GCSE

COMBINED SCIENCE: SYNERGY

8465/1F Paper 1 Life and environmental sciences
Report on the Examination

8465/1F
June 2023

Version: 1.0

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General

The paper overall was at a similar standard to previous years. It did contain some unfamiliar contexts to stretch the more able students at level 5, but this was also offset by some very straightforward questions so that the number of marks gained was in line with pre-Covid years. Some topic areas such as practical procedures, radioactivity and genetics always prove challenging to foundation tier students, but they appeared to struggle even more this year There was a good mix of knowledge and understanding required (AO1 and AO2) as well as explanations, data analysis and evaluation (AO3).

As in previous years, poor handwriting meant that examiners were not always able to read the responses and this meant students failed to gain marks. Also failure to read the questions carefully resulted in irrelevant answers in a number of instances.

Questions 1 – 7 - Foundation tier only

1.1

Foundation tier students found the slightly unusual diagram of the water cycle without images more difficult to interpret. Evaporation from the ocean was most commonly identified. Condensation and precipitation were seen much less often despite the options in the box. The question discriminated very well and three quarters of students gained 1 or more marks.

1.2

4 out of every 5 students knew that desalination was required to produce drinking water from sea water.

1.3

Only a quarter of students knew that desalination required energy. Many thought that it would need to be filtered.

1.4

Adding chlorine was the most common response for sterilising drinking water. Three quarters of students gained 1 or 2 marks.

1.5

This question was well answered, mainly with the idea of avoiding people becoming ill. 4 out of 5 students gained this mark.

2.0

Overall students found this question on plants difficult.

2.1

The function of meristem tissue was not well known with less than one third of students choosing this option.

2.2

There was considerable confusion about the structure and function of xylem and phloem. Many student believed that both were involved with the transport of water and ions. About a half of students gained 2 or more marks.

2.3

Less than 1 in 100 students scored 2 marks. Common incorrect responses were guard cells expanding, or getting bigger/wider. The most common mark scored by nearly half of students was the compensation mark for saying that the guard cells opened.

2.4

Transport in plants was not well understood even with the prompts in the box. Only a fifth of students gave completely correct responses.

3.1

Less than a third of students chose the correct option, neutrons, from the 3 choices. This shows that the concept of isotopes containing different numbers of neutrons in the nucleus is not well understood.

3.2

Carbon passing from plants to animals was correctly given by about a half of students.

3.3 to 3.9

These questions concerning radioactivity and half-life were not well answered showing that the whole topic is proving difficult for Foundation tier students, even those working at levels 4 and 5. Schools may consider devoting a little more time to this topic.

3.3

Just over a half of students were able to identify the beta particle.

3.4

About one half of students were able to name nitrogen as the element with an atomic number of 7 by using the periodic table.

3.5

Identifying the substances that would stop beta particles was well answered with most scoring at least 1 mark.

3.6

The biology of decay was clearly familiar to students as over three quarters knew it was caused by microorganisms

3.7

Good graph reading skills meant that about three quarters of students were able to give the correct value of 70%.

3.8

Around a fifth of students understood the concept of half-life and had accurate graph reading skills to gain the marks. 3000 was a common incorrect reading which was the halfway point of the x-axis.

3.9

Risk from radiation was not always well understood so only a third of students knew that the radioactivity in this case would be low.

4.1

Two thirds of students knew that magnification of a microscope is obtained by multiplying the power of the eyepiece lens by the power of the objective lens.

4.2

The equation was given with all variations on rearrangement but there were many errors with many students writing ‘size of real object = magnification x size of image’. About a third of students gave the correct version of the rearranged equation.

4.3

Students struggled with this question. In some cases, due to the incorrect formula given in 4.2, others with rearranging the correct formula. Few students complete substitution before attempting rearrangement which means, if incorrect, they cannot score any marks. Advice is always to substitute first then rearrange, the same advice in all calculations requiring rearrangement. Many students didn’t recognise the need to convert cm to mm or converted incorrectly. Less than 1 in 10 students gave a fully correct response and a further 1 in 10 scored 3 marks having failed to convert.

