LEVEL 3
APPLIED SCIENCE

1775/ASC1 Key Concepts in Science
Report on the Examination

1775/ASC1
June 2023

Version: 1.0

Further copies of this Report are available from aqa.org.uk

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.

This paper gave students the opportunity to apply their knowledge and understanding across a range of different topic areas in 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 many aspects of the paper which proved to be very challenging for the majority of students. For example, the key concepts of indirect calorimetry, describing how pacemakers re-establish a regular heart rate, explaining the properties of metals, describing how Newton's Third Law can be applied in the Dynamics topic as well as the behaviour of resistance in parallel circuits in the Electricity and Circuits topic need to be better understood by students to raise achievement in future series.

Students should also be aware of units in questions – for example, only about 10% of students were aware of the need to convert 17 mA to 0.017 A.

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.

The fact that students are prompted in questions to 'Use the Periodic Table' and 'Use the Formulae Sheet' has helped students. Performance in calculations was much better in this exam compared to other series. 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 – many students simply wrote their final answer in the space provided.

Biology

Question 1

1.1. Approximately three quarters of students correctly identified the function of ribosomes in bacterial cells as the synthesis of proteins. The most common incorrect answer was to synthesise lipids, followed by digestion of food particles.

1.2. One third of students correctly identified the function of the mesosome as increasing the surface area for respiration. The most common incorrect answer was to enclose substances and transport them. All possible options were selected by a significant number of students.

1.3. This question discriminated well, and half of the students gained 1 or more marks, with one fifth gaining all 3 marks. A significant minority of students identified Y as a sugar, without clarifying that this was a pentose sugar or ribose. A small number of students thought the sugar in DNA is glucose and some correctly named the three different parts but in the wrong places.

1.4. Two thirds of students gained full or partial credit for matching the stages of respiration with the correct description. The most common correct answer was for glycolysis followed by the Krebs cycle.

Question 2

2.1. The vast majority of students gained full or partial credit in this question, with approximately two thirds gaining one mark for calculating the difference in basal metabolic rate between males and females. However, only 15% went on to multiply this by 24 to give the difference **per day**.

2.2. The question stated that the graphs showed BMR for males and females of different ages, and asked students to give two other factors that affect BMR. However, a small minority of students stated sex or age, which did not gain credit.

Three quarters of students gained full or partial credit in this question, with one third gaining both marks. The most common correct answers were for body weight and height. Muscle mass was also seen often. Common incorrect answers were diet and exercise.

2.3. Only approximately 5% of students gained 2 or 3 marks in this question, with a further 20% gaining 1 mark. When students did not gain marks, it was often because they were attempting to explain how direct calorimetry works to measure BMR without describing **how** it is measured. The most commonly scored mark was for the idea that the temperature of the water is measured or recorded. A small, but significant, minority of students were clearly describing indirect calorimetry.

Question 3

3.1 Approximately one quarter of students gained full or partial credit in this question. The most commonly awarded mark was for the idea of the electrical impulse being sent to the AVN. Some students wrote in detail about how the pacemaker is fitted and the different types, but this did not answer the question asked and did not gain credit.

3.2 Almost 30% of students gained full or partial credit in this question. A significant number of students simply restated the information in the question, such as ‘last longer’ or ‘no need to replace the batteries’, but these were insufficient to gain credit. The most commonly seen correct answers were for:

3.2.1 battery leakage
3.2.2 fewer surgeries being needed.

Chemistry

Question 1

1.1 Almost all students gained at least one mark and one third gained full marks. A large proportion of students were able to assign a uniform scale on the x axis. Equally many plotted all points correctly. There was a significant number of students who were unable to draw an appropriate line of best fit. Some students drew two lines, one that resembled the correct answer and a second straight line. Students should be aware that if one answer is required giving two answers will mean that no marks can be awarded.

1.2 Approximately two thirds of students answered this question correctly. However, a significant proportion of students who had drawn a correct graph in question 1.1, incorrectly gave an answer in the range 5 to 8.

1.3 This question was generally well answered, with half of students gaining the mark.

Question 2

2.1. Very few correct answers seen. A large number of incorrect answers discussed the metals themselves being alkaline.

2.2. This question was generally well answered with approximately 60% of students gaining credit.

2.3. Over one third of students gained both marks in this question for correctly giving 21 neutrons and 19 protons.

2.4. Many students answered correctly and overall, this question was answered better than in previous papers. However, a significant proportion did not use the correct mathematical method, some divided the mass of each isotope by its respective abundance. Others were unable to calculate the percentage of the potassium-41 isotope.

2.5. Almost half of all students gained some credit in this question, and a good number of correct answers were seen. Unfortunately, some diagrams that looked correct had the particles labelled as protons and so could not be awarded a mark. Some diagrams incorrectly showed covalent or ionic bonding.

