GCSE

COMBINED SCIENCE: SYNERGY

8465/1H Life and environmental sciences
Report on the Examination

8465/1H
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General

The paper overall was at a similar standard to previous years. It did contain some unfamiliar contexts and some challenging concepts to stretch the more able students, but this was also offset by some very straightforward questions so that the number of marks gained was in line with pre-COVID years.
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 led to loss of marks. Also failure to read the questions carefully resulted in irrelevant answers in a number of instances.

Question 1 – common question

1.1

The functions of red blood cells and white blood cells was widely known with three quarters of students gaining 2 marks. 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 less well known with many incorrect ideas given including for carrying other substances around the body such as amino acids or glucose and to stop the blood clotting.

1.2

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 third of students provided a single arrow which went from the left atrium into the left ventricle but no further.

1.3

Less than half of students could locate the pulmonary vein.

1.4

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

1.5

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

1.6

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

1.7

Around a half of students knew that the pacemaker cells were located in the right atrium of the heart.

1.8

This was a challenging question for level 4-5 students and it was not well answered
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. Only about one sixth of students gained any marks at all.

1.9

Almost all 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 2 – common question

2.1

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 half of students correctly gave Lolium as the genus.

2.2

Most higher tier students could name chlorophyll as the green pigment in leaves, but a minority are still confusing the pigment with the structure that contains it, the chloroplast.

2.3

Approximately half of students chose the correct option of magnesium ion. However many chose the nitrate ion, possibly because they associate nitrate ions with plants.

2.4

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 half of students gained 3 or more marks.

2.5

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 higher tier paper this was about half of students.

2.6

About one 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.

Questions 3 – 9 – Higher tier only

3.1

The processes of evaporation and condensation in the water cycle were well known by students with three quartesr of them correctly identifying both.

3.2

Those students who understood the chemistry of potable water usually gave chlorine and / or UV light as methods to sterilise water. Those students relying on general knowledge usually gave boiling it or less often distillation. A tenth of students gained 2 marks and a further half gained 1 mark.

3.3

Most students identified that the problem with sea water was excess salts that needed to be removed but this did not gain any credit unless they went on to name a process to achieve this. About one third of students named reverse osmosis, distillation or desalination and of these very few linked this to the need for more energy which is expensive.

3.4

This question was well answered with most students able to name one or two agricultural pollutants. Some only gained 1 mark for naming more than one type of pesticide such as fungicide and insecticide. 'Weedkiller' was acceptable for herbicide, but references to 'chemicals that make plants grow' was not accepted as fertiliser.

3.5

A very small percentage of students could name both treatments. Some gained the compensation mark for knowing that the first process was aerobic followed by an anaerobic process, even if not correctly named. Sewage treatment is part of the chemistry content of this specification and it is often appearing to have been overlooked.

4.1

The lack of practical experience in school laboratories due to COVID is probably the cause of a poor understanding of the correct use of a microscope. Despite being a required practical on this specification only a fifth of student reached level 2 to gain 3 or 4 marks. The hurdle for many students was that they did not have an understanding of how to focus the image using coarse and then fine focus controls.

4.2

Almost all students could identify at least one characteristic of an electron microscope given the choices.

4.3

Less than half of students attempted this question asking how a population of plants could all become resistant to a virus. The most able one quarter of these students gained 2 or 3 marks with three quarters scoring 0 or 1.
The most common mark seen was for a mutation giving resistance to the virus occurring, but this mark was not awarded if the student implied that the plant mutated itself rather than it being a random occurrence. The mark rarely seen was for the understanding that the process took many generations or a long time to be complete.

5.0

Students found the novel context of wet and dry earwax challenging. Only students working at grades 7 to 9 were able to apply their knowledge of genetics to this situation with any degree of success.

5.1

A fifth of students gained the mark. Many said that earwax 'stopped pathogens / dust entering the ear' which it does not. Those that said it stopped pathogens entering the body via the ears were awarded the mark. Most who gained the mark did so for saying that the earwax trapped or caught

pathogens. Vague references to stopping diseases, infections and germs were common but insufficient.

5.2

The definition of a gene was not well known with over three quarters of students scoring 0 marks. About one fifth of students gained one mark for knowing it was a section of DNA, but very few wrote that it coded for one specific protein.

