



## **General Certificate of Secondary Education**

# **Additional Science 4463 / Chemistry 4421**

**CHY2F      Unit Chemistry 2**

## **Report on the Examination** *2008 Examination – January Series*

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*Dr Michael Cresswell Director General.*

## **Additional Science / Chemistry Foundation Tier CHY2F**

### **General**

Candidates should be reminded to write their answers clearly in black ink or ball-point pen and within the space provided. Note that when candidates give several answers when only one or two are required, they might not be credited for their correct ideas if errors or contradictions are included in their response.

### **Question 1 (Low Demand)**

Part (a) was intended as an easy starter question but it proved difficult for many of the candidates with only about half of them gaining the mark. Incorrect responses included  $C_4H$ ,  $Ch_4$ ,  $CH^4$  and Me. Some candidates gave irrelevant words such as atom, ion etc.

All three answers were seen in about equal proportions in part (b). The question showed that many of the candidates are not able to distinguish between diagrams of atoms, ions and molecules.

Part (c) was surprisingly the best answered part of this question. The majority of candidates were able to identify the bonding as covalent.

### **Question 2 (Low Demand)**

Part (a) was well answered with virtually all of the candidates gaining at least one of the two marks and over half gaining both marks. Diamond was the best known of the three structures.

For part (b) the type of bonding in part (b)(i) and the properties in parts (b)(iii) and (b)(v) were well known. Less well known were the number of bonds to each carbon in graphite and diamond.

A wide range of answers were seen in part (c) which included references to metals, non-metals and a number of different elements. This part highlights the importance of reading the question carefully since the answer can be worked out from the information given in the question.

### **Question 3 (Low Demand)**

In part (a) the vast majority of the candidates knew the meaning of the term exothermic.

In parts (b) and (c) it is pleasing that most of the candidates could correctly identify the electronic structures of the oxygen atom and the magnesium ion.

Identification of the salt produced by the reaction of magnesium oxide and hydrochloric acid was not well done in part (d). All three possible answers were seen in about equal proportions.

### **Question 4 (Low Demand)**

About half the candidates correctly answered part (a)(i) and part (a)(ii). All of the responses were seen.

All permutations were seen in part (b). Oxygen and sodium metal were frequently given. The best known answer was substance A, chlorine. Substance C, sodium hydroxide solution, was the least well known.

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**Question 5 (Low Demand)**

Part (a)(i) was quite well answered. A common error was to reverse the positions of hydrogen and ammonia while some candidates invented names such as nitrogen hydroxide or inserted the conditions used in the process. A few candidates inserted incorrect formulae or mixed and matched names and formulae. Candidates would be well advised to give a word equation when asked rather than making the question more difficult by attempting a symbol equation.

Many candidates answered part (a)(ii) correctly either by stating reversible or by describing the meaning of reversible. A few candidates incorrectly thought that the symbol means equal or balanced.

A variety of responses were seen for part (a)(iii). Some candidates thought that the answer was linked to the reactivity of iron or heating effect of iron.

Part (a)(iv) was poorly answered with only about one third of the candidates giving the correct response.

Part (a)(v) was well answered. Credit was given for ideas such as the gases are reused or are sent back to the beginning. A few candidates mistakenly thought that the gases are released into the atmosphere, stored or sent to the cooling chamber.

In part (b)(i) good answers referred to explosives / bombs or medicines. The use of ammonia to gas people or in gas bombs was commonly seen. Some candidates gave vague answers such as weapons or equipment which did not gain credit.

In part (b)(ii) the majority of candidates made the link with fertilisers. Incorrect responses included dyes to colour the food and plastics to package food.

Very few candidates answered part (c)(i) correctly. A range of answers were accepted such as the availability of a workforce or the existence of a transport infrastructure. Incorrect responses included the idea that the atmosphere would contain a good supply of nitrogen and hydrogen.

Candidates found it difficult to suggest **and** explain in part (c)(ii). The majority of candidates gained one mark. This was often gained for some reference to pollution but candidates then failed to go on to discuss the effect of the pollution. Some good answers were seen which explained that the plant would produce a lot of noise which would affect the local neighbourhood day and night. Many vague answers were seen such as it will cause global warming.

**Question 6 (Standard Demand)**

The key idea in part (a) was that the point at 4.5 minutes was anomalous. The line of best fit should be a smooth curve which omits that point. Some candidates drew a line which had a kink to include the anomalous point or which missed a number of points in order to accommodate the anomalous result. Other candidates drew straight lines with a ruler between the points and many persist in the misconception that a line of best fit must be a straight line.

In part (b) very few candidates made the link between the decrease in mass and the evolution of carbon dioxide shown in the equation. Some candidates stated that other gases such as hydrogen or chlorine were evolved. Other incorrect answers included ideas such as; the acid had evaporated, heat is given off, the reaction has cooled down, all the reactants have been used up and the marble chips are getting smaller.

Many candidates gave the correct response of 7 minutes in part (c). Ten minutes was a common incorrect response.

In part (d)(i) a mark was awarded for a line to the left of the points and a mark for this line levelling off at 99.0. Candidates found this difficult and many made no attempt. Other candidates gave straight lines, less steep lines or lines which levelled off below 99.0.

Some excellent answers were seen for part (d)(ii) but a large number of candidates gave vague answers which did not gain credit. Some simply restated the stem and stated that heat speeds up a reaction without any explanation. Common errors included references to surface area, pressure and catalysts.

### **Question 7 (Standard Demand)**

In part (a) few candidates gave the simple idea stated in the specification that the layers of atoms can slide over each other. Misconceptions included ideas to do with the metal being heated to melting point and vague references to particles and electrons. Some candidates just stated that the metal is soft.

In part (b) many candidates realised that nanoparticles are smaller than normal sized particles but a significant number thought that they are larger.

In part (c) many candidates gained one mark for stating that they are stronger or harder. Fewer were able to explain why these properties would be of benefit in a hip replacement joint. A simple answer such as; the nanocrystalline metal is harder so it will wear less quickly, was sufficient for two marks.

### **Question 8 (Standard Demand)**

About half of the candidates were able to identify the formula as  $N_2O$  in part (a). Some candidates showed their working and clearly understood what was required while others either made no attempt or were simply guessing.

In part (b) the percentage calculation proved to be difficult for many of the candidates. A number of candidates gave an incorrect answer with no working. Some candidates ignored the value of the  $M_r$  given in the question and attempted to calculate a value for themselves, often incorrectly. Some calculated  $(14 \div 100) \times 101$  rather than  $(14 \div 101) \times 100$ . Other candidates ignored the question and calculated percentage of potassium or oxygen. Candidates should be careful with rounding.

### **Mark Ranges and Award of Grades**

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.