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Examiners' Report
Principal Examiner Feedback

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In Biology (WBI12)
Paper 01 Cells, Development, Biodiversity and Conservation

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Introduction:
This paper was the second of the new specification and tested the knowledge, understanding and application of material from the topics 'Cell Structure, Reproduction and Development' and 'Plant Structure and Function, Biodiversity and Conservation'.

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. For example, nearly all students wrote lengthy answers to the last question on the paper.

There were some straightforward questions that yielded high marks across the ability range and some more challenging questions that discriminated well. It was very pleasing to see so many excellent responses which were clear and comprehensive, showing a good use of appropriate biological terminology.

It was clear that centres have been working hard to ensure their students read the command words more carefully and tailor their answers appropriately. However, when asked to analyse and explain data, compare and contrast or apply their knowledge to unfamiliar contexts, many students found the marks harder to obtain.

Question 1(c)

This question asked students to compare and contrast the structure of a cellulose molecule and a starch molecule.
The command words expect students to identify both similarities and differences between the two molecules and then write their answer in a concise and comparative manner.
However, many students gave a paragraph of information about one molecule, followed by a paragraph of information about the second molecule. This was not comparing and contrasting and therefore the students lost marks.
Students were more likely to identify differences between the two molecules. A maximum of two marks could be awarded for the identification of differences.

Question 2(a)(ii)
This question provided the students with data about the diameter of a blue poison dart frog egg cell and the volume of a human egg cell.
They were expected to calculate the radius of the blue poison dart frog egg cell and use this value to calculate the volume. The majority of students were able to calculate the volume of the blue poison dart frog egg cell correctly, however there was a significant number who used the diameter value instead.
The majority of candidates could divide their blue poison dart frog egg cell volume by the human egg cell volume. However only a minority of students followed the instruction given in the question to give their answer to two significant figures.
A minority of candidates confused two significant figures with two decimal places.

Question 2(b)
This question asked students to explain why the genetic material was different in an egg cell and a skin cell.

Nearly all students were able to explain that the egg cell was haploid / had half the number of chromsomes.
The majority of students were also able to explain that the egg cell was formed by meiosis.
Few students recognised that the egg cell genetic material would also differ due to random assortment or crossing over.
Lack of precision in their answers often prevented the awarding of mp2. Fusing of egg and sperm cells was not sufficient. They needed to refer to the fusion of the nuclei of the egg and sperm cells.

Question 3(a)(ii)
This question asked students to draw a labelled diagram of a nucleus, as seen using an electron microscope.
There was a lot of variation in the quality of the drawings seen.
Some students drew excellent diagrams, clearly showing the labelled double membrane, nucleolus and pores.
Some students drew a whole cell instead of just the nucleus. This often resulted in negated marks and wasted time in the examination.
The most common drawing errors were drawing a single line for the nuclear envelope, or chromosomes in the nucleolus.
The most common labelling error was giving incorrect structures such as a cell membrane, cytoplasm or cell wall.

Question 3(b)(i)
This question asked students to explain why the bilayer structure of the cell surface membrane could not be seen using a light microscope.
The answer required was that the the two layers of the bilayer were very close together and that the resolution of the light microscope was not high enough to see them as separate layers.
The majority of candidates were able to identify that the resolution of the light microscope was not high enough, but few students were able to gain the second mark.
A common response was that the cell membrane was too small or thin and this was not credit worthy.
Students need to be able to distinguish between magnification and resolution and determine which is appropriate for the given context.

Question 3(b)(ii)
This was another question assessing mathematical skills.
Students were required to measure the line XY accurately and convert this measurement into µm. This image size then needed to be divided by the magnification to give the answer 130 µm.
A tolerance of 1mm was given for the measurement of the line XY.
It was surprising that a large number of students were not able to convert their measurement into µm. This limited the number of marks they could be awarded.

Question 3(b)(iii)
This question tested the students ability to recognise the centriole organelle from a photograph taken using an electron microscope.
It was disappointing that the majority of candidates were not able to identify the organelle correctly and therefore gained no marks. Common incorrect responses were mitochondria, rER and lysosomes.
Where candidates did recognise the organelle correctly, the number of marks that could be awarded was often limited by the precision of the language used, for example ‘spindles’ instead of ‘spindle fibres’.
The most commonly awarded marking point was mark point two.

