LEVEL 3 CERTIFICATE AND EXTENDED CERTIFICATE

APPLIED SCIENCE

ASC1: 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 topic areas from this unit.

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. All questions were attempted by the vast majority of students.

It was notable that in the Chemistry section a significant number of students gave two alternative answers when clearly only one answer was required, particularly where a numerical answer was required. Students must be made aware of the list principle as two contradictory answers will not gain credit.

In the questions that required the use of a formula, many students were 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.

Numeracy difficulties were evident in a significant number of scripts. A large number of students made some effort to show working, but their working often lacked structure and clarity.

Within the Physics section of the paper, the key concepts of energy and efficiency and the relevant formulae need to be better understood by students.

Students should be encouraged not to repeat or restate the question as this gains no credit.

Section A: Biology

Question 1

1.1 Most students gained full or partial credit in this question, correctly stating cell wall and/or chloroplast. However, a significant number of students stated 'vacuole' as their answer despite no vacuole being present in Figure 1. A small minority referred to the light sensitive spot or chlorophyll.

1.2 Most students correctly described the role of the flagellum in movement.

1.3 Approximately 80% gained credit for correctly identifying the hydrogen and oxygen.

1.4 This question differentiated between students well. Most of the possible answers were seen and most commonly students wrote about:

- lack of membrane bound organelles
- lack of a nucleus
- presence of a ring of DNA
- presence of plasmids.

A common incorrect answer seen was to state the prokaryotes have a flagellum.

1.5 Approximately a third of all students gained full credit in this answer. The most commonly seen incorrect answer was 'to control the movement of oxygen'.

Question 2

2.1 Most students correctly identified the hypothalamus as the part of the brain responsible for monitoring the concentration of the blood. Incorrect answers seen were left side of the brain, right side of the brain, cerebellum, occipital lobe

2.2 This question differentiated well and approximately 50% of students gained credit. All incorrect options were seen, with the adrenal gland and pancreas being most commonly selected.

2.3 Many students struggled with this question and some students opted for the opposite effect of ADH and therefore incorrectly stated that the person would have increased urine output or more dilute urine. All correct answers were seen.

A significant number of students did not give a symptom of the increased ADH level and instead gave the symptoms that would be seen as a further consequence and this was insufficient to answer the question asked.

2.4 Approximately 30% of all students gained full or partial credit in this question. Some answers were very confused as to the function of the glomerulus and the Bowman's capsule and hence some students wrote about selective reabsorption in their answer.

2.5 Approximately 15% of students gained at least one mark in this question, often for the idea that glucose, ions or water would be reabsorbed. Some answers described absorption but did not make it clear that this was **re**absorption or absorption **back** into the blood.

A significant number of students described all the contents of the blood being filtered out of the blood, including proteins and blood cells.

2.6 Many students described the test as starting with not eating for eight or more hours. Some answers were too vague and referred to not eating for a period of time or for a couple of hours and this was insufficient to gain credit. A small number of students did think the person should not eat for 24 or more hours.

For marking point 2 some answers were too vague to gain credit as the students described the doctor looking at the glucose levels or checking them without giving the idea that the blood is tested.

2.7 Approximately 35% of students gained full or partial credit in this question. The specification lists three tests which students need to be clear on, one of which is the fasting blood test which Question 2.6 referred to. Vague answers such as ‘dip test’, ‘prick test’, ‘stick test’ were insufficient to gain credit.

Section B: Chemistry

Question 1

1.1 Many correct answers were seen with three-quarters of all students gaining credit.

1.2 This question was generally well answered. Some students, however, incorrectly calculated the relative molecular mass. Many totalled the atomic numbers rather than the relative atomic masses. Some students incorrectly rounded their correct answer.

1.3 A quarter of all students gained credit. Of those who did not gain credit, some omitted to use the required factor of 1000.

Question 2

2.1 Many students seemed unaware of the number of orbitals in the s,p,d, and f sub energy levels. Others did not fill the sub energy levels in the correct order. This fundamental concept is required on this specification.

2.2 Many students incorrectly stated that the loss or gain of electrons gave rise to colour. A significant number were able to describe absorption of light energy promoting electrons from the ground state. Several, however, did not correctly link either absorption with excitation, or emission with falling back to the ground state.

2.3 A small number of students were able to answer this correctly. Many incorrectly described the reaction as combustion or thermal decomposition.

Question 3

3.1 Whilst a large number of students realised that covalent bonding involved sharing, many incorrectly discussed sharing ions or atoms. Many students realised that electrons needed to be mentioned. However, a significant proportion seemed to think that a covalent bond consisted of only one electron.

