current paper was drawing. It is clear that some students had developed a high level of facility in this area, but others had a weaker understanding. This is an area for some extra attention over the next interval before an exam.

Candidates showed no problems in completing the paper and there were few blank responses seen.

1a

Generally, this question was well done. Most students could outline a safety technique and the majority used a suitable piece of apparatus to remove cheek cells. Many could correctly name a stain, even though this was not needed.

Terminology for coverslip varied. Few candidates went on to talk about the power the microscope that would be needed to see these cells.

1bi

Some candidates did not attempt to draw cell W, but instead drew a 'fried egg' diagram of an idealised animal cell.

Most students could label suitable features. However, there was a good number of cell walls, chloroplast (plants), ribosomes and mitochondria as well as other organelles (too small to be seen). It is a good reminder to students to read the stem of the question properly for a better answer.

The stem of the question:

'The photograph shows three human cheek cells, seen using a light microscope.

Draw the cell labeled W in the photograph. Label two structures on your drawing.'

The key points are that the photograph is of cells taken through a **light microscope** (ribosomes etc. will not be visible) and the instruction to draw the cell W.

The other point to make is that this is predominantly a practical, not a theory, paper. This question was testing practical skills, drawing and the use of light microscopy.

1bii

Many were able to do this question, although a few were unable to read off the scale correctly. For those who did, the calculation was relatively straightforward although a substantial minority did not spot that $3 \times 10^{-6} = 1 \mu\text{m}$ so there was no need for any conversion.

1ci

Most students attempted this question well. A range of answers was credited to cover different methods of doing calculations involving π and $4/3$.

1cii

Most students were able to correctly divide their answer to part ci into 80. However, converting their answer to the right power of ten defeated almost all students.

2ai

This question was well done but a minority misunderstood completely and talked about variables to be controlled.

2aii

Again, this question was generally well answered. The most common error was to just suggest a water bath without any idea how the temperature inside it might be controlled. The majority were able to suggest the use of buffer for pH control.

2bi

The graph was generally very well done. Most axis labels were complete with axes correctly orientated. There were some plotting errors, most commonly magnesium, 12. Most scales were sensible and there few which did not start the y-axis at zero or had a discontinuous scale on the y-axis. There were some line graphs, but only from a minority of responses.

2bii

Most students were confident in stating that plants in phosphate free solution grew better than those in a solution lacking nitrate. This was expressed in many ways.

Knowledge of the uses of nitrate in plants was fair. However, candidates often provided a list rather than developing a single use. Nitrates needed for proteins for growth was the most common answer.

2ci

This question yielded at least one mark for many candidates, usually the suggestion, expressed in many ways, that counting would be difficult. Differences in size were also frequently mentioned, but rarely was the variation in leaf number pointed out.

2cii

This question proved challenging. The main issue was the lack of understanding of the word 'accurate'. In the previous question, candidates had been pointed at the idea that counting is inaccurate, so it is hard to see why they mentioned counting in this question.

Marks could still be gained by discussing measuring.

Very few suggested how the measurement could be made more accurate, such as removing excess water, using an electronic balance, or graph paper if measuring area.

Calculation of growth rate was not often addressed, even though it is clearly in the stem of the question.

3ai

Most students gained one mark, most often for the two arteries in C and D. There were many left atria for A which is not acceptably accurate at this level.

3aii

This is the first time this core practical has been examined. In light of this, it was pleasing to see some very good attempts at this drawing.



However, some ignored the photo altogether and drew something else (perhaps what they could label) e.g., sections through arteries and veins or the outside of the heart to show coronary arteries.

Most common labels were valve, tendon (cords) and cardiac muscle.

3aiii

The function of ventricles was well known, but the description of valve function was often too vague about where backflow might occur.

The role of tendons is also solid.

Papillary muscles were rarely discussed. Other features commonly seen included named blood vessels (aorta, vena cava, pulmonary artery and vein), coronary arteries, atria, semilunar valves, septum

3bi

Some candidates failed to measure the lines on the diagram correctly. Calculating % increase caused problems for some, and many forgot to provide their answer to 2 significant figures, even when they had done the calculation correctly.

3bii

A good number of candidates were able to spot all the relevant comparisons, although similarities were less often seen than differences. However, there were substantial number of students who were confused by the question. Common problems were the use of vague terminology, such as heart is thicker, rather than heart muscle is thicker; left side, rather than left ventricle. These were really common and lost students a lot of marks. Many confused the right and left sides of the heart. Finally, there were vague answers in which the heart had thicker muscle; all other parts of the heart are the same.

3bii

The most common errors were, no units, units in body of table, incomplete header e.g. not "mean" not "of artery". A number of students read the figures wrongly from the graph.

Finally, most candidates ignored the standard deviations.

3biv

This was a really challenging question. Answers were frequently unstructured which made them hard to read and disentangle. Candidates should learn to approach such questions more systematically. Very few took note of the command word 'determine'.

On the specification this is defined as:

The answer must have an element which is quantitative from the stimulus provide or must show how the answer can be reached quantitatively.

Consequently, few numerical manipulations were seen and so mp1 was not often gained. All that was required was a simple relevant subtraction to show the size of a difference, and then this used to illustrate the point being made.

Answers needed to be much clearer about the effects being described. Such phrases as 'the difference is little or none' or 'there is not much difference'. A clear statement like 'there is no difference', or 'there is a difference, but is not significant' is what was required.

Summary

Students are advised to make sure they are very familiar with every aspect of each of the 9 core practicals and the 5 recommended practicals, any of these may form the context for questions on this paper.

Attention to detail is vital in A Level science. On this paper, descriptions of heart features were often fundamentally correct but too vague to actually gain marks.

It is important to remember that the DV has to be measured in some way, and it needs to be quantitative. It might be a measurement on a suitable piece of equipment. When thinking about accuracy, there are various considerations. Something must be chosen by the DV which can be accurately measured. In this paper, we saw that a count was not such a DV. Then, a relevant piece of equipment must be chosen to measure it accurately. For example, to weigh something very tiny, household scales will not be suitable.

Students are also advised to think about their drawing skills and the difference between a learned diagram and a drawing of an actual specimen.

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