Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2022

Pearson Edexcel International GCSE

In Chemistry (4CH1) Paper 1CR and Science (Double Award) (4SD0) Paper 1CR

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Question 1

In (e) most candidates could identify neutralisation and both products in (f) although some gave *salt* rather than naming the salt, and a few thoughts hydrogen was produced.

Question 2

As expected in (a), the majority knew what was meant by a solute and a solvent. However, the explanation of a saturated solution in (b) caused some issues, with many merely stating that all the solid had dissolved without clarifying that no more could dissolve. Many also forgot to mention temperature. In (c) Although the process was often correctly identified as diffusion, a number of candidates just repeated references to dilution given in the question. Others failed to refer to particles as was required in their answer.

Question 3

In (a) the most common correct answer was keeping the same solvent. Fewer candidates identified the same type of paper although some were able to suggest one of the other allowed alternatives. Many gave non-creditworthy suggestions such as time or temperature. In (b)(i) most appreciated dye C was insoluble, but a few suggested it was made of a single dye. In (ii) some did not gain the first mark as they failed to clearly identify which R_f value they were choosing. Of those that did, good candidates gave a correct explanation, but many who picked the correct R_f value then did not score the second mark as their reason was just that it was different to the other value. In the R_f calculation in (c) many were able to gain full marks. Surprisingly however, some candidates ignored the measurements on the question paper and took their own. It is also worth making the general observation here that some candidates either do not process numbers correctly, and/or do not appreciate what "to two significant figures" means. In the case of this calculation, the correct working gave 0.80833.... which was then frequently followed by a final answer of 0.8 or 0.80 instead of the correct answer of 0.81 to the required two significant figures.

Question 4

As expected most gave correct meanings of atomic number in (a) and many scored both marks in (b) although some just referred to silicon without stating it was in group 4 and others just said it had atomic number 14. In (c) the correct answer to the relative atomic mass calculation was frequently seen. Incorrect answers were usually because they were either not given to the required 1dp, or were again due to mathematical errors in truncating 32.0925 to 32.0, rather than correctly rounding to 1dp.

Question 5

As anticipated part (a) was very accessible and in (b) although some answers did not refer to particles, it was well-known that liquids contain moving particles, whereas movement of particles in a solid is limited to vibration. However, some just described the arrangement of the particles instead of referring to their movement. In (c)(i) magnesium burning with a white flame was well known but in (ii) many gave a description or the name of the product instead of a property. In (d)(i) many failed to gain the mark as they just stated magnesium or sulfur would react with the air rather than oxygen specifically. The process of forming an ionic substance by electron transfer was well known in (ii), with many candidates also providing the correct charges on the resulting ions. The name of the compound was clearly given in the question so referring to a sulfate ion was incorrect. As always, in part (iii), marks were lost by candidates who think that ionic substances are held together by intermolecular forces. As there was only one compound referred to in the question, a *large amount of* energy is required, and not *more* energy. In (iv) the formula of magnesium chloride was frequently seen as MgCl.

Question 6

The explanation of empirical formula was not well done, although there were many close attempts from candidates who knew it was to do with a ratio but did not use the term simplest or atoms or elements. In their attempts to come up with a definition, many candidates forgot to give the empirical formula of ocimene (C_5H_8) as an example. In (c) many good answers were seen but a few only explained unsaturated so could only score one mark. Part (d)(ii) was only answered well by good candidates with others making suggestions such as ocimene should have twenty hydrogens or it is not an alkene. In (e) although correct answers were reasonably common, a surprising number of candidates could not come up carbon dioxide and water as the products of complete combustion. In (f) both parts were often well answered, with the correct products of incomplete combustion being frequently seen although water was sometimes suggested. Some candidates still think that carbon monoxide damages the lungs or prevents breathing, rather than preventing oxygen transport in blood.

Question 7

In (a) some candidates only scored one mark as they effectively just repeated the question by using decompose in their answer. A few believed heat was evolved in thermal decomposition reactions. The calculation in (b) was frequently correct, the common errors being omitting the 2:1 ratio in the chemical equation or calculating the formula masses of the carbonate and hydrogencarbonate incorrectly.

Question 8

Many gave the correct state symbols in (a) although some identified the acid or salt as a liquid rather than aqueous. In (b) most candidates plotted the points accurately and drew an acceptable curve, although a small number did simply join the dots, sometimes with a ruler. The reason given in (iv) was not often correct with most candidates simply referring to the reading being inaccurate. Having plotted the points correctly with one square on the y-axis being two units, candidates quite often then read the scale incorrectly in (v). In (c)(i) despite the wording of the question too few answers referred to the steepness or gradient of the graph. Those that did often claimed that the gradient became steeper as the reaction proceeded and so thought the rate of reaction increased. In (ii) many just stated that the zinc was used up as given in the question, instead of concluding that the acid was in excess, or that zinc was the limiting reagent. In part (d) some candidates did not focus well enough on *comparing the rate* of reaction in the two experiments as the question asked. Many answers simply referred to the metals having different reactivity, or the acids having different concentrations, without saying how the *rate* would be affected. The question did prove to differentiate well between candidates with those candidates that did deal with the changes individually and their effect on rate scoring at least two and often all three marks. In (e) the language used here was generally more accurate than in previous similar questions. The most common weakness was candidates simply saying that the number of collisions increases as the temperature increases without any reference to a time factor or equivalent statement.

Question 9

Part (a) was only answered well by good candidates. Many thought copper carbonate is blue or surprisingly discussed the reactivity of copper. Part (b) gave a good opportunity for candidates to display their knowledge of practical tests, and many scored full marks. The two most common errors were to refer to a yellow *colour* rather than a precipitate in the test for iodide ions; and to imply or state that limewater is added to the tube containing the sample solid and acid, rather than a gas being bubbled through it.

Question 10

In (a) good candidates rightly stated the crystals were hydrated or contained water *of crystallisation*. Although the masses in (b)(i) and (ii) were sometimes transposed, most candidates scored well and in (iii) the empirical formula calculation was often well done. It seemed likely from the answers to (c)(i) and (ii) that significant numbers of candidates had either no experience of doing a similar experiment or confused the situation with another experiment. Examples of this included some candidates seeming to think that it involved the evaporation of a solution, as in the preparation of a soluble salt. Others thought that it was like the burning of magnesium in a crucible to calculate the formula of magnesium oxide and therefore referred to a crucible lid being needed.

Question 11

Part (a) of this question proved quite challenging with answers often showing that candidates did not have the practical experience or knowledge of the metal displacement reaction involved. Hence many answers referred to gases being given off and the possible effect that having the bung or not would have on this, including possible explosions. Others thought that the reaction would get so hot that a glass beaker would be too hot to handle, or the polystyrene cup would melt. Other answers, although better, sometimes lacked detail e.g. correctly stating that polystyrene was an insulator, but then not stating that this had the advantage of reducing heat losses. However, there were also very good answers from candidates who obviously were familiar with such experiments. Part (b) was well done by many candidates although some did not make it clear that they appreciated the 1:1 molar ratio involved. In (c) the first part of the calculation was very well understood with many candidates scoring all three marks. The second part was less well done with the conversion to kJ, and the negative sign, being omitted by many. In (d) it was surprising to see how many candidates did not get oxidation and reduction the right way round. Those that did then frequently failed to specify that it is the copper *ions* being reduced, not copper.

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