



General Certificate of Secondary Education

Additional Science 4463 / Chemistry 4421

CHY2H Unit Chemistry 2

Report on the Examination *2008 Examination – January Series*

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Additional Science / Chemistry Higher Tier CHY2H

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.

The quality of the work seen was generally very good and there were some outstanding scripts.

Question 1 (*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. A few candidates did not extend the line to the first point.

Most candidates made the link between the decrease in mass and the evolution of carbon dioxide shown in the equation in part (b). 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.

The majority of candidates gave the correct response of seven 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. Most of the candidates made a good attempt at this question and many gained both marks. Some candidates gave straight lines, less steep lines or lines which levelled off below 99.0.

Some excellent answers were seen for part (d)(ii) and the vast majority of the candidates gained at least one mark. A few candidates gave vague answers which made no reference to collision theory. Errors included references to surface area, pressure and catalysts. Some candidates tried to include references to activation energy and gave confused answers such as; the increase in temperature will make the activation energy higher or the reaction will go faster because the increase in temperature will lower the activation energy.

Question 2 (*Standard Demand*)

In part (a) many candidates gained this mark for 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 or malleable. A few candidates were distracted by giving descriptions of delocalised electrons.

Most candidates realised that nanoparticles are smaller than normal sized particles in part (b). Some candidates did not read what was required sufficiently carefully and gave responses which did not answer the question asked. Some candidates gave answers such as they have stronger bonds.

In part (c) most 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 3 (Standard Demand)

Most 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.

In part (b) the percentage calculation was well answered by 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 the percentage of potassium or oxygen. Candidates should be careful with rounding.

Question 4 (High Demand)

Many candidates found difficulty in explaining the meaning of the term electrolysis in part (a). These candidates knew that it was something to do with electricity but could not give any further information. Other candidates did not mention electricity but simply talked about the movement of ions.

The majority of candidates gave the correct response which was hydrogen in part (b). A variety of incorrect responses were seen including oxygen, chlorine and sodium oxide.

In part (c) many of the candidates gained one mark for the idea of delocalised electrons. Fewer candidates were able to give a more detailed answer which explained that each carbon atom has one free electron. Some candidates thought that graphite must be a metal.

Question 5 (High Demand)

The whole of question 5 was generally well answered with only part (e) giving significant problems.

In part (b) the equation was often completed and balanced correctly. Some candidates ignored the formula of magnesium oxide given in the stem of the question and instead gave MgO_2 .

A number of candidates lost this mark because they did not give the charge on the ion in part (d).

In part (e) a number of candidates described in detail how the ions are formed rather than how they are held together in the solid. A few candidates thought that covalent bonding, sharing of electrons or intermolecular forces were involved. Some simply gave ionic bonding which does not explain what is happening.

Part (f) was well answered. Some candidates ignored the question which asked them to complete a **word** equation and attempted to give the formula. A correct formula was accepted but we did not accept $MgCl$.

Question 6 (High Demand)

Part (a) was not well answered. Many candidates ignored the question which asked them to name suitable compounds for A and B. Instead they gave vague answers by copying out sections from the solubility information such as most chlorides, bromides and iodides. They found great difficulty in interpreting and using the solubility data that they had been given. They could give any named metal bromide except silver or lead for compound A. Ammonium and hydrogen bromide were also accepted. Only silver nitrate and silver sulphate were accepted as possible answers for substance B since these are the only compounds that they can deduce from the information given. A few candidates did not understand how to name compounds and gave answers such as sodium bromine.

Part (b) proved surprisingly difficult for the candidates. The mark could be gained by simply using information from the stem of the question such as silver bromide is changed to silver by light.

Very few candidates identified the reaction as a precipitation in part (c).

A large number of candidates correctly stated that electrons are gained in part (d). Common errors included electrons being lost, and in a few cases, protons being lost.

Question 7 (High Demand)

Part (a) was intended as a challenging calculation for the more able candidates and that proved to be the case. Some excellent answers were seen but many answers were simply a jumble of numbers which were difficult to give any credit. Very few candidates set out their working clearly. The problems for the markers were compounded by strange rounding of intermediate answers in the calculation so that a wide range of final answers was given. Candidates would be well advised to defer rounding until they reach their final answer. Some common errors included calculating the relative mass of 2NH_3 as if it were N_2H_3 and getting the answer of 31 and using 14 as the relative molecular mass of N_2 .

Part (b) was better answered than part (a). Many candidates gained the marks either by error carried forward from their part (a) or by using the value of 1100 given in the question. A number of candidates used 1000g as their maximum yield rather than 1100g or their answer from (a).

In part (c)(i) few candidates linked an increased yield with the fact that the forward reaction is exothermic. Similarly in part (c)(ii) few realised that there would be an increased yield because in going from reactants to products there is a decrease in the number of gaseous molecules. Since we did not specify that the yield is an equilibrium yield the mark scheme was expanded to include sensible answers based on rates of reaction.

Part (d) asked the candidates to discuss the economic, safety and environmental factors. To gain all three marks the candidates were required to address all three issues. Many candidates only addressed one or two of them. Some common misconceptions were that nitrogen is a pollutant and that the ammonia produced would be sold in the local town. Many answers were long and vague often extending well beyond the available space. Candidates should be encouraged to be more concise and precise in their answers. A wide range of answers was accepted.

Mark Ranges and Award of Grades

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