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Examiners' Report
October 2025

Pearson Edexcel International Advanced Subsidiary level In Chemistry
WCH11/01A

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Question 21(a)(i)

This straightforward question produced a good number of correct answers, though a steady number lost a mark for including the electrons or describing neutrons as nuclei. A few students gave the answer for the 35 isotope or gave numbers alone or gave the number as equal to the mass number. Some misinterpreted the question and gave the possible isotope combination for a chlorine molecule.

Question 21(a)(ii)

This was very well known, with few giving the simpler 2,8,8 notation or using the mass number of electrons. The main errors were not adding an electron or removing an electron instead while a number couldn't resist borrowing from the p subshell to create a d subshell. Many students had altered a 5 to a 6 and need to be aware that on a scanned script it is not always possible to pick out the top layer so should be encouraged to cross out, not overwrite.

Question 21(a)(iii)

Marking here was usually straightforward, with the majority of candidates within the familiarisation sample giving the correct value to the appropriate number of decimal places, with or without showing their working. Very rarely did candidates round to one decimal place. Rare errors included doubling the value; using 35.5 instead of 35; occasional use of incorrect units

Question 21(b)(i)

Most candidates showed a good understanding of how to determine the electronic structure. A common error was to give an incorrect number of electrons for the chlorine resulting in only one lone pair. Another common error was attempting to give structures for ions. Other errors seen included the omission of the non-bonded electron pairs around the fluorine atoms, or multiple bonding pairs between the fluorine and chlorine. Rarely candidates swapped the dots and crosses.

Question 21(b)(ii)

Many responses identified the correct peaks at 92 and 94 and showed the correct ratio in a number of ways (60:20; 90:30). Errors included a reversal of the ration; showing a peak at 92.5 either alone or in addition to the correct peaks; giving a 1:1 ratio. Although candidates are instructed that they may use HB pencil when drawing diagrams and/or graphs, these frequently do not show up clearly when photocopied

for assessment. This is especially the case in examples such as this, where the peaks are drawn along existing lines on the graph outlined on the question paper. It is sometimes necessary for the examiner to use the 'zoom' facility to have any realistic chance of checking the candidates' efforts. This has been an issue for many years…

Question 21(c)

Careless mistakes were not uncommon here, with many candidates failing to follow the instructions to give their final answer in cm3, even though this was emphasised in bold type.

Powers of ten proved problematic on occasions, as candidates often struggled to convert volumes quoted in the question in dm3 into cm3 for their answers. This conversion proved to be further compounded with some candidates dividing by 24.

Question 22(a)

The specification states that students will be assessed on their ability to define first, second and third ionisation energies and understand that all ionisation energies are endothermic'. As such, this is a question where candidates would be expected to score highly. This was not always the case. Common omissions involved failure(s) to note that:

- the enthalpy term is endothermic (the energy required')
- atoms and ions must be in the gas phase.

Many responses showed an understanding of the concept of ionisation but often omitted key terms 'mole' 'atom' or 'gaseous'. Rarely did candidates suggest that energy was given out.

Question 22(b)

This was very well known, with many adding state symbols as well. A small number used the wrong element symbol, gave the first ionisation energy, added an electron to get from +1 to +2, started with neutral Li or went from L2+ to Li+.

Question 22(c)

This question proved straightforward for most candidates. In a few cases, careless misreading of the question caused candidates to discuss the ionisation energies of lithium rather than helium.

Question 22(d)

This question was accessible to most candidates.

Most candidates scored some of the marks. Common errors included omission of crosses for the first and second electrons; showing a jump between 7th and 8th electron; missing one side of the plotted points; some values shown decreasing on the right hand side; a jump at 9 not 10.

Question 22(e)

Although candidates occasionally found difficulty in expressing themselves clearly and cogently, there was usually a sound understanding of the factors which result in a general decrease in the values of the first ionisation energy on descending a group in the Periodic Table. Most candidates identified the increase in atomic radius and shielding. Many candidates stated the increase in nuclear charge but did not always make clear that the value was decreasing in spite of the increase in nuclear charge.

Question 22(f)

Candidates usually appear to recognise that the outermost electron in sulfur is paired. However, they often lose credit by failure to state explicitly that this electron pair is in a p-orbital. Amongst those who noted the type of orbital occupied, a significant proportion stated, erroneously, that this was the 2p-orbital rather than the 3p-orbital. Whilst many candidates realised that there was repulsion between electrons, they were not always clear in identifying where these paired electrons were.

