



Examiners' Report Principal Examiner Feedback

Summer 2025

Pearson Edexcel GCE
In Chemistry (8CH0)
Paper 01: Core Inorganic and Physical Chemistry

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2025

Publications Code 8CH0_01_2506_ER

All the material in this publication is copyright

© Pearson Education Ltd 2025

General Comments

There were some very strong candidates who have good scientific knowledge and understanding. It was clear that some candidates were not prepared and gave weak answers to several questions. In general, the greatest area for improvement on this paper was calculations, significant figures and bonding. There was a concerning number of students getting GCSE level questions incorrect. Lots of marks were lost due to candidates referring to incorrect chemistry or not answering the question asked.

Question 1a

Q1a multiple choice required candidates to define electronegativity. This question was answered well, with over 80% of candidates getting it correct.

Question 1b

Q1b required candidates to draw a dot-and-cross diagram of silicon tetrachloride. This question was answered well with most candidates losing marks for either only drawing three chlorines bonded or not drawing all the electrons on the chlorine atoms.

Question 1c

Q1c required candidates to explain polarity of molecules in chlorine and silicon tetrachloride. Most candidates could recognise that chlorine was non-polar because it has no difference in electronegativity, although some referred to the dipoles cancelling out, which is incorrect. They struggled to explain that the chlorine-silicon bond is polar due to the difference in electronegativity of the atoms and many stating the difference and quoting that it is too small to create a dipole. Lots of candidates referred to the symmetrical nature of silicon tetrachloride causing the dipoles to cancel out.

Question 1d

Q1d was answered reasonably well. It required candidates to explain the difference in boiling temperature of chlorine and silicon tetrachloride. Most candidates lost marks for referring to the covalent bonds being broken in silicon tetrachloride or by referring to the incorrect bonding. Some candidates compared the size of the London forces but did not explain that it is due to the number of electrons in the molecule.

Question 2ai

Q2ai required candidates to draw a labelled diagram of the metallic bonding in sodium and the ionic bonding in sodium chloride. Considering this is GCSE content, it was not answered considerably well. Candidates must ensure the diagram is labelled or they will lose marks, and the question asks for nine ions in each example - any other number of ions will lose marks. They should read the question carefully. In addition, candidates lost marks for charges missing on the ions, the ions not being in a regular arrangement and drawn randomly, and for drawing the incorrect type of bonding.

Question 2aii

Q2aii required candidates to describe the bonding in sodium and sodium chloride. This was answered better than part i, with most candidates correctly describing the bonding. Some candidates lost marks for missing the word 'electrostatic' in their answers or describing the incorrect bonding.

Question 2aiii

Q2aiii required candidates to compare the bonding in sodium and sodium chloride. Although this question was answered well, lots of candidates stated that 'ionic bonding is stronger than metallic bonding' which is an incorrect statement and required the mention of sodium and sodium chloride for the mark.

Question 2aiv

Q2aiv required candidates to compare and contrast the electrical conductivity of sodium and sodium chloride. As a compare and contrast question, candidates were required to list similarities and differences. Most candidates stated that sodium conducts, however they needed to specify the states it conducts in to compare with the sodium chloride. Most candidates achieved the mark for the charge carriers, although a small number of candidates talked about delocalised electrons for sodium chloride, which is incorrect.

Question 2bi

Q2bi required candidates to write the equation for the formation of sodium hydride. This was answered well, with over 70% of candidates correctly answering. Some candidates lost the mark for incorrect balancing, incorrect formula of sodium hydride and incorrect formula of hydrogen.

Question 2bii

Q2bii required candidates to balance an equation. This was answered well, with over 70% of candidates correctly answering. Candidates do not need to put a number on every line, only where one is required.

Question 2biii

Q2biii required candidates to identify and explain dative covalent bonding in aluminium hydride. This was answered reasonably well. Some candidates explained dative covalent bonding in general and did not specify that it was the hydride donating the pair of electrons, so did not achieve full marks.

Question 2biv

Q2biv multiple choice required candidates to identify the name and diagram of the bonding in aluminium hydride. This was answered reasonably well, with approximately 60% of candidates answering correctly.

