GCSE

Additional Science / Biology

BL2FP

Report on the Examination

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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 and which wastes both time and space (there being 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; or, if three *other* examples are required, no marks are available for the including the examples given in the question
- careless reading of the question resulting in an inappropriate answer, for example failure to give a comparative answer to a comparative question, or selecting a single option in a multiple-choice question on the rare occasions when two are required, or missing a question because there are no dotted answer lines and the answer has to be placed on a diagram
- careless reading of data from a graph – especially when one square represents two units
- mixing units in a calculation (for example millimetres and centimetres) and thus arriving at an answer that was out by a factor of 10
- poor understanding of certain topics, such as the relationship between chromosomes, genes and DNA, the industrial uses of specific enzymes, the use of glucose to make other organic compounds, the pH scale and the fact that energy cannot be created
- 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 and makes on-screen marking very difficult
- 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, on the topic of cell structure and cell division, was well answered by most students.

(a) The vast majority knew that structure A in the yeast cell was the *nucleus* and that structure B was the *cell membrane*. Common errors were to identify A as a chloroplast or mitochondrion and B as either the cytoplasm or the cell wall.

(b) Although just over half of the students understood that cell division was necessary in the skin for either growth or repair, many gave trivial answers such as 'to make new skin', 'to let you stretch' or 'to stop you getting old'.

(c)(i) Two-thirds of the students correctly selected *embryos* as a possible source of human stem cells, although 'nerve cells' was a powerful distracter.

(c)(ii) This part was more problematic, with only one-third of students selecting *paralysis* as a condition that might be treatable with stem cells, and 'cystic fibrosis' being incorrectly chosen by many.

Question 2 (Low demand)

This question was about enzymes and their industrial uses. It was well answered by the majority of students.

(a)(i) The vast majority correctly selected the term *catalyst* as a description of an enzyme, 'an antibody' being the most common error.

(a)(ii) Around three quarters of the students knew that an enzyme was made of *protein* (rather than carbohydrate or fat), although 'carbohydrate' distracted most of the others.

(a)(iii) Almost two-thirds of students knew that the enzyme amylase was made in the *salivary glands*, with 'stomach' being selected by most of the remainder.

(b) In this question, students were required to link each of three enzymes, carbohydrase, isomerase and protease, to their correct industrial uses. Just under half got all three right. Most students knew that isomerase would change glucose into fructose, but the removal of grease stains from clothes proved to be a powerful distracter for the possible use of each of the other two enzymes.

Question 3 (Low demand)

(a) Over three quarters of students knew that the stomach was an *organ*, that the cells lining it made up a *tissue*, and that the mouth, oesophagus, stomach, liver, pancreas, small and large intestine constituted an *organ system*.

(b)(i) Just over half the students recognised that the process of *diffusion* had been defined in the question as the process by which oxygen moves from the blood to the cells lining the stomach, although some suggested 'respiration' and others 'photosynthesis'.

(b)(ii) The vast majority selected *glucose* as the other substance that would also need to be supplied for use in respiration.

(b)(iii) Most students knew that the *mitochondria* were used for aerobic respiration, although the 'cell membrane' and the 'nucleus' distracted a few in equal proportion.

Question 4 (Low demand)

This question was about photosynthesis and the use of elevated carbon dioxide levels in greenhouse management for the production of tomatoes.

(a)(i)/(ii)/(iii)

Nearly three quarters of students were able to complete the equation for photosynthesis by inserting the names of the missing substances, *water* and *oxygen*. A slightly lower

proportion knew that light was the type of energy for photosynthesis; many suggested 'the sun' or 'solar energy' which lacked specificity, while the answer 'heat and light' disqualified a potential mark. However, only about one-third knew that a *chloroplast*, or *chlorophyll*, was the part of a plant cell that absorbed energy for photosynthesis, with 'ribosome' or 'mitochondrion' being common incorrect answers. Those who answered 'the leaf' should have read the question more carefully.

(b)(i) The vast majority were able to read *20* arbitrary units as the maximum rate of photosynthesis shown in the graph.

