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Examiners' Report  
Principal Examiner's Feedback

January 2022

Pearson Edexcel International Advanced Level  
In Biology (WBI14) Paper 01  
Energy, Environment, Microbiology  
and Immunity

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## Introduction

We saw a wide range of responses from candidates, with some really excellent responses from the more able candidates. The MCQs generated a range of responses as did the calculations. The two levels-based questions did generate some level 3 responses, but candidates still need schooling on how to structure their responses to access all six marks. A vast number of centres are using our mark schemes and examiners reports to prepare their candidates; this is evident in the answers where mark points have appeared on previous mark schemes.

## Question 1

This question was supposed to be the most straightforward on the paper but a surprisingly high number of candidates struggled with it, even the two MCQs. In part (c) only the more able candidates used the mark allocation to appreciate that they had to make two points. The less able candidates either repeated the information we had given them about producing metabolic water or talked about the insulating properties of the fat or suggested that the polar bears could not drink the water as this would frighten away the seals.

In (d) a very high proportion wrote detailed accounts of speciation resulting from mutations and increased genetic diversity. The question asked about genetic diversity in polar bears; if speciation had occurred they would not be polar bears anymore.

## Question 2

Being asked to draw the action spectrum caused some candidates problems, presumably because they had not fully-understood the topic, but there were some very carefully drawn graphs which easily scored both our marks. The calculation was generally well done except by those candidates who tried to express their answer as a percentage. In responses to (a)(iii) far more candidates were referring to the 'absorbance' of light than in previous series which was very encouraging. However, we did see very lengthy responses which must have used up valuable time in the exam. Candidates need to appreciate that if there are only a couple of marks available for a question, then they do not need to write essays on the topic.

The MCQ in part (b) saw a number of candidates opting for distractor B which was surprising. A number of candidates could tell us that amino acids were made from GALP and nitrates but again, we saw lengthy accounts that included detailed descriptions of the Calvin cycle.

### Question 3

Candidates clearly know the HIV infection process; we saw several detailed accounts in part (a), which unfortunately were not answering the question asked. However, the majority of these candidates did go on to explain how the immune system was weakened so scored a high proportion of the marks but must have wasted invaluable time. Again, it was apparent that our comments on candidate performance are helping centres prepare their candidates as there were fewer references to the 'killing' of viruses and 'B cells' producing antibodies.

Responses to part (b) indicated that candidates know the role of reverse transcriptase and integrase enzymes. Marks were lost by those candidates who did not make it clear which enzyme was involved with which process or by candidate who wrote that the RNA was converted into DNA, implying that the RNA molecule is broken down and the component parts used to make the DNA. The last two parts to this question showed a range of responses, with very few blank responses. However, it was clear that candidates do not understand how the HIV transitions from being a provirus into the lytic cycle; we saw a number of responses where candidates said that existing viruses incorporated the DNA copy into the host genome and then replicated, bursting from the cell.

### Question 4

The MCQ was answered incorrectly by a number of candidates. The most commonly seen incorrect distractor was C but it was obviously impossible to tell which statement candidates thought was wrong.

Part (b) generally caused few problems except for candidates who gave generic responses and did not use the context of the question in their answer. Very few stated that RNA was injected into the *E. coli* which was refreshing.

Part (c)(i) was probably the easiest question on the paper and did not cause any problems except to candidates who said that sugar was used to 'produce' energy. However, only a very limited number of candidates realised that that question had been included as a clue to access full marks in the levels-based question that followed.

A high number of candidates have a good understanding of the evolutionary race concept and we saw several level 2 responses. Some of the common errors and misconceptions included: generic responses that did not refer to *E. coli* and  $\lambda$  phage, describing mutations to the slime capsule which we felt went beyond the scope of the question, descriptions of  $\lambda$  phage incorporating its DNA into that of the *E. coli* and describing viral and bacterial division as mitosis.

## Question 5

Part (a) clearly surprised candidates as they clearly had not thought about the structure of mitochondrial DNA. We saw lots of responses that suggested it was a single stranded molecule, which was surprising as they will not have some across this unless mentioned in the teaching of virus structure. The most frequent correct comparison was that of shape, circular versus linear. Some of the more able candidates commented on the unbound phosphate groups or realised that there would be fewer phosphodiester bonds.

Generally, part (b) was answered well. Candidates could name at least two molecules needed in PCR and there were a number of candidates who gave all four of our options. The calculation saw a number of answers of 1.38. The explanation of how the process shown in our diagram scored well provided the candidate used the temperatures shown and did not simply write everything that they had been taught about PCR. Another example of where the context of the question must be incorporated into responses.

