Pearson Edexcel

Examiners' Report

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Pearson Edexcel International GCSE Level In Chemistry (4CHI1) Paper 2C

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Question 1

This question was well answered with the majority of candidates scoring four or five marks. Part (c)(iii) proved the most difficult of the five questions, with a fair number of candidates not identifying sulfur as the non-metal which is a solid at room temperature.

Question 2

In (a) the majority of candidates knew that fractional distillation was used to separate crude oil into fractions. A small minority thought the process was cracking.

In (b) aircraft fuel was the most common correct answer. Some candidates lost the mark by just writing aircraft and not specifying that it was the fuel for aircraft. Others similarly mentioned cooking or lamps but without reference to fuel. A small minority thought kerosene was used as a fuel for ships.

In (c) the majority knew that the alkane was butane and were able to calculate the relative molecular mass correctly. Only a very small minority used atomic numbers instead of relative atomic masses in their calculation.

Again (d) was well answered by the majority of candidates. Some common errors included giving a structural formula or a name instead of a molecular formula for heptane in (i) and giving the general formula for alkenes in (ii).

In (e)(i) the majority of candidates knew the correct catalyst for cracking with alumina and silica being the most common answers. A small minority quoted catalysts used in other reactions such as phosphoric acid and iron. The explanation in (ii) proved difficult for many candidates. The most common answer was to state that shorter chain alkanes were more useful or in greater demand, but only a small minority went on to say that they were in short supply or that there was a surplus of long chain alkanes. Consequently, the majority gained one mark here and only a few scored both marks. A fair number of candidates wrote about the efficiency of burning the alkanes or about the production of alkenes to make plastics, which were not relevant points when answering this question.

Many candidates scored both marks for (f) but there were some weird answers of compounds that do not exist and where the numbers of C and H atoms did not add up to the totals on the LHS of the equation. A common answer which scored one mark was $C_3H_6 + C_3H_6$. Candidates need to read questions more carefully as they were specifically asked to give two different alkenes.

Question 3

In (a) the majority of candidates gained at least one mark for knowing that metals contain delocalised electrons and many stated that these electrons moved and therefore gained both marks. A minority lost a mark by talking about free electrons or a sea of electrons rather than delocalised electrons. Only a very small minority lost both marks by referring to mobile ions.

Part (b) proved difficult for many candidates. In (i) a fair number of candidates knew that bubbles were formed at the positive electrode but only a small minority gave a correct observation at the negative electrode. Some did not give observations at all and just wrote the names of the products, copper and oxygen which were given in the stem of the question. In (ii) most candidates knew that reduction was gain of electrons but often lost the mark by stating that it was copper that gained the electrons rather than the copper ions.

In questions of this nature candidates need to state clearly which species is gaining or losing electrons. This has been pointed out several times in previous examiner reports.
Part (b)(iii) proved very challenging for a large majority of candidates. A few realised that copper ions were being removed from the solution but often failed to mention that the blue colour was caused by the copper ions. A significant proportion of candidates thought that there was some conversion of hydrated copper(II) sulfate to anhydrous copper(II) sulfate which caused the blue colour to fade, even though the copper(II) sulfate was in solution.
Many candidates gained full marks for showing correct working in (c). The most common error was to not find the mass of water and to divide 12.5 by 159.5 and 8.0 by 18. Only a small minority reversed the numbers in the calculation. A few gained one mark by finding the mass of water, but were unable to proceed any further.

Question 4

In (a) most candidates scored one mark with a relatively small proportion scoring both marks. There was some confusion with the colours of phenolphthalein. Surprisingly, despite the name of the indicator, a significant minority managed not to suggest orange as one of the colours with the acceptable colours of red and pink often being given as the colour at the end point. Some gained one mark for the colours in the reverse order.
The majority of candidates struggled to score full marks for (b) but many scored two or three marks. Use of a pipette instead of a measuring cylinder was a common correct response and many gained the mark for repeating the titration, although some suggested repeating without the indicator, which was not creditworthy. The ideas of rinsing the flask with water and the burette with sulfuric acid and the idea of swirling the flask were seen quite often. Very few mentioned taking the initial burette reading, using a white tile or adding the acid dropwise at the end point.
In (c) many candidates scored full marks, with some losing a mark for incorrect rounding of 0.1497 to 0.149 instead of 0.150. Others either failed to divide the moles of NaOH by 2 or multiplied by 2 instead but were still able to access two of the marks if they carried their error forward correctly. A minority had no clue how to attempt the calculation and some just left it blank.