(b)(ii) Rather fewer were able to suggest that either light or temperature might have been a limiting factor once this maximum rate was attained. Although the question asked for just one factor, many students were apparently keen to show all that they knew and included an extra – those that gave both light and temperature were fortunate that both were correct as an extra incorrect answer would have cancelled the mark.

(c)(i) Only half the students selected the correct option of extra carbon dioxide increasing the growth rate of the tomato plants. Many thought that the extra carbon dioxide would increase the rate of respiration of the plants.

(c)(ii) Many students failed to read the instruction to tick two boxes and hence automatically forfeited half of the marks for this question. Only one-fifth appreciated that a carbon dioxide concentration higher than 0.08% (the minimum concentration shown in the graph for attaining the maximum rate of photosynthesis) would not only cost more money but would not increase the rate of photosynthesis any further.

Question 5 (Low demand)

This was a question about chromosomes and the inheritance of a genetic disorder due to trisomy of chromosome 18 (Edwards syndrome, but identified in the question simply as 'genetic disorder E').

(a)(i) Three quarters of students stated that they could tell the given karyotype came from a female human due to the presence of two X chromosomes. There were some confused answers that indicated that *all* the chromosomes were X – presumably this related to the shapes of the chromosomes as karyotypes are produced from cells arrested at metaphase of mitosis.

(a)(ii) Less than a quarter realised that an extra chromosome was present, with even fewer identifying it as being number 18. A common misconception was that only 22 pairs of chromosomes were present (chromosome pairs were labelled in the diagram as 1 to 22 and XX). Others thought it odd that the chromosomes were of different sizes and some cited chromosomes 21 and 22 as these seemed to be missing part of the structure common to the remainder.

(b)(i) and (ii)

Nearly three quarters of students were able to read the correct figure from the graph which showed that, at the age of 40, the chance of a woman have a baby with disorder E was *14* per 1000 births. It should then have been straightforward, given that the chance of a 35-year-old woman having a baby with the disorder was 2 per 1000 births, to calculate that the

40-year-old woman was *7* times more likely to give birth to such a baby. However, less than half the students achieved this, the most common error being to subtract 2 from 14 rather than dividing 14 by 2.

(c) Here, students were provided with a table of information comparing two methods of embryo screening from which to select two advantages and one disadvantage of one of the methods compared with the other. About one-third were able to select at least two relevant points, but only a small minority managed to make three points. The main problem was that students failed to be comparative in their answers and simply quoted points from the table. Also, some students failed to understand which points were advantages and which disadvantages. Other misconceptions abounded, with some students indicating that an advantage of Method 1 was that there was no need for the woman to have a pregnancy at all in order to have a healthy baby or, even better, that she ` would not have to go through labour.

Question 6 (Low demand)

This question was about fossils and extinction.

(a)(i) Students had to suggest how insects might be preserved in amber, as shown in the photograph. Since information about the formation of amber from sticky pine tree resin was given in the stem of the question, many students suggested that the insects first of all got stuck but relatively few expanded upon this. A few better students also suggested that the amber would prevent decay – although many got no further than the question by stating simply that the amber 'preserved' the insects.

(a)(ii) A little over half the students could offer at least one other method by which fossils may have been formed, such as the body of a dead animal being buried in sediment, or a fossil footprint being formed. A common error was to describe how an animal would be covered by layers of rock or be compressed into rock, rather than initially in mud or some other sediment. There was some misunderstanding about decay and mineralisation as some referred to animal parts decaying and then being fossilised and minerals entering decayed parts, although other students gave good accounts of minerals entering the non-decayed bones.

(b)(i) Nearly all students correctly selected the option that new technology might provide more valid evidence for a new scientific theory (such as collision with an asteroid) replacing an older theory (such as volcanic activity) to account for a past mass extinction.

(b)(ii) Students were required to give three reasons '*other than volcanic activity and collision with an asteroid*' to account for a species becoming extinct; some students ignored this exclusion and hence limited their ability to score marks. Others gave good answers, around three quarters being able to state at least two reasons for extinction, the most common correct examples being disease, lack of food, new predators, isolation, and not being able to find a mate. Some gave specific examples of environmental change, such as flooding, drought or temperature change, while others were too general, citing 'environmental change' or 'climate change' – which were only allowed as a concessionary mark by examiners in the absence of any other, more specific, points.

