Examiners' Report
Principal Examiner Feedback

January 2023

Pearson Edexcel International Advanced Subsidiary Level in Biology (WBI11) Paper 01 Molecules, Diet, Transport and Health

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.

Item 1a:

This was generally very well answered by the vast majority of students.

However, the most common errors were

- to give full charges to the atoms (+/-) instead of partial charges (δ^+/δ^-)
- to show 2 oxygen atoms and 1 hydrogen atom in the water molecule.

Item 2a:

Many candidates recognized the fibrous nature of collagen and commonly were able to state the triple helix nature of the molecule, while some described the 3 chains wound round each other. In the better responses, candidates noted that hydrogen bonds held the chains together, but in some less clear examples this was not made clear enough with an ambiguous statement which could easily be interpreted as being between amino acids. The very best responses referred to the repeating sequence of amino acids, or to the high proportion of glycine or proline, with some actually referring to glycine being repeated as every third amino acid.

Item 2bi:

Those drawing a tangent correctly touching the curve at 30 minutes generally were able to score both marks by also giving an answer for the rate within our acceptable range. Pleasingly, many candidates were able to do this, however, in a number of cases, for example:

- a tangent was not drawn accurately, thus only gaining mp1 in most cases
- instead of a tangent a line was drawn across to the curve from the y-axis and then dropped to the x-axis and a value read from the x-axis which would be incorrect, thus not gaining either marking point.

There were also a small number of blanks for this question.

Item 2bii:

Most candidates were able to score a mark for correctly stating that the substrate binds or fits the active site, but a sizeable number merely stated that these were complimentary, which is not enough for the mark. However, some

easily picked up this mark by referring to an enzyme-substrate complex being formed. Again, most picked up a second mark for the idea of activation energy being lowered by the protease. These were the most common marks.

Only in the best responses did we see references to breaking peptide bonds and hydrolysis. A small number mentioned other types of bonds being broken, such as hydrogen bonds and disulfide bonds.

Item 3a:

Students most commonly referred to the thick or sticky mucus being formed and that this reduced the air flow in and out of the lungs. A smaller number were able to state that the FEV would improve if the treatment was working (or the converse statement).

Many candidates failed to realise that this question was asking why we used a change in **mean** FEV for this investigation. Only a few of those who did realise this were able to state that the validity of the investigation increased, while many of them referred to accuracy instead.

Very few stated that different people had different FEV's, again because they did not realise that the question was asking about the mean FEV being used. It is very important to read the questions carefully.

Item 3b:

Many candidates were able to state that the results for individual drugs were not shown. However, many failed to score a second marks as they made no reference to a comparison being made with the combination of 3 drugs. Only a minority of students clearly pointed this out. Hardly anyone referred clearly to there being no indication of what the nature of the control was.

Item 3c:

In the clearer responses, a good number of candidates referred to the idea of cystic fibrosis being due to a number of mutations, or to different symptoms or organs being affected. However, there were very few who considered the CFTR protein being affected in different ways.

Item 4bi:

Extremely well answered by the vast majority of candidates.

Item 4bii:

Also well answered by a majority, but some candidates showed incorrect rounding, thus failing to score the mark.

Item 4biii:

The majority of candidates were able to state that atropine increased heart rate while propranolol decreased the heart rate. However, less referred to this increase or decrease in heart rate being the case no matter which order the two drugs were given.

Only in a smaller number of very good responses were found references to either regime resulting in the same overall heart rate. Some managed this by referring to the final day 8, but some failed to score this mark by referring to day 7, which is not the overall time.

Only a very few responses made any suitable comment on error bars.

Item 5aii:

The most common points made were about salts, alcohol, or saturated fats, with less responses referring to fibre or energy content. Many responses made one good point but failed to capture the marks as their second choice was not suitable. Some responses had made only one point, leaving the second line blank, perhaps not realizing that two points were required for the mark.

There were plenty of references to non-dietary changes, sugar, sodium, and cholesterol etc.

Item 5bii:

Each of the three points were seen in the variety of correct responses seen with the majority of responses achieving at least 1 mark and a sizeable minority achieving two marks.

Item 5biii:

Most candidates were able to explain that this investigation was looking at the effect of diet on development of CVD, however a common error was to omit reference to development. There were a good number of references to the women developing the disease but failed to refer to the idea of therefore being at risk. Only those who recognized the risk factor achieved this mark.

There were also a reasonable number of references to validity of the data or investigation, but this point was lost in a fair number of cases due to failing to refer to the investigation or data, or by referring to reliability or accuracy instead of validity.

Item 5c:

A common practice with this question was to describe how saturated fats actually resulted in more cholesterol and more plaque, atheroma's or blood clots etcetera.

However, of those who did describe in terms of a low saturated fat diet, many were able to score for less cholesterol in the diet and also for less plaque or atheroma's being formed, but very few references to less blood clots. Only in the best responses did we see any reference to less blocking of the coronary artery, with many just referencing arteries in general. Very few scored on the last point of blood continuing to flow to heart cells or heart muscle or heart tissue, to finish off the answer.

Item 6aii:

The best way to answer this type of question is with statement such as laid out in the mark scheme, for example both have …….. or the FM model has ……. But the DD model does not.

The best responses were in this fashion, but many responses, although stating what both had, failed to clearly state the differences in categoric statements. So, although a good number were able to score 3 or 4 marks, many were restricted to 1 or 2 marks.

Item 6bi:

Most responses that scored marks here did so for referring to movement of substances in or out of the cell and by referring to the consequences e.g., shrinking or bursting of the cells or less often, to not maintaining ATP levels or oxygen for respiration.

There were few references to not being able to maintain gradients and very few references to loss of cell recognition or adhesion or membrane embedded molecules. This was quite a low scoring question in general.

