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Examiners' Report
Principal Examiner Feedback

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Introduction:

This paper tested the knowledge, understanding and application of material from the topics 'Voice of the Genome' and 'Biodiversity and Natural Resources'. The range of questions provided ample opportunity for students to demonstrate their grasp of these topics and apply their knowledge to novel contexts.

The questions on this paper yielded a wide range of responses and some very good answers were seen. The paper appears to have worked very well with all questions achieving the full spread of marks. Very few questions were left blank and there was no evidence in the vast majority of papers that students had insufficient time to complete the paper.

There were some straightforward questions that yielded high marks across the ability range and some more challenging questions that discriminated well. It as clear that centres have been working hard to ensure their students read the command words more carefully and tailor their answers appropriately. The 'compare and contrast' type answers in particular showed a significant increase in the quality of comparative answers as opposed to separate paragraphs about each. More students utilised the data they were provided with in some of the questions.

As previously, questions that demanded recall were generally well answered, as were the majority of the calculation questions.

However, when asked to analyse and explain data and apply their knowledge to unfamiliar contexts, many students found the marks harder to obtain. The application of knowledge regarding codominance for example proved more challenging for some students. The practical skills questions were also more challenging for some students than in previous years, perhaps due to less practical work being carried out by students due to remote learning.

Question 1(a)(i)

This question required students to indicate the position of the nucleolus on an image taken by an electron microscope. Most candidates were able to do this with only a few idenifying an object shown outside of the nucleus..

Question 1(a)(ii)

This multiple choice question was very well answered with most responses identifying that prokaryotic cells do not have a nucleus.

Question 1(a)(iii)

This question asked students to explain why the nucleus could not be seen during mitosis. Most students were able to refer to the nuclear membrane breaking down but few referred to changes to the composition of DNA.

Question 1(b)(i)

This was a more challenging multiple question that proved difficult for some students. A range of distractors were seen.

Question 1(b)(ii)

This question continued in the context of cell division required students to focus on the importance of the mechanisms involved rather than the mechanisms themselves.

Few students gained both marks with the importance of producing genetically identical cells often omitted.

Question 1(b)(iii)

This question was not very well answered by the students, with only a small number of responses relating the definition of phenotype to the scenario.

Question 2(a)

This question was a calculation requiring an answer in standard form. Those failing to gain full marks did not convert the mass from grams to kilograms.

Question 2(b)(i)

This question required the students to describe the structure of starch. The majority of students gained multiple marks although often with a disorganised structure in their response.

Question 2(b)ii

This question asked students to explain sustainability in terms of a plastic made partially from renewable polymers. A large number of students referred to the term biodegradeable, and missed the point of the question.

Question 2(c)

This question required to consider the tensile strength core practical in a novel manner. A comparison of two methods was necessary and the focus on accuracy of results. Many students considered the method of hanging masses to be the most accurate, perhaps as this was what they were familiar with, and so scored no marks.

Question 3(b)

This question asked students to explain the importance of a placebo and double blind trials. On the whole, students were able to recognise the terms, but some struggled to describe the idea of a control group.
The concept of avoiding bias was more easily explained.

Question 3(c)

This question gave the students data from the results of a drug trial and asked for an analysis. Most students were able to identify a lack of difference between the placebo and the test group although few used the term significant difference. Only a small minority identified the relevance of the error bars so full marks were rarely seen.

Question 4(a)(iii)

This question gave the students a familiar concept of the root tip squash practical and asked for a small section of the process. There were many who scored all three marks. There were some difficulties on naming a stain.

Question 4(a)(iv)

This question asked students to calculate a percentage of cells undergoing mitosis from a field of view from a root tip squash.
Students had difficulty in identifying those cells in the different stages of mitosis so many were unable to calculate the percentage correctly.

Question 4(b)

This question introduced the context of the cell cycle and the effects of radiation. It proved to be the most challenging question on the paper. The information given in the stem of the question should guide students to the marking points however few correctly identified the scenario correctly. A number of students related the damage to the specific gene or the gene causing the damage. Few scored more than one mark.

Question 5(a)(i)

This question asked students to complete the diagram with the indication of a possible locus for the gene. A simple question that was generally answered correctly.

Question 5(a)(ii)

This question asked students to complete a genetic diagram to show the potential inheritance of a sex linked characteristic and use the diagram to explain how males are unable to pass the condition to their male offspring.
There were some very good responses however most failed to make the link between the diagram and the explanation.

Question 5(b)(i)

The students were asked for a simple definition of a polygenic characteristic. Most of the responses were able to refer to different loci but few referred to continuous variation.

Question 5(b)(ii)

This question expected students to complete a calculation using percentages.

Question 6(b)(i)

This question asked students to compare sources of stem cells. The difference between totipotent and pluripotent were well understood and some students were able to link the idea of cell specialisation to the scenario.

Question 6(b)(ii)

This question required the students to relate the concept of cell differentiation to the scenario of stem cell transplant. Those candidates that had learned the process were able to write a coherent answer that achieved all marking points.

Question 6(c)

A question that had not been asked recently referring to the role of society in determining the use of stem cells. This produced mixed responses with students often unable to formulate their ideas clearly. The most common response being a reference as to loss of a potential life.

Question 7(b)

This question required the students to relate simple concepts of magnesium an calcium ions in the growth of plants to a given scenario. The given diagram showed the effects of the lack of each ion alongside a control. Responses were varied, most able to identify the issues shown on the diagram but few were able to link this to the role of the relevant ion in plant growth.

Question 7(c)

Students were aske to use their knowledge of the mineral ion core practical to plan an investigation to support a given statement. The question referred to both growth and to germination. Responses were frequently unbalanced with little though given to germination. The best responses were clear and gave direct information about values and methodoly, for example measuring the mass of heigh of seedlings after set time.

Question 8(a)(i)

This question was a calculation that tested students ability to use a given equation. Although given students needed to recall the relevance of N and n. This meant that some students were unable to correctly calculate the value. Some arrived part way through the calculation and then chose to stop and some to add another intermediary step before giving their index of diversity.

Question 8(a)(ii)

This question asked students to relate the equation for the index of diversity to the concept. The link between a large range of species was understood to give a higher diversity but few linked this to the mechanics of the equation.

Question 8(b)(i)

Students were asked to calculate the percentage change in the heart rate of shrimp 2. It was pleasing to see that nearly all candidates could calculate percentage change correctly, however some students did not take note of the direction to give their answer to one decimal place.

Question 8(c)

This question was the levels based question and produced a range of marks. It well answered by some however many students answered in terms of the evolution of bees rather than of the orchids. With the information set up in the question to relate the link between bees and fertilisation of the orchid there was little that could be awarded for these candidates.

Whether referring to orchids or bees there were all examples of selection pressures, changes in gene pool and all the explanations associated with natural selection. The anatomical differences being shown in the orchids were much rarer.

Paper summary

Based on their performance on this paper, students are offered the following advice:

- Read the whole question carefully, including the introduction, to help relate your answer to the context asked. You should take into account the command words as well as the context given. Answers which do not match the command words or do not relate to the given context will not gain high marks.
- Study the mathematical skills which could be tested and make sure you include your working with all calculations. Give relevant units where applicable.
- When asked to compare and contrast, make sure you have included both similarities and differences in your answer.
- Ensure you use the relate specification content to the scenario given in the question

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