APPLIED GENERAL
APPLIED SCIENCE

1775/ ASC1 Key Concepts in Science
Report on the Examination

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General

It was encouraging to see that the entry for this series returned to pre-pandemic levels (over 440 entries compared to just over 250 in January 2022). It was also positive to see that the mean mark in this series was higher than in the summer 2023 series.

In this report, the performance of students in this series is summarised in a way that is as helpful as possible to teachers preparing future cohorts.

This paper gave students the opportunity to apply their knowledge and understanding across a range of topics from Unit 1. It was clear, as with last series' exam, that the best students had managed to prepare well for this examination and were able to attain high marks. However, there were a number of aspects of the paper which proved to be very challenging for the majority of students. For example, the key concepts of the role of aldosterone in controlling sodium ion concentration in the blood, titration curves, representing motion in displacement against time graphs and describing the forces on an accelerating car in the Dynamics topic as well as the description of free electrons and the behaviour of conductors in the Electricity and Circuits topic need to be better understood by students to raise achievement in future series.

Presentation was generally good with handwriting being legible and it was clear that the space provided for answering questions was sufficient for the vast majority of students, as there were very few additional pages to mark. It was also evident that students had sufficient time to complete the paper. All questions were attempted by the vast majority of students.

The fact that students are prompted in questions to 'Use the Formulae Sheet' has helped students in questions that require an equation. It should be remembered that, in their answers, students should be encouraged to always write the formula down and then substitute in the required data, setting their work out clearly, as many students simply wrote their final answer in the space provided.

ASC1B – Biology

Question 1

1.1 Approximately 85% of students gained at least partial credit in this first question, by correctly identifying different parts of a eukaryotic cell. Just over one third scored full marks. A common error that was seen was mixing up the cell membrane and the cell wall.

1.2 Just under two thirds of students gained credit for recognising that the cell in Figure 2 was prokaryotic or bacterial. A significant minority of students incorrectly identified the cell as a plant cell.

1.3 In this question students needed to give reasons to justify the type of cell they thought the cell in Figure 2 was. Nearly 40% of students gained 1 mark and a further 15% gained 2 marks. The most commonly gained mark was for stating the presence of flagella. A significant number of students described the cell as having three layers or an extra layer, but did not give enough detail as to what this layer was. Reference to the smaller ribosomes in prokaryotic cells was seen a small number of times.

Question 2

2.1 Approximately two thirds of students correctly identified organism X as a producer, algae, or plant. A significant minority of students either listed a range of organisms, meaning it was unclear if they knew this was a plant or gave the names of marine animals, such as whale, shark and dolphin.

2.2 Approximately two thirds of students gained full or partial credit in this question, with 1% gaining 3 marks. Most students correctly identified food chain 2 as the most efficient for human food production. The most commonly seen way of gaining the second marking point was for stating that this was the shortest chain. The third marking point was very rarely seen. Answers often did not make clear that energy is lost at each transfer point or between each level of the chain. Vague responses such as ‘less energy lost’ were not sufficient to gain credit.

2.3 Just over half of the students gained credit for correctly identifying excretion as the factor. All other distractors were selected by some students.

2.4 The vast majority of students did not accurately define the term ‘net primary production’. Often the link to the definition referring to ‘plants’ and ‘after respiratory losses’ was missing from the students’ definitions.

Question 3

3.1 Approximately one third of students correctly identified the hypothalamus as the part of the brain that monitors the concentration of the blood. Commonly seen, incorrect answers included the medulla and the cerebellum.

3.2 This question discriminated well, although only one fifth of students gained credit. Some students used correct technical terms of 'ultrafiltration' and 'selective reabsorption' and gained credit. Answers that did not gain credit often demonstrated a lack of detail or precision, such as 'to absorb glucose, ions and water'.

3.3 Half of all students could interpret the graph and gained some credit in this question. The most commonly seen points were:

- the sports drink kept the sodium ion concentration highest throughout
- the sports drink kept the sodium ion concentration in the normal range throughout.

3.4 One fifth of all students gained credit in this question, with approximately 3% gaining full marks. A significant number of students incorrectly named ADH or adrenaline as the hormone released by the adrenal cortex. Some students described 'absorption of sodium ions' but did not make clear that this was reabsorption or absorption into the blood.

ASC1C- Chemistry

Question 1

1.1 Many correct answers were seen with nearly two thirds of students gaining the mark. However, a significant number of students incorrectly stated halogens as the name of the elements in Group 0.

1.2 A large proportion of students realised that noble gases have full outer shells. Only 30% expanded their explanation to say what atoms of noble gases did not need to do, in terms of electrons, in order to explain why the Group 0 elements are very unreactive.

1.3 Over 40% of students' answers stated that each element has an extra shell, going down the group. A much smaller proportion correctly discussed shielding or attraction between the outer electrons and the nucleus to gain the second marking point.

1.4 Many students did not convert, or incorrectly converted, kPa to Pa and thus had a magnitude error. Some students incorrectly converted temperature to Celsius and some did not recognise that a measurement in Kelvin was a temperature. Many answers were not given to 3 significant figures and a significant proportion of students rearranged the ideal gas equation incorrectly. Overall, just under 10% gained full marks in this question.

Question 2

2.1 Nearly three quarters of all students gave incorrect answers when giving the name of the type of reaction, including combustion and neutralisation.

2.2 Although a substantial number of equations contained the correct formulae some element symbols were written with no capitals and some subscripts were as large as the element symbols and therefore did not gain credit. Overall, just over one third of students gained credit in this question.

2.3 Many correct energy profiles were seen, and over one third of all students gained full credit. A significant proportion of answers did not show the correct shape of an energy profile and the reactants and products were not labelled on several answers.

2.4 In this question, students were asked to draw an arrow to show the activation energy and a significant proportion of students incorrectly labelled the overall energy change instead, and did not gain credit.

2.5 A large proportion of answers showing a regular arrangement of atoms were seen, and nearly one third gained full credit and a further third gained 1 mark. Incorrect answers included:

- representations of ionic bonding
- two atoms being covalently bonded
- particle diagrams showing a gas.

Some answers showed metallic bonding and labelled the delocalised electrons as aluminium. This question was not attemped by nearly 15% of all students.

Question 3

3.1 Just over half of all students identified the correct shape of titration curve for a weak base being added to a strong acid.

3.2 Nearly one third of all students identified the correct indicator. Some excellent answers were seen but many students were unable to correctly explain why the indicator was chosen.

ASC1P- Physics

Question 1

1.1 Just over half of students were able to identify that the variable resistor would be used to change the voltage across the lamp in the circuit.

1.2 Students are generally good at plotting graphs (a skill they would have had much experience of in Unit 2: Applied experimental techniques) and over 80% of students were able to gain at least one mark, with approximately 45% gaining two marks. Those students only gaining one mark here, was mainly due to drawing a straight line of best fit when a curve was required. Students should be taught that lines of best fit can be a curve or a straight line and must be given practice at identifying which type of line is required. Approximately, 14% of students gained zero marks on this question – a higher proportion than in previous series.

1.3 This question required students to read a value of current from the line of best fit on their graph and substitute it correctly into the equation $I = \frac{V}{R}$ to calculate the resistance. Students were also expected to give the unit for resistance. The best candidates showed their value clearly either on the graph itself or wrote 'current = …'. Just over 30% gained full marks on this question. The majority of students, unfortunately, were unable to rearrange the equation correctly (to give $R = \frac{V}{I}$). Students should be given much practice at rearranging all the equations on the formulae sheet in lessons.

1.4 Less than a quarter of students were able to state that a curve (with decreasing gradient) on the graph showed the resistance of the lamp increased. Students should be able to interpret voltage-current graphs for a range of components including lamps.

1.5 This proved to be one of the most demanding questions on the paper with just under 75% of students gaining zero. Indeed, a little over 1% of students gained full marks. It is clear that there are still many misconceptions with electricity. The specification states that learners should develop their knowledge and understanding of 'free electrons and the electrical behaviour of conductors and semiconductors and the effect of temperature on the resistance of conductors and semiconductors'. We would expect students to provide a clear qualitative description of the behaviour of ions in a filament lamp as it heats up (they vibrate more) and that this leads to free electrons colliding more frequently with the ions. It was clear that many students knew that the resistance increases due to an increase in collisions, but that did not make it clear that electrons would collide with the ions. A very common misconception was that the resistance of the lamp would need to increase to 'protect it' from the increased current.

1.6 Just under three-quarters of students were able to use the data to calculate the maximum power of the lamp. A common mistake was to add the powers for each of the voltages given in the table.

Question 2

2.1 In previous series, the use of the suvat equations has proved to be very demanding. It was encouraging, therefore, to see just over half of students select the correct equation from the formulae sheet and substitute the data to get the correct answer.

2.2 Around 23% of students were able to use F = ma and give the correct unit for force to gain both marks. Disappointingly, a third of students were unable to do either.

2.3 The specification states that students will 'develop their knowledge and understanding of representing motion through the use of graphs of displacement against time'. It was clear that most students were unaware of how the displacement of a car varies as it accelerates. This was a multiple choice question with four options and fewer than 25% of students selected the correct answer.

2.4 This question was asking students to apply their knowledge of forces. This proved to be the most challenging question on the paper with just over 80% of students gaining zero marks and less than 1% of students gaining full marks. Just under 15% of students were able to state the resistive forces on the car would increase as its speed increases but were unable to state how this would affect the resultant force on the car and its acceleration.

2.5 Just over 35% of students were able to describe the transfer of kinetic energy to heat/sound as the brakes are applied correctly. A very common misconception was to consider friction to be an energy instead of a force – it must be remembered that the friction force transfers the kinetic energy to heat.

Mark Ranges and Award of Grades

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