Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

January 2020

Pearson Edexcel International GCSE Level

In Chemistry (4CHI1)

Paper 1CR

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Question 1

The multiple-choice questions in parts a-d were well answered showing a good understanding of atomic structure, atomic numbers and mass numbers.

In (e) most candidates correctly identified the element as beryllium. In part (ii) many candidates scored a mark for identifying that an ion or a positive ion is produced when beryllium loses its outer shell electrons. The most common wrong answer was 'helium' because the cation produced has the same electron configuration as helium.

Question 2

In (a) most candidates were able to draw the particles of a liquid in an irregular arrangement with some particles touching. Some candidates forfeited the mark by drawing particles far too far apart. Of the three states of matter, candidates seemed to be least familiar with the arrangement of particles in the liquid state.

In (b) most candidates correctly gave the state symbols for the changes of state. Some gave the words which was allowed. There was some confusion with (aq) and (l) in the evaporation of water and the melting of ice. There were some excellent answers to (c), many candidates stated that the molecules gained kinetic energy, so more were able to overcome the intermolecular forces of attraction which answered the question very well.

Question 3

In (b), most candidates were able to make the link between Y_2 and the test for alkenes so correctly identified halogen Y_2 as bromine. In (d)(i), too many answers were not specific. Examples of incorrect answers included 'products are poisonous' or 'poisonous gas released'. The answer needed candidates to state that chlorine is poisonous. In (d)(ii), many candidates correctly gave the formula for iron(III) chloride as $FeCl_3$ although care is needed with capitals and the size of the number. Many candidates lost the second mark for giving chlorine as Cl_3 or as Cl. Many equations attempted to show ions reacting.

Question 4

In (b), many candidates scored all three marks. Some candidates limited their score to 1 for failing to add sodium hydroxide solution or adding an acid instead. Candidates should be reminded to state the colour for litmus in this test i.e. red litmus turns blue. Some candidates confused this with the test for chlorine and stated that litmus paper was bleached. In (c), many candidates scored 1 mark for reversible reaction or a description of a reversible reaction. Comments about equilibrium were seldom seen and ignored. In (d)(i) there were lots of well-expressed answers. The vast majority stated that ammonia molecules moved faster than hydrogen chloride molecules and some related it to the fact that the ammonia molecules moved further in the same time. Many responses mentioned the different masses of the molecules which was ignored. Few candidates scored full marks in (d)(ii). All too often, responses were about rate of reaction or about gas particles travelling slowly, despite the information in the question. There were some well-expressed answers which referred to gas particles moving in random directions and colliding with the air particles or with the walls of the tube.

Question 5

In (a), most candidates knew that all the oxygen had reacted because the last few readings were the same and were familiar with similar experiments. In (b), a lot of candidates had studied the information in the diagram and suggested using a scale with closer divisions e.g. $0.1cm^3$. in (c), most candidates were able to calculate the percentage of oxygen in the air. Many candidates lost a mark by not giving the answer to 1 decimal place.

Question 6

In (a), most candidates correctly identified that magnesium is more reactive than copper. Some lost marks by comparing the reactivity of magnesium with copper(II) sulfate or with copper(II). The vast majority of candidates correctly completed the word equation. In (b)(i), many candidates could recall and use $Q=mc\Delta T$. The most common error was candidates dividing by 1000 to give the answer in kJ, despite the question asking for the answer in joules.

Most candidates scored at least 1 mark in (b)(ii) for identifying that a polystyrene is a good insulator or poor conductor of heat. Many candidates then linked this to less heat energy lost to the surroundings. Most common incorrect answers referred to polystyrene being able to withstand the temperature rise and therefore not shatter during the experiment. In (c)(i), many candidates were able to calculate the number of moles of zinc. The most common error was giving the final answer to more than 3 significant figures or forgetting that enthalpy changes for exothermic reactions have negative values despite the question asking for a sign in the answer. There were some excellent answers to (c)(ii). Most candidates realised that oxidation and reduction were taking place and that oxidation is loss of electrons and reduction is gain of electrons. Candidates need to refer to the species in the equation, many failed to score full marks for stating that copper is reduced by gaining electrons.

Question 7

In (b)(i), a number of candidates misread the graph or gave a range of pH values. This question was asking for a single pH value after $40cm^3$ of sodium hydroxide solution had been added. In (b)(ii), most candidates knew the colours of universal indicator and correctly applied these colours to the pH values read from the graph.

There were some concise and high scoring answers to 7(c). Many candidates correctly identified that the temperature rises because the reaction is exothermic and therefore stops rising because the acid has been fully neutralised. Few candidates went to explain that after this point no more heat energy was given out or that continuing to add sodium hydroxide would simply cool the mixture down. Many candidates failed to score any marks because they described the shape of the graph which is not what the question was asking.

Question 8

8(a) was well answered. Candidates used the diagram and the formula to describe calcium losing two electrons and two chlorine atoms each gaining one electron. Incorrect names for particles was a common error e.g. ions in place of electrons or atoms. In (b), most candidates were able to describe the flame test and result for calcium ions. An acceptable alternative was to add dilute sodium hydroxide solution and look out for a white precipitate. Some candidates knew that calcium hydroxide is sparingly soluble in water so described the precipitate as a faint white precipitate which was excellent chemistry. Many candidates knew the test for chloride ions.

In (c), the graph was well plotted, but a lot of candidates missed the point at 0,0. Candidates are advised to show points as x-x as these are much easier to see. In (c)(iii), candidates had to think carefully to get a correct reason for the anomalous result. The student couldn't have simply forgotten to add a spatula of calcium chloride as this would have affected all the other results. Candidates should not give answers such as human error unqualified. In part (d), many candidates only scored 1 mark for stating they would melt the calcium chloride. Few scored full marks for stating they would heat the calcium chloride until it was molten. As this question was asking what should be done to the calcium chloride, comments about mobile ions or mobile electrons were ignored.

Question 9

In (b)(iii), candidates performed well in this extended response question, using the information in the table and adding their own knowledge. Many candidates commented that poly(ethene) was inert and therefore non-biodegradable, both responses being creditworthy. Problems with disposal of poly(ethene) were well understood. In (c), many candidates were able to draw the displayed formula of propene. Brackets and an 'n' were ignored in this question. Candidates should check that C atoms in any displayed formula must always show 4 bonds.

Question 10

In (a)(i) the dot and cross diagram was well answered whereas in (a)(ii), many candidates needed to be more precise with their description of the forces of attraction in covalent bonds between shared pair(s) of electrons and nuclei. In (b)(i), many candidates could explain why graphite conducts electricity. A few scored 0 by referring to ions in graphite. In (b)(ii), many candidates lost marks for referring to molecules of diamond or stating that diamond had intermolecular forces of attraction. Candidates also lost marks for comparing the bond strength in diamond and C_{60} implying that diamond had strong covalent bonds and C_{60} weak covalent bonds. Some candidates used table lines to structure their answer which made it easy to compare the two structures.

Question 11

The empirical formula in (b)(i) was by and large well answered. There were many examples of great exam technique with the steps of the calculation laid out logically.

In (c)(iii), candidates had clearly practiced reacting mass calculations using tonnes. Many worked out the answer as if 30 g had reacted then changed the units at the end. Most candidate knew how to use the stoichiometric ratio in the equation. (c)(iv) was well answered by many using a variety of approaches. Many candidates calculated the number of moles of carbon as 70,000 then used the equation to work out that 23,333 moles of iron(III) oxide would be required. Other candidates scored 2 by working out that 75,000 moles of carbon would be required and calculating that there were only 70,000 moles, hence calculating that carbon is limiting.

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