

Examiners' Report

Principal Examiner Feedback

October 2020

Pearson Edexcel Advanced Level

In Biology (9BI0)

Paper 01 Advanced Biochemistry, Microbiology and Genetics

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Introduction

A wide range of responses were seen for the items on this paper, with all mark points seen.

Candidates have clearly been taught on how to tackle compare and contrast questions and how to address the levels-based questions. Candidates from some centres have also been prepared for this exam using questions from past papers.

Question 1

A range of responses were seen for this question. On the whole, candidates could name the structures in the diagram except for **L,** which was frequently named as the generative nucleus. A number of candidates tried to give actual number of chromosomes in the righthand column, but the actual number given varied.

Question 2

Part (a) performed poorly, possibly because this is the first time that candidates were asked for a definition of this term. Most responses were too vague and along the lines of 'It is forced out of the blood vessel'.

A range of responses were seen for part (b) and many were again too vague and barely above GCSE level. A common reason given for the lower oxygen content in the tissue fluid was 'the oxygen has gone into the cells'. A high proportion of candidates seem to think that all proteins remain in the blood plasma.

Some good responses were seen for part (c). Candidates know that there is a lymphatic system and that the lymph returns into the blood stream. There was some confusion between lymphatic vessels and lymph nodes.

Question 3

A range of responses were seen for each of the components to part (a); candidates either knew the answer or they did not.

A number of candidates did not read the question properly for (b)(i) as we read several descriptions of how to control malaria without any mention of an implication. The two calculations were attempted by most candidates but not all candidates expressed their answer to (c) in standard form, as instructed.

Candidates knew what was expected of them in part (d) but marks were lost by candidates who did not talk about the validation of results, confusing the term validity with accuracy, repeatability etc.