Question 5

In (a) the test for oxygen was well known.
In (b) the majority of candidates knew that a catalyst lowers the activation energy and a fair number of these also mentioned the alternative pathway. Those who did not score any marks here just stated that a catalyst speeds up a reaction, which was already implied in the stem of the question, rather than stating how a catalyst speeds up a reaction. A minority of candidates thought that a catalyst increases the energy of the particles indicating that they were confusing catalysts with the effect of temperature.
Many fully correct answers were seen in (c)(i) with only a small minority reversing the final subtraction, giving a value of +212 KJ. Common errors included thinking there was only one O-O bond in two molecules of hydrogen peroxide and sometimes only three O-H bonds in two molecules hydrogen peroxide or/and in two molecules of water. Those who did not score one or both of the first two marking points often scored an error carried forward mark for a correct subtraction. Those who gained all three marks in (i) often went on to draw a correct energy level diagram in (ii). Some however lost marks for sloppy diagrams where the arrow for ΔH did not reach the product line. Many included the activation energy in their

diagrams but they were not penalised for this. Those who obtained a positive value in (i) often still drew the product line below the reactant line, which showed a lack of understanding.

Question 6

In (a)(i) the correct temperature and pressure were well known by many candidates.
The main error in (ii) was to omit the bond between O and H, which meant the formula was not fully displayed.
The better candidates scored both marks for the equation in (b)(i). Others wrote the correct reactants and products but failed to balance it correctly, limiting them to one mark. A common error was to omit the oxygen which meant they could not be awarded any marks.
In (ii) candidates generally understood that carbon monoxide reduces the capacity of the blood to carry oxygen and some explained the formation of carboxyhaemoglobin and its effect. A few merely repeated the stem of the question by stating that it is toxic or it can kill you. Some vague or incorrect answers were seen such as causes breathing problems, damages lungs, damages red blood cells or prevents blood flow, all of which were not creditworthy.
Part (c) was usually well answered. Common incorrect answers included polyester, just ethanoate on its own and ethanediol.
In (d)(i) condensation polymerisation was generally well known with a minority writing addition polymerisation. Part (d)(ii) proved very difficult for many candidates with the majority not having a clue where to start. Some gained one mark for a correct ester link and a small minority drew out the rest of the polymer correctly with extension bonds, but often the third marking point was lost as there was no 2 in front of the water molecule. A small number drew a dimer instead of a polymer unit but could still gain two marks for the ester link and in this case one water molecule. Some included brackets and an n, which was not asked for and invariably this equation was then not balanced as they failed to put an n in front of each reactant and 2n in front of the water molecule.

Question 7

The majority of candidates wrote a correct word equation in (a)(i). Those who did not gain the mark usually did not read the question and attempted a balanced symbol equation which was often incorrect as they wrote the formula of calcium hydroxide as CaOH even though they were told the question was about Group 2 elements and their compounds.
Many candidates gained one mark for (ii) usually for the mention of bubbles or fizzing.
The most common mistake for the first marking point was to write about the gas being given off instead of what would actually be seen. The second marking point was scored less often as candidates confused calcium with a Group 1 metal and said it floated or moved on the surface of the water. Some said a white precipitate was formed. Only a small minority mentioned heat being evolved or the test tube feeling warm.
A small number of candidates gave a clear concise answer for the preparation of the salt in (b)(i). Many candidates thought it necessary to heat the mixture, but they were not penalised for this unless they were heating to evaporate water and obtain crystals. This type of response was quite common where candidates confused the preparation of a soluble salt with an insoluble salt which caused them to lose marking points three and four. Several candidates just mixed the two solids with no reference to making solutions, which lost them

the first two marking points. A small minority just gained one mark for a suitable drying method.

Very few candidates were able to write a correct ionic equation in (b)(ii). Many candidates ignored the word ionic and attempted to write a full chemical equation for the reaction. Some still gained one mark for the correct state symbols even if the full equation was incorrect. A few attempted to put charges on the ions but failed to omit the spectator ions. Candidates need to be taught that the whole point of writing an ionic equation is to simplify the equation by removing any spectator ions.

The calculation in (c)(ii) was a good discriminator giving marks across the whole mark range. Only the best candidates scored all four marks. A common error was to not realise that there were five moles of gas on the RHS and they just multiplied the moles of magnesium nitrate by 24. If they then rounded their answer to two significant figures they could then have error carried forward marks and score three out of the four marks. The better candidates realised there were four moles of nitrogen dioxide and one mole of oxygen in the equation and often gained the second and third marking points by working out the volumes of nitrogen dioxide and oxygen separately and then adding them together. Unfortunately, some of these then failed to give their answer to two significant figures and therefore lost the fourth marking point.

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