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Examiners' Report
October 2025

Pearson Edexcel International Advanced Subsidiary level In Chemistry
WCH11/01

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October 2025
Question Paper Log Number P84360A
Publication Code WCH11_01_2510_ER
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General comment

The majority of learners had prepared well for this paper and were able to apply their knowledge of the topics in the specification to familiar and novel situations. However, it appeared that a significant number did not seem to have a good basic understanding of dot and cross diagrams of ions, the hydration of alkenes and geometric and structural isomerism. Although calculation questions generally scored highly, it was sometimes hard to follow the working when learners were faced with the unfamiliar context of calculating a volume using density or converting ppm into a volume. There was no evidence of learners running out of time and there were very few pages left blank.

The most accessible multiple-choice questions were **11(b)** and **1(c)** (atomic structure) and the least accessible were **2(c)** (mass spectrum of) and **8** (Avogadro calculation).

Question 14

14(a) The majority of learners appreciated that orbitals are where the electrons are found, but many answers were not clearly expressed and did not score. There was often confusion between orbitals, shells and sub shells and some thought that an orbital was a track or path of an electron. A number scored one mark by describing the probability of finding an electron in an orbital and some went on to say the maximum number of electrons that could be present. However, very few mentioned they had opposite spins.

14(b) This was well answered by the majority of learners. Many correctly identified the trend and were able to score full marks by achieving any 3 of the 4 marking points. Although few stated the increase in atomic radius going down the group, M2 was usually accessed by saying there were more shells, an allow option on the mark scheme. Most learners mentioned increased shielding for M3 and commented on the reduced attraction between the nucleus and outer electrons for M4. However, sometimes answers were too vague and did nots state what the attraction was between. A large number of learners mentioned the increase in proton number, but very few scored M5 as they did not seem to appreciate that the ionisation energy decreased despite the extra protons in the nucleus.

14(c) Almost all learners understood that Ca was in Group 2 so there would be a big jump between the second and third ionisation energies. However, very few commented on the overall trend in the first four ionisation energies despite it being asked for in the question.

14(d) This ionisation equation was well known with many learners scoring full marks. It was rare to see missing or incorrect state symbols but the diatomic molecule, F_2 was sometimes seen. A number of learners got confused with mass spectrometry and included a high energy electron responsible for the ionisation.

14(e) Most learners were able to state an acceptable value for the ionisation energy of oxygen. But the other marks were more elusive as there was often confusion between the p-subshell and p-orbital. Despite this, there were some excellent explanations, and a number used the electrons in boxes diagrams to support their answer.

14(f) Many learners gave a correct explanation of why the ionisation of aluminium was lower that of magnesium. However, a common error was to only identify the 3p electron in aluminium and sometimes the wrong shell (2s/2p) was quoted.

Question 15

15(a) This calculation was found to be particularly challenging for many learners. Getting started was the main problem as very few were able to calculate the mass and moles of propane correctly. A common error was to use 18.4 as the volume and use it in the ideal gas equation to calculate n. Despite this, many were able score a transfer error mark by substituting a value for the number of moles correctly into the ideal gas equation. However, the final calculation often did not score as the units were incorrect.

15(b) The topic of metallic bonding was well known by the majority of learners and this question scored well. However, some dropped a mark for failing to mention 'attraction' or 'strong' in their answer and a number of good responses were spoiled by adding an incorrect statement concerning intermolecular forces or molecules.

15(c)(i) The majority of learners were able to write this equation correctly. Where mistakes were made, most involved the incorrect number of oxygen molecules and occasionally a different alkane was used.

15(c)(ii) This question appeared to be particularly challenging for many learners. It was expected that they would simply notice that the extra carbon atom would produce an extra mole of carbon dioxide, but various incorrect calculations involving multiplying of dividing by 24 where often seen instead.

15(c)(iii) Nearly all learners were aware that burning alkanes leads to global warming or climate change as carbon dioxide is a greenhouse gas.

15 (d)(i) This calculation well done and many fully correct answers were seen. However, the conversion of units from m^3 to dm^3 was found to be quite challenging which resulted in many final answers being a factor of 1000 out. However, many learners who failed to use the volume of the room and the molar gas volume in their calculation were able to score a transfer error mark by using *L* correctly.

