AQA

A-level
CHEMISTRY

CHEM1 Foundation Chemistry
Report on the Examination

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General comments

With the introduction of the new AS and A-level specification, this paper was taken mainly by Year 13 students who were either sitting all examinations at the end of their two year course or as a resit. A number of questions testing recall of knowledge were well attempted, although those requiring students to apply their knowledge were not as well answered. Schools should be aware that in the new AS and A-level examinations there will be significantly less recall and a greater emphasis on application of knowledge, evaluation and analysis.

The paper appeared to be a fair test of students' ability at AS level and there were some high performing answers that showed a deep understanding of the subject.

The standard of literacy is still an issue since many students often referred to 'it' in their answers and it was often unclear what they were referring to; hence the answer was often ambiguous and could not score marks. It was noted that the more mathematical questions were attempted by almost all students and that there were many students who performed well in these questions. However there are still some students who do not give answers to the required precision as stated in the question. There is still evidence of a lack of legibility of students' responses due to very poor handwriting and/or the use of pens that do not allow the papers to be scanned well. The instructions regarding the use of a black pen are clearly stated and schools must ensure that all students follow the rubric on the front of the examination paper. There were many students who used additional sheets. This should be considered carefully since answers on the additional sheets often contradicted answers on the paper and hence no marks could be gained. Students must always cross out work that is not to be marked.

Question 1

The definition of relative atomic mass is still not well known. Most students scored one mark but average or mean was often omitted as was mass, particularly with reference to an atom of carbon-12. Most students knew that a magnetic field deflects ions. In part (b)(ii) a number of students stated incorrectly that electrons flow from the ions to the detector in a mass spectrometer. The relative atomic mass calculation in part (c) was done well, although some students did not read the question correctly and gave their answers to three significant figures when the question specified three decimal places. Others failed to divide by 100. Students had difficulties applying their knowledge to state a similarity and difference in the mass spectra of a sample ionised by electron beams of different energies, although marks were often gained for correct explanations.

Question 2

Students struggled to explain how van der Waals' forces arise between molecules. Most scored a mark by referring to 'electron movement' but did not go on to explain that a dipole is induced in an adjacent molecule. Many answers were based on the difference in electronegativity. Most students correctly explained the difference in boiling points between methanol and methanethiol and between methaneselenol and methanethiol. On occasions the quality of students' language was poor either stating that boiling results in all bonds breaking or indicating that the O-H bond in methanol was broken. For this reason a statement that the relevant forces act 'between molecules' is necessary to gain credit. Nearly all students answered part (b)(ii) correctly. The shape and bond angles of SF_6 proved a good discriminator. Some students were not able to deduce the correct number of lone pairs around SF_4 and others did not appreciate the effect of the single lone pair on the bond angles. In part (d)(ii) most students were able to deduce NaCl as the missing product but not all were able to balance the equation. Multiples were accepted.

Question 3

In part (a)(i) most students were able to deduce that CO_2 and H_2O were the missing products but not all were able to balance the equation. Multiples were common and accepted. Most students deduced correctly that bubbles would be observed in (a)(ii). A statement such as 'CO_2 gas is formed' is not an observation. The definition of the term empirical formula is still not well known. One or more key words, usually atoms of each element, were frequently omitted. The empirical formula calculation in part (b)(ii) was answered well with many students scoring full marks. For those who did not score full marks there was a good attempt at the question with marks one and two being accessed by the majority of students, although a number simplified the ratio by rounding 1.5 up to 2, rather than doubling the entire ratio to obtain the simplest whole number ratio.

Question 4

Most students answered part (a) extremely well. They recognised that octane is an alkane and then correctly balanced an equation for its complete combustion. A number stated $8.5O_2$ in the equation having not taken into account that CO_2 contains two oxygen atoms. Most students could give the correct IUPAC names in (a)(iii) and (b)(i). The molecular formula of the alkane produced in (b)(ii) was deduced well and the type of cracking and conditions were mostly stated correctly. A number of students then gave zeolite catalyst as a condition. The displayed formulae in part (b)(iv) were drawn accurately with many students scoring full marks. For those who did not score full marks there was a good attempt at the question with marks two and three being accessed by the majority of students. A number of students did not always show the displayed formula or did not deduce the chain isomer.

Question 5

In part (a) the trend in ionisation energy was explained well with many scoring three or four marks. Many students did not read the question carefully and explained the anomalies in the trend. Those who lost a mark usually omitted the key word 'outer' in respect of the electron being removed. In part (b) many students correctly identified and explained an element that deviated from the general trend. In part (c) most were able to recognise the large jump after the sixth ionisation energy and deduce the element as sulfur. Most students knew that silicon had the highest melting point and went on to score full marks, although aluminium was a common incorrect answer. The quality of language was not always sufficiently clear and some used chemical terms incorrectly such as covalent bonds between molecules or strong van der Waals forces between atoms.

Question 6

The calculation in part (a) was answered well with many students scoring full marks. Common mistakes included using a M_r of 31 for P_4 or that of phosphorus(V) oxide or misreading the question and starting with 200g of phosphorus. The correct answer to the calculation in part (b) was seen regularly. The most common errors were incorrectly calculating the amount in moles of phosphoric acid since they failed to convert the volume of solution from m^3 into dm^3 or failed to use the factor of 4 from the equation. Part (c) discriminated well. Alternative methods based upon mass or moles were seen and these were all given full credit. The most common error was incorrectly calculating the amount in moles of phosphoric acid since many students failed to convert the given mass in kg into grams. A number of students failed to use the factor of 2 from the equation or misread the question and calculated the percentage yield of sulfuric acid. Part (d) was well answered although there were some students who incorrectly based their answer on moles of product formed and others who thought that a one step process was more economical.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator