Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

January 2021

Pearson Edexcel International GCSE

In Chemistry (4CH1) Paper 2C

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Question 1

As expected, most candidates were able to work out the mass number and correctly identified the atom as lithium. The majority of candidates were able to describe a difference and a similarity of isotopes. This question asked for sub-atomic particles so comments about atomic and mass numbers were ignored.

Question 2

Many candidates identified all four gases in a(i) to a(iv). The gas produced by complete combustion of a hydrocarbon was least well answered with relatively few candidates choosing carbon dioxide. In b the test for hydrogen was well known by most. Candidates needed to mention a lit splint followed by a pop. Burning with a pop was insufficient. Some candidates confused the test for hydrogen with the test for oxygen and suggested using a glowing splint.

Question 3

In a(i), most candidates correctly identified variables that needed to be controlled in this experiment. The term 'amount' was accepted for the mass of magnesium and also for the volume of carboxylic acid, since the concentration of the acid was identified in the question as a control variable. Most incorrect answers referred to the concentration of magnesium powder or identified possible errors in the apparatus. In a(ii) most candidates correctly identified the reason for connecting the bung quickly as losing as little hydrogen gas as possible. Common incorrect answers referred to stopping gas getting into the apparatus. Unqualified comments about accuracy were ignored.
In b(i) the vast majority of candidates scored 1 mark out of 2 by calculating the mean of all four values rather than ignoring the anomalous result. Candidates need to watch out for incorrect rounding in questions as several scored 0 for rounding 75.8 down to 75. In b(ii) most correctly identified the relationship between the number of carbons and the time taken to produce $10cm^3$ of hydrogen. Comments about rate of reaction were ignored.

In c few candidates scored 2 marks for the displayed formula of ethyl ethanoate. There was some confusion presumably with condensation polymers as a lot of structures had an extra O-H group. Some candidates scored 1 mark for drawing an isomer such as propyl methanoate with a correctly displayed ester linkage.

Question 4

The equation in a(i) was correctly balanced by most candidates. Some lost a mark for putting (l) as the state symbol for sodium hydroxide. In a(ii) most candidates knew that hydroxide ions cause solutions to be alkaline. Candidates are reminded to include the charge on an ion as OH did not score. In a(iii) many candidates scored 3 marks for correct observations during the reaction of sodium and water. Candidates need to be careful to record observations: gas formed did not score as it is not an observation but bubbles of gas did. A few candidates lost a mark by referring to a lilac flame, showing confusion with potassium.
A lot of candidates scored 3 marks in b. Despite it being asked for in the question, many did not explicitly refer to the electron configurations of sodium and potassium. Most linked bigger atoms with less attraction between the outer shell electron and the nucleus making the outer shell electron easier to lose. Some forces of attraction were incorrect e.g. intermolecular forces of attraction.

Question 5

In a(i) candidates needed to refer to layers or rows in order to score, reference to a regular structure was insufficient. In a(ii) many candidates described the structure of a metal which was not what was asked. To score 2 marks candidates needed to mention delocalised electrons which can move throughout the structure. Free electrons did not score any marks unless qualified.

In b most candidates correctly compared the reactivity of aluminium and carbon. A few failed to score by stating that aluminium is too reactive and making no comparison. A number of candidates compared the reactivity of aluminium and the reactivity of iron.

c(i) discriminated well. Candidates needed to recognise that aluminium ions are positive and therefore are attracted to the negative electrode. To score the second mark, they needed to state that electrons were gained by the ions. References to reduction were ignored as it was unclear as to whether the candidate meant loss of oxygen or gain of electrons. In c(ii) few candidates were able to write a correctly balanced half equation for the oxidation of oxide ions. Many equations balanced in terms of oxygens but not in terms of charge. In c(iii) some answers showed an excellent understanding of why carbon dioxide is formed. They had to state that the carbon in the positive electrodes reacts with the oxygen produced at the electrode. Many candidates referred to a reaction with oxygen from the air.

In d(i) references to electrons were ignored as this was not shown in the equation. The best candidates referred to iron(III) oxide losing oxygen whereas some gave a less precise answer of iron (presumably from the iron(III) oxide) losing oxygen. In d(ii) there were some clear energy level diagrams that scored 3 marks. Candidates are reminded to put the formulae or names of both reactants and products in the correct place on

these diagrams. Many candidates labelled E_a and ΔH which were ignored as this is not what the question was asking for.

Question 6

Some candidates scored 4 marks by giving a concise method that would have produced pure, dry crystals of silver chloride. A number of candidates hadn't read the question properly or didn't understand the term solution as they started by dissolving silver nitrate and copper chloride in water first. The first mark was for mixing silver nitrate solution and copper chloride solution. Many candidates then went on to heat the two solutions which, although unnecessary, was ignored. After this point a lot of candidates did not realise that silver chloride is formed as a solid and limited their marks to 1 by describing a method involving evaporation, either of the mixture of silver chloride solid and solutions or the filtrate of copper nitrate.

In b(i) and (ii) the points were well plotted by most. Fewer candidates scored the mark for two lines of best fit as the horizontal line was missed or the second line was in the wrong place. Occasionally candidates did not start their line at 0,0. In b(iii) few candidates correctly identified an error that caused the anomalous result to be lower than it should have been. There were a lot of comments about measuring errors such as parallax errors. The question was looking for a specific answer such as measuring before the precipitate had chance to settle or not adding enough silver nitrate solution. In b(iii) many candidates scored full marks by calculating the mass of silver chloride as 3.6g. The most common mark lost was for failing to correctly calculate the moles of copper(II) chloride solution. Most candidates spotted the ratio in the equation and went on to show they could calculate a mass from a number of moles.

Question 7

In a, many candidates had clearly taken the time to learn the steps. Most candidates knew that the crude oil was pre-heated in order to vapourise most hydrocarbons. Few then went on to state that the vapours rose up the column. The temperature gradient in the column was well understood as was the hydrocarbons condensing at their boiling points. A few failed to answer the question asked despite showing some knowledge of the process and some confused fractional distillation and cracking.

In b, many candidates correctly identified the conditions for cracking. Some confused the conditions with the hydration of ethene or the Haber process.

In c(i) many candidates correctly stated than the high temperatures in car engines cause nitrogen and oxygen to react. Some lost marks for stating the gases came from the fuel or as a product of combustion rather than simply from the air. In c(ii) There were many correct and clearly laid out answers. Most candidates knew how to calculate the number of moles of a gas and then converted this to a mass of carbon dioxide.

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