Item 6bii:

A good number of responses referred to the ability of phospholipids to move, but instead many responses talked about the membrane or bilayer moving rather than stating clearly that the fluid nature was due to the phospholipids in the membrane.

Attaining the second mark proved more difficult for the majority as many just repeated the question stem by saying that the phospholipids just fused together, rather than saying that they interacted or bonded or interacted hydrophobically etc. There were a number of students who referred to the phosphate heads bonding, which is not acceptable.

It was good to see a few responses which referred to vesicles fusing with the membrane in order to join it.

Item 6biii:

Many students found this question testing, but there were a reasonable number of good responses scoring mainly for more phospholipids, proteins or cholesterol needing to be made. Fewer mentioned the need for these new components being added to the membrane. Fewer yet referred to the need for increased respiration or ATP synthesis.

Item 7a:

Very well answered in general.

The most common errors were to refer to a glyceride and 3 fatty acids, or just to refer to 3 glycerides. The vast majority referred correctly to esters bonds, but a tiny minority mis-named the bond or omitted the bond.

Item 7b:

This was well answered with the majority attaining 2 marks at least.

Many were able to state that large lungs would take in a large volume of air or that more oxygen was taken in. There were also plenty of good responses stating that there would be **more** alveoli for gas exchange or a large surface area for **more** gas exchange. Some examples, however, failed to give the idea of more alveoli or gas exchange and thus did not claim the mark.

Those who referred to the large heart mostly claimed this mark, but again many omitted a reference to **more blood** being pumped by a larger heart.

Fewer candidates managed to score the point about supplying cells with **sufficient** oxygen, but some did achieve this by referring to meeting metabolic demands. There were very few references to supplying more blood to maintain body temperature.

Item 7cii:

This calculation was achieved most of the candidates scoring at least 1 mark for the correct sphere volume and many of them scoring both marks by calculating the correct ratio, which was pleasing.

Some errors were to use a value of 16 for the sphere radius in the formula, but an ECF was built into account for this and award a mark.

Item 7ciii:

This question produced a whole range of marks from 0 to 6.

A good number of candidates used the information well and achieved higher level 2 or above, but many made only very simple comments about one, two or three of the characteristics with some very vague statements and connections, thus limiting themselves to level 1 or to lower level 3.

Indeed, there were some responses referring to a thick layer of fat, large lungs or a large heart, despite the question clearly asking them to discuss why the blood of the Yaks allowed them to live at high altitude. To achieve the marks candidates had to choose the adaptations to discuss from the information provided.

To achieve higher level 2 or to reach level 3, candidates had to provide more extended comments and links and the discussions had to be very clear and cover all 4 possible characteristics to reach level 3. There were some extremely good responses which achieved this.

Item 8a:

Many of the candidates were able to express that both alleles are expressed or are equally dominant to achieve the second marking point about dominance, however a good number of responses did not express this clearly, saying rather that both alleles are dominant.

Fewer candidates scored the phenotype marking point which needed them to state that the phenotype or blood group of individual 3 was different from either parent, i.e., individuals 1 and 2.

Item 8b:

The vast majority of candidates were able to score two marks for showing the genotypes of parents (individuals 1 and 2) or the genotypes of their gametes and also going on to show the genotypes of their offspring.

The very best responses were able to go on and clearly show the corresponding phenotypes (i.e., blood groups) of these offspring and the appropriate ratio of these phenotypes to score all 4 marks.

However, in some cases, step 3 was missed out by not identifying MM as blood group M, MN as blood group MN and NN as blood group N, but giving the correct ratio of blood groups, thus achieving 3 marks.

Those who achieved two marks only gave the ration of genotypes instead of identifying phenotypes before matching these to the ratio.

Despite the key in the diagram giving the appropriate letters to use, many candidates ignored this and gave other letters which could be given credit, but some also chose to use X and Y as if this was an example of sex linkage.

Although a minority, there were a fair number who did not understand how to properly set out a Punnett Square and were too confused to achieve a mark or to achieve more than 1 mark.

Item 8ci:

A good number of candidates were able to state that there were both proteins on the surface of the red blood cells for marking point 1, but not all were able to state that both alleles were present or that individual 3 must be heterozygous for marking point 2.

Very few responses carried on to state that both genes would be transcribed and translated.

Item 8cii:

Making very simple comments only about substitution, insertion or deletion mutations here would keep candidates in level 1 with a mark of 1 or 2.

Candidates who extended these comments to discuss these mutations further and give extended comments and links could gain the higher levels, for level 2 this required further discussion of the effects of one or more of these mutations and how this affected the protein formed **OR** the phenotypes. This would allow them to achieve level 2, with a mark of 3 or 4.

Those who discussed the effects of one or more of these mutations further, but included discussion of the effect of the protein **AND** the effect on phenotype would achieve level 3, with a mark of 5 or 6.

While the best responses were from candidates who discussed substitution mutations and / or deletion and insertion mutations, some simply referred to mutation in a general sense and attempted to state the general effect that this would have on a protein, thus limiting the value of their response.

Summary

A few suggestions for improving candidate performance are given below:

- Candidates should avoid repeating information in the stem of the question in their answers as this will not gain marks.
- 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.
- 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 check the command word for each question before attempting their response. In particular, if the command word is 'explain, then they need to make sure that some science has been used some science to say why something has happened. Their answer should include terms like: because, therefore, as a result, so. Appendix 7 in the specification lists all the command words and their meanings.
- 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 must be used in the response.
- Maths skills as outlined in the appendix should be practiced and in particular candidates need to be able to convert one unit into another, write a ratio in the form x : 1, express a value in correct standard form (only one digit to the right of the decimal point), round up values to a given number of decimal places or significant figures and work out percentages.