# Examiners' Report

# Principal Examiner Feedback

## November 2020

Pearson Edexcel International GCSE

In Chemistry (4CH1) Paper 1CR

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## Introduction

There were many well answered questions in this paper. A lot of candidates had clearly continued their study of chemistry post 16 and a lot of responses reflected this. There were lots of unanswered questions, particularly for the questions that required longer responses.

## Question 1

(1b) Most candidates correctly answered dissolved. Many knew the terms solute and solvent, but these were often the wrong way round. Some answered solution for water rather than solvent.

## Question 2

(2b) The vast majority of candidates scored 1 mark for the electron configuration of a sodium atom. The most common wrong answers were 2,8 for an $Na^+$ ion or 2,8,8,1 for a potassium atom. It was pleasing to see a few answers using SPD notation giving an answer of $1s^2 2s^2 2p^6 3s^1$

## Question 3

(3a) Most candidates correctly named propene. A number of candidates got empirical formula and molecular formula the wrong way round whereas a few put the structural formula for one of these answers. A number of candidates didn't score the mark for the displayed formula as there was no double bond or some carbons made more or fewer than four bonds.

(3bi) Most candidates knew that an unsaturated hydrocarbon has a double bond. Common wrong answers included carbon hydrogen double bonds or saying that unsaturated hydrocarbons have double bonds only. A few defined saturated hydrocarbons.

(3bii) Most candidates were familiar with the bromine water test for alkenes. The most common reason for scoring one mark was stating bromine rather than bromine water. A few candidates failed to score for giving a wrong test e.g. limewater turns cloudy. Starting colours of bromine water were ignored in this question. A number gave the colour as brown showing confusion with liquid bromine.

(3ci) There were many correct answers for this substitution reaction. The most common wrong answers included atomic chlorine or an incorrect product such as hydrogen gas.

(3ciii) Most candidates scored a mark for ultraviolet light or ultraviolet radiation. To score candidates needed to state light, radiation or rays; ultraviolet on its own was insufficient

(3di) Many candidates were able to give a correct definition for isomers. Most common incorrect answers had molecular formulae and structural formulae the wrong way around.

(3dii) Many candidates scored 1 mark here for drawing mirror images of 1,1-dichloroethane or 1,2-dichloroethane. There were some odd answers with carbon atoms replaced with chlorine atoms.

**Question 4**

(4a) Most candidates were able to correctly balance the equation for the decomposition of hydrogen peroxide.

(4b) Most candidates knew the test for oxygen gas. Candidates need to be careful to state a glowing splint. Many spoke about splints relighting or about a burning splint burning more brightly which, although true, is not the correct test for oxygen gas.

(4c) The vast majority of candidates scored a mark for a catalyst increasing the rate of a reaction. References to decreasing activation energy were ignored here as this question wanted a practical reason for adding a catalyst.

(4d) and (4e) Many of the graphs were well plotted and the anomalous result identified. The reason for the anomalous result was less well answered. The question was looking for the reading being taken too soon or a reading error. A lot of candidates mentioned an error that would have affected multiple results.

A lot of candidates forgot to answer 4ei, missing out on two accessible marks. The line drawn was nearly always drawn below the first line but rarely levelled off at 40$cm^3$. Candidates should have appreciated that half the concentration of hydrogen peroxide would have given half the volume of oxygen gas.

In (4eii) there were some excellent answers for the effect of decreasing the concentration of hydrogen peroxide on the rate of reaction. Candidates need to be reminded of the need to mention number of particles per unit volume and link it to the number of collisions per unit time. Some candidates had clearly learnt the effect of increasing the concentration of a solution and therefore limited their marks in this question. A number of candidates thought that decreasing the concentration of the particles also decreased the energy which limited their mark to 1.

**Question 5**

(5aii) The reason for methanol not being a hydrocarbon was well understood. Some candidates failed to score for stating that methanol contains an oxygen molecule rather than an oxygen atom.

(5aii) Candidates need to be precise when stating what is meant by a covalent bond. Many candidates did not refer to stared pairs of electrons or wrote about forces between oppositely charged electrons. A lot of candidates wrote excellent answers about the forces of attraction in a covalent bond which was acceptable as long as there was an indication about two nuclei in the answer rather than just one nucleus.

(5bii) There were some excellent dot and cross diagrams for methanol. Most common incorrect answers included double bonds to the oxygen atom. Candidates need to count the number of electrons on each atom as the lone pairs on the oxygen atom were sometimes missing.

(5c) The empirical formula was well answered with clearly laid out working in many cases. Many candidates correctly converted the empirical formula to the molecular formula. A few candidates lost a mark for giving the molecular formula as $(CH_3O)_2$

**Question 6**

(6aiii) Many candidates knew the test for chlorine gas but some confused it with the test for chloride ions. Many candidates also knew that chlorine has acidic properties as well as being a bleach and mentioned damp litmus paper turning red before being bleached.

