APPLIED GENERAL
APPLIED SCIENCE

ASC/1B Key concepts in science
Report on the Examination

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General

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.

Although students continue to face disruption due to COVID, it was very encouraging to see a much larger entry for this component this series compared to January 2021. It was clear, as with last series' exam, that the best students had managed to prepare well in the circumstances for this examination and were able to attain very high marks.

However, there were many aspects of the paper which proved to be very challenging for the majority of students. For example, the key concept of the *suvat* equations and Newton's Laws in the Dynamics topic as well as the behaviour of current and voltage in parallel circuits in the Electricity and circuits topic need to be better understood by students. The detail of glycolysis, the production of ATP in the electron transfer chain and the forces involved in different types of bonding are areas that could be improved in terms of students' answers.

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 pages to mark). It was also clear that students had sufficient time to complete the paper. All 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 (for example, I = Q/t caused problems when rearranging for charge, Q) that are, of course, provided on the formulae sheet. Indeed, students are prompted in questions to 'Use 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.

Biology

Question 1

1.1 This question discriminated well, with nearly half of the students gaining all three marks, and a further quarter gaining 2 marks. The most frequently incorrect answer was in response to the function of aldosterone.

1.2 Approximately two thirds of students correctly identified the effect of adrenaline on blood glucose concentration. However, a significant number of students wrote about the effect on blood pressure.

1.3 In this question students were told the lower limit of normal blood glucose concentration and asked how long the concentration was below the normal range. Therefore students needed to interpret the graph to give a duration of one hour or 60 minutes. Just over half of the students correctly determined this. Common incorrect answers arose from giving the times of the day instead of a length of time or from incorrectly interpreting the scale.

1.4 In this question students needed to recall the upper limit of the normal range of blood glucose concentration and then determine how many times the graph rose above this value. Over half of the students did not correctly answer this question, presumably because they did not accurately recall the upper limit of blood glucose concentration.

1.5 This question proved demanding for students and only approximately 15% correctly explained that the fasting was to check the person could maintain a normal concentration of glucose in the blood or to establish a baseline. Most answers that did not gain credit lacked precision and generally referred to food not affecting the results.

1.6 Approximately two fifths of the students gained full or partial credit for explaining how to test urine for the presence of glucose. Answers that did not gain credit included the following:

- referring to a 'stick' being placed in urine, which is too vague for 'dipstick'
- comparing the colour, but not being specific about what the colour is compared to
- the doctor smelling or tasting the urine to see if it is sweet.

1.7 The vast majority of students gained full or partial credit in this question. The most common correct answer stated was for exercising. Some students wrote about losing body mass or body weight. A significant number of students did not gain credit because they wrote vague answers such as 'eat a healthy diet' or 'eat a balanced diet'.

Question 2

2.1 Over half of the students gained two marks in this multiple-choice question and a further third gained one mark. When students failed to gain two marks it was most frequently for selecting the Golgi apparatus or the rough endoplasmic reticulum. All possible options were selected by a small number of students and a very small minority only ticked one box.

2.2 Over half of the students correctly stated active transport as that which uses ATP. Those students who did not gain credit often stated diffusion as their answer.

2.3 This question required students to complete the diagram of ATP by adding a third phosphate to the ADP diagram, and over half correctly did this. In a small number of cases, a further two phosphate groups were added and of the other answers that did not gain credit a range of shapes were added to the ribose sugar or the adenosine (rectangle). Approximately 9% of students did not attempt to answer this question.

2.4 This question discriminated well and required students to complete the description of glycolysis. One fifth of the students gained 1 mark and a further 8% gained both marks. Of the students who gained a mark, this was commonly for pyruvate.

2.5 Over a quarter of the students did not attempt an answer to this question and approximately 15% gained full or partial credit. The first and second marking points were most commonly seen.

Chemistry

Question 1

1.1 This question was generally well answered, although some students incorrectly stated that the atomic number gives the number of neutrons. Others did not mention protons at all and some discussed protons on a shell.

1.2 Whilst a significant proportion of answers mentioned outer electrons, only some mentioned that the outer shell or highest energy electrons would be in the s sub-shell.

1.3 Many students were unable to assign the correct number of electrons to p sub-level and some did not realise that there would be a 3d sub-level not a 4d sub-level.

1.4 A large proportion of answers incorrectly discussed reactions of metals or melting/boiling. However, some excellent answers were seen.

