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Examiners' Report
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Introduction:

This paper tested the knowledge, understanding and application of material from the topics 'Lifestyle, health and risk' and 'Genes and health'.

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 drawn arrows onto the provided diagram to show the route that blood would take as it retuned from the body, enters the heart and is then pumped to the lungs. It was pleasing to see that most students knew that the blood would only travel through the right side of the heart. The most common error was that they didn't show the route blood would take to enter the right atrium.

Question 1(a)(ii)

This question was very well answered by the students, with only a small number referring to diastole or ventricular systole instead of atrial systole.

Question 1(b)

This question asked students to name the valves in the heart. The question was very well answered by the students, with only a small number of responses naming only one type of valve, despite the question being worth two marks.

Question 2(a)(i)

Nearly all of the students could recognise that the blood vessel in the diagram was an artery.

Question 2(b)

This question continued the context of cardiovascular disease (CVD) and asked students to explain how the diet of a person could affect the development of CVD. It was clear to see that dietary risk factors were well known as nearly all responses gained marking points one and four. However, some students lost marks due to imprecision. Reference to high intake of fats unqualified was insufficient for example.

Most students knew that high blood pressure would lead to damage of endothelium of an artery, but few could explain how high salt intake would cause this.

Question 3(a)(i)

This question was very well answered by the students, with only a small number of incorrect responses.

Question 3(b)(i)

This question gave the students the structure of sucrose and asked them to draw out the structure of the two monosaccharides that would be produced after hydrolysis had occurred. It was clear that the majority of students understood the process of a hydrolysis reaction and could therefore correctly copy the structures given and add the hydroxide groups.

Question 3(b)(ii)

This question asked the students to name the two monosaccharides that are produced after sucrose is broken down. A significant majority of students answered this question correctly.

Question 3(c)

This question asked students to compare and contrast the structure of a disaccharide with glycogen. It is important to take careful note of the command words used in questions. The command 'compare and contrast' means that students need to identify both similarities and differences between the molecules in order to gain full marks. There were a number of students who only identified differences and therefore could not gain full marks. It is also important to understand that a separate paragraph about each molecule is not a suitable answer. Students are encouraged to use comparative language in their answers in order to access the highest marks available.

The most common answers centred around glycosidic bonds and gained both the similarity and the difference mark. Only one response considered that disaccharides and glycogen both contain carbon, hydrogen and oxygen.

Question 4(a)

This was the first time that this specification point had been tested on this new specification. The most common response was to say how the risk might differ from the predicted actual risk, demonstrating their understanding of the information in the table. A significant number of students struggled to explain why the perception of lifetime risk was different from the predicted actual risk. A common response was to consider lack of knowledge by the person involved, without expanding on this to consider what CVD risk factors the people involved might not know about. When a student did consider risk factors, it was rare to see an answer covering both mp2 and mp3.

Question 4(b)

This question asked students to explain how blood tests and obesity indicators can be used to collect data to predict the risk of developing CVD. On the whole, students were able to identify what a blood test would be used to measure, with the most common answer being cholesterol levels. Few students, however, could give mp2. Some students were able to name a correct obesity indicator to gain mp4, however many students just repeated the term 'obesity indicator' in their response which was not credit worthy.

Question 5(a)(ii)

This question gave the students information about an unfamiliar situation of codominance. They were asked to deduce the genotypes and phenotypes of the parents from the given offspring blood type probability.

Most students were able to deduce that each parent must have one of the dominant alleles and one recessive allele, but fewer students were able to deduce the phenotypes.

It was surprising to see some students choosing to use different allele letters than the ones provided in the question.

Question 5(b)(ii)

This question gave the students two of the three components of a mononucleotide. Students were asked to name the other component. Most students were able to name the component correctly, although a few did not read the question properly and stated organic base.

Question 5(b)(iv)

This question asked students to describe the role of tRNA in the production of the protein part of a glycoprotein. This proved challenging for many students for two main reasons. Firstly, some just gave a standard translation answer which focussed on mRNA instead of tRNA. Secondly, many answers lacked the required level of detail e.g., they described a tRNA bonding to an amino acid and bringing it to the ribosome but didn't describe the specificity aspect.

The most awarded mark was for the description of tRNA anticodons being complementary to mRNA codons.

Question 5(c)

This question introduced the context of transport through a cell surface membrane via endocytosis and exocytosis. Students were asked to give two differences between these two processes. Most students were able to give the first difference on the mark scheme, although some students lost the mark as they just made a statement about what happen in one process which was insufficient. The higher level answers considered the vesicle aspect of the mark scheme, although there were some students who thought endocytosis also involved vesicles (outside the cell) fusing with the cell surface membrane.

