

General Certificate of Secondary Education

Chemistry 4421

CHY3H Unit Chemistry 3

Report on the Examination

2010 Examination – June series

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Chemistry Higher Tier CHY3H

General

The examination proved challenging for the weaker candidates but the more able and better prepared candidates were able to demonstrate their knowledge and understanding.

The following questions were well answered by the majority of the candidates: question 1, question 2 and question 3(a)(i) and 3(b).

Question 6(a) was very poorly attempted and the following questions proved difficult for over half of the candidates: question 4(a)(ii), question 4(b)(ii) and question 5(b)(ii).

This report should be read in conjunction with the published mark scheme.

Question 1 (Standard Demand)

- (a) A large proportion of the candidates knew that the source of the ions was the rocks; however the word dissolve was less frequently stated.
- (b) This question was well answered by the majority of the candidates. A number of the candidates included the chloride ion in their answer and were penalised.
- (c) The formation of scale and scum was well known by the candidates. Unfortunately a number of the candidates stated that scum was formed in kettles/pipes. A pleasing number of the candidates recognised that the formation of scale in kettles/pipes reduced the efficiency of the equipment. Many candidates however, simply that scale blocks pipes without any qualification.
- (d) The majority of the candidates were able to state a method used to soften water.

Question 2 (Standard Demand)

- (i) The straight line graph was well drawn by the vast majority of the candidates. Candidates should be encouraged to use a sharp pencil and a ruler for drawing straight lines.
- (a) (ii) Almost all the candidates were able to read the graph correctly.
- (a) (iii) Most candidates gave an appropriate reason for the reliability of the estimate for pentane. Rather surprisingly, most opted for the closeness of pentane to the measured results rather than the more obvious straight line of the graph. A number of candidates whose answer referred to the line simply stated that it was a line of best fit rather than a straight line.
- (a) (iv) The majority of the candidates correctly read the value for butane from the graph and performed an appropriate calculation. Some candidates then went back to part (a)(ii) and changed the value for octane so that the value was outside the allowable range and lost the mark in that part of the question. This was presumably so that the candidate could state that the prediction was correct.

- (b) (i) A significant proportion of the candidates added the values for hydrogen and bioethanol together and compared the value to the sum of the values for coal and natural gas, which led them to believe that the conclusion was correct.
- (b) (ii) The broad range of answers in the mark scheme allowed the majority of the candidates to score full marks on this question The majority of the candidates who did not gain credit were imprecise in their use of language. For example, instead of using the names given in the table, the word they was used to discuss renewable fuels. Candidates should be encouraged to state specific examples when interpreting given data.

Question 3 (Standard and High Demand)

- (a) (i) The reaction of sodium with water is well known by many of the candidates however candidates were required to state what they would see during the reaction and not state the names of the products. A majority of candidates knew that the Universal Indicator changed colour but many candidates either did not state what the colour change was or gave the colour as red.
- (ii) It is disappointing to note that over two fifths of the candidates were unable to write the formula of sodium hydroxide. Those candidates who were able to state the formula usually balanced the equation correctly.
- (b) The majority of the candidates were aware of the relationship between the electronic structure and the reactivity of francium but a lack of precise language meant that only a third of the candidates gained maximum credit.
- (c) The general properties of metals were stated by many candidates rather than the differences in properties between the transition elements and Group 1 elements.

Question 4 (High Demand)

- (a) (i) This question highlighted the lack of knowledge of the tests for ions. A significant proportion of the candidates gave the correct response for the result but were unable to state the reagent used. Some candidates were penalised because they simply said that the colour was green but did not identify that a precipitate was formed.
- (a) (ii) Over half of the candidates gained no credit on this question. The reagent for the sulfate ion test was not well known indeed a number of candidates stated that the reagent used for the test is barium rather than barium chloride or barium nitrate.
- (b) (i) The candidates responses to this question were disappointing. Many candidates were unable to interpret the equations given in the question and frequently the silver nitrate was referred to as silver and the carbonate ion as carbon. Candidates should be encouraged to use the full names of chemicals in their answers. A large proportion of the candidates made no attempt at the question.
- (b) (ii) Only a third of the candidates gained credit. A significant proportion of the candidates stated that hydrochloric acid could not be used because it is a strong acid or stated that the solution contained chlorine rather than chloride ion.

Question 5 (High Demand)

- (a) The vast majority of candidates appreciated that hydrogen ions are formed in aqueous solution of hydrogen chloride but the covalent and molecular nature of gaseous hydrogen chloride was only recognised by the better candidates. Most candidates simply stated that hydrogen chloride does not contain hydrogen ions.
- (b) (i) Whilst a majority of the candidates recognised that potassium hydroxide forms hydroxide ions in solution, the extent of ionisation was less well known. A significant proportion of the candidates answered the question in terms of concentration of ions or pH.
- (b) (ii) The responses to this question were very disappointing with almost three quarters of the candidates being unable to explain the neutrality of potassium chloride solution. Many candidates stated that the solution is neutral because there are no hydrogen or hydroxide ions in the solution or that the potassium ion cancels out the chloride ion.
- (c) (i) Almost half of the candidates correctly stated the Bronsted-Lowry definition of a base. Some candidates correctly stated the definition and then spoilt their answer by referring to hydrogen ions.
- (c) (ii) This question was very well answered by the majority of the candidates.

Question 6 (High Demand)

- (a) A significant number of the candidates simply stated the use of sodium chloride in food and that it is therefore not poisonous. Other candidates appreciated that chlorine is a gas and sodium chloride is a solid but made no reference to the fact that one is an element and the other a compound. Of those candidates who knew that sodium chloride is a compound the majority did not make the statement that chlorine is an element. The small proportion of successful candidates followed the alternative explanation and gained credit for knowing that sodium chloride is ionic and chlorine is covalent. Only the very best candidates were aware that the properties of elements are not transferred to their compounds.
- (b) A majority of the candidates knew of the dangers of too much salt in the diet.

Question 7 (High Demand)

Almost two thirds of the candidates were able to calculate the number of moles of carbon dioxide and water but many of these candidates were able to successfully translate these values into a correct empirical formula. Many of these candidates did not recognise that water contains two atoms of hydrogen and gave CH as the empirical formula, whilst others included oxygen in the empirical formula.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the <u>Results statistics</u> page of the AQA Website.