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General Certificate of Secondary Education

Additional Science 4463 / Chemistry 4421

CHY2F Unit Chemistry 2

Report on the Examination

2012 examination – January series

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Additional Science / Chemistry
Foundation Tier CHY2F

General

Question 1 *(Low Demand)*

Fairly well answered – most gained at least 3 marks. In 1(c)(ii) some students guessed the answer and electrons and protons were common responses.

Question 2 *(Low Demand)*

(a) Was generally well answered.

(b) Good students clearly specified that the cobalt chloride paper would turn from blue to pink. However, a significant number of students confused cobalt chloride paper with indicator papers detecting acids and alkalis. Answers referring to the paper changing green indicating neutrality, changing from blue (alkaline) to red/pink (acidic) were common. Other incorrect responses were confused, with anhydrous copper sulfate changing white to blue. Purple and clear were common answers. Vague answers discussed the colour of the cobalt chloride paper changing with no specified colours and the paper 'going lighter or darker'.

(c) Vague references were common referring to the papers reacting with air, oxygen, carbon dioxide, hydrogen or gases in the air. Credit was awarded for recognising that water, dampness or moisture could react with the papers. Others thought that the jar was sealed to prevent cobalt chloride escaping and referred to its toxicity or harmful nature.

Question 3 *(Low Demand)*

(a) Wild guesses were evident in both parts.

(b) Generally well answered though natural gas was commonly chosen. In (b)(ii) and (iii) many correct answers were seen.

(c) A minority of students gave the incorrect response solid or gas or solution.

Question 4 *(Low Demand)*

Only the more able students were able to choose the correct structures in (a).

Incorrect responses were often given for (b)(i) indicating a lack of knowledge and understanding of the terms involved.

(b) (ii) A variety of incorrect processes were described with heating and evaporation being common responses. Thermal decomposition and electrolysis were often seen. Vague answers such as 'let it sink to the bottom' and 'collect at the bottom' scored no mark. Relatively few students realised that filtration was the required method-misspellings such as filterisation were credited the mark.

(b) (iii) The majority of students chose the correct response which was hydrochloric acid.

(c) (i) Many students answered in terms of how electricity passed through either ionic compounds or metals but few realised the significance of magnesium chloride

being molten/liquid. Vague answers such as 'heat it' or 'make it positive' were common. Credit was given for adding the solid to water or making a solution.

(c) **(ii)** This part was well answered with most students appreciating that magnesium ions were positive with the subsequent resultant attraction due to being oppositely charged. Some students who appreciated that magnesium ions were positive then negated their answer with phrases such as positive electrons, magnesium electrodes or in trying to extend their answer described the attraction of the electrodes with each other.

(c) **(iii)** Chloride was a common incorrect response with chemicals that were mentioned in the question such as magnesium chloride. Other students who realised the product was chlorine often negated their answer by including the word ions not realising that it was the product that was wanted and not what was attracted to the positive electrode. Random guesses such as copper, hydrogen and carbonate were seen.

Question 5 ***(Low Demand)***

(a) Most students scored at least one mark.

(b) Covalent was the common correct choice.

(c) A large number of students realised that the particles were arranged in layers that could slide or move over each other or that the layers were joined by weak bonds. Vague references to 'the layers having weak bonds' only scored partial credit. Vague answers referring to weak bonds in the layers, atoms being not close together and particles rubbing or slipping received no credit.

Question 6 ***(Standard Demand)***

(a) The vast majority of answers were correct. Many students discussed the lack of technology, equipment or resources. The idea that scientists did not know how to was also common and some students mentioned the unavailability of electrolysis. Among the answers that did not receive credit were restatements of the information in the passage such as 'Scientists thought that alumina …. … an undiscovered metal' and 'alumina is a white solid'.

(b) Many students were awarded a mark for quoting information from the passage that 'scientists were not able to obtain the same results or able to repeat the experiment. Common incorrect answers stated that 'he did not repeat the work', he could not prove it' and 'he needed to repeat the work for it to be a fair test'.

(c) The most common creditable answer was reference to the endothermic reaction in Step 1. A few students correctly mentioned activation energy. A small number of students made errors confusing endothermic and heat out, and exothermic and heat in. The most common errors related to increasing the rate of the reaction. This idea was expressed in a variety of ways, 'particles with more energy moved quicker', 'more collisions' and 'more successful collisions'. Vague references 'to make the reaction happen' and 'reaction only starts if hot 'scored no marks.

(d) Many students successfully completed the word equation. References to metal or particles after aluminium were ignored. Incorrect formulae received no credit and potassium chlorine or just chloride were penalised. Occasional answers suggested carbon, magnesium and chlorine

(e) A good discriminating question with only the more able students scoring any marks. Copying from the stem of the question 'he tested the metal and recorded its properties' was a very common response and scored no credit. Many students simply stated that he had made a huge lump of metal compared with only tiny particles which also did not receive any credit. The most common correct response included some comparison with the properties of other metals although testing it to prove it was a metal first was often omitted. The idea of testing conductivity or reaction with acids was only realised by a minority of students.

Question 7 *(Standard Demand)*

(a) (i) This question was a good discriminator and well answered by many students. A large proportion of students gave the correct answer of 40. The most frequent errors included 24X16 = 384, 24 + (16+16) = 56 and 24 + 16/2 = 20. Some students used 8 and 12 as the atomic masses of the elements ignoring the information in the question stem.

(a) (ii) Credit was allowed for error carried forward from part(i). Only the more able students scored credit. Many students simply subtracted the relative atomic masses or divided the sum of the relative atomic masses by 2. Evidence of 24/40 scored 1 mark but 16/24 and 16/40 were commonly seen.

(a) (iii) A lack of thought was evident in this part of the question. Many answers resulted in the mass of magnesium needed to make 25g of magnesium oxide being greater than 25g! Many students did not attempt this part of the question.

(b) (i) A good discriminating question. Many answers were vague and students wrote at length without the required detail. Common examples were 'experiment was done wrong', 'equipment was faulty' and 'incorrect measurement'. The majority of students scored credit for stating that the lid was lifted too long or that magnesium oxide escaped. The idea that the magnesium had not fully reacted/had not been heated long enough was realised by fewer students. Few students correctly gained a mark for specifically mentioning a weighing error for the magnesium or the magnesium oxide. Vague answers such as 'not enough magnesium used' were common.

(b) (ii) There were frequent references to human, random and systematic errors, which received no credit. A large number of students gained credit for improving the reliability although there was often confusion between reliability and accuracy. Many answers included the idea of checking if the first result was anomalous but the wording was often vague and credit was not awarded for the simple idea of checking for errors. A minority of students gained credit for calculating an average or mean.

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