APPLIED GENERAL
APPLIED SCIENCE

ASC1 Unit 1: Key Concepts in Science
Report on the Examination

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General

This paper gave students the opportunity to apply their knowledge and understanding across a range of topics in Unit 1.

Many aspects of the paper proved to be challenging for the majority of students. For example, the key concept of electricity and circuits and indirect calorimetry needs to be better understood by students and in general students struggled with much of the Chemistry content.

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 (there were very few additional sheets to mark). It was also clear that students had sufficient time to complete the paper. Most questions were attempted by the vast majority of students.

In the questions that required the use of a formula, many students were still unsure how to rearrange the equations that are, of course, provided on the formulae sheet. Students should be familiar with the formulae sheet so that they can identify the correct equations to use and be confident in rearranging them. 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.

Section A: Biology

Question 1

1.1 Just over half of all students correctly identified the number of nucleotides. A range of incorrect answers were seen, with '3' being the most common answer.

1.2 Just over half of all students gained credit in this question, with 34% gaining full credit. In some cases, very poor spelling prevented students gaining marks and a small number of references to uracil were seen.

1.3 Over 80% all students correctly identified ribosomes as the organelle that produces proteins. All other distractors were seen, with mitochondrion being the most common incorrect answer.

1.4 Two thirds of all students correctly identified lysosomes as the organelle that breaks down damaged cell organelles. All other distractors were seen, with Golgi apparatus and smooth endoplasmic reticulum being the most common incorrect answer. Very few students selected the nucleus.

Question 2

2.1 Just under half of all students correctly selected the right atrium (D) as the location of the SAN. The most common incorrect answer was E, which is where the AVN is located.

2.2 Only one third of all students could correctly identify the location of the AVN. The most frequently seen incorrect answers were between the two ventricles (A) and C, which is the tricuspid valve.

2.3 Over 95% of all students correctly answered this question.

2.4 Approximately two thirds of all students correctly identified the role of the baroreceptors. The most commonly seen incorrect answer was for the change in blood glucose concentration.

2.5 Just over half of all students gained partial credit in this question, with a further 20% gaining full credit. Most commonly, those students that gained two marks gave the idea of high blood pressure and the risk of a heart attack. All possible answers were seen, including the risk of kidney stones and dehydration.

2.6 Over half of all students could correctly identify a situation where there is a risk of low salt concentration. Most commonly students referred to exercise and sweating, but they weren't always clear that it is 'a lot of' sweating or exercise.

Question 3

3.1 Many students struggled to express their answers to this question and often wrote about a nurse counting the number of breaths or using a respirometer. Both possible answers, peak flow and spirometer, were seen.

3.2 The majority of students correctly answered this question, with the most common incorrect answer being 'physical and internal', potentially showing some confusion between breathing and respiration.

3.3 The full range of marks were seen in this question, with approximately half of all students gaining one or more marks. In the third box, a significant number of students wrote about NAD.

3.4 Students struggled to answer this question, with only a small number of students gaining a mark. Many students wrote about the lack of accuracy of direct calorimetry or the expense, which did not gain credit.

Section B: Chemistry

Question 1

1.1 Just over a quarter of all students gained credit and many incorrect answers were seen including 'non-metals' and 'halogens'.

1.2 A very large number of students seemed unable to understand numbers quoted in standard form. Some were able to interpret the values but did not identify a trend. Only one fifth of students gained credit in this question.

1.3 Just over one third of all students gained credit, with a large number of students believing that the charge was positive. There were many who also identified the charge incorrectly as -1 or -3.

1.4 Only 10% of students could give a correct answer to this question. Incorrect answers seen included water, hydrogen, and sodium chloride.

1.5 Many equations involved sodium. Unfortunately, a good number of students gave the wrong formula of sodium or hydrogen and only 16% of all students gained credit.

1.6 Over 85% of all students did not gain credit, with the vast majority wrongly thinking that chlorine would have the highest atomic number. A good number thought that chlorine had more shells and a significant number thought atomic radius increased from left to right across a period.