Question 2

2.1 Most students plotted all the points accurately. A significant number identified multiple anomalous points. A large proportion of scripts were seen with a straight line of best fit, which was incorrect, and some students did not exclude the anomalous point when drawing their curve of best fit.

2.2 Many students stated that the number of shells would increase. Only a small number then discussed the attraction between the nucleus and the outer shell electrons. Many students incorrectly discussed only the number of protons. Others incorrectly discussed electronegativity, reactivity, acidity, reaction rate, and surface area.

2.3 Whilst many students were able to calculate the relative atomic mass several seemed unaware that they needed to calculate a weighted average. Some, who realised an average was required simply added each mass and then divided by 3. A significant proportion of those who performed the correct calculation left the answer as 4 significant figures.

Question 3

3.1 A significant proportion of answers incorrectly identified the bonding as metallic or ionic. Many students who correctly discussed covalent bonding then went on to incorrectly discuss intermolecular forces. A significant number of answers contained several contradictions.

3.2 Many correct answers seen. Incorrect answers included discussions of melting point and ionic bonding.

Physics

Question 1

1.1 Over three quarters of students were able to calculate gravitational potential energy correctly. The most common error was students converting the mass from kg to g. Students should be reminded that kg is the SI unit for mass in Physics.

1.2 More than 68% of students were able to use the data given in the question to calculate kinetic energy. The most common errors seen were students forgetting to square the speed or needlessly converting kg to g (as in question 1.1).

1.3 This question was the second most demanding question on the paper. It was clear that the vast majority of students were unfamiliar with the suvat equations. However, this question discriminated well with some very good, clearly set out answers seen. Just under 16% of students achieved the full 2 marks. About a fifth of students were able to gain 1 mark by substituting the data into the correct suvat equation (v2 = u2 + 2as) but could not progress further with the question, generally by rearranging incorrectly. The majority of students incorrectly attempted to use the equation v=s/t to calculate the distance travelled. However, there was no time given in the question. Students should be taught that the suvat equations are required when an object is accelerating/decelerating. They should also be encouraged to identify which suvat equation to use by identifying what data/quantity is given in the question. In this case, the initial (u) and final (v) speeds were given along with the acceleration (a). The question was asking for a distance (s) which should lead students to pick the correct equation (v2 = u2 + 2as). Nearly 8% of students did not attempt this question.

1.4 Almost half of students were able to correctly give one description of how the child's momentum changed as they accelerated down the slide. However, only 11% were able to correctly state the momentum was zero at the top of the slide or zero at the bottom once the child had stopped.

1.5 This was the most demanding question on the paper, with only 2% of students gaining the full 2 marks. 17.5% of students gained 1 mark by recognising the First Law did not apply because the child was accelerating. Many students wrongly stated it did not apply because the child was not stationary. Students should be taught that Newton's First Law also applies to objects which are travelling at constant speed. Over 11% of students did not attempt this question.

1.6 Just under 9% of students gained all 3 marks in this question. Over a third of students were able to state that the efficiency increased because there was less friction. Many students were able to correctly state that the reduced friction decreased the energy wasted. Few students were able to identify that the useful kinetic energy increased as the child's speed increased.

Question 2

2.1 Over three quarters of students were able to gain 1 mark here, correctly identifying the four renewable energy resources. The most common error was to identify nuclear fuels as renewable.

2.2 This question has been asked a number of times over previous series. However, just under 30% of students were able to give a correct advantage and disadvantage for solar power. While more than half of students were able to give a disadvantage, too many students gave unqualified answers such as solar power produces 'no pollution' or it is more 'eco-friendly' for the advantage. We are looking for specific reasons such as it produces no carbon dioxide (CO_2) or greenhouse gases.

2.3 Around 12% of students were able to correctly calculate the charge and give the correct unit in this question. Around a third of students were able to rearrange the equation I = Q/t to calculate charge and give the appropriate unit. The most common mistake was the failure to change the time of 8 hours to 28 800 seconds.

2.4 The behaviour of current and voltage in parallel circuits was poorly understood by most students with just under 14% getting both marks here. In the parallel circuit shown, the voltage would be the same across each LED and the current would be a third. Students should be given the opportunity to practise identifying the voltage and current in different parallel and series circuit diagrams.

2.5 Around a third of students were able to give a valid reason why a series circuit would not be suitable for the garden lights.

Mark Ranges and Award of Grades

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