



General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1H Unit Chemistry 1

Report on the Examination

2010 Examination – June series

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Science B / Chemistry
Higher Tier CHY1H**General**

There were six questions on this paper. The first two were common to Foundation and Higher Tiers. They were targeted at grades D and C. The final four questions were targeted at grades B, A and A*.

The candidature was very similar to previous years, ranging from very able candidates to those who might have been better doing the Foundation Tier paper.

The mark scheme was designed to allow candidates to gain marks for showing knowledge, understanding and application of chemistry. The extended response questions caused problems for the candidates who could not organise their answers. The majority of candidates appeared to have sufficient time to complete the paper.

Basic knowledge and understanding of how science works in everyday situations, including in the laboratory, are tested throughout this paper. This means that it is essential that candidates read and analyse the information provided, then read the question before writing their response.

Question 1 (Standard Demand)

- (a) (i) This was a familiar situation for the vast majority of candidates. After selecting the correct company and pad most candidates were aware that the result for Company A Pad 3 was an anomalous result.
- (a) (ii) This was answered well. Most correct answers referred to the volume of water used although a few candidates incorrectly gave the volume of water collected.
- (a) (iii) Again well answered with most candidates opting for the measurement of the water as a potential error. A few candidates gave suggestions that were too general, for example human error or errors in measurement without specifying the actual error in this context. There were a few candidates who thought the cause of error was zero error on the cylinder or lack of precision on the instrument scale neither of which answered the question.
- (b) (i) This part was not answered as well as the other parts of this first question. Several candidates thought that company B was the best company and lost one mark. However, the majority of candidates did gain one mark with the idea that the nappy pad would absorb more water or that Aqanaps wanted to be the best company. It was clear that a sizeable minority of candidates misinterpreted the data in the table, believing that the better the nappy the more water would be collected in the measuring cylinder.
- (b) (ii) This part was well answered with many candidates identifying that it would cost Aqanaps more money or reduce their profits. However, there were several candidates who wrote about a disadvantage to the baby, the parents or the environment, rather than a disadvantage to the company as stated in the question.

Question 2 (Standard Demand)

- (a) (i) This part was reasonably well answered with many candidates gaining both marks. A few candidates assumed that the water vapour could be converted into

a different gas, such as oxygen or nitrogen. Other candidates did not appreciate the time interval between the Earth's early atmosphere and the Earth's atmosphere today and thought that the water vaporised and disappeared because of the Earth's high surface temperature of 400°C.

- (a) (ii) This was well answered with a majority of candidates gaining both marks. By far the most common correct response was that plants use carbon dioxide and change it into oxygen, although there were a few candidates who stated that plants breathed in or sucked in carbon dioxide. However, it was pleasing to see a fair number of candidates who knew that carbon dioxide was also dissolved in the oceans or locked up in sedimentary rocks and (less commonly) fossil fuels.
- (b) (i) A large majority of candidates realised that the Earth's core is inaccessible. However, the lack of evidence comment with no explanation did not gain any credit.
- (b) (ii) This question was reasonably well answered by candidates across the ability range with perhaps a majority gaining marks for realising that the controversial theory involved convection currents in the mantle. Better candidates mentioned radioactive processes but many of these neglected to link the convection currents to the energy released by these radioactive processes.

Question 3 (*Standard Demand*)

- (a) (i) It was not surprising that a large percentage of candidates gave the correct symbol for carbon.
- (a) (ii) In this part, a good proportion of candidates completed and correctly balanced the chemical equation for two marks. Many candidates failed to appreciate the fact that iron is a metallic element and were awarded one mark for the very common response $\text{Fe}_2 + 3\text{CO}_2$. As always happens with balancing chemical equations there were a large range of variations, although possibly the most disappointing aspect of this question was the use of CO^2 , especially considering that (a)(i) contained the correct formula for carbon dioxide.
- (a) (iii) This part was well answered, candidates having possibly taken note of similar questions on previous papers. Most of the correct answers gained credit for mentioning that the layers of atoms in pure iron could easily slide over each other, although some candidates gained credit for using the reverse argument and explaining why cast iron is harder than pure iron.
- (b) Not many candidates gained full marks for this part. Often candidates would just repeat information given in the stem of the question, such as reduces energy or reduces waste and as such gained no credit for these comments. Vague scientific ideas were also very common and did not gain credit. These included the ideas of less pollution or less waste gases. However many candidates appreciated the problems caused by the extraction of the ore in terms of diminishing iron ore reserves. The mention of carbon dioxide and its associated environmental problems was one of the most commonly made creditworthy points. There was some confusion over the different atmospheric problems, such as; carbon dioxide affects the ozone layer was seen.

Question 4 (High Demand)

- (a) (i) Many candidates were able to state correctly that the oils would decolourise the iodine solution. Some candidates, however, still confuse the ideas of turning colourless and turning clear.
- (a) (ii) Most candidates did realise that unsaturated means that the molecule has a carbon-carbon double bond, but some of the answers only referred to the health effects of unsaturated oils.
- (a) (iii) Most candidates correctly identified palm oil as the oil that would probably cause the highest risk of circulatory and heart problems and went on to correctly explain their choice in terms of the relative amount of unsaturated fat or saturated fat in palm oil. A few candidates tried to explain their choice only in terms of iodine number or failed to select the correct oil – sunflower oil being the most common incorrect choice.
- (b) In this part a reasonable proportion of candidates gained all three marks by stating that the hydrogenation reaction involved hydrogen and a nickel catalyst at 60°C. There were many incorrect responses that described the emulsification of the palm oil or suggested that the palm oil could be hardened by the addition of a saturated oil or by placing the palm oil in a fridge.

Question 5 (High Demand)

- (a) (i) Most candidates found it difficult to express how limestone releases carbon dioxide. Answers such as decomposition were rare and yet burning was more common.
- (a) (ii) Most candidates found it difficult to express how limestone removes sulfur dioxide. The correct idea of a chemical reaction or neutralisation was not often seen.
- (b) This part was not answered well because many candidates thought that the carbon monoxide came directly from heating or burning limestone.
- (c) (i) This part was poorly answered with very few candidates gaining two marks. The idea of locked up carbon dioxide was not at all well understood. Many candidates thought that the carbon dioxide was locked up in green plants or even locked up in the chimney.
- (c) (ii) The majority of candidates gained the mark because they knew that carbon dioxide causes global warming.

Question 6 (High Demand)

- (a) Most candidates gained the mark for indicating that the crude oil needed to be separated into fractions to get useful products. Only the more able candidates were able to express this in terms of crude oil being a mixture of hydrocarbons.
- (b) (i) This part was quite well answered with most candidates gaining both marks. As usual there was a lot of confusion between cracking, fractional distillation and

hydrogenation, not just in terms of reaction conditions but also in terms of what is happening chemically.

- (b) (ii) The majority of candidates understood that ethene has a double bond between its carbon atoms.
- (c) This part discriminated well; with many candidates producing well reasoned and argued answers. Poor examination technique, such as giving an argument for one method and then the reverse argument for the other method, restricted many students to three marks when, no doubt, they thought they had made four points plus a conclusion. Those who favoured the food crop method to produce ethanol usually concentrated on it being renewable and carbon neutral; while those arguing for crude oil method to produce ethanol most often argued for the speed of production and the conservation of food supplies. The most able students gave excellent answers which could have gained far more than the five marks available.

Mark Ranges and Award of Grades

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