3.2 Approximately one quarter of all students gained credit in this question. Those who answered incorrectly often made reference to weak covalent bonds. Some incorrectly referred to delocalised electrons or ionic bonding. Many incorrectly made reference to forces between bonds.

3.3 Few students knew the meaning of the term volatile. Most students incorrectly thought that the term related to ease of flow or vigour of reaction.

3.4 A small number of students knew that the bond enthalpy was the heat energy required to break a bond. Many failed to gain credit as they gave factually incorrect answers such as 'the heat energy required to make a bond'.

Many students incorrectly stated that the bond enthalpy was the number of bonds.

3.5 The majority of students simply stated what an average was. Students did not demonstrate an understanding that the enthalpy is an average for the same bond in many different molecules.

3.6 Whilst many students successfully calculated the enthalpy change for the reaction very few recognised that the number, they had calculated was double the enthalpy of formation of ammonia.

A significant number were unaware of the bonding present in nitrogen, hydrogen and ammonia molecules. Again, many students showed a lack of understanding of chemical formulae.

Section C: Physics

Question 1

1.1 This question required students to correctly identify the useful energy transfers from a battery and electric motor. A fifth of students could identify three of the four energies allowed in the mark scheme. 72% of students were able to identify at least one energy and this tended to be the kinetic energy of the motor or marble.

Few students could state that a battery was a store of chemical energy. Many students incorrectly referred to the electrical energy as 'electric' so were not awarded this marking point. A large number of responses referred to the kinetic energy of the marble as it rolled down the track which was not an energy transfer from the battery or electric motor so was not creditworthy. Many students, too, described the wasted energies (such as heat/sound) – these gained no further marks. Nearly 4% of students did not attempt this question.

1.2 Just over 80% of students were able to use the correct equation from the formulae sheet and correctly substitute the data for one mark.

1.3 It was encouraging to see that students are becoming more confident at rearranging equations. Almost half of students could rearrange P = E/t and substitute their answer from Question 1.2 to gain the mark.

1.4 Like Question 1.2, this question did not involve the rearrangement of an equation but it was not as well answered with 58% of students getting the full two marks; 20% gained one mark.

Students seem less familiar with using the equation GPE = mgh, with many students instead calculating mg. Marks were also missed because students incorrectly converted 0.015 kg to 15 grams or 0.30 m to 30 cm. Students should be aware of the importance of the use of SI units in Physics as opposed to the use of grams, for example, in Chemistry. Over 4% of students missed out this question.

1.5 The concept of efficiency proved to be very challenging to all but the highest-attaining students with 13% gaining two marks. 7% of students failed to attempt this question. Although the equation is given on the formulae sheet, students were not able to identify the correct useful energy output or total energy input for the context of the roller coaster. A common error was the mixture of energy and power in the equation.

1.6 This question required students to give one reason why it is important to improve efficiency and 40% of students were able to give a correct response.

Many students described how waste energy can be eliminated from a system. This is not possible so did not gain credit. Examiners were looking for a description of how **less** energy is wasted or **more** energy is usefully transferred.

1.7 28% of students knew the definition of inertia. Two thirds of students incorrectly selected 'Momentum'.

Question 2

2.1 Students showed that they are more familiar with calculating kinetic energy than gravitational potential energy with 51% gaining two marks here.

The most common error was not squaring the speed or squaring (mass × speed). Again, a number of students tried to convert the mass to grams or made errors converting their answer to standard form (the answer does not have to be given in standard form).

2.2 Over 90% of students were able to give at least one advantage or disadvantage of using wind power. Marks were generally missed due to unqualified answers such as 'don't cause pollution'; 'better for the environment' or 'affected by the weather'. More detail was required; for example, a reference to no emission of CO_2 or unreliability due to it not always being windy. 60% of students were able to give a suitable advantage and disadvantage.

2.3 Just over half of students were able to accurately plot data effectively on a graph and draw a line of best fit. However, over 40% of students unable to draw a suitable **curve** for the line of best fit. Students have been examined on this twice in previous series so this year's entry should be familiar with them.

Students should be able to clearly mark points with a cross (×) rather than a 'blob' (•). The 'blobs' often get obscured by the line of best fit making it difficult for examiners to see where the points are plotted, leading to a mark being lost.

2.4 This question required students to interpret the data given in Question 2.3. Approximately 60% of students gave a simple description of the relationship (eg as the length of turbine blades increased so did the power output). The question asked students to use data in their answer and just over a third did so.

A small number of students (just under 2%) were able to correctly state that the power is directly proportional to the length of turbine squared or that the rate of change of power output (or gradient of the graph) increased as the length increased. Students should be encouraged to interpret data and graphs in as much detail as possible – Figure 3 clearly showed a curve with increasing gradient, so students should refer to this in their answers.

Mark Ranges and Award of Grades

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