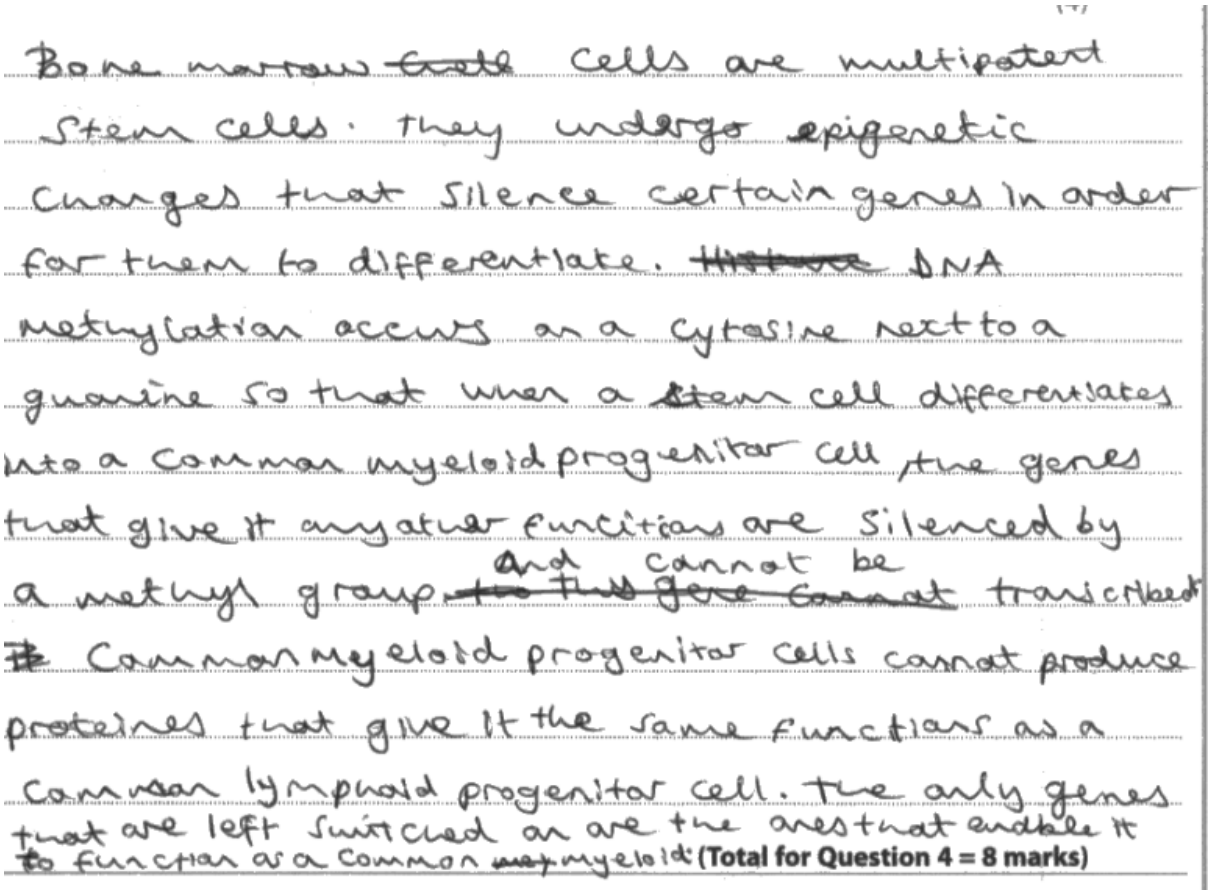
Question 4

Part (a) was answered reasonably well but there were a few candidates who expressed the ratio the wrong way around and opted for distractor **B**.

Candidates understood what was asked in part (b) but marks were lost by candidates who did not explain that it is the proportion of erythrocytes to leucocytes that is important and not just the number of leucocytes.

Candidates found part (c) a challenge. The only marks that were really awarded were the first two.

The response below is one of the better ones that we saw.



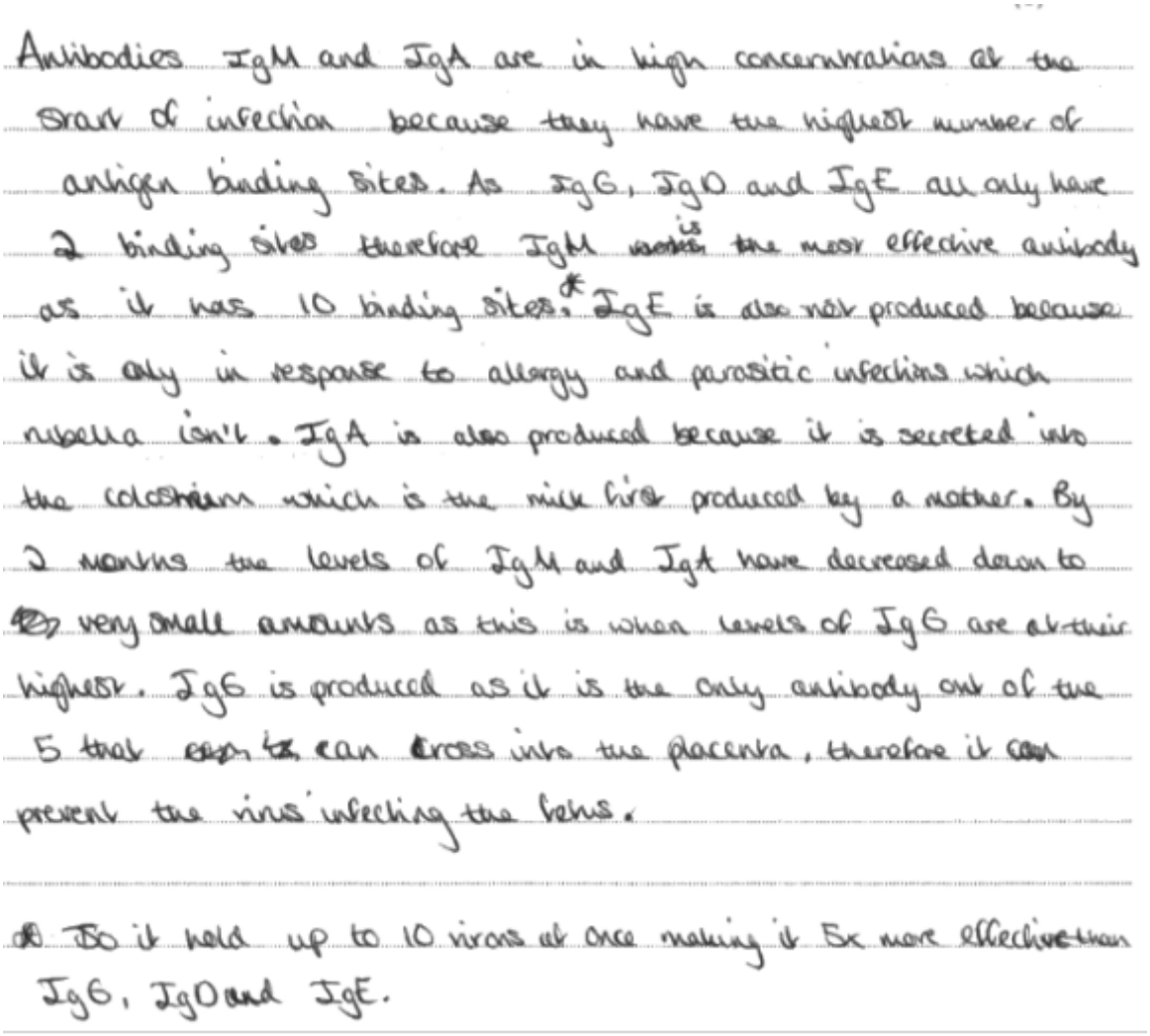
Bone marrow ~~stem~~ cells are multipotent stem cells. they undergo epigenetic changes that silence certain genes in order for them to differentiate. ~~this~~ DNA methylation occurs on a cytosine next to a guanine so that when a stem cell differentiates into a common myeloid progenitor cell the genes that give it any other functions are silenced by a methyl group and cannot be ~~so this gene cannot~~ transcribed ~~It~~ Common myeloid progenitor cells cannot produce proteines that give it the same functions as a common lymphoid progenitor cell. the only genes that are left switched on are the ones that enable it to function as a common ~~may~~ myeloid: **(Total for Question 4 = 8 marks)**

