AS LEVEL
BIOLOGY

7401/1
Report on the Examination

7401
June 2018

Version: 1.0

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General comments

Many students struggled to express their ideas in clear, concise, scientific English. This is reflected in the mean score on this paper being less than half marks (30.4), with the highest score being 71, and the lowest being 0.

The papers now include more guidance to help students, such as 'use your knowledge of water potential…' in question 02.3, and 'do **not** include descriptions of transcription and splicing in your answer' in question 07.3. These instructions seem to have been completely ignored by many students who, consequently, often failed to do what was asked of them in the question.

Many students struggled to select specific sections of knowledge to answer questions succinctly. As a result, there was often a lot of irrelevant material to read through before students finally included some credit-worthy material in the last line or two.

The number of answer lines per question was increased somewhat on this paper. The aim of this increase was to reduce the number of additional pages students have been prone to use in the past; it was not an indicator that students were required to fill every line with text.

Many students struggled with the questions testing mathematical skills. There was little evidence of students' understanding of statistics, and many failed to demonstrate knowledge at an appropriate level.

Every marking point on the mark scheme was seen within the range of student responses.

Question 1

Questions 01.1 and 01.2 were designed to assess Assessment Objective 1 and expected recall of basic knowledge. Question 01.1 allowed students to score well, with just over 50% of them scoring all three marks, and 93.3% scoring at least one mark. Question 01.2 was less well answered with only 31.6% of students scoring the mark.

Question 01.3 tested practical drawing skills that students should have acquired, and there is guidance for drawing in the practical handbook. This was poorly answered, with just 2.4% scoring all four marks. Most drawings were sketches, and did not look similar to Figure 2, despite the question asking students to draw the mitochondrion shown. The question also asked students to label the matrix and a crista. Very few did, and most did not include a scale of any sort.

Question 2

02.1 was a question requiring recall of a definition from the specification. Almost 60% of students gained the mark; those who failed to score only gave the first part of the definition, i.e. it is a small unit. Many students also used simpler descriptive words, such as 'building blocks.'

Question 02.2 required a similarity and a difference; students generally performed well with the similarity, but failed to give a difference, with answers such as "lactulose contains fructose". Students must state the actual difference when asked, e.g. lactulose contains fructose but lactose contains glucose.

Question 02.3 showed that many students do not understand high and low water potentials, confusing the two. Also, many students thought water moved from the lactulose solution into faeces, thereby showing a lack of understanding of water movement by osmosis. Only 28.6% scored two marks.

In question 02.4, students did not show an understanding of how to use standard form, with many choosing to ignore it. Only 12.2% of students scored two marks, and 77.9% scored zero. A common error was to base the calculation on the lower range of H^+ concentration.

Question 3

Question 03.1 required students to draw a diagram that is included in the specification. Just under half (46.3%) were able to do this successfully. The main issues were bonds drawn in the wrong place, and the use of the word pentose, rather than deoxyribose. Most were able to recognise that it was supposed to be a pentagonal molecule.

Again, 03.2 should have been simple recall of knowledge; however, only 9.2% scored two marks. Features were simply described and not explained. Students did not give the idea that the hydrogen bonds between bases were weak or easily broken, and, for mark point 2, most students said there were two strands, so one acts as a template, rather than both being templates.

32.3% of students scored the mark for question 03.3, with many appearing simply to guess, as demonstrated by no working appearing on their scripts.

Question 4

Questions 04.1 and 04.2 revealed very poor spelling of key terms. 31.7% of students scored two marks on 04.1 and 16.7% scored two marks on 04.2. Common errors included W and X being referred to as the inner and outer membranes, and the capsule being labelled as a capsid. In 04.2, several students gave the functions of the parts, rather than naming the main biological molecule. For X the most common answer was cellulose.

04.3 was reasonably well answered (57% of students gained the mark); those failing to score most commonly stated just fission, or often mitosis.

Just under half (44.7%) of students scored two marks on 04.4. A common error was to multiply by 6 or 24, rather than 2^6.

Question 5

Parts 05.1 and 05.2 were well answered. Some students inverted their answers for 05.1 and many stated glyceride instead of glycerol for P.

05.3 was answered fully correctly by nearly half (47.3%) of students. Errors included not adding water, or adding water first then ethanol, using the word cloudy with no colour and using the word precipitate.

Question 6

Students had clearly either learned or not learned what a hierarchy is for 06.1 – just under 60% of students scored zero. A similar picture emerged for the taxonomic groups tested in 06.2, with half getting it correct, and half incorrect. Surprisingly, many students correctly identified the taxonomic groups, using the letter f, g and s in the diagram, but then failed to convert the "f" into family in their answer.

Question 06.3 was well answered, with 85.8% of students scoring at least one mark. Errors included not using Figure 6 as asked, simply stating they are different, but not giving a difference, and many did not understand what the term frequency means, mistaking it for amplitude.

In question 06.4, only 3.4% of students scored two marks, but 57.1% scored one mark. Mark point 2 was very rarely seen; again, students did not use Figure 6, and did not understand that courtship is a behaviour that stimulates, causes, or leads to mating. Students mostly stated that the female 'knew' that it was another female.

Question 7

Only 17.9% of students scored the mark on 07.1. Although this term is clearly defined in the first sentence of section 3.4.2 of the specification, few students seem to have learnt it. Wrong answers were often pure guesses, such as 'where proteins are stored' or 'where tRNA is made'. 13% of students did not even attempt the question.

07.2 was generally well answered; those who failed to score two, once again, did not state a clear difference, e.g. that "tRNA is clover leaf, but mRNA is linear". There were also students who thought tRNA was a double-stranded molecule.