Candidates know that gel electrophoresis can be used to study genetic relationships and they know details of the process. This was another example of candidates writing far more detail of the process than needed. What was evident was that centres are drumming it home that 'bands' must be compared. There were a few responses to identifying common ancestors, but this was not quite answering this particular question.

## Question 6

This question started with 5 MCQs, which were quite discriminating with the exception of the fifth one.

Part (b)(ii) was very poorly answered, and this was not due to the command word used; candidates are clearly being taught how to answer a compare and contrast question. Marks were lost due to inaccurate reading of the graph, particularly the cross-over temperature. There was a high proportion of candidates stating that this was  $16^{\circ}\text{C}$ , when the lines clearly cross to the left of this temperature. The temperature values given for the two optimums were also inaccurately stated, even though we allowed a generous range of values to be accepted. The question about  $Q_{10}$  divided candidates into three. Some candidates clearly knew what was meant and could describe how to determine it, albeit using an actual example in their response. Other candidates thought that tangents had to be drawn for each line and subtracted. Others simply left the question blank.

Although just about every candidate could tell us that Wheatland would be the most likely region for the growth of *Spartina*, only a few realised that this was because the temperatures were higher here throughout the whole of the year. Most candidates just focussed on the optimum temperature in their explanation. A number of candidates did not link the reason into enzyme

activity either which was a little surprising as we have asked temperature-related questions on a number of occasions in previous series.

### Question 7

In part (a), the majority of candidates could define the terms population and sustainable, but weaker candidates did not relate their definition to the context of the question.

Part (b) saw some very detailed descriptions of how greenhouse gases cause global warming. However, the focus on food production was over-looked by a number of candidates, although we had several graphic descriptions of methane production by cows.

A wide range of values were seen for this three-mark calculation, although a significant number did score all three marks. A number of candidates correctly calculated 71% of 149 million but did not divide it by two, others did the calculation using 71% of 149 and then did not add the million back into their answer, others did not express their answer in correct standard form. In part (iii) a number of answers used the correct values but did not express them as a ratio.

The responses to our second levels-based question were on the whole very disappointing. In previous questions we have commented that candidate do not use the data we supply them with and only write what they know. In this question we asked them to use their knowledge in their answer, but the vast majority of candidates only described what the graph was showing, limiting themselves to three marks.

### Question 8

From previous papers we know that candidates clearly know a lot about the 'dead body' section of the spec, and this series was no exception. We saw some very detailed responses.

In part (a)(i) we saw some good explanations of why forensic entomology was accurate after 72 hours and we saw some excellent explanations of why other methods were not accurate after this time period. However, not all candidates gave an explanation for both in their answer; another example of where the mark allocation needs to be considered before responding to a question. In the second part of (a) many candidates could tell us that there would be different insects present but did not state that different species are found in different habitats. A proportion related the differences to temperature differences and stages of life cycle.

In (b)(i) a number of candidates could tell us that the cage was there to prevent other animals from eating or moving the body, although a number of candidates thought it was to keep the temperature constant. The calculation itself did not cause problems, but again marks were lost for values not being read from the graph accurately enough. Responses to (iii) were a little disappointing as there

were a number of candidates who did not use the forensic entomology theme of the question and simply described microbial decomposition. Others did not reference the time points or temperature changes shown in the graph and wrote what they knew, without relating it to the question. Most candidates could tell us that eggs were taken back to the lab to identify the insects that laid them but did not mention the term 'species' which we felt was important. Despite it being the last question on a long paper, candidates had a good go at part (v) and used the information in the table to illustrate their answer.

## Summary

A few suggestions for improving candidate performance are given below.

- Candidates need to take notice of the mark allocation for each item to help them decide if they have written enough points to be awarded that many marks. Conversely, to avoid writing too much detail and as a result the risk of running out of time.
- Candidates should write their answers using the context of the question, avoiding generic responses.
- Candidates should consider the questions asked in the early question parts as they are quite often trying to give a clue as to what is expected in the latter question parts.
- Candidates should always read through their answers very carefully as it is easy to make some silly mistakes under the exam pressure. They should think about each word used and make sure what they have actually written is what was meant to be written. This goes for calculations too where it is easy to press the wrong button.
- In levels-based questions, before you start writing, identify the command word and then each component in the question. Each component must be addressed if you are to access the higher-level marks. If there are graphs and tables, they should each be written about. If you are told to use your own knowledge, then you must do so.
- Any information given in a question is there for a reason, albeit in a table, a graph, a diagram or in the text of the question, so make sure it is used.

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