Question 22(g)

In a number of cases, the value suggested for the first ionisation energy of aluminium was outside of the accepted range. Where candidates gave a value in the correct range, they often omitted where the electrons were for both magnesium and aluminium. Explanations for the value given were very variable and stretched a number of the candidates

Question 23(a)

Many responses showed a correct rearrangement and evaluation of the ideal gas equation. The most common error seen was the use of 108 for the temperature, the

conversion from °C to K. Sometimes transcription errors led to an incorrect final answer e.g. 1.08 x10^5 for the pressure. Often a mark was lost as the final answer was given to 4 significant figures. The conversion of volume units also led to errors e.g. thinking the equation gave an answer in dm3 not m3 or converting in the wrong direction e.g. dividing by 1 x 10^6. Failure to express answers 'to an appropriate number of significant figures' here 2/3 SF.

Question 23(b)(i)

Simple diagrams frequently helped candidates to express their answers clearly. The majority of answers recognised that sigma bonds result from 'head-on orbital overlap' whilst pi bonds involve 'sideways orbital overlap'. However, it was unusual for candidates to note the number of areas of overlap unless they chose to illustrate their response with a diagram. It was more common for answers to comment on the relative areas of overlap, for which there was no credit. Some responses included irrelevant references to where pi and sigma bonds were found in single and double bonds.

Question 23(b)(ii)

Mostly correct. Some responses just discussed different groups on the carbons in the carbon-carbon double bond.

Question 23(b)(iii)

Many responses correctly identified and E and Z isomers with rare reversals. A significant number of candidates felt that cyclobutene was an acceptable answer as an example of an alkene with the molecular formula, C4 H8 that does not exhibit E–Z isomerism. Many of those who were able to draw displayed formulae of but-1-ene, or 2-methylpropene, proved to be unable to apply IUPAC nomenclature in order to name these alkenes accurately.

Often candidates forget to give a name.

Question 23(c)(i)

This was more challenging, with 1,2 dibromopropane being the most well known and Ni/H2 the least. Many struggled with showing substituents in a structural formula, choosing to add vertical and horizontal bonds or writing the H and Br on opposite sides of the C e.g. CH3BrCHBrCH2. Grouping the H atoms in the alcohol was also common e.g. CH3CH2OCH3O. Some sidestepped the problem by giving displayed

or molecular formulae. Errors in the chemistry included adding both Br or OH groups to one C atom, retaining the alkene group or forming an alkene. Steam and phosphoric acid were often given as the catalyst.

Question 23(c)(ii)

All students will have met this polymer so there was a good number of correct answers. A few gave just one repeating unit or a single repeating unit with a subscript of 2. Most opted for hybrid or displayed formulae so the numbers of H atoms were usually correct. A few answer missed the trailing bond, retained the alkene group or incorporated C3 into the polymer backbone.

Question 23(d)

Over time, the responses to this type of mechanistic question in organic chemistry have improved dramatically. It was pleasing to see so many fully correct mechanisms. Where credit was lost, it was usually as a result of carelessness, rather than a lack of familiarity with the mechanism of addition across the C=C double bond. Very few candidates attempted to invoke free-radical, homolytic reactions and/or to use 'fish-hook' arrows in their responses. Common errors were mostly slips such as reversing the partial charges on the HBr or using Br2. Very occasionally the arrow was in the wrong direction at different stages of the mechanism. The most common error was to give the minor product.

Question 24(a)(i)

Candidates gave thorough answers to this question, often gaining full credit. Where incorrect final answers were seen, they usually resulted from a failure to calculate the correct formula mass of the starting material, hydrated iron (II) sulphate for mark 1, the use of the wrong Mr in mark 3, and dividing not multiplying when attempting to calculate a percentage in mark 4.

Question 24(a)(ii)

The majority of candidates appeared uncertain of what was expected of them or were simply unable to calculate the number of moles of cations in two moles of Mohr's salt. However almost all recognised that, whatever answer was achieved in the first step of the calculation, it was possible to gain some credit by multiplying their answer by the Avogadro constant. Often candidates attempted to calculate the number of moles using Mr values from the previous question. Surprisingly, few correct responses were seen.

Question 24(b)

This is the best known of the three bonding types, so most students were along the right lines, though not all included both "electrostatic" and "attraction" and many added that it was a strong bond. Where students used "oppositely charged ions", the word ion wasn't always included. There were a small number of more basic answers based on electron transfer or simply a bond between ions. Descriptions of metallic and covalent bonding and the attractions within atoms all occurred occasionally.

Question 24(c)

Many students appeared unfamiliar with the practical aspects of this experiment/demonstration. Most of the diagrams seen were considered to be of poor quality, or incomplete. Labelling was typically less than adequate. Whilst a number realised that electrolysis was required, a viable electrical circuit was frequently omitted. The copper (II) chromate solution in the u-tube/beaker or on the microscope slide were seldom labelled or mentioned.

Some candidates misunderstood the question as they gave dot and cross diagrams, rather than the colour changes observed. Sometimes descriptions of crystallisation were given. Some candidates gave diagrams which resembled a cell without the salt bridge (e.g. each electrode in a separate beaker).