Examiners' Report
Principal Examiner Feedback

October 2024

Pearson Edexcel International Advanced Subsidiary Level in Chemistry (WCH11) Paper 01 Introduction to Organic Chemistry

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General Comment:

Many candidates had prepared well for this paper and were able to apply their knowledge of the topics in the specification to familiar and novel situations. There was little evidence of candidates being short of time. However, it appeared that a significant number did not seem to have a good basic understanding of fractional distillation and found an application of knowledge about shapes of molecules challenging. The calculation questions were answered well with many scoring the majority of these marks.

The mean mark for the paper was 41.4 and the multiple choice, section A had a mean of almost 12.

The most accessible multiple choice questions were 1 (molecular formulae), 5 (balanced equation), 8 (atom economy), 11 (bonding), 14 (free radical initiation) and 15(a) (general formula of cycloalkenes). The most challenging one was 15(b)(deduction of an addition polymer structure).

17(a) A calculation question that included a graph, the scales had been given and the candidates asked to draw a straight line of best fit. It was then necessary for interpolation of some data – some found this tricky as they had their axes mixed up. The final part required the calculation of the number of water molecules in the crystal structure.

17(b) A concentration calculation that was answered correctly by the majority of candidates.

18(a) Generally, answered correctly. The nomenclature part of the question caused the most problems. Some had the numbering incorrect, and some had named the longest chain of carbon atoms incorrect.

18(b)(i) The majority of candidates correctly identified fractional distillation as opposed to just distillation.

18(b)(ii) This question was a challenge to many candidates, and many went on the describe the industrial process of separating the fractions in crude oil. Very few scored both marks.

18(c)(i) Nearly all candidates were able to write a fully correct balanced equation for the complete combustion of isooctane.

18(c)(ii) Here the candidates were asked to describe how CO and NO could be formed in car engines. Balanced equations could be included in the response. Many mentioned that the nitrogen had come from the fuel rather than the air. Others were unable to balance the equation for the reaction between nitrogen and oxygen.

18(c)(iii) The majority of candidates were able to identify other pollutants produced by car engines.

18(d)(i) Approximately half the cohort were able to state the type and mechanism for the reaction between chlorine and isooctane.

18(d)(ii) About 2/3 of the candidates correctly gave the essential condition required for the reaction between chlorine and isooctane.

18(d)(iii) Calculation of the empirical formula of a chlorinated hydrocarbon where the majority of candidates scored 2 of the 3 available marks, usually missing the final molecular formula mark.

19(a)(i) Approximately half the cohort were able to state the type and mechanism for the reaction between propene and hydrogen chloride.

19(a)(ii) This question was about the relative stability of carbocation intermediates. Many candidates lost marks here for stating that the final products (2-chloropropane and 1-chloropropane) were the carbocations. Consequently, they were only able to access the final mark.

19(b) This question was about electrophilic addition mechanism but using the reaction between propene and sulphuric acid. The candidates were given the structures of the reactants and products and only needed to supply the structure of the intermediate including dipoles, charges and lone pairs. This was marked using a points-based mark scheme, this allowed more candidates to score marks.

20(a)(i) This was about the general trend in first ionisation energies across period 2. About ½ the cohort managed to score just one of the two available marks. This was because they missed about the electrons being removed from the same shell.

20(a)(ii) This question was about one of the elements in period two that did not follow the general trend. Many candidates correctly identified the element but then were unable to explain why, again shielding was missed.

20(b) This question was about ionisation energies but this time about the successive ionisation energies of an unknown element. Sadly just under ½ the cohort were able to correctly identify sulfur.

20(c)(i) Many candidates were unable to plot approximate melting points for boron and nitrogen. Indeed, may clearly forgot that nitrogen is a gas at room temperature, giving a value of over 4000K!

20(c)(ii) Structure and bonding of carbon, this seemed to challenge many candidates. Some mentioned ions and metallic bonding. Others included comments about intermolecular forces. They also failed to mention that much energy is required to break the many strong covalent bonds present in the giant covalent lattice.

21(a)(i) This was answered correctly by ¾ of the cohort. The question concerned the electron configuration of aluminium.

21(a)(ii) A surprising number of candidates failed to score for this question. Just recalling that group III elements all have three electrons on the shell after the last full one would have scored one mark. The second mark was for stating that the three element have a different number of electron shells.

21(a)(iii) This question was about the shapes of molecules of the group III chlorides. The majority of candidates correctly identified trigonal planar and the marking point about no lone pairs was the one that was usually not scored.

21(b)(i) Ideal gas equation, many candidates did score all three marks. There were many approaches that could be used here to show that aluminium chloride existed as a dimer in the vapour phase. The most common mark to be lost was for the conversion from cm^3 to m^3.

21(b)(ii) Dot and cross diagrams to show the electron pairs present in Al_2Cl6. It was necessary to show the pairs of electrons in the covalent bonds and the dative covalent bonds correctly. Some candidates showed ionic bonding and so failed to score any marks.

21(c) Many candidates failed to fully appreciate all the information they were given the question and were therefore unable to apply this to the shape of the $TlCl^{3-}_4$ ion. Many missed the lone pairs and the effect that these might have on the shape.

In order to improve their performance, students should:

- Always read the information in the question carefully, noting the command words
- Show working when carrying out calculations, think carefully about units and their interconversion, significant figures and rounding and check the legibility of your work
- Learn the laboratory process of fractional distillation
- Learn the effect of lone pairs on the shapes of molecules and ions
- Practise drawing dot and cross diagrams for dative covalent bonding

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