Examiners' Report/ Principal Examiner Feedback

Summer 2015

Pearson Edexcel International GCSE
Chemistry (4CH0) Paper 1C
Science Double Award (4SC0) Paper 1C

Pearson Edexcel Level 1/Level 2
Certificate Chemistry (KCH0) Paper 1C
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Examiner's Report International GCSE Chemistry 4CH0 1C

Question 1

This question was about states of matter. Nearly all candidates scored full marks in part (a), with most diagrams clearly showing the gas molecules spaced out and not in a pattern.

Part (b) was almost as well done, with only a few choosing 'boiling and condensing' in (b)(ii).

Question 2

This question was about diffusion. Most candidates chose the two correct responses in (a), although the distractors 'bromine and air react to form bromine oxide' and 'liquid bromine sublimes during the experiment'.

In part (b), there were a surprising number of incorrect choices for the position of the white ring, which then prevented marks from being scored in (b)(ii). Most explanations scored both marks, although inaccurate statements such as 'ammonia molecules are less dense' were not accepted, and some candidates wrote that ammonia diffused more quickly because it had greater kinetic energy.

Question 3

This question was about the burning of magnesium in air. This was a familiar experiment for most candidates, although a disappointing number of references to precipitates and bubbling were seen in (a).

The most common wrong choice in (b) was to state that magnesium oxide was an acidic oxide formed from a metal.

In part (c), although most chose blue as the final colour of the litmus paper, red appeared quite frequently, and many of those who made the correct choice then gave Mg^{2+} or O^{2-} as the ion responsible.

Question 4

This question was about the formation of calcium sulphate in a precipitation reaction.

In part (a), most candidates correctly chose all four state symbols, with by far the commonest error being the use of (l) in place of (aq).

Part (b) was designed to test candidates' knowledge of practical techniques, and the diagram scored full marks in almost all cases.

In (c), most identified the ion as calcium, although the incorrect formula Ca^{+} was not accepted in place of Ca^{2+}.

There were few acceptable answers to (c) (ii) - these were the realisation that the calcium chloride may have been in excess and so passed through the filter paper, or that calcium sulphate was partially soluble.

Part (d) showed fewer all-correct answers than expected, with many precipitates described by wrong colours, and silver nitrate instead of silver chloride identified as the substance responsible.

In (d) (iii), many incorrect answers referred to silver nitrate providing the nitrate ions, and sometimes even 'nitrogen ions'.

Answers to part (e) were very disappointing and revealed the perennial failure to understand the difference between residue and filtrate, even though both terms were included in the question in a way that should have made clear which was which. Although the residue had been obtained by filtration, many answers started with a reference to a further filtration, although this was not penalised. Many answers clearly indicated that it was the filtrate and not the residue that was being written about, with references to evaporation and crystallisation. A few answers referred to unsuitable separation methods such as fractional distillation, but it was a relief to see succinct answers such as 'wash the residue with water and leave it to dry in a warm place' that scored full marks.

Question 5

This question was about familiar organic compounds.

Answers to parts (a) to (c) were often correct, although in (a) (ii) the molecular formula was sometimes given instead of the empirical formula.

Many candidates found part (d) difficult, with the structure of compound T repeated in a different orientation or the appearance of formulae such as C_2H_4 + Br_2; many attempts at the name were successful - the expectation was 'dibromoethane', with or without locants, worked out with knowledge of the use of di- as a prefix (as in carbon dioxide and sulphur dioxide), and the required name bromomethane.

Part (e) was well answered, with few incorrect displayed formulae and names for compound P.

The commonest error was in (d) (iii), where a variety of catalysts were given as answers.

The calculation in part (f) was often correct, with very few examples of serious errors, such as dividing atomic mass by percentage.

Question 6

This question was about the fractional distillation and cracking of crude oil, and the combustion of hydrocarbons.
Parts (a) and (b) were well answered, although with some errors in (b), such as referring to a mixture or to carbon and hydrogen molecules, rather than atoms.

Most candidates scored 2 marks in part (c), with the meaning of 'viscosity' not being well understood.
Both parts in (d) were well answered, with relatively few incorrect answers, the commonest of which were 'C_4H_8 + CH_2'.

Answers in part (e) about carbon monoxide were invariably well answered; the commonest errors referred to 'no oxygen' rather than insufficient oxygen in (i), and in (iii), references to replacing or destroying haemoglobin.

There were many disappointing answers in (f) (i), with all three sulphur compounds rarely correct - sulphur oxide, sulphur monoxide and hydrogen sulphate were the commonest errors; most answers in (f) (ii) mentioned acid rain and one relevant effect.

Question 7

Parts (a) to (d) of this question about polymers were well answered, and it was pleasing to see many all-correct structures in (c) (ii), with —CH_2—CH_2—CH_2— the commonest wrong answer. Biodegradability in part (e) was well known, but there were two frequent errors seen; having seen 'not' in the question stem, some candidates wrongly included it in their explanation of 'biodegrade', and many in (e) (ii) stated that bond strength was responsible for preventing polymers from biodegrading.

Question 8

The theme of this question was the calculation of an acid concentration by titration. Success in parts (a) to (d) is likely to be easier for candidates with direct experience of using this technique.

In (a), candidates were asked to choose apparatus for adding 25.0 cm^3 - a pipette was the expected answer. The use of a burette was not accepted because this apparatus is designed to add variable volumes, and a measuring cylinder was not accepted because it would be suitable only for the addition of 25 cm^3, not 25.0 cm^3.