Question 5

Part (a) was the first of our two levels-based questions on this paper. Many candidates realised that they needed to refer to both the table of information and the graph, and the more able candidates wrote about all five different antibody classes. However, few candidates picked up on the 'assess' command word and did not go much further in

their accounts than to describe the information. Many responses were limited from scoring well due to the terminology used that did not relate to immunity. For example, there were lots of vague references to 'protecting the baby'. Very few candidates realised the significance of IgD being located on the surface of the B cells.

The response below is an example of a level 1 response as the candidate has made descriptions only except for the explanation that IgE is only involved in allergies and not viral infection.

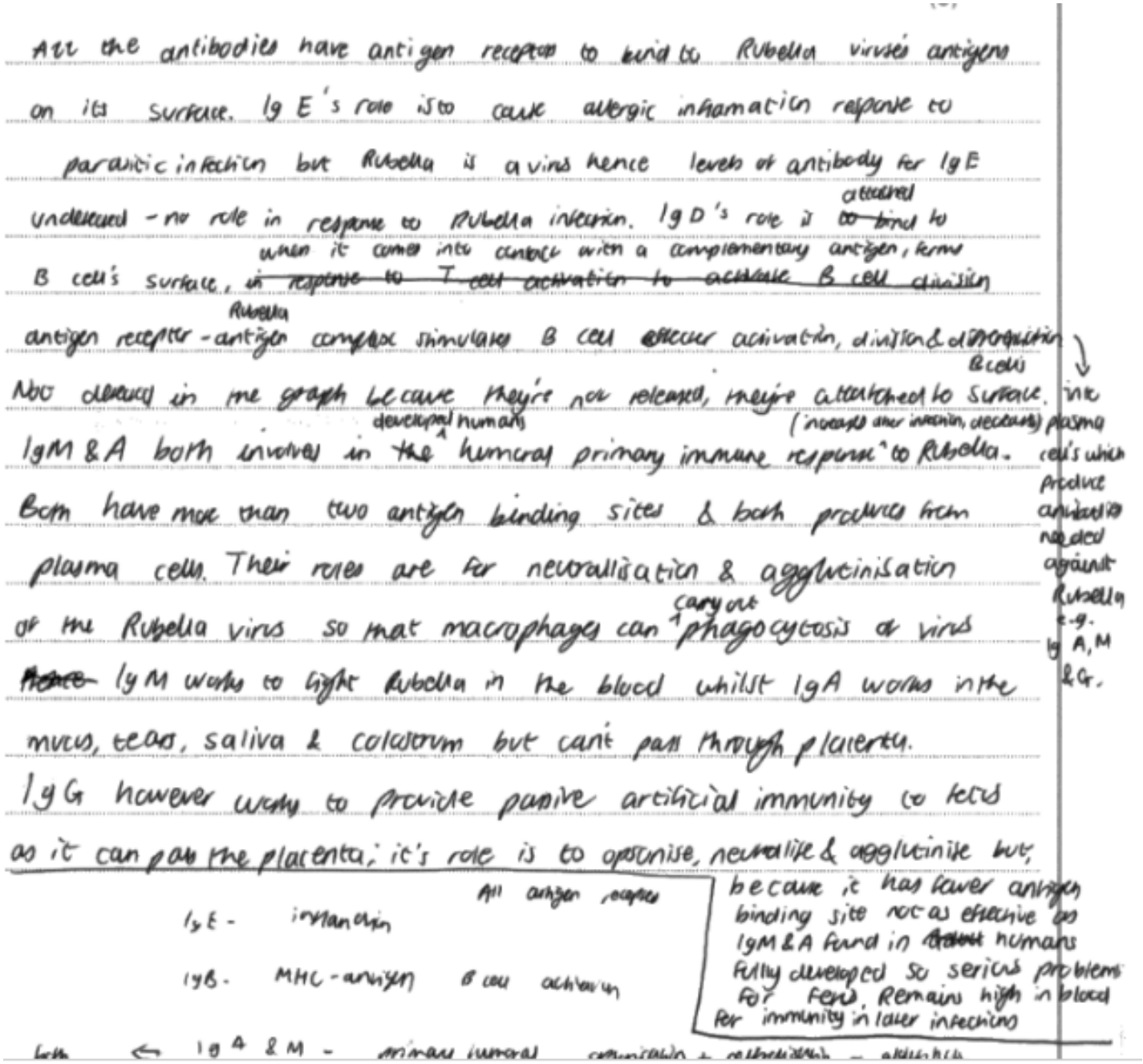

Antibodies IgM and IgA are in high concentrations at the start of infection because they have the highest number of antigen binding sites. As IgG, IgD and IgE all only have 2 binding sites therefore IgM is the most effective antibody as it has 10 binding sites. IgE is also not produced because it is only in response to allergy and parasitic infections which rubella isn't. IgA is also produced because it is secreted into the colostrum which is the milk first produced by a mother. By 2 months the levels of IgM and IgA have decreased down to very small amounts as this is when levels of IgG are at their highest. IgG is produced as it is the only antibody out of the 5 that can cross into the placenta, therefore it can prevent the virus infecting the fetus.

It can hold up to 10 virons at once making it 5x more effective than IgG, IgD and IgE.

The response below is a level 2 response. The role of classes G, A and E have been described. The comment about IgD is a bit too vague.

~~For first~~ While the fetus is developing, IgGs can cross through the placenta so the baby will have some natural passive ~~immunity~~ immunity when they are ~~born~~ born so IgGs has a large role in response to rubella as none of the other 4 can cross the placenta. After infection, the first two antibodies to be produced in high concentration are IgM and IgA. However, only IgA can pass through the colostrum to the baby so IgA has a larger role for a fetus. It has 4 binding sites so may be better at agglutinisation than IgG, IgD and IgE. IgE ~~has~~ is least involved in response to rubella as it is involved in allergy and parasitic infections and rubella is a virus ~~that it make~~ IgG levels increase after the infection so do not play much role in the primary response but levels increase and stay high after 1.5 months for at least 4 months so have a bigger role in the secondary response. It allows adults to only have a mild secondary infection of ~~the~~ immunity. IgD is involved in the humoural response as it is a B lymphocyte so has a role in ~~the~~ immunity in secondary ~~infection~~ response.

A level 3 response is shown below. This candidate has discussed the role of all three antibody classes in the immune response.



In the responses to part (b), we saw the first- and third-mark point but rarely awarded the second point due to poor wording; the fact that there were fewer people infected was not stated, as illustrated above.

This will cause herd immunity. This means the virus will not be able to spread as much so people without the vaccine won't be infected. ~~Loss people will be infected so it~~ won't Less likely for pregnant women to get it so the fetus won't be infected.

Question 6

Candidates who had learnt the structure of the types of virus listed in the specification scored well on these three MCQs.

The estimates for part (b) were disappointing. There were a number of candidates who did not make a realistic estimate of the proportion of cases caused by norovirus and there were other candidates who did not appreciate that their answer had to be a whole number.