5.3

This question was set at a high demand and required clear logical reasoning as well as knowledge. Less than a tenth of students gained the mark for understanding the data and being able to express the reasoning for why wet earwax must be the dominant allele.

5.4

Students have become well practised at completing Punnett square diagrams and one half of them deserved the 3, 4 or 5 marks gained. The most common missed mark was for identifying the phenotypes of each genotype, although they must have known this as many went on to give a correct probability.

6.1

This straightforward question about sub atomic particles in isotopes was answered correctly by about one third of students.

6.2

Most students failed to make the link between this question and their knowledge of the carbon cycle. Instead they attempted to explain it by saying the carbon dioxide in the air containing carbon-14 was breathed in and ‘reacted with oxygen in respiration’ leaving carbon-14 in the body. This is totally incorrect in both biological and chemistry terms and gained no credit.
Just over 1% of students did make the link and usually then gained 3 or 4 marks. The most common missed points were for not saying that carbon dioxide entered the plants via the leaves or stomata, MP1, or for not saying that the glucose or other molecules made in the plant were then absorbed into the body, MP5.

6.3

Another straightforward physics question where students either understood the decay equation, or more often did not.

6.4

Nearly one fifth of students knew that microorganisms were responsible for decay to gain 1 mark. But very few indeed were able to relate this to the conditions in the glacier to say there was insufficient oxygen for respiration or that it was too cold for enzyme activity. Many students said that it was 'too cold' which was insufficient.

6.5

Many students found it difficult to interpret the decay curve with just over half choosing the correct option.

6.6

This was a challenging high demand question requiring a detailed knowledge of the decay of radioactive nuclei and half-life. The most common mark gained was for MP3 stating that after 60 years that 25% of the original activity would still be present. About one sixth of students gained this mark. Students who attempted MP1 and MP2 most often did not gain credit for lack of precise physics terminology.

7.1

This calculation was well answered by nearly half of all students. Nearly a quarter gained full marks and many more gained 4 marks for a correct method after failing to convert 1260 kJ to J.

7.2

Students who understood specific heat capacity found it a simple task to gain 1 mark, but did not often go on to give the explanation. The significant number who linked energy to density or boiling point gained no credit.

7.3

This question discriminated very well with a third of students gaining 1 mark and a further one third going on to gain 2 or 3 marks. A thorough understanding of gas pressure in a closed container was required and those students who gained 1 mark usually did so by knowing that increased temperature would increase the kinetic energy of the gas molecules or that more simply they would move faster. To gain further marks students needed to know that the pressure was caused by the molecules hitting or bouncing off the walls of the container, not each other, and that they would be doing this more frequently or with more force. Nearly a sixth of students were able to express all three points clearly.

8.0

Nearly three quarters of students gained some marks for their knowledge of xylem and phloem tissue. A wide range of marks was seen. In some responses a good understanding of the differences in the two tissues was seen but marks were capped at 3 marks because the similarities were not mentioned. Just one similarity such as both tissues are tubes or both are involved in

transport in plants was enough to gain up to 6 marks. It may be worth students and teachers noting that a question asking for a comparison will always require both similarities and differences to gain full marks.

9.1

This question part on the last question of the paper was not as easy as many students imagined. They need to understand from the method that the gel had already been prepared for the method and so references to alkali, indicator or gel density were ignored. About a quarter of student did gain marks, usually for the concentration of acid or temperature.

9.2

A third of students calculated the percentage of the cube that changed colour correctly. About half used the method of subtracting the volume that did not change colour from the total volume and then calculating the percentage, while the other half calculated the percentage that did not change colour and subtracted it from 100%. Both methods are equally valid.

9.3

Students showed a very poor understanding of surface area to volume ratio and the significance for organisms of different sized. Generally, the only mark seen was for the knowledge that as size increases, surface area to volume ratio decreases.

9.4

Using gel cubes as a model for organisms was recognised as having limitation by nearly a half of students. Usually 1 mark was gained for stating that organisms are not cube shaped but sometimes a further mark for the understanding that an organism is comprised of more than one tissue or not made of gel.

Mark Ranges and Award of Grades

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