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Principal Examiner Feedback

Summer 2014

Pearson Edexcel GCE
Chemistry Unit 6CH01 Paper 01R
Core Principles of Chemistry

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General

This paper had many straightforward questions that all candidates could access, but it was also sufficiently challenging for the most able students who were given an opportunity to show the extent of their knowledge and understanding of the unit.

The mean mark for Section A (multiple-choice questions) was 15/20, with Questions 1, 7, 9 and 12 found to be the most straightforward. Questions 4, 6, 13 and 15 were the most challenging for the candidates.

A number of scripts with a raw mark of 70 or more out of 80 were seen. Several questions produced responses lacking precision, with words such as ion and atom being used interchangeably.

Question 19

Parts (a)(i) to (a)(iv) provided a straightforward start to Q19. Many candidates were familiar with the processes occurring in a mass spectrometer and also how to calculate the relative atomic mass of potassium given the percentage abundance of its isotopes.

In (a)(v), many candidates seemed unaware that elements are arranged in the Periodic Table in order of increasing atomic number. The relative positions of potassium and argon in the Periodic Table were often justified in terms of the number of occupied electron shells. In (a)(vi), candidates' Quality of Written Communication was thoroughly tested. The majority of candidates understood that, on forming a potassium ion from a potassium atom, the fourth electron shell was no longer occupied. However, the resultant increase in attractive forces between the protons and the remaining electrons was rarely mentioned for the second scoring point.

The diagram showing metallic bonding in (b) frequently showed the metal cations, K^+, incorrectly labelled as 'nuclei', although the delocalised electrons were nearly always shown. In (c)(i), the majority of candidates defined the first ionization energy correctly. Part (c)(ii) required an understanding that the element at the beginning of a period has a much lower first ionization energy than the noble gas preceding it in the Periodic Table.

Question 20

Parts (a) and (b) proved straightforward for many. The calculation of the moles of both the copper (II) oxide and nitric acid was performed correctly by the majority of candidates in (a), enabling them to deduce why copper (II) oxide was in excess in the experiment described.

In (b), the percentage yield calculation was answered correctly, although a number of candidates forgot that the nitric acid was the limiting reagent and so did not divide the moles of nitric acid by two. The reason for the yield being below 100% eluded many, however, in (c).

This, perhaps, reflected a lack of experience at the laboratory bench. Part (d) proved discriminating, with only half the candidates being able to apply their knowledge of dative covalent bonding correctly to an unfamiliar situation.

Question 21

Part (a) required recall of two key terms in organic chemistry. Whilst the term 'hydrocarbon' was often correctly defined, the term 'saturated' provided more of a challenge. Many candidates mistakenly thought that this meant that a carbon-carbon double bond was present in the molecule.

Parts (b)(i) to (b)(iii) showed that the majority of candidates could, with confidence, tackle thermochemistry questions relating to enthalpy changes of combustion. In (b)(iii), however, the negative sign was sometimes left out of the final answer. Part (b)(iv) proved to be very challenging, with 'heat losses' given by the majority of candidates as the reason for inaccuracy, despite being required by the question to suggest an alternative factor.

Parts (c)(i) to (iii) proved accessible for many candidates, with an incorrect state symbol for the carbon atoms being the only error on completing the Hess cycle. Part (c)(iv), however, proved challenging as many candidates were not aware that bond enthalpies are only applicable to substances in the gaseous state and that, under standard conditions, water is a liquid.

Question 22

Part (a) was answered well. Part (b) proved more challenging, with many candidates unable to define the term 'free radical'. In (c)(i), candidates were required to appreciate that the C-Cl bond is weaker than the C-H bond.

Parts (c)(ii) and (iii) proved more straightforward, with many candidates able to apply their understanding of propagation and termination steps to an unfamiliar mechanism. Part (d), however, required that the 100% atom economy for the reaction $C_2Cl_6 + Cl_2 \rightarrow 2CCl_4$ be acknowledged, but many did not do so.

Question 23

In (a), whilst many candidates could draw the σ and π-bonds in (a)(i), they were unable to explain their relative strength in (a)(ii). The structural formula of E-but-2-ene was correctly drawn by the majority of candidates in (b)(i).

Part (b)(ii) proved far more challenging, with relatively few candidates being able to explain the non-existence of E/Z isomerism in but-1-ene. The bromine water test was familiar to the majority of candidates in (b)(iii), as was the reaction of an alkene with acidified potassium manganate(VII) in (c).

Part (d), relating to the process of polymerization, was well answered by many. The Green chemistry application in (e), however, elicited very few correct answers.

Hints for revision

- Learn your definitions thoroughly, such as saturated hydrocarbon
- Try to practise as many of the different types of calculation question found in this unit
- As well as learning practical techniques, think about the reason for each step of the procedure and why it works
- Make your writing clear. If the examiner cannot decide whether you have written “s” or “g”, when a correct state symbol is required, you will not get the mark
- Make sure you understand what you are being asked to do before you start to answer the question

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