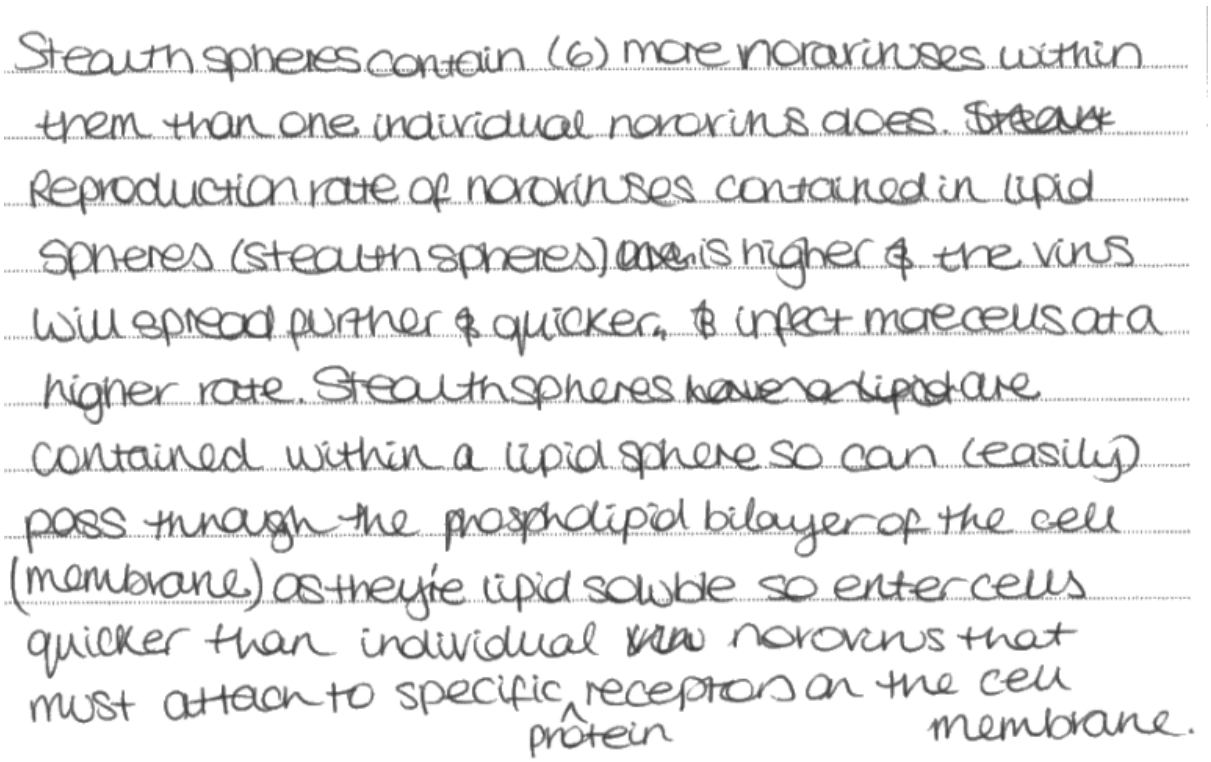
Part (c) was answered in a number of ways. There were candidates who knew about the electrolyte imbalance resulting from food poisoning and focussed on this in their response and there were a significant number of candidates who thought that an RNA virus is a retrovirus and behaves like HIV. As a result, we saw lots of accounts of the formation of a provirus.

The example below is along the lines of what we were looking for.

RNA virus enters cells by binding onto receptors on cell membrane. viral RNA will replicate when it is inside the cell and new viral proteins will be produced. This produces new viral particles which will cause the cell to lyse. viral particles will pass out of the cell and go on to infect other cells.

In (d)(i) there are three possible reasons that a stealth sphere could cause the development of gastroenteritis to be slower and the symptoms to be milder. Although we saw all possibilities identified, we rarely saw all three identified in any one response. Explanations were rarely linked to the slower development or the milder symptoms.

The response below scored full marks.



Responses to (d)(ii) were quite vague. A number of candidates stated that the stealth sphere could be targeted but did not specify that the lipid would be the target molecule. The third mark point was the one most commonly seen but full marks were rarely awarded.

This response is one of the few responses awarded full marks.

used to treat these infections.

(2)

An enzyme that digests the lipid sphere can destroy the stealth sphere. This takes away a barrier of protection so immune cells can more easily detect the antigens/the virus and produce the right antibodies

Question 7

The MCQs in parts (a) and (b)(i) were answered well.

Part (b)(ii) caused the majority of candidates a problem; few candidates thought about the information given in the flow chart and to then use it, together with what they had been taught. A common suggestion was that oxygen was needed to hydrolyse the lipids. Another suggestion was that ATP was needed to hydrolyse the lipids.

Part (c) also scored poorly. Very few candidates appreciated that the hydrogen ions are significant in ATP production and that the higher hydrogen content of lipids will generate more ATP.

Part (d)(i) scored well.

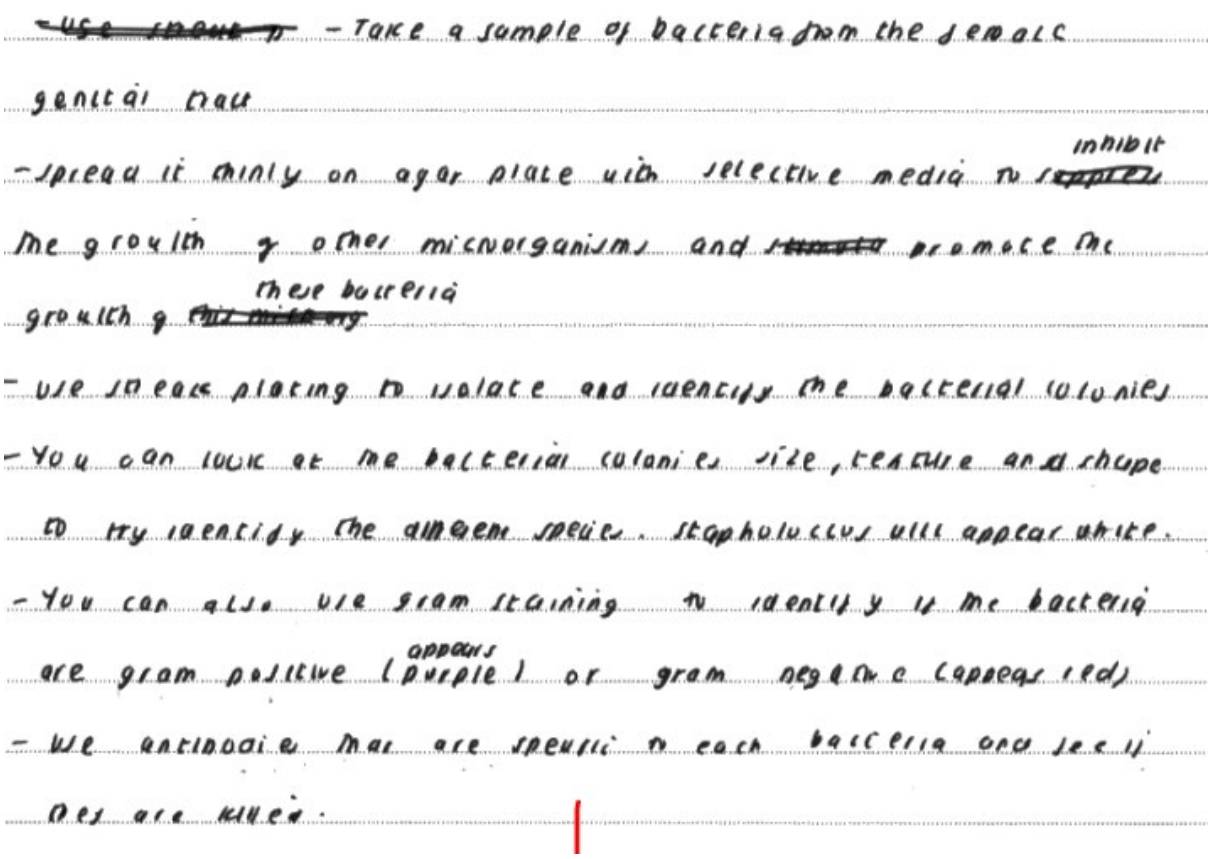
The calculation in (d)(ii) yielded a range of answers. A number of candidates lost a mark because they expressed their answer to an inappropriate number of significant figures.

Part (e) did not yield many responses with full marks. The only mark that was frequently awarded was the third one.

Question 8

The question asked in part (a)(i) is not dissimilar to one asked earlier in the series, so those candidates who had used past papers in their preparation for this exam scored well.

This response was awarded full marks:



Part (a)(ii) was answered reasonably well, with all four-mark points being seen.