07.3 tested recall, with a specific instruction **not** to include descriptions of transcription and splicing in answers. Many did include this, or *only* discussed this. Only 8.4% of students scored all five marks. Many described mRNA leaving the *cell* to associate with a ribosome, and there were many who also stated that RNA polymerase joins amino acids or forms peptide bonds. Start codon and first codon were 'synonyms' for many students. Overall this question discriminated well.

Question 8

Answers to 08.1 showed good knowledge, but there was some confusion between heat capacity and the latent heat of vaporisation. Many students hedged their bets by referring to latent heat capacity. There were several students who stated that a high heat capacity was caused by strong hydrogen bonds, or that hydrogen bonds were between H^+ and O^{2-} in water, not between water molecules.

Question 08.2 was well answered; the most common mistake was stating *adenine* diphosphate instead of adenosine diphosphate.

In 08.3 many students did not consider the question and either gave variables whose control had already been given in the question, or gave unqualified answers of temperature and pH. Only 7% of students scored two marks. Many also stated the concentration of ATP hydrolase, again showing a failure to consider the question and realising that this cannot be controlled as it was produced by the muscle tissue.

In question 08.4, the description was well answered by the majority, however many students thought the muscle became shortened as the muscle tissue was being hydrolysed. Several also stated that ATP released more energy **for** respiration. References to energy being 'produced' negated otherwise good responses.

Students found 08.5 very difficult, with only 3.7% of them scoring all three marks. Many failed to use Table 1 correctly and realise that the concentration of ATP added to the slide was x 10^{-6} mol dm^{-3}. Two marks were regularly awarded for incorrect responses, however, for including 12200 and 0.61 in the workings. 7.5% of students made no attempt whatsoever to answer this question.

Question 9

Part 09.1 was not well answered (70.3% scored zero); many students seemingly did not understand what is meant by pathway and gave the mechanism instead.

Question 09.2 asked for an explanation of a feature of an alveolus, not all of the alveoli. Only 23.3% of students scored two marks, the majority giving answers relating to a large surface area. Those who scored well did have an understanding of a reduced diffusion pathway, but a significant number involved a "thin membrane" or "one-cell-thick membrane" or "thin epithelium" in their response.

09.3 was the question students struggled with the most; only 1.2% scored all four marks. Students did not use the data provided, and, when they did, appeared not to understand or use the term significance. Those who used the word simply stated that the 'data' or 'results' were significant or not, rather than that the increase or difference was significant. They applied standard, learned responses without considering the question, such as "no repeats", even though Figure 7 shows mean values and standard deviations, i.e. it must have been repeated, "sample size too small", "correlation does not mean causation", and "there may be other factors involved". Students can assume that if an experiment or investigation in a question has been completed by scientists, that it has been completed correctly, unless otherwise stated. There was also a common misconception that children (and not even their haemoglobin) have a high affinity for oxygen. This question evoked many lengthy responses that failed to score any marks. Students tended to write a whole page of raw data comparisons with no conclusions or linger on the same idea for the duration of their answer, stating the same thing in several different ways. A significant number suggested that CO from vehicle emissions was also of importance, hence the high levels with an open window and no smoking. Astute students could see that the CO concentration was significantly and consistently higher after five minutes of exposure to tobacco smoke when the windows were closed. Equally, these same students could also analyse the data and notice that the 2 x SD values for the CO concentrations (when the window was open) overlapped. Therefore, there was no 'statistical' difference with these values. The link between Hb and CO was established by some, resulting in less oxygen being carried/delivered or provided to tissues. A small minority appreciated that no evidence/data was available for breathing rates in children. Many students made reference to breathing rates and lung volume. However, they did not manage to make the link that smaller lung volume and higher rate could result in similar volumes of CO being inhaled. Very rarely students questioned whether 5ppm was a deadly level, even though they readily accepted that CO was dangerous. Equally they failed to establish that any increase in CO concentration would be dangerous.

Question 10

Generally, the comprehension was far better answered than in 2017. This may be partly due to the specification content included this year compared with last. The main issue, as with last year, is that students attempted to answer the question without using the passage. However, these are true comprehension questions. This was the main issue with question 10.1, though 70.7% of students did score at least one mark. Many students appreciated that the presence of an antigen caused the production of more T cells which resulted in increased amounts of cytokines being produced. Other students appreciated the former but attributed the swelling to the accumulation of T cells. There were some spurious arguments based on alteration of water potential resulting in accumulation of water, and hence swelling.

10.2 was similarly well answered, but those students who failed to score (28.8%) gave vague responses, such as 'it is passed on' and also thought that those with Crohn's disease had genes to make bacteria pathogenic instead of normal.

10.3 was poorly answered, with nearly 80% scoring zero marks. Students failed to get from the passage that 5-ASA is a drug that reduces swelling. Incorrect answers centred round "the body seeing the drug as foreign", "being immune to the drug", "making antibodies against the drug", "digesting the drug", "having no receptors for the drug" or, as 5-ASA is an acid, it "denaturing protein/cytokines". A significant number of students attempted to relate their argument to an allergy to the drug, but many expressed this in terms of suffering side-effects.

10.4 was better answered, with the majority of students able to follow the idea that DNA replication will slow, meaning fewer T cells and less cytokine. The question gave guidance not to include details of enzyme inhibition or protein synthesis. This was to help guide students to the correct answer; many based their arguments on a failure to form enzyme-substrate complexes, despite the advice. There was some confusion of cytokine and cytosine, and some students thought that 6-MP would have stopped bacteria or "Crohn's" reproducing, not T cells.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.