GCSE

Additional Science / Biology

BL2FP

Report on the Examination

4408 / 4401

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General

Nearly all questions were attempted by all students. Particular problems which occurred quite frequently included:

- the inability to express ideas clearly and unambiguously, in particular the misuse of the pronouns 'it' and 'they'
- paying insufficient attention to information provided in the stem of a question in order to guide a reasoned response and avoid the inclusion of irrelevant information
- repeating, rather than using, information given in the question, for which no marks are available. This wastes both time and space as there is adequate space provided for relevant material without recourse to additional answer sheets
- the inclusion of extra, incorrect information in addition to the correct answer – for example, if one point is asked for, then a second point, if incorrect, would cancel a potential mark
- careless reading of the question resulting in an inappropriate answer, for example failure to give a comparative answer to a comparative question, or failure to use the information given in a table or a graph
- careless reading of data from a graph
- mixing units in a calculation (for example metres and centimetres) and thus arriving at an answer that was out by a factor of several orders of magnitude, especially when an area had to be calculated
- poor understanding of certain topics, such as mitosis, meiosis, fertilisation and chromosome numbers, the fact that energy cannot be created and the understanding of specific terminology such as *phenotype*, *genotype* and *gamete*
- poor handwriting, for example with numerals – especially the distinction between the numbers 1 and 2, and the use of non-black ink which does not scan well for marking
- although chemical formulae are generally acceptable as alternatives to the names of substances, they need to be correct, for example, CO_2 is an acceptable alternative to carbon dioxide but CO^2 is not.

Question 1 (Low demand)

This question was about cell structure and function.

(a) Most students were able to correctly identify the function of the cell membrane and the nucleus. A common error was to link mitochondria to the site of protein manufacture.

(b) Although nearly all students were able to identify at least one of the labelled structures in the plant cell that is not present in an animal cell, less than half could correctly select two. A common error was the inclusion of the cell membrane.

Question 2 (Low demand)

This question was about the digestive system.

(a)(i) Identification of the *large intestine* and *small intestine* was generally done correctly but students frequently identified structure **C** as the 'stomach' rather than the *pancreas*.

(a)(ii) The stomach's function of producing hydrochloric acid was frequently identified correctly. However, many students clearly believe that water is absorbed into the blood by the liver

and that fats are digested in the large intestine. A relatively small number of students scored full marks.

(b) Students appeared to know that there had to be a difference in concentration of glucose between the blood and the small intestine for absorption to occur by diffusion, so it was extremely rare to see option 3 selected. However, only about a third of students selected the option that the blood had a *lower* concentration of glucose than that found in the small intestine.

Question 3 (Low demand)

This question was about the use of a quadrat to find the population size of ragwort plants growing in a grassy field and the evaluation of two different methods of controlling ragwort.

(a) The correct interpretation of the data proved very challenging for many students. It was quite common for students to have taken the total number of ragwort plants in ten quadrats as the number of plants shown in the table for the final (tenth) quadrat. Where students did arrive at the correct total number they frequently appeared to be unable to calculate accurately the mean number of plants in 1 m^2. The location of the decimal point within their answer was often incorrect. Students were able to gain one mark for a correct answer for the number of plants in 1 m^2 but fewer students were able to gain both marks.

(b) Around two thirds of students were able to select the correct option of placing the quadrat in 100 random positions as a method of obtaining a more accurate estimate of the number of ragwort plants in the field.

(c) Overall this was done well by most students who were able to select the relevant information from that provided within the body of the question itself. Around three quarters of students scored two of the three marks available. The most commonly suggested advantages of using human volunteers rather than a herbicide to get rid of ragwort plants related to cost and to not killing other plants in the environment; disadvantages included the missing of plants by the volunteers and the increased time it would take them to do the job.

Question 4 (Low demand)

This question was about the inheritance of brown hair and red hair in humans.

(a) Over half of the students correctly selected the option that a recessive allele only determines a characteristic if the dominant allele is not present.

(b)(i) Just over half the students understood that a brown-haired parent of a red-haired child must have been heterozygous, ie with the genotype **Bb**.

(b)(ii) The vast majority of students successfully completed the Punnett square diagram to show the missing offspring genotypes.

(b)(iii) Two thirds selected *1 in 2* as the correct probability for a red-haired child.

Question 5 (Low demand)

This was a question about the extinction of species.

(a)(i) Half of the students appreciated that a reduction in *photosynthesis* would be the cause of extinction of the plants if a reduced amount of light reached the earth due to the dust thrown up in an asteroid collision. However, a very common answer was that 'plants need light (and heat) to grow' and many used weaker terms similar to this such as to 'live', 'survive' or 'exist'.

(a)(ii) This was well answered with most students realising that the extinction of plants would lead to the extinction of many animals due to the lack of *food*. Some students correctly suggested that a lack of oxygen or a reduction in habitat might have been the cause.

(a)(iii) Most students were able to make at least one correct suggestion about alternative causes of extinction in animals, such as predation (or 'hunting'), global warming or competition for food ('competition' unqualified was not considered adequate), but less than half were able to give a second possible cause. A number of students gave weak responses, such as 'climate change' or a 'natural disaster'.

(b)(i) Only just over half the students were able to identify that there were *three* mass extinctions in Figure 6.

(b)(ii) There was greater success in this part with more than three quarters of students suggesting that *fossils* would provide evidence about the types of animals that lived hundreds of millions of years ago.

(c)(i) Over three quarters of the students were successful in choosing 65 million years ago as the timing of the most recent mass extinction. As the three options were widely spaced on the time axis, the reason why many students chose 250 million years ago was presumably because the lowest figures were at the right hand end of the axis.