1.7 Approximately one quarter of all students gained full or partial credit in this question. Some students divided by their smallest number and determined a whole number ratio but had not divided by relative atomic mass to calculate number of moles initially. Others calculated the moles but were unable to continue with the calculation. Many incorrectly multiplied the mass and the relative atomic masses.

Question 2

2.1 Generally well answered with 70% of all students gaining credit, although a substantial number thought that graphite was ionic.

2.2 Many different geometrical shapes were seen in answer to this question, and over 60% gained full or partial credit. Several students showed multiple layers. Many answers showed diagrams with tessellated squares and pentagons. Other answers showed hexagons with many triangles or rhombi. The vast majority of answers showed no regular shape at all.

2.3 Most students answered this question correctly.

Question 3

3.1 Very few correct answers seen and only 10% of all students gained full or partial credit. Only a small number of students realised that the energy change is for 1 mole of the substance.

3.2 Very few correct answers seen. The majority of students seemed completely unaware of what was required.

3.3 Only 12% of all students gained credit, and many incorrect answers were seen, including ‘oxygen takes a lot of energy to form’, ‘oxygen is not a reactant’, ‘because it’s hard to test just oxygen’ and ’because oxygen has a full outer shell’.

Section C: Physics

Question 1

1.1 This question required students to correctly identify the symbol for a variable resistor. 60% of students could do this.

1.2 Over 92% of all students were able to describe the relationship between voltage and current shown on the graph. The best students identified a **directly proportional** relationship.

1.3 This question required students to read voltage and current data from a graph and substitute it into a rearranged formula and give the correct unit for resistance. Almost 40% of all students gained three marks here.

1.4 Nearly 59% of all students were able to correctly state that the energy transferred by the resistor increased as the voltage and resistance were increased. However, 4% of students did not attempt this question.

1.5 To gain the marks in this question, students were required to recall the behaviour of voltage and current in a series circuit. While the majority of students realised that the current would be the same (0.8 A) in series, very few (less than 2%) were also able to correctly give the voltage across component X as 2 V. Students should be taught that the voltages across components in series add up to the voltage of the power supply. This proved to be a challenging question with over 7% not attempting it.

1.6 Just under half of students were able to correctly draw a graph for a resistor of higher resistance. Approximately a third of students recognised that the line would be straight but should one of a higher gradient. Needless marks were lost by many students as they did not use a ruler to draw a straight line. Nearly 10% of students did not answer this question, unfortunately.

1.7 This proved to be the most challenging question on the paper with nearly 64% of students gaining no marks. 22% of students were able to say that the resistance would increase but fewer than 10% could give even a partial adequate explanation of why. Only 1.5% of students gained 3 marks. The specification states that 'Learners will develop their knowledge and understanding of **free electrons and the electrical behaviour of conductors** and **the effect of temperature on the resistance of conductors**'. Students should be taught that the ions/atoms of the conductor vibrate more when the conductor is heated meaning there will be more collisions between electrons and ions/atoms – which increases the resistance.

Question 2

2.1 Just over 49% of students could give an advantage of using tidal power to generate electricity. Too many students are still giving unqualified answers such as 'does not cause pollution' or 'good for the environment'.

2.2 Only 10% of students could correctly describe how the tides can be used to generate electricity and give the correct useful energy transfer. 50% of students gained one mark. Many students were confused between wave power and tidal power so could not gain the first mark. A number of students thought that the tidal power would be used to heat water and turn it into steam – becoming confused with generating electricity from fossil fuels (or geothermal).

2.3 42% of students were able to calculate the total power of the turbines correctly and use the correct equation to calculate the energy. It was encouraging to see an increasing proportion of students being able to rearrange the formula correctly. Only 7% of students, however, were able to gain full credit for this question. Marks were lost because students were not aware of the need to change the time in hours to seconds. There was also some confusion

over the use of MW and MJ – many students lost the final mark because they divided their final answer by 1 000 or 1 000 000 needlessly.

2.4 About 40% of students were able to conclude that the turbines were not 100% efficient or wasted energy due to sound or heat. Many students failed to gain a mark here as they referred, incorrectly, to energy being 'lost'.

Mark Ranges and Award of Grades

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