Question 4(a)(ii)
This question was in the context of a flowering plant in the domain Eukarya.
Students were asked to describe the evidence that Carl Woese used to propose the three-domain system of classification.
It was surprising that a significant number of students did not grasp what was expected of them and just described the three domains.
The majority of students were able to state that Carl Woese used evidence from molecular phylogeny, but only a small minority were able to describe the comparison of the evidence or the identification of similarities / differences in the biological molecules.

Question 4(b)
This question asked students to explain the function of a pollen tube in the fertilisation of flowering plants.
This question proved to be challenging for many students.
The majority of students were able to correctly explain that the pollen tube grew to the egg cell and were awarded mp1.

Precision of language was important in this question and references to eggs were insufficient. Some students thought that the pollen grain contained sperm.
As the key term 'fertilisation' was given in the question, credit was not given for just allowing the male nuclei to fertilise the egg cell. Fusion of nuclei was required, or the named structures formed from the fertilisation. Many students referred to enzymes without linking the enzymes to digestion.

Question 4(c)(i)
This question required students to analyse the given data to determine the effect of Verapamil on the growth of pollen tubes.
It was pleasing to see that most students could correctly identify the relationship between concentration and length.
However, fewer students took note of the command word 'determine' and therefore did not provide manipulated data to support their answer.

Question 4(c)(ii)
This question linked to the information given above the graph on the previous page.
Students were asked to explain why Verapamil can reduce the strength of cell walls.
This question proved to be a very good differentiator.
Mp1 was rarely awarded as many candidates just restated the information they were given above the graph without recognising the impact that this would have on concentrations of calcium ions inside the cells of the plant.
Mp2 was the most commonly awarded marking point. The majority of students were able to give one of the acceptable responses in the mark scheme. More students tended to state the additional guidance, that calcium ions were needed to form calcium pectate.
However fewer candidates were able to explain the role of the caclium pectate in sufficient detail. The most common answer was that calcium pectate was needed for the middle lamella, but this did not fully answer the question asked.
It was pleasing to see a significant number of excellent responses describing the calcium pectate holding the cellulose together in the cell wall.

Question 5(a)
This question asked students to explain why the Venus fly trap needs compounds containing nitrogen.
This question discriminated well.
One of the best responses seen clearly explained that these compounds were needed to form amino acids which would be used in protein synthesis to form enzymes for photosynthesis and respiration.

However, many students recognised that the compounds would be required to make amino acids or proteins, but did not go onto to explain why these proteins would be needed by the plant. Therefore these responses were limited to one mark.
A minority of students described the effects of nitrogen deficiency on the plants.

Question 5(b)
This question asked the candidates to describe the role of the Golgi apparatus in forming extracellular enzymes.
Therefore it was expected that the students would refer to the given context.
It was disappointing to see a large number of students referring to the role of the rER in these responses. This was not credit worthy.
The most commonly awarded marking point was mp1. Students were able to describe the role of the Golgi apparatus in the modification of the protein.
However, it was disappointing to see that many students then gave a stock answer without relating to the given context of the enzymes.
They described the packaging of a protein into vesicles and then exocytosis of this generic protein. This was not sufficient for marking points two and three.

Question 5(c)
This question was set in the context of extracts from Venus fly trap plants being used in some alternative medicines as a treatment for HIV and some cancers.
Students were asked to complete a diagram to show how an extract could be tested as part of the initial stages of a drug trial.

The first box gave them a clue as it contained the phrase ‘pre-clinical stage’. This was designed to be the most accessible marking point and the vast majority of students gained this mark.

It was disappointing that few students were able to describe what happens after phase 1, in order for a decision to be made about whether the drug trial could continue to phase 2.
Where candidates did give an answer that gained mp2, it was usually for the identification of side effects. The peer review aspect was rarely mentioned.

It was pleasing to see more candidates correctly linking phase 2 to the given context, which shows an improvement from the June 2019 paper.

Question 6(b)
The students were given information regarding three features of the strawberry poison dart frog. The students were asked to complete a table to show the types of adaptations shown by the frog.
It was pleasing to see that many students could correctly answer this question, with approximately half of students gaining full marks, However, a significant number of students stated that the production of poison was a pyschological or behavioural adaptation, which were not credit worthy.

Question 6(c)
This question continued with the strawberry poison dart frog adaptations. Students were asked to suggest the advantages for the frog of these features.
The majority of students could recognise that the poison or skin colour would deter predators or protect the frog from predation. However, some did refer to camouflage which was not credit worthy.

Fewer students could suggest an advantage to the frog of the adhesive toes. Common answers related to assisting the frog in movement in an aquatic environment or jumping without consideration of the adhesive nature of the toes.