2.6. Many answers identified strong bonding but could not be awarded a mark as they discussed intermolecular forces or covalent bonds. Electrostatic forces were frequently and incorrectly referred to as electromagnetic forces. Several references to molecules rather than atoms or ions were seen. Approximately one quarter of students gained one mark.

Question 3

3.1 Approximately 45% of students balanced this equation correctly, which demonstrated an improvement on previous series.

3.2 Just over 25% of students answered this question correctly. Some incorrectly copied the formula of ammonia and therefore did not score the mark.

Physics

Question 1

1.1. Just over 60% of students were able to give the correct definition for a renewable energy source. The most common incorrect answer was a renewable energy source can be ‘reused’. Students should understand that a renewable energy source is one which can be ‘replaced’/ ‘replenished’.

1.2. This proved to be more challenging for students with fewer than half of students able to give an acceptable advantage of solar power, that it produces no carbon dioxide or greenhouse gases or that there are no fuel costs once set up. Students should be reminded that unqualified answers such as it is ‘environmentally friendly’, or it causes ‘no pollution’ will not gain credit.

The question was deliberately worded 'One advantage of solar power is that it is a renewable energy source. Give one other advantage of solar power'. Despite this a number of students gave 'it is renewable' as an answer. The importance of reading questions carefully should be emphasised to students.

1.3. Students were much more confident giving a disadvantage of solar power with over 85% giving a correct answer.

1.4. This question required students to draw a circuit diagram including a correctly positioned ammeter and voltmeter. It was encouraging that most students knew the correct symbols for an ammeter and voltmeter. About a quarter of students were able to get both marks here. Around half of students were able to show an ammeter connected in series but also showed a voltmeter in series. Students should be taught (and have experience of setting up circuits) that voltmeters are connected across a component. About 2% of students did not attempt this question.

1.5. Just under 75% of students were able to select the correct equation from the Formulae Sheet and calculate the power of the solar cell. However, only around 10% of pupils were able to convert the current in milliamps to amps. Students should be familiar with the prefixes that appear in this paper and be able to convert them – mega, M; kilo k; centi,c and milli, m. Other common prefixes are micro, μ and nano, n which are often seen in the biology paper too.

1.6. Just over 75% of students were able to calculate efficiency correctly in this question. Which demonstrated an improvement from when last assessed. Where students had made an error in question 01.5, this error was carried forward.

1.7. This question required students to apply their knowledge of electricity and energy to a lamp shining on a solar cell. The best answers clearly stated that there was less light / energy reaching the solar cell and this then meant the solar cell produced a smaller voltage or less electrical energy for the motor. Over 90% of students were able to state the motor would slow down. This dropped to 30% being able to describe how the light received by the solar cell decreased and about 20% of students were then able to go on to describe how this affected the energy passed on to the motor.

1.8. Fewer than a third of students were able to clearly describe why the experiment should be completed in a darkened room. The most common incorrect answer was an unqualified 'it would affect the student's results.' At Level 3 more than this is expected. The question referred to the student doing an experiment to measure the efficiency of a solar cell. A correct answer would refer to the light affecting the student's results for efficiency or voltage / power etc.

1.9. This proved to be the most demanding question on the physics paper with just 22% of students able to select the correct response (from a three-option multiple-choice question). The specification states that students will 'develop their knowledge and understanding of the behaviour of resistance in series and parallel circuits'. As well as being able to use the equation for resistors in parallel, it is useful for students to remember that the total resistance of resistors in parallel is always less than the resistance of the lowest individual resistor.

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 Just over 40% of students were able to use p = mv to calculate the momentum in this question. However, only around 10% of students were able to state the correct unit for momentum. Many students lost marks as they confused the two acceptable units (kg ms^{-1} and kg m/s), producing an amalgam of both- kg/ms^{-1}.

Where students had made an error in question 02.1, this error was carried forward. Unfortunately, around 6% of students did not attempt this question.

2.3 This question asked students to apply their knowledge of forces. Only the most able students were able to gain two marks in this question. Describing the force of a ball on the surface and the equal and opposite force on the ball from the surface. The question asked students to use Newton's Third Law in their explanation. Around 60% of students were unaware that this related to the equal and opposite forces involved when two objects interact. It is useful for students to bear in mind that Newton's First and Second Laws apply to one object, whereas the Third Law always involves two objects. Approximately 6% of students did not attempt this question.

2.4 Around 40% of students were able to describe that energy is wasted or transferred to heat / sound when the ball bounces or that the ball bounces back up with less speed / kinetic energy. Unfortunately, less than 3% of students were able to describe both. Again, at Level 3 students are expected to be more specific in their answers rather than just state the ball has less energy, a reference to kinetic energy was required.

Mark Ranges and Award of Grades

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