4.4

Many students thought that using the high power objective lens would affect the focus or ‘zooming’ of the image so a low quality image would be seen. Only 1 in 10 students correctly linked the movement of the lens to the potential for damage to the slide, the lens or the stage.

4.5

This simple knowledge question on which type of microscope should be used to view a very small object (a virus) elicited a wide range of answers that indicated students did not recall the correct terminology. Common errors were: electrical, electronic and electromagnetic rather than electron microscope. A sixth of students were correct.

4.6

Half of all students correctly read the values from the two bars and subtracted to gain the required value. Incorrect reading from the graph was the largest source of error but some students just read off from one bar and gave that as their answer.

4.7

Most students scored this mark with the idea of stopping TMV spreading. The largest source of error was students thinking that TMV was a risk to humans and therefore needed removing from the food chain to avoid illness in people.

5.1

Most students gained at least 1 mark, usually for identifying the trachea or the alveolus. A quarter of students scored all 3 marks.

5.2

This question was not well answered. A large surface area was the most common correct answer. Students did not link the number of alveoli or thin walls of alveoli to gas exchange. The most common incorrect answer referred to 'breathing'. It is possible students were trying to express the idea of good ventilation but 'breathing' was too vague to gain credit.

5.3

Students confused the independent and dependent variables, or gave the type of acid for either one. Over a half of students gained 0 marks.

5.4

The volume was the only one of the 3 simple calculations done at all well and about a quarter of students gained this mark. 8 was a common answer for the total surface area (SA) of the cube. Some students squared the 4, giving 16 or squared the 4 then multiplying by 6 to give 96 as the surface area as they thought the cm^2 meant the number also needed to be squared. The ratio was often omitted because one of the previous calculations was incomplete, and some students wrote the smallest number first rather than realising SA was first in the ratio.

5.5

Correct interpretation of the data in the table meant that over three quarter of students were able to describe the relationship between increasing size of the cube and the time it took to go colourless.

5.6

Most students knew that repeating and calculating a mean would improve the investigation.

6.1

This extended response question discriminated well with a quarter of students reaching level 2 to score 3 marks. Knowing that the skin was a physical barrier which stopped pathogens entering and that the stomach contained acid to kill pathogens was the most common way to achieve this. Extra details were needed to reach full marks.
There were many students who discussed white blood cells, which was not relevant to this question. Common errors when referring to pathogens was using incorrect terminology such as germs, diseases. A number of students referred to acid in the stomach 'burning' or 'dissolving' pathogens so did not gain credit for this.

6.2

Many students knew that genes were found on chromosomes or in the nucleus. DNA was a common answer that was ignored as it is not a cell structure.

6.3

Only around a quarter of students knew that genes were made of the chemical DNA.

6.4

Only a sixth of students knew we have two alleles for earwax because we inherit one from each parent, of because they come in pairs. Common incorrect answers seen were that we need one for each ear, that we need 2 to make enough wax, that we need a spare in case one stops working or that we need one for wet earwax and one for dry earwax.

6.5

The term heterozygous was known by just over half of students.

6.6

As is usual now students do well in completing Punnett square diagrams. Most gained 2 or 3 marks, and again the most commonly missed mark was for failing to identify the genotype that would lead to dry earwax. When writing down probabilities, a number of students wrote 50/50 which was not given the mark.

6.7 and 6.8

There were many suggestions for a characteristic that could be affected by both genes and the environment. The most common correct pairs were skin colour influenced by sunlight or UV exposure and hair colour influenced by either dyes or sunlight.. A common incorrect answer was eye colour. Other sensible causes linked to a factor were given, including ideas around lack of money to buy food relating to the weight of a person. Lifestyle was a common answer but was too vague to be credited. In 6.8, there were a few insufficient causes that were commonly seen including the sun, weather or temperature for affecting hair colour or skin colour.

7.1

A half of students gained 2 or 3 marks for ticking the correct boxes about gas pressure.

7.2

Four fifths of students gave the correct temperature.

7.3

Two thirds of students made the correct conversion. Some incorrect conversions were seen such as multiplying by 1000 rather than dividing.