15(d)(ii) Most learners were able to score one mark for stating the experiment should be performed in a fume cupboard. Although the toxic nature of carbon monoxide seemed to be well known, many suggested the use of a surgical mask, despite it offering no protection to gaseous carbon monoxide molecules. Although the question was worth two marks, a significant number of learners gave only one suggestion and so limited their score.

Question 16

16(a)(i) Stronger responses showed a clear understanding of structural isomerism. However, some learners found the question quite challenging. General, molecular and structural formulae were sometimes confused, and the description of geometric isomerism was occasionally seen too.

16(a)(ii) Despite this being a commonly asked question, many learners were not specific enough in their answer. The restricted rotation about the C=C was understood by many but a lack of precision cost marks, particularly for the second scoring point. Here it was common for learners to omit one or more of the emboldened words in the mark scheme.

16(b) The catalyst for this reaction was well known with Ni being the most common correct answer. However, there were quite a few blanks possibly because learners did not notice the dotted lines above the arrow.

16(c) This proved to be one of the more straightforward questions on the paper and the majority of leaners were able to draw the displayed formulae correctly. The most common errors included 1-bromopentane and a variety of branched bromoalkenes.

16(d) Although there were a number of excellent well-presented answers to this question, they were not the norm. The first scoring point was often not addressed at all, or it was only in terms of the carbocations involved which did not score. Most learners could draw the 3 correct structures, although the connectivity of the OH group was often incorrect. However, naming the alcohols was more challenging with the omission of the 'an' a common mistake, with pent-1-ol instead of pentan -1-ol etc often seen. Also, pentan-1-ol was often incorrectly named as pentanol. Many learners also failed to state that both alkenes could produce pentan-2-ol.

16(e) This unfamiliar polymer structure proved to be quite challenging to many learners. Common errors included linear polymers, only one repeat unit, wrong side chains or a lack of continuation bonds.

16(f) This was relatively well answered with the majority of learners giving the correct skeletal structure. Linear or cyclic molecules were the most common incorrect answers.

16(g)(i) The rather unusual context of this question about bromine proved to be very challenging. Many stated, incorrectly that bromine would decolourise. Others suggested light would be released, which was also incorrect.

16(g)(ii) A good proportion of learners scored both marks by correctly drawing three isomers. Although any formulae could be used those who drew skeletal or displayed, generally seemed to be more successful than those who used structural formulae. A number of learners included cyclopentane as one of their answers despite the question stating it was not to be drawn and there were a few non-cyclic alkenes seen too.

Question 17

17(a) Many leaners were able to demonstrate a good understanding of the electron-pair repulsion theory and score well on this question. However, with weaker responses there was often confusion between ammonia and the ammonium ion and which one had the lone pair of electrons. The shapes of the two substances were quite well known although some thought that ammonia was planar rather than pyramidal. The bond angles also caused problems for some with 107.5° and 109° stated, instead of the correct 107° and 109.5°.

17(b)(i) The majority of learners knew this question was about electrolysis, even if they did not use the word, and there was a general understanding that aqueous ions would move to the oppositely charged electrode when a current was applied. However, many leaners did not describe how the experiment was carried out and so failed to score M2. Despite this, many were able to score M3 by stating the blue copper ions would move towards the cathode/negative electrode. But weaker responses often got the anode and cathode confused so did not score.

17(b)(ii) This proved to be the most challenging question on the paper. The majority of leaners were unable to draw the correct number of electrons round each of the atoms in the ion. There was also confusion about where the extra triangle electrons should be placed. Many learners seemed unsure where to begin and simple rules governing the number of electrons in a covalent bond were often ignored.

17(c)(i) This final calculation, was particularly well done by the majority of learners. However, a few made errors calculating the formula masses of the compounds and a minority did not say which was in excess.

17(c)(ii) Calculating the formula mass of 399.7 was quite challenging to some leaners but transfer error meant they could access the other marks. The percentage yield calculation was quite well known with most using the alternative mass method to score.

Summary

In order to improve their performance, students should:

- always read the information in the question carefully, noting any instructions in bold type
- practise drawing and naming organic compounds
- practise drawing dot and cross diagrams for molecules and ions
- show working when carrying out calculations and think carefully about units, significant figures and rounding
- learn the rules that govern the shapes of molecules and practise drawing the structures
- learn how the different types of isomerism arise and practise explaining them