Question 3a

Q3a multiple choice required candidates to identify the bonding between water molecules. This was answered well, with 75% of candidates answering correctly.

Question 3b

Q3b multiple choice required candidates to explain the difference in solubility between ethanol and ethanethiol. This was answered well, with over 80% of candidates answering correctly.

Question 4ai

Q4ai was not answered well considering it is GCSE content. This question required candidates to identify the gas and positive test when a metal reacts with an acid. Not many candidates identified the correct gas and fewer described the correct positive test. Those candidates that did identify hydrogen as the gas lost marks for describing the test for oxygen, mentioning a glowing splint or stating that the lit splint should be held above the gas and not in it.

Question 4aii

Q4aii required candidates to write the equation for the reaction between magnesium and nitric acid, including state symbols. This was answered reasonably well. Most candidates lost marks for the incorrect formula of nitric acid, incorrect balancing or incorrect/missing state symbols. Many candidates struggled to identify magnesium nitrate as aqueous.

Question 4aiii

Q4aiii required candidates to write the equation for the above reaction forming nitrogen dioxide and water. This was not answered well. Some candidates did not attempt the question, others lost marks for incorrect balancing or products. Candidates should ensure they correctly read the question as there were examples where water and nitrogen dioxide were not present as products.

Question 4bi

Q4bi required candidates to state the colour change of the gases. This was answered well, however some candidates lost marks for referring to oxygen as clear or white which is incorrect.

Question 4bii

Q4bii required candidates to explain the change in colour of the gases and universal indicator solution. This was not answered well. Most marks were achieved for the colour change of the gas. Lots of candidates stated the indicator changed colour due to an acid but did not state that the nitrogen dioxide is an acidic gas.

Question 4biii

Q4biii was answered well, with over 90% of candidates getting correct. The question required candidates to read the volume of gas collected in a measuring cylinder.

Question 4biv

Q4biv required candidates to calculate the molar volume of a gas. This was answered reasonably well, with most candidates gaining marks for calculating the moles of magnesium nitrate. Some candidates lost marks for not calculating the moles of oxygen by halving their moles, or incorrectly doubling their moles, or incorrectly adding all their moles together. Very few candidates divided the volume by moles to calculate the molar volume. Most candidates multiplied their moles by 24 to calculate the volume and thus incorrectly gave cm^3 or m^3 as their unit rather than $\text{cm}^3 \text{ mol}^{-1}$. A significant number attempted to use $PV = nRT$, despite being told that this was not required in the rubric.

Question 4bv

Q4bv required candidates to explain why three significant figures is appropriate in this example. This was answered poorly. Some candidates could recognise that the volume was measured to three significant figures but did not explain that this is the lowest number of significant figures. Many candidates stated that it was accurate so did not achieve the mark.

Question 5ai

Q5ai was answered well with nearly 90% of candidates getting full marks. The question required candidates to state the electron configuration of zinc and the magnesium ion. Marks were lost for having the incorrect number of electrons in the d orbital for zinc, labelling the 3d as 4d, or incorrectly stating the electron configuration of the magnesium ion.

Question 5aii

Q5aii required candidates to explain why zinc and magnesium form stable $2+$ ions. This was not answered well with very few candidates referring to ionisation energy and just mentioning electron configuration. Only a small number of candidates mentioned that the third electron was removed from a new shell.

Question 5bi

Q5bi was answered well with nearly 100% of candidates getting this question correct. The question required candidates to calculate the number of protons and neutrons in zinc. Marks were lost for putting the answers in the wrong boxes.

Question 5bii

Q5bii required candidates to explain why an isotopes mass is not an integer. This was not answered well. Most candidates gained marks for stating that it is compared to $1/12$ mass of C-12; however, those candidates that gave the definition of relative atomic mass were not awarded the mark.

Question 5biii

Q5biii required candidates to calculate the relative isotopic mass of an isotope and state the symbol of the isotope. This was answered well, with most candidates getting the correct mass. Some candidates lost marks for not giving their answer to three decimal places or not giving the symbol of the isotope.

Question 5biv

Q5biv was not answered well, with only 11% of candidates scoring the mark. The question required candidates to calculate Avogadro constant. Not many candidates attempted this question, and some candidates just stated the value for Avogadro constant without any calculations. A small number of candidates managed to do the correct calculation but very few candidates used the corrected value for isotopic mass and gave their answer to five decimal places.

Question 5c

Q5c required candidates to calculate the moles of water in hydrated zinc sulfate. This question was answered reasonably well. Most candidates could calculate the mass of water lost and many could calculate the moles of water lost. Less candidates were able to calculate the moles of zinc sulfate and calculate the ratio. Some candidates were confused with the mass being given in mg and were converting.

Question 6ai

Q6ai required candidates to explain why a reaction should be carried out in a fume cupboard. This was answered relatively well. Some candidates lost marks for not stating which gas is toxic or stating products that are not gases. Some candidates did not state that the toxic gas should not be inhaled.

Question 6aii

Q6aii required candidates to give two observations for the reaction. This was answered reasonably well, with lots of candidates getting a mark for purple vapour of iodine and effervescence.

Question 6b

Q6b was answered well with 84% of candidates achieving the mark. The question required candidates to state the oxidation change in sulfur.

Question 6c

Q6c required candidates to deduce the two half equations. This was not answered well. Most candidates could get the half equation for the oxidation of iodide but few candidates could get the reduction half equation.

Question 6di

Q6di was answered reasonably well, with approximately 60% of candidates correctly identifying HCl as the misty fumes.

Question 6dii

Q6dii required candidates to explain the strength of chloride and iodide as reducing agents. This was answered poorly. Most candidates could identify that iodide was the stronger reducing agent but without the correct explanation they were not awarded the mark.

Question 7a

Q7a required candidates to explain the trend in atomic radii. This question was answered reasonably well. Most candidates stated that the number of protons increased but only some stated that the electron is in the same shell.

Question 7b

Q7b was answered well, with approximately 70% of candidates achieving the mark. The question required candidates to state the equation which does not represent first ionisation energy.

Question 7c

Q7c required candidates to state the ion with the smallest radius. This question was answered reasonably well, with approximately 50% of candidates getting the mark.

Question 7d

Q7d required candidates to explain changes in the ionisation energies of period three. This question was answered relatively well, with the mean mark of three. Most candidates could identify the increase in number of protons, but some did not achieve the mark as they only referred to sodium and magnesium and not the trend across the whole period. Only some candidates referenced similar shielding across the period. Some candidates referred to a decrease in atomic radius, rather than similar shielding. The two 'dips' in the values were widely recognised, though the new sub-shell produced a range of comments, often related to the 'p orbital' without reference to magnesium's outer 's orbital'. The increase in shielding for aluminum was seen infrequently. Many recognised that the values for phosphorus and sulfur were similar, but explanations of the pair forming in one orbital were often quite poor, with the reference to 'repulsion between electrons' also being limited to 'repulsion', with little explanation. Many diagrams of electron configuration were seen and these often supported explanations.

Question 8

Q8 required candidates to calculate the molecular formula of ferrocene. This was answered reasonably well. Although there was a large number of blank answers, those candidates who did answer were able to calculate the moles of hydrogen and carbon and achieve three marks. Very few candidates scored full marks.

Summary

Based on their performance on this paper, candidates are offered the following advice:

- Labelled diagram – when asked to draw a labelled diagram, candidates must ensure that the diagram they have drawn is labelled. If labels are missing, they will lose marks.
- Significant figures – when asked to give their answer to an appropriate number of significant figures, they should give their answer to the same number of significant figures as the least precise data in the question.
- Read question carefully – if the question asks for additional information e.g. 'three decimal places', 'referring to ionisation energy', 'including nine ions', etc. the candidate should ensure they follow these instructions or they will lose marks.
- Compare and contrast – when asked to compare and contrast, the candidate must state at least one similarity and one difference to gain all the marks.
- Equations – when writing an equation, candidates should ensure that the formula is correct and the equation is balanced.