Question 6(d)

This question asked students to suggest how natural selection could have given rise to frogs that can produce poison.

It was pleasing to see that many students had a good understanding of the process. However, imprecision of language or not relating their answer to the given context limited the number of marks that could be awarded.

The most commonly awarded marking point was mp3. Students could clearly explain that the frogs with poison would be more likely to survive and reproduce. Some gained this mark for the converse statement in the additional guidance for the frogs which did not produce poison.

The next commonly awarded marking point was for mp1. Most students were able to recognise that there had been a genetic mutation. However a significant number of students referred to genes instead of alleles and therefore were not able to be awarded mp2 or mp4. Some students referred to a new allele without reference to the given context of poison production.

Mp5 was rarely seen.

Question 7(a)(ii)

This question asked students to give one similarity and one difference in the structures of sclerenchyma fibres and xylem vessels.

This was a very good differentiator.

The majority of students were able to identify a similarity in the structures, with 'dead cells' or 'hollow' being the most common answers given. The most common non credit-worthy responses linked to similarity in function instead of structure or that they both had cell walls.

Fewer students were able to give a correct structural difference. The most common error was to give a difference in function and not structure. Some students also thought that xylem vessels had end walls / sieve plates.

Question 7(b)

This question asked candidates to explain why hemp fibres are a sustainable resource.

It was pleasing to see so many responses demonstrating students clear understanding of this part of the syllabus.

Where students did not gain full marks, it was usually mp2 that had not been awarded.

Question 7(c)(i)

This question gave students information regarding global bioethanol production in 2000 and 2011. Students were asked to determine the global bioethanol production in 2020, assuming the mean rate of increase stays constant.

It was clear that many students were able to calculate the mean yearly increase to gain one mark.

However, fewer students were able to use this figure to calculate the total volume in 2020 and gain mp2.

Where students could do this, they often lost the third mark for either not giving their answer to the correct power of 10 or for not giving appropriate units.

Question 7(c)(ii)

This question was the first levels based question on this paper.

Students were given both graphical and tabular data to analyse. Students were then asked to explain the advantages and disadvantages of using these crop plants as a sustainable resource to produce biofuels.

It was disappointing that many students just gave advantages and disadvantages, without consideration of 'sustainable resource'. This meant they were limited to level 1.
Students who considered advantages, disadvantages and sustainability could access level 2.
Many students recognised that hemp required the least resources out of all the crop plants and were awarded 3 marks.
Some excellent responses then considered the advantages and disadvantages in terms of cost of the resources, land use, eutrophication and impact on biodiversity for example.
These could access the higher mark in level 2 or level 3 marks depending on the depth of their answer.

Question 8(b)
This question asked students to name the solid ball of cells formed after a fertilised rabbit egg cell had divided by mitosis.
It was disappointing that three quarters of students were not able to name the morula.
Common incorrect responses were totipotent cells and embryo.

Question 8(c)(i)
In this question, students were required to describe one form of epigenetic modification.
They had also been given the information that epigenetic modification can alter the activation of certain genes.
It was pleasing to see the majority of students were able to name one form of epigenetic modification, with DNA methylation being the most common answer.
However, fewer students were able to link this to the statement in the question and explain how the activation of certain genes would be altered.

Question 8(c)(ii)
This question tested similar content to a question in the June 2019 paper and it was pleasing to see an improvement in the quality of most answers.
Mp1 and 3 were the most commonly awarded marking points. Where mp3 was not awarded it was for the ommission of {structure/function}.
Some excellent answers included an example of a protein that would be produced to change the cell structure and were also awarded mp2.
A minority of candidates confused the processes of transcription and translation, or did not state the location of translation and therefore lost marks.

Question 8(d)
This was the second level-based question on this paper. Students were given information regarding the genotype and phenotype of three different types of rabbit. They were also given the information that one type of rabbit produces and enzyme that is inactive at the core body temeprature of the rabbit.
Students were asked to use this information to discuss how genes and the environment interact to produce the fur colour of the three types of rabbit.
Some excellent answers were seen that used the information in the table, the information given to them in the question and their own knowledge to give a detailed answer as to why the three rabbits had the different phenotypes.

This question was a very good differentiator with the full range of marks awarded.
Nearly all students could describe some basic information, although there were quite a few that referred to polygenic inheritance.
It was surprising that only a minority of students linked the genotype to protein synthesis.

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.
- Do not try and make a mark scheme you have learnt from a previous paper fit a different question with different context and command words.
- 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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