Compare and contrast is a command word that centres, and therefore candidates, are becoming more familiar with; more responses are including both similarities and differences and are writing paired statements and not two descriptions. However, there was lots of confusion about what a hexose sugar and a pentose sugar is, with many candidates thinking it refers to the number of sides on the ring structure and not the number of carbon atoms.

Candidates scored reasonably well in part (b)(ii). Candidates should be referring to ATP at A level and not just energy.

Question 9

The marks assigned for an explanation of photosynthesis being reduced if water was not available were frequently awarded. However, full marks were rarely awarded as not many candidates thought about the effect of drought on transpiration and the subsequent lack of mineral ions.

This is an example of one of the better responses seen:

(5)

Wombats are primarily herbivores & feed on plants. Plants require water. Drought's little water available for photolysis in photosynthesis to synthesise glucose for cell walls decreases rate of photosynthesis & Calvin cycle. Hence decreases plant quality & quantity. Less water means less transpiration & uptake of mineral ions e.g. NO_3 for plants proteins & Ca^{2+} for middle lamellae so decreases quantity & plants more prone to disease decreases plant quality of grasses & leaves so wombats have less food.

The calculation in part (b)(i) did not cause too many candidates a problem.

Part (b)(ii) was the second of our levels-based question and scored higher than the one in question 5. In this question we expected the candidates to work down through the table explaining the effect of drought on each measurement. A number of candidates picked up on this but some of the explanations were weak, just repeating the stem of the question that the quality and quantity of food was low.

This response is an example of a level 1 response as it only describes the information given in the table.

As the months of drought increased the body mass decreased. This then lowered the water potential increasing the mineral ion content in the stomach of the wombat ~~as the~~ as the plants had less water. The moisture of the faeces

This is a level 2 response as there are a couple of explanations given for the change in measurements.

As drought progressed we see a decrease in body mass, organic matter in stomach, and moisture content of faeces. These results all indicate a reduction in resources for food. Low calorie diet causes body mass to decrease and organic matter in the stomach to decrease. The moisture content of the faeces dropping during drought suggest dehydration, which will also impact on body mass as wet mass is reduced. Mineral content increase as the body becomes more concentrate with reduced hydration levels. The body of the wombat may also be trying to reserve valuable resources.

However, after 2 months of rainfall we see an increase in BCI (body condition index) from 0.76 to 0.85. In addition body mass, organic matter in stomach and moisture content in faeces all increase. The mineral content also returns to a lower concentration. This suggest cause- and - effect between the drought and measurement of wombats health and BCI.

A level 3 response is shown below.

As the drought progresses, the BCI of the wombat decreases. This means the longer the drought goes on, the poorer the health of the wombat will be. After rainfall however, the BCI increases, most likely due to a more plentiful and nutrient rich food supply. Organic matter in the stomach also decreases through the drought, due to less available foliage and scarce food supply. The moisture content of the faeces also decreases, from 815 g/kg before the drought to 522 g/kg 14 months in: a 35.9% decrease. This shows that more moisture is being retained rather than excreted, as water supply is limited then it is important to conserve as much of the moisture as possible. However, all of these factors are seen to be recovering to normal levels after rain. This shows that overall the wombats can adapt well to survive in drought conditions, but are able to return to their normal functions when rainfall occurs.

Summary

A few suggestions for improving candidate performance are listed below.

- A greater focus on teaching the maths skills is needed by some centres, especially in teaching candidates how to decide on the number of decimal places or significant figures that they should use in their answer
- Candidates should be encouraged to show all their working in calculations worth more than one mark.
- As the number of past papers increase, these should be used for preparing candidates and to illustrate the depth of knowledge and the terminology that we expect in an answer
- Centres need to continue to emphasise how a compare and contrast answer should be written to access full marks. Both similarities and differences are expected, and marks are not awarded by piecing together two descriptions.
- Candidates need to be taught how to use the stem of a question to help them identify what is needed in their responses. Frequently, early question parts are used as clues for the later question parts. This was particularly the case in question 7 where parts (c) and (d) were trying to get candidates to think about the greater yield of ATP from the respiration of lipids than carbohydrates as clues for part (e).
- Candidates should be encouraged to consider what might be expected of a level 1, 2 and 3 response in our levels-based questions, to help them plan their response to fully answer the question. This includes identifying the command word used, the component parts of the question itself and how many sources of information are given in the question to be used.

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