In (b), the colours of phenolphthalein were well known, with A and B being the most common commonest answers, and it was pleasing to see that most candidates looked back to the method to be sure of the direction of colour change.

Many candidates had difficulty with part (c) - some with knowing in which ways phenolphthalein and universal indicator were different, and others with not using the correct words to express themselves. To score the mark, a correct reference to the number of colours of one of the indicators, or to the sharpness of the end-point, was needed.

Reading burettes has been frequently tested in previous papers, and many candidates answer questions such as part (d) well, although there are still some reading the burette in the wrong direction (giving 25.85 instead of 24.15 for the after reading) and others who overlook the instruction to use values to 0.05 (giving 2.3 instead of 2.30).
Similarly, in part (e), there were many all-correct answers, but also rather too many that made a bizarre choice (given that the criterion of being within 0.20 cm^3 of each other was stated in the question) of concordant answers.

The final calculation in (f) was generally well done, although with predictable errors of failing to use 1000 in either or both of (i) and (iii) and in (ii) not recognising the need to divide the previous answer by 3.

Question 9

This question was about different types of bonding, structure and properties.

Part (a) tested the relationship between melting point, conductivity and the type of structure, which the majority of candidates were able to succeed with.

Part (b) (i), about magnesium chloride, required a description of how the ions are formed from the atoms; the commonest omission in otherwise good answers was clarification that each magnesium atom lost two electrons or each chlorine atom gained one electron. Fortunately, few answers were spoiled by references to sharing electrons or covalent bonding.

The diagrams in (b) (ii) were often carefully drawn, but often lacked inner circles of electrons or showed charges of + and 2–.

The dot and cross diagram of carbon dioxide in (c) usually showed bonding pairs of electrons, although not always two in each case, although others did not show all the non-bonding pairs.

In contrast, answers to part (d) were disappointing, with a significant number of candidates interpreting the reference to 'in indium' as meaning 'shown by indium in its compounds', which could explain the answers mentioning negative ions.

In (d) (ii), malleability was better explained, although with some references to layers of electrons sliding across each other. Another relatively common error was to use the terms nuclei or protons in place of cations.

Question 10

This question was about a rate of reaction investigation, using hydrogen peroxide.

Part (a) required candidates to select appropriate factors to keep the amount of hydrogen peroxide constant, and it was good to see many examples of relevant factors (volume and concentration), rather than the obvious, but incorrect in this case, temperature.

The choice of experiments least and most affected by a solid in (b) was often correct; although in (ii), A was sometimes chosen (it had the longest time).

Answers to part (c) were very disappointing; the question required candidates to describe they would do with the contents of the flask in a particular experiment, so answers that described a catalyst as a substance that increased the rate of reaction, or explained how it achieved this (often by reference to an alternative route with lower activation energy) did not answer the question. The expectation was that answers should indicate how A would be removed from the flask (ideally by filtration), then weighed (ideally after drying) to be sure that it’s mass was unchanged.

In (d) (i), the plotting of the points was almost always well done, with few marks deducted for incorrect plots; in most cases an acceptable curve was drawn, with most of those failing to score the curve mark showing straight lines between the points or clearly missing the points.

Almost all answers to (d) (ii) scored 2 marks; most of those who did not either failed to indicate on the graph how their answer was obtained or used the original curve for solid F.

Nearly all answers to (d) (iii) scored the mark for indicating that the curve for F would be steeper or would level off earlier.

Question 11

This question was about three industrial methods of producing hydrogen by reversible reactions. Parts (a) and (b) were about reaction 1 in the table, which indicated that it was endothermic and that there were more moles of products on the right-hand side.

Part (a) was about pressure and so expected answers in terms of numbers of moles, while (b) was about temperature and so expected answers that referred to the reaction being endothermic. In many cases, candidates answered correctly, but a disappointing number referred to temperature in (a) and moles in (b). Fortunately there were few answers that referred to Le Chatelier's principle (which is not mentioned in the specification and which is not appropriate in answers to questions of this kind), but substantial numbers wrote about 'favouring' the endothermic reaction in both parts; such arguments were not accepted, partly because 'favouring' is ambiguous (does it indicate an increased reaction rate of only the forward reaction or a shift in equilibrium position to the right?), and partly because it does not show that the candidate knows that the forward reaction is endothermic.

Part (c) was an unfamiliar question that was answered correctly by large numbers of candidates, often in terms of size of enthalpy change.

Answers to part (d) were generally disappointing, usually because they continued to refer to equilibrium rather to rate; many candidates find dealing with rate and equilibrium in the same question impossible, and seem only to be able to deal with one or the other.

In (d) (i), there were many answers that referred to rate, and in (d) (ii), many of those that referred to rate mentioned more collisions but not a greater collision frequency.

It was pleasing to see many correct answers to part (e), but there was the usual problem for markers of not being able to follow the jumble of numbers that led to the final answer. Students need more training in setting out answers in calculations, and should be aware that if their final answer is incorrect, then scoring any marks depends on the marker being able to follow the working and see any intermediate answer identified. For example, in this question, those using the moles route should obtain an answer of 2000 mol for the amounts of methanol and ethanoic acid; however, if 2000 appears somewhere in the middle of several other numbers, with no indication of what it represents, then it may not be possible to award any marks for this intermediate answer.

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