(6b) The test for iodide ions was well known. Some candidates forgot to add dilute nitric acid or acidified with dilute hydrochloric acid which would react with silver nitrate solution.

(6c) There were many concise, high scoring answers here. A lot of candidates understood why chlorine displaces bromine from potassium bromide and why bromine reacts with potassium iodide.

Many candidates lost a mark for imprecise language such as chlorine displaces bromide.

A number compared the reactivity of halogens with potassium.
Colour changes were less well answered. Candidates need to be reminded that solutions of group 1 halides are colourless, and that bromine will appear as an orange coloured solution and iodine as a brown coloured solution.

**Question 7**

(7ai) There was some confusion with state symbols for sulfuric acid and zinc sulfate which should both have been (aq). Many were given as (l). A few candidates put hydrogen as (l).

(7aii) Most candidates scored a mark here for bubbles of gas or effervescence. Zinc gets smaller was also allowed here. Candidates must record observations as something that can be seen e.g. bubbles of gas produced rather than gas produced.

(7bi) Most candidates realised that excess zinc needs to be added to ensure all the dilute sulfuric acid reacts. Few scored the second mark as they failed to realise that this would mean there was only zinc sulfate solution or zinc sulfate crystals produced.

(7bii) most candidates scored 2 marks for drawing a funnel with a filter paper and a suitable piece of apparatus to collect the filtrate. Some candidates scored 1 mark for forgetting to include a piece of filter paper.

(7c) a lot of candidates failed to score 2 marks in 7c(i) as they calculated the Mr of anhydrous zinc sulfate or misunderstood the significance of the 7 in the formula. Error carried forward applied throughout 7(c). There were a lot of correct and clearly laid out answers for parts (ii) and (iii)

**Question 8**

(Q08ai) The observations when magnesium is burned were poorly expressed by many. The question was looking for a white flame and a white solid produced. Many failed to give the colour of the flame.

(Q08aii) many candidates gave excellent answers about why this is an oxidation reaction. Again, some candidates gave answers from their post 16 studies such as the oxidation state of magnesium rising from 0 to +2.

Candidates should avoid vague answers such as 'it loses electrons' as it is unclear whether they mean magnesium or oxygen.

(Q08bi) Most candidates scored a mark here. The most common answer that didn't score was for mentioning that exothermic reactions give out energy rather than heat energy.

(Q08bii) A pleasing number of candidates scored a mark for a correctly balanced equation for the reaction between magnesium and carbon dioxide.

(Q08biii) A lot of candidates failed to appreciate that use of a carbon dioxide fire extinguisher could actually make a magnesium fire worse. Many candidates stated that magnesium reacts with carbon dioxide and didn't state that the reaction is very exothermic.

(Q08c) This question was poorly answered by many. A lot of candidates stated they would take the lid off the crucible but failed to mention the need to replace the lid. Many candidates correctly mentioned that lifting the lid would cause more oxygen to react with the magnesium.

Many candidates knew about heating to constant mass but failed to link it to the magnesium being completely reacted. Others knew the magnesium needed to be heated again but didn't mention the need to reweigh.

**Question 9**

(9bii) The equation for thermal decomposition of lead carbonate was well answered.

(9cii) there were some well written, concise answers to this question that scored full marks.

Candidates were told that both compounds had covalent bonds but had to appreciate that silicon dioxide is giant covalent whereas silicon tetrachloride is simple molecular. In a question like this, candidates need to mention both structures, what bond and force is broken or overcome and then compare the energy required for the process. A lot of candidates lost marks by overcoming intermolecular forces of attraction in silicon dioxide or stating that the covalent bonds broken in silicon tetrachloride were weaker than in silicon dioxide.

**Question 10**

(Q10ai) The word equation for this neutralisation reaction was well answered by most candidates. The most common wrong answers had hydrogen instead of water or an extra product such as carbon dioxide.

(Q10aii) Many candidates appreciated that potassium hydroxide and hydrochloric acid were stirred to mix the reactants more thoroughly. Relatively few expressed a correct reason why i.e. to ensure that the mixture is the same temperature throughout or so that the heat energy is released more quickly.

(Q10b) Most candidates correctly calculated the mean temperature of the two solutions.

(Q10ci) Many candidates lost marks in this question by either misreading the end temperature on the thermometer or by copying the mean start temperature from the previous question.

(Q10cii-iii) Most candidates correctly calculated Q in part ii. Some forgot to add the masses of the two solutions together and got an answer of 546.

The conversion to molar enthalpy change was less well answered with a lot of candidates forgetting to add the – sign to the answer. Most candidates got some credit for either dividing by 1,000 or dividing by the number of moles.

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