(c)(ii) Just over half correctly read the figure *17* from the graph as the mean number of groups of animals becoming extinct per million years.

(c)(iii) Only a third of students were able to make a sensible suggestion about why scientists might not be sure how many groups of animals became extinct in the most recent mass extinction. These included references to a lack of fossils being formed (although some thought there had been insufficient time for fossils to form), or to a general lack of evidence. Some gave examples of why fossils of some animals might not have formed, such as the animals being soft-bodied.

Question 6 (Low demand)

This question was about *in vitro* fertilisation.

(a) Nearly all students correctly selected the *ovary* as the organ in the human body that produces egg cells.

(b) Only half of the students were able to choose *46* as the number of chromosomes in each cell of a human embryo, '23' being a common error.

(c)(i) Fewer than half of students could suggest why the given result might have been thought to be anomalous. Of those that gained the mark, most stated simply that it did not fit the pattern. Unfortunately, some students gave a correct response but lost the mark by quoting incorrect figures from the table. Other common inadequate responses were statements such as 'it is too high'.

(c)(ii) Students were much more successful in this part and nearly two thirds described the general trend shown by the data that the percentage of women who successfully had a baby as a result of IVF treatment decreased with age. Some students appeared not to understand the meaning of the term *trend*.

(d)(i) This part was very poorly answered, with less than half gaining two marks. Many students selected the correct values of 66 and 2 but subtracted 2 from 66 rather than dividing 66 by 2.

(d)(ii) Three quarters of students scored at least one mark out of the two available, usually for making the observation from the data in Table 2 which showed there was a low success rate for IVF in women over 40 years of age. Many of these went on to point out that, from Table 3, the incidence of chromosomal abnormalities increased with the age of the women. However, a significant proportion of these students did not make it clear whether the chromosomal abnormality was in the baby or in the mother, and so forfeited the mark. Many other students failed to make any reference to the data given in the two tables and hence were unable to score any marks.

Question 7 (Standard demand)

This was the first of three standard demand questions common to both the Foundation and Higher Tier papers. This question was about the effects of exercise on the body.

(a)(i) Only a third of students were able to explain that anaerobic meant without oxygen.

(a)(ii) Around two thirds were able to state that the production of lactic acid, as shown in the graph in Figure 7, gave evidence that the athlete respired anaerobically during his run.

(b)(i) Since the graph of changes in the rate of blood flow through the muscles in Figure 8 showed the rate rising from 0.5 minutes, levelling off at about 1.5 minutes and then falling between 2.0 and 3.0 minutes, many students were confused when trying to decide the duration of the actual run. Fewer than a quarter gave the correct answer of 1.5 minutes.

(b)(ii) Few students were able to give a thorough description of the changes in blood flow during the run, including appropriate data from the graph. Many included irrelevant details of what happened before and / or after the run.

(b)(iii) Students had to explain how the change in blood flow helped the athlete to run. Just over half of the students scored marks – usually just the one for stating that there was a greater need for oxygen. Other relevant details, such as the use of this oxygen in respiration in order to release energy needed for running, and the supply of extra glucose as a source of energy, were generally omitted, with very few students able to include full details.

Question 8 (Standard demand)

This was the second of the three common questions.

In this question, students were required to describe how they would use the apparatus shown in the diagram to investigate the effect of light intensity on the rate of photosynthesis in some pondweed. Around one in twenty students scored five or six marks, with about one third gaining three or four marks.

The most common correct points included placing the pondweed in water in the beaker and shining a light on it; nearly all students succeeded here, although many forgot to include the water. Better answers gave details of how they would use the release of bubbles of oxygen as their criterion for measuring photosynthesis, some expanding on this by stating that they would count the number of bubbles released in a given time, possibly repeating their measurements and calculating a mean value, but very few were in this category. Similarly, some better responses realised that the distance of the lamp from the pondweed could be used as a measure of light intensity and that carrying out the experiment with the lamp at different measured distances would enable them to find the effect of different light intensities on the rate at which bubbles of oxygen were released. Control variables were mentioned by a few – such as using the same sprig of pondweed throughout and ensuring that the temperature remained constant. Many weaker students used growth of the pondweed as their criterion for determining the rate of photosynthesis and forgot to include many of the details given above. However, it appeared that many students had not encountered this investigation before, despite its mention in section 2.3.1 of the specification.

Question 9 (Standard demand)

This was the third of the three common questions, on the subject of enzymes.

(a) A third of students knew that an enzyme was a catalyst, or that it speeded up a reaction. A small number of students were able to give a second appropriate detail, such as enzymes being proteins, or that they were specific in their action.

(b) Even with a choice of three options, only half of students were able to select the *cytoplasm* as the correct part of a cell in which most enzymes operated.

(c) In this question, students had to make use of the information given about two methods of preserving milk – either by ultra-heat treatment or by using hydrogen peroxide with subsequent breakdown of the hydrogen peroxide using the enzyme catalase – in order to give an advantage and a disadvantage of the enzyme method. The majority found this very difficult and did not score any marks at all, mainly due to just copying from the information given rather than *using* the information to formulate their own arguments. For example, the information given stated that the hydrogen peroxide would not necessarily kill all disease-causing bacteria and students were expected to use this to state that drinking the milk treated in this way might result in illness / sickness / catching a disease. Similarly, very few students seemed to know that UHT milk might have an altered texture or flavour or could suggest that the heat treatment might denature the milk proteins.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator