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Examiners' Report
Principal Examiner Feedback

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This paper followed the usual format of six questions, the last two of which contained the extended writing questions. This is the last sitting of this paper.

Question 1

The two multiple-choice choice questions, particularly (b) provided a good start for most candidates and in part (c) most could use the data in the table to suggest the relationship between the number of carbon atoms in a molecule of an alkane and its boiling point although some unnecessarily tried to find a direct mathematical relationship. The correct structure of ethene showing all the atoms and bonds was usually seen in part (d) but a few candidates, having correctly shown a double bond, then had added an extra carbon atom or extra hydrogen atoms. In (e) most correctly selected yeast and almost all were able to suggest problems related to drinking excess alcohol.

Question 2

Around half of candidates recognised ethanol reacting to form ethanoic acid in part (a) as being an oxidation reaction. A large majority used the information given in (b) to produce the correct word equation although a few wrote ethanol instead of ethanoic acid or gave an extra species in their equation, usually water. It was a little surprising that not more candidates named all three elements shown in the structure of a molecule of ethyl ethanoate in (c). Almost all were able to correctly link esters and vinegar to at least one and usually two of their uses. In (d) the reagent and condition needed to form a soap from a fat or oil were not well known and it was clear some candidates had confused the process with fermentation with suggestions including *yeast* and *anerobic*.

Question 3

In (a)(i) finding the mass of dissolved solid in a 25cm^3 sample of hard water proved much more challenging than anticipated. Many candidates were under the misconception that filtration could be used to remove the dissolved solid. Many others tried to describe methods of removing hardness involving ion-exchange resins. The more successful candidates identified the need to evaporate the water and weigh the remaining solid but only a minority scored all three marks by employing a method involving weighing and use of a suitable container such as an evaporating basin. The calculation in (a)(ii) proved accessible to only the best candidates with others most often multiplying the two numbers together to give 15 as the answer. However, many did identify magnesium ions as being a cause of hardness in water in part (iii). In (c) the majority did pick out the hardest water sample, although some chose water sample A which produced the most lather. Some candidates unfortunately did not use the data from the table and wrote more generally about hard water and how it formed scum. More than half correctly gave *scum* or another acceptable observation in (c) although there was sometimes confusion between scum and limescale. It was quite common to see all the correct state symbols but many candidates gave (*aq*) for water and sometimes for calcium carbonate suggesting it was soluble despite being told it was a precipitate.

Question 4

The question in (a)(i) indicated that the explanation for solid sodium chloride not conducting electricity involved ions. Despite this, many gave explanations involving electrons. Others stated it is because *the ions are not charged*, indicating a lack of understanding of what an ion is. *The ions are too tightly packed so there is no space for electricity to get through* or similar ideas were also common. In (a)(ii) many recognised electrons played a role, however some candidates became confused and described loss of electrons to form ions. Chlorine gas being *toxic/poisonous* was the most common correct answer as expected in (b)(i), but some answers did refer to hydrogen. More general terms such as *harmful* and *dangerous* were not accepted. In (b)(ii) good numbers of candidates could explain why chloride ions forming chlorine

is an oxidation process although some did show some misunderstanding over gain/loss of electrons. Some students became confused and tried to discuss the oxidation in terms of the addition of oxygen. Part (c) concerning the purification of copper was poorly answered with only a few candidates suggesting a correct electrolyte in (i) and in (ii) many failed to score marks as they did not describe what could be **seen** but instead described the process from a theoretical standpoint. Comments such as *ions move from the anode to the cathode* and references to *a change in mass* occurs at the electrodes are not untrue but not things that could be **seen**. *Sludge* was probably the most common correct answer.

Question 5

Although many correctly suggested filtering in (a)(i) a lot of answers did not clearly explain the purpose is to remove the solid/zinc carbonate or an acceptable alternative. Many candidates described making crystals, either through not reading the question, or possibly not knowing what a solution is. The use of separating funnels and even fractional distillation descriptions were not uncommon. In (ii) more than half of candidates completed the equation fully. Of the others, most correctly inserted either a *2* before HCl or the missing gas as CO_2 but not both. It was surprising that not more candidates could name a suitable acid-alkali indicator in (b). Some suggested universal indicator despite having been told it was not suitable. Of those who suggested phenolphthalein, many had the colour change the wrong way around. Litmus was the most likely to have the correct colour change and it had been expected that this would have been a much more common answer. The extended writing part (c) concerned the advantages and disadvantages of artificial fertilisers. Some very good answers were seen with marks of 6 not infrequent. Descriptions of eutrophication were very common, along with advantages such as promoting growth and a higher yield. Common misapprehensions were that fertilisers act as pesticides/ herbicides.

Question 6

Many candidates recognised that the green precipitate in (a) showed the presence of iron(II) ions. Part (b) was quite demanding but a lot of candidates recognised the fact that both aluminium and calcium ions produce a white precipitate or gave one of the other alternative explanations. Despite being advised in the question, some did not use the information in the table to answer this question, and instead made suggestions from their own knowledge. In (c) very few candidates recognised the test results and were able to name *copper sulfate*, with fewer identifying *sulfate* ions than *copper* ions. In (d) many candidates could use the information in the question to form the equation, although it was common to see mistakes in attempts at balancing the equation. The extended writing part (e) involved describing analytical tests and their results and it proved a more challenging exercise than 5(c). Flame test descriptions and results were better known than halide tests with significant numbers giving *sodium hydroxide* or *barium chloride* instead of *silver nitrate*. Often weaker candidates said they would *do the precipitate test* but with no reagents given.

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