Question 6(a)(i)

This question asked students to complete the diagram to show the arrangement of four phospholipid molecules on a surface between air and water.

It was surprising that a number of students did not answer this question and went straight onto the MCQ, students need to look at mark allocations on the right-hand side of the page to ensure they are not missing questions and therefore losing marks.

It was surprising that few students gained full marks on this question.

Some students did not read the question carefully and drew more than 4 phospholipids which lost them a mark. Some students did not recall the

hydrophobic nature of the fatty acid tails, whereas some drew three fatty acid chains instead of two.

Question 6(b)

This question asked students to explain why betalain molecules cannot move through intact cell membranes. The students were told that the molecules were large and polar, but it was surprising how many students just repeated this information without explaining why these properties would result in the molecules not being able to move through intact cell membranes.

The most commonly awarded mark was for explaining that {carrier/channel} proteins would be needed to move betalains through the cell membrane. The highest-level answers considered why the polar nature of the betalains meant they couldn't move through the fatty acid tails of the phospholipids in the bilayer.

Question 6(c)(i)

The students were given a result for the 0.5% detergent solution to plot on the graph. Some students need to take care that they do not miss questions out. Most students were able to plot this result on the graph correctly, however there were a significant minority who plotted at 0.5 a.u. and 0.25% instead.

Question 6(c)(ii)

This question expected students to analyse the two sketch graphs to compare and contrast the predictions made by the two students, in order to apply this context to their methods.

This question proved to be a very good differentiator with the full spread of marks awarded.

To achieve level one students needed to recall the core practical and apply it to this context. Most students achieved level one by explaining how they would place beetroot cores into different detergent concentrations, have replicates at each temperature and then use a colorimeter to measure absorbance.

In order to achieve a high level two students needed to have used the information in the graph to select the range of detergent concentrations used as well as explaining how to control other variables. Many students were limited to a lower level two because they gave a range of concentrations which did not extend beyond 1.0% and this would not have enabled them to fully test the predictions.

Higher level answers which achieved level three demonstrated their analysis of the differences between the two graphs as well as how to use the colorimeter to obtain valid data.

Question 7(a)(i)

This question asked students to name a piece of apparatus that would be used to measure the light absorbance of the mixture described in the question.

It was clear to see that many students knew that a colorimeter would be used, however a significant number of students gave the incorrect answer calorimeter.

Question 7(a)(ii)

Students were asked to calculate the initial rate of reaction from the data shown in the graph. As no units were provided on the answer line, students were also expected to provide the correct unit. However, most students did not give a unit.

It was clear that many students did not know the difference between rate and initial rate of reaction. Many answers were seen calculating either 0.8÷15 or 1/t.

Question 7(a)(iii)

It was pleasing to see that most students could draw a correct line on the graph to show the expected trend for a 5% amylase solution.

Question 7(b)

Students were expected to use the given information to help them explain why the light absorbance of the mixture changed over time. Almost all of the students recognised that they needed to state how the light absorbance had changed and therefore were awarded marking point one. Those students who used the given information were usually awarded marking point two as well. However few students linked the colour of the iodine solution to the light absorbance, many did not refer to iodine turning blue-black in the presence of starch, but remaining the lighter colour of yellow-brown if starch was not present.

Question 7(c)

Students were provided with information regarding starch hydrolysis in Visking tubing. Students were expected to recognise that there was a difference in the surface area of the two tubing's and then apply their knowledge of Fick's law when writing their answer.

Unfortunately, although the majority of students gave answers which gained marking point one, a significant number of answers centred around osmosis and not diffusion of maltose.

Higher-level answers included the linkage to all of the aspects of Fick's law and therefore gained marking points two and four.

Question 8(a)(i)

This question was very answered, with most students gaining both marks, demonstrating an improvement from a similar question in a previous paper.

Question 8(a)(ii)

This question asked students to state and justify two variables that should have been controlled in the given investigation. They were also provided with some scaffolding. The main reason students lost marks here was because they failed to follow the command to state and justify. The majority of students gained two marks for stating two variables that should have been controlled.

One common incorrect answer given was that the same ghost shrimp should have been used, which ignored the information in the provided table.

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(b)(ii)

Students were asked to comment on the results of the investigation shown in the table. This command required the synthesis of a number of factors to form a judgment. The majority of students were able to state that as the caffeine concentration increased the heart rate decreased and that the heart rate of shrimp 3 did not fit this trend. Numerous answers commented on the difference of this trend to what would occur in Daphnia which was unexpected.

However few students considered that there was no 0.0% concentration and therefore the normal heart rate was not known.

Question 8(c)

This question was very answered, with most students gaining both marks, demonstrating an improvement from a similar question about zebrafish in a previous paper.

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 correct technical names and terms in your answer.

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