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 digestion of fat.

(a)(i) Less than half of Foundation Tier students were able to select the answer *glycerol* as a product of fat digestion; 'glucose' being a common error.

(a)(ii) About the same proportion knew that lipase was made in either the pancreas or the small intestine, the most prevalent errors being the 'liver' and the 'stomach', and some answers lacked specificity – for example, the 'intestines'.

(b) Approximately two-thirds of students were able to give at least one variable that should have been controlled in the investigation of the effect of bile on the digestion of fat. Far too many considered 'time' to be significant, although the 2-minute interval for taking pH measurements was entirely arbitrary. Another common, incorrect answer was 'pH', this actually being the dependent variable. Where substances in the reaction mixture were mentioned, it was often the 'amount' that was stated rather than the *volume* or the *concentration*. Some students correctly identified *temperature* as a control variable.

(c)(i) Despite an equation having been given in part (a)(i) which showed that *fatty acids* were produced when fat was digested, hardly any Foundation Tier students were able to relate the fall in pH shown in the graph to *fatty acid* production. Many strange ideas were suggested about the nature of bile and water and their supposed effects on pH, although some students at least realised that an acid was produced in the reaction. Many students clearly did not understand the pH scale and stated that a fall in pH represented a decrease in the amount of acid present.

(c)(ii) It was evident to almost half the students that the faster fall in pH in the presence of bile provided evidence that bile helped lipase to digest the fat.

(c)(iii) Only one-tenth of students could offer a suitable explanation for the levelling off of the pH towards the end of the investigation – such as the fat having been completely digested or the pH now being so low that the enzyme was denatured.

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 a 100-metre tape measure, a ruler and a light meter to investigate whether the size of ivy leaves decreased as light intensity increased. This was set in the context of a large ivy leaf having been found on an ivy plant growing in a shady woodland area and a smaller leaf found growing in a sunny area at the edge of the woodland. Most students were relatively successful in answering this question, with around two-thirds scoring at least three of the six marks available and almost a quarter scoring five or six marks.

Common correct points included measuring leaves found growing in at least two locations and recording the light intensities at each location with the light meter. Better students ran transects, using the 100-metre tape measure, between the centre and the edge of the woodland, taking their

results at intervals along it, then repeating the procedure at various locations. The concept of calculating a *mean* value from the results was well known but, unfortunately, this was often expressed ambiguously and examiners were unable to tell if the mean was for values measured at a particular location (or light intensity) or the mean of all the results. Better students mentioned control variables such as sampling at the same height above the ground, or measuring light intensities at the same time of day. Some students were very confused and seemed to think that a light meter was a source of light for illuminating leaves (attached to, or detached from, their parent plants) in order to see how they grew, or shrank, over a period of time. Other, more adventurous, students decided to place their transects vertically up the woodland trees in order to sample ivy leaves growing at different light intensities – these students still gained credit if they were able to salvage sensible points from this unusual situation. A common omission by students of all abilities was to state that the 'results' should be taken rather than stating that the size of the leaves should be measured. Poor expression by many students also cost marks, for example: 'Use the tape measure to find how far the leaf is from the sun' conjured up an amusing picture but probably meant how far the leaf was from the light area at the edge of the woodland.

Question 9 (Standard demand)

This was the third of the three common questions.

(a)(i) Around two-thirds of Foundation Tier students knew that DNA was found either in the nucleus or in the chromosomes; although very few gave both of these details.

(a)(ii) Similarly, very few were able to explain that cells produced by mitosis were genetically identical because the chromosomes / DNA / genes had been replicated. Many stated that the 'cell' had been copied or that the offspring cells had the 'same' chromosomes / DNA / genes, an answer which added no value to the point given in the question that the cells were 'genetically identical'.

(b)(i) Almost one-third of students understood that because polydactyly was caused by a dominant allele then just *one* copy of this dominant allele would have to be inherited to cause the condition.

(b)(ii) A similar proportion also understood that *two* copies of the recessive allele for cystic fibrosis would have to be inherited for a person to have this condition.

(c) Nearly all students identified genetic fingerprint B as being identical to the sample found at the scene of the crime.

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