



Examiners' Report  
Principal Examiner Feedback

January 2025

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

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Publications Code WCH11\_01\_2501\_ER

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## General Comments

This paper on introductory chemistry offered opportunities for candidates to demonstrate their knowledge and understanding of the underlying principles of this subject. Calculations, especially those of a standard nature, were often successfully tackled. There was very little evidence that learners experienced problems with having insufficient time.

The mean mark for this paper was 44.

**MCQ** The mean was 12/20 with questions 10 and 17 being answered correctly by fewer than 30% of candidates.

### Question 21

**21(a)(i)** The majority of candidates produced correct displayed formulae. The most common errors seen were drawings of 2-chloropropene or carbon atoms in the alkene group with 5 bonds.

**21(a)(ii)** It was clear that many candidates understood the concept of a homologous series. It was therefore unfortunate that in some cases extra information negated marks already scored. Examples of these were stating that both chemical and physical properties were similar, confusing general formulae with molecular/empirical formulae or giving an incorrect general formula.

**21(a)(iii)** There was a degree of confusion in many responses. A minority of candidates described structural isomerism and so related the difference to the number of carbon atoms in the molecules, using statements about the possibility of the chlorine atom being on the end or middle carbon. Some responses attempted to explain the difference by stating that one C=C bond rotated, and the other didn't.

However, in general, answers were clearer than a few years ago - a much larger proportion of candidates now realise they need to discuss the groups bonded to **each** carbon instead of just discussing 'sides' of the double bond.

**21(b)(i)** This item was usually answered correctly. Responses that failed to score the first marking point included methyl groups being shown as part of the main polymer chain rather than pendant to the chain or using an incorrect monomer.

For those that failed to score the second marking point, brackets were usually shown but n was most commonly omitted.

**21(b)(ii)** Many vague answers were seen that could have suited questions from previous papers on environmental considerations rather than linking properties of metals and plastics with the proposed use. The lack of reactivity towards water/oxygen and the relatively low density were most commonly awarded. It was disappointing that many answers referred to perceived cheapness when cost considerations were specifically excluded in the question.

### Question 22

**22(a)** Responses that did not score tended to discuss electron or spin-pair repulsion rather than the spins being opposite in direction; many quoted Hund and/or Pauli but were not always accurate in their explanations.

**22(b)** Many responses showed that candidates understood that s and p orbitals had different energies but failed to state which had **higher** energy. There was some confusion with the concept of ionisation energy, and this frequently led to a failure to score M2.

**22(c)** This was well known but a lack of appreciation of the three-dimensional nature of orbitals led to a loss of this mark.

### Question 23

**23(a)(i)** Many fully correct answers were seen. Those that achieved partial credit calculated the percentage of the missing isotope but did not proceed or simply calculated the average for those given already. Most adjusted their answer to 2 significant figures.

**23(a)(ii)** Very few responses were awarded the mark. Often there were references to the precision of the data given in the table. Some candidates who understood that a mass number should be an integer mentioned either protons or neutrons rather than including both.

**23(b)** Marks were generally lost on this item as a result of a failure to read the question carefully, discussing differences in bonding, reactivity, ionisation energies or molecular structure. Those that adopted a systematic approach to the numbers of protons, neutrons and electrons present were usually successful, although the identical mass number was often missed.

### Question 24

**24(a)** The calculation was generally very well done. The most common error was failing to convert the volume or using the wrong temperature (often by adding 273). A correct value for the number of moles often led to fully correct answers for the next steps and hence the molecular formula.

**24(b)** Many candidates deduced that the structure had no double bonds but then drew alkenes in their response to 24(c).

### Question 25

**25(a)** The majority of candidates identified the termination step, but few achieved M2 as they failed to state that **two** radicals combine in a termination step.

Radicals were generally shown correctly, but many candidates struggled to combine two  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\cdot$  radicals into an appropriate formula.

**25(b)(i)** Responses showed that the understanding of a polar molecule was good. The difference in electronegativity was the correct reason offered most frequently. Candidates had more difficulty with a description of non-polarity with

“dipoles cancel” appearing often, showing a lack of appreciation that a bond between two identical atoms would not have a dipole.

**25(b)(ii)** Very few candidates provided an acceptable explanation here. A common misconception was that lone pairs of electrons on the chlorine molecule caused it to be attracted to the  $\pi$ -bond of the alkene's  $\text{-C=C-}$  double bond. Clearly like charges cannot behave in this way. Some candidates described the electrophilic addition mechanism, neglecting to mention the initial formation of a temporary dipole. There was some confusion with the reaction of chlorine with butane via a homolytic, free radical mechanism.

## Question 26

**26(a)** Many correct answers were provided. A common misspelling - "fluorine" was not penalised.

**26(b)** Most of the fluorine outer shell electrons had already been drawn so marks were occasionally lost for showing sulfur electrons as crosses. Other rare mistakes were to show the S-S bond as a dot/cross i.e. including a fluorine electron or as a double bond.

**26(c)** This was also often correct. A failure to show the lone pair of electrons was the most frequent error.

**26(d)** The diagram given in the question for SF<sub>6</sub> should have alerted candidates that 3-D drawings were required. Where attempts had been made, using wedge bonds, there was considerable leeway applied in marking.

**26(e)** The valence shell electron pair repulsion theory was well known, although it is disappointing to see responses that ascribe the repulsion to atoms or electrons without mentioning **pairs**.

**26(f)** The idea that the lack of reactivity of SF<sub>6</sub> was due to the sulfur atoms being "hidden" by the surrounding fluorines was almost never seen. Many candidates attempted to find a common link to the reactivity of SF<sub>4</sub> and S<sub>2</sub>F<sub>10</sub> in terms of polarity. This often led to incorrect statements about S<sub>2</sub>F<sub>10</sub> being polar (in contrast to SF<sub>6</sub>, which most recognised as being non-polar). Those responses that considered the three molecules separately were more likely to score partial credit but there were very few fully correct answers.

## Paper Summary

Based on their performance on this paper, candidates should:

- Read the questions carefully and use the information provided to help you frame your answer.
- Set out calculations clearly.
- Use common terms e.g. molecule, atom, ion, radical accurately.
- Practise drawing three dimensional molecular shapes.