7.4

This calculation was mainly well answered as no conversions or rearrangements were needed. Some students tried to work out a temperature change, missing that the temperature provided in the question was a temperature change. There were some incorrect attempts to convert values, a common attempted conversion was kg to g. Three quarters of students gained both marks.

7.5

Two thirds of students knew that the energy required increased.

Question 8 – common question

8.1

The functions of red blood cells and white blood cells was less widely known by foundation tier students with about one half of students gaining 1 mark. Common errors were to say that red blood cells carried blood around the body and vague references to diseases or infections were insufficient for white blood cells. The role of platelets was rarely correct with many ideas for carrying other substances around the body such as amino acids or glucose and to stop the blood clotting.

8.2

Many students drew multiple arrows even though the question specified one. Many arrows originated in the blood vessel at D and ended in the blood vessel at C so did not indicate that the student knew where the left atrium and left ventricle were. Only one tenth of students provided a single arrow which went from the left atrium into the left ventricle but no further.

8.3

Less than one fifth of students could locate the pulmonary vein.

8.4

The aorta was slightly more well known with just over a quarter of students giving the correct letter.

8.5

Only a quarter of students were able to name valves as the structures which kept blood flowing in the correct direction in the heart. A significant number of students gave ‘veins’ as their response, possibly because they knew that veins also contain these structures,

8.6

Despite the options given some students clearly struggled with this concept and 'arteries' proved a strong distractor. About one third of students ticked the correct option of capillaries.

8.7

About a third of students knew that the pacemaker cells were located in the right atrium of the heart.

8.8

This was a challenging question for level 4-5 students and it was not well answered, especially on the foundation tier.
MP1 was a chemistry mark and required specific reference to haemoglobin whereas many students described carbon monoxide as taking the place of oxygen. When answering MP2, students were vague about where there was less oxygen, with many thinking less could access the lungs or that there was less in the air because of the presence of carbon monoxide. In answering MP3 just referring to the heart pumping faster rather than increased blood flow was insufficient for the mark. Very few students gained any marks at all.

8.9

Many students provided a correct response.
Some students used 130 as the denominator or failed to work out the difference in heart rate and used just one of the figures provided. Some students must have used calculators incorrectly as a common answer was 30 which meant the student had not evaluated 130-80 or put it in brackets before completing the rest of the calculation.

Question 9 – common question

9.1

The binomial naming system is still not well known leading to all possible permutations of *Lolium perenne* as well as some unusual creative ideas. About a fifth of students correctly gave Lolium as the genus.

9.2

Most higher tier students could name chlorophyll as the green pigment in leaves, but on the foundation tier a third were correct. Many confused the pigment with the structure the contains it, the chloroplast.

9.3

More students chose the nitrate ion rather than the correct response of magnesium ion. This could be because students associate nitrate ions with plants.

9.4

This six mark extended response question was based on the required chemistry practical for paper chromatography. However the unfamiliar context of pigments in leaves may have meant that some students did not make the link between this investigation and the chromatography experiment undertaken in school.

Common indicative content seen was drawing a pencil line, the need for the paper to go into water and the colours separating. This provided a low level response and to access higher levels there needed to be recognition that the pencil line needs to stay above the water line and for top level answers, reference to filtering to get the extract from the leaves. Instead many students put the ground up leaves onto the chromatography paper. Another common error was to indicate that there would also be ink or marker pen dots on the paper running up at the same time, no doubt in confusion with their own practical in school. About a third of students gained 3 or more marks, but many foundation tier students gained 1 or 2 marks for mentioning a couple of steps but without any linking.

9.5

Many students seemed unclear as to which measurements to take for this question. Some measured the distances of all of the pigments and added them together for the numerator in the equation. Others used two pigment distances rather than the pigment and the solvent.
For those who measured the correct distances accurately to within 1 mm they usually gained all 4 marks. On the foundation tier paper this was about a fifth of students.

9.6

Just under a quarter of students gained this mark, usually for lack of light or water, and occasionally for lack of photosynthesis. A common error was to refer to ‘the sun’ rather than light or sunlight, which has been noted in previous examiner reports. Many answers said ‘because it was yellow’ or ‘because it had no chlorophyll’, both of which were insufficient.

Mark Ranges and Award of Grades

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