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General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1H Unit Chemistry 1

Report on the Examination

2011 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 paper produced the usual range of answers, from candidates whose responses showed an excellent understanding to candidates who would have found the Foundation paper a more positive experience.
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 some candidates who could not organise their answers. However, candidates are becoming better at fully answering questions and therefore gaining more than one mark on the questions that are worth more than one mark.
The majority of candidates appeared to have sufficient time to complete the paper. There seemed to be a large number of candidates whose scripts were difficult to read, either due to poor handwriting or inappropriate pens, or both.
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 and understand the question before writing their response.
Candidates should read through their answers, especially those that are descriptions or explanations.
As with previous papers, this paper produced a good degree of differentiation amongst candidates with a fair spread of marks.

Question 1 *(Standard Demand)*

(a) (i) Nearly every candidate correctly identified Fat A as having the lowest melting point.

(a) (ii) The majority of candidates gained this mark. The most common mistakes were references to ‘boiling points’ or to ‘saturated fats’, rather than to ‘unsaturated fats’ and ‘melting points’ as asked for in the question.

(a) (iii) The majority of candidates correctly identified that Fat D had the smallest number of carbon carbon double bonds per gram. These candidates understood that fats with carbon carbon double bonds are unsaturated.

(b) There were some blank answer spaces here, which was disappointing. Of those who got this correct many did so for stating that Fat A ‘becomes harder’, ‘turns solid’, ‘the melting point increases’ or ‘the saturated fat increases’. Some candidates just stated that ‘the melting point changes’ or stated incorrectly that ‘the colour/taste changes’.

(c) Again the majority of candidates selected the correct response that scientists are not able to stop people eating unhealthy fat.

Question 2 *(Standard Demand)*

(a) (i) This part was reasonably well answered with a majority of candidates gaining two marks. Most candidates that gained only one mark here did so by stating that for cracking the hydrocarbon was heated. There was the usual confusion with 'hydrogenation' or 'fractional distillation'.

(a) (ii) There were some blank answer spaces here, which was disappointing. The equation was challenging. A common error was to interpret 'Cl' as two separate elements, 'C' (carbon) and 'I' (iodine), which led to the incorrect formula, C_3H_3I. It was pleasing to see the vast majority of candidates using subscripts for numbers in the formula, even those who got the incorrect answer.

(a) (iii) There were a number of blank answer spaces. Most candidates that attempted the structure of the polymer gained the mark here. Several candidates came close but spoilt an otherwise correct answer by additions outside of the brackets. The most common error was to show a double bond between the carbon atoms.

(b) (i) This question was answered correctly by most candidates. There was widespread understanding of the need to have only one independent variable. Several candidates correctly realised that it would affect the results if they changed the size of the PVC sample. Very few candidates made reference to control variables.

(b) (ii) The majority of candidates correctly used the idea of 'reliability' in their answers. There were also candidates who correctly mentioned 'anomalous results' or 'the need to calculate a mean/average'. The word 'anomalous' presented many candidates with a spelling problem. As would be expected, there was a scattering of incorrect terms such as 'precision' and 'accuracy'.

(b) (iii) Most candidates did not realise that they needed to ignore the anomalous result and they calculated, for one mark, that the mean was 21. Many candidates who managed to work out that the mean was 23 also explained how they calculated their answer.

(b) (iv) Most candidates managed to realise that the samples 'had been used before' or 'were worn out/weaker'. Several thought that the student had added more plasticiser/mass to the last sample. A few thought that test 4 must be the 'most correct' as the student had perfected their investigative skills by then.

(c) Unfortunately 'strong/sturdy/harder' or 'air/weather/heat proof were common incorrect responses. A few candidates thought that the uPVC needed to be flexible so that it could be moulded or fitted into the required shape. Most candidates did realise from the results of the experiment that the uPVC would not bend or flex very much.

Question 3 *(Standard Demand)*

(a) The first part of this question was well answered with many candidates giving full explanations about why brass is harder than pure copper. However, there was confusion about the type of particles that made up the pure copper and the alloy brass. Candidates often used 'molecules' and/or 'compounds' instead of 'atoms'.

(b) (i) There were a number of blank answer spaces. The reaction to produce metal oxides from metal carbonates produced responses in which nearly every chemical process possible was given, including 'electrolysis', 'oxidation', 'reduction', 'displacement' and 'hydrogenation'. A common misconception was the fact that some candidates thought that the metal oxides had been obtained from the oxidation of the metals.

(b) (ii) Again there were a number of blank answer spaces. Many candidates thought that this was a question about the uses of zinc and lead and went into great detail about pencils and church roofs. The most common creditworthy answers involved the lead/zinc oxide reacting with carbon and some candidates appreciated that reduction had taken place. Very few candidates linked this reaction to the difference in reactivity between zinc and carbon or between lead and carbon.

(b) (iii) Most candidates had difficulty interpreting the information provided. Very few candidates gained two marks. Weaker candidates described the process by using the diagram and adding nothing to the information given. The most common scoring point came from appreciating that zinc turned into a gas. While many candidates appreciated that the lead melted there were only a few who also included the fact that the lead did not boil/turn into a gas.

Question 4 ***(High Demand)***

(a) Most candidates scored at least one mark, usually for understanding that the additives provided colour to improve the appearance of the drink. However, candidates often incorrectly suggested that these coloured additives improved taste and shelf-life. More able candidates realised that additives with E numbers are licensed for use within the EU and that the link to hyperactivity in children is not fully proven.

(b) It was expected that the 4000 children would be divided into four equal groups – one control group taking none of the additives and each of the three additives tested separately on the three other groups. Almost all candidates knew that a control group of children would be required to compare with the children taking additives and that some type of monitoring of behaviour for hyperactivity would be required. Only a small percentage of candidates realised that the additives needed to be tested on separate groups.

(c) (i) Bias was very well understood by the vast majority of candidates.

(c) (ii) A surprising number of scripts were left blank. Candidates either tended to have good knowledge and understanding of chromatography or to have little knowledge at all. Many candidates drew clear diagrams of the expected chromatogram. A disappointing number of candidates used the orange drink as the solvent.

Question 5 ***(High Demand)***

(a) Most answers were correct, but a surprising number of scripts were left blank. Possibly, candidates did not realise that they had to do something to the structural formula of the alkane. A common error was only the addition of one single H on the right hand side. Candidates who adopted the strategy of writing down the formula C_6H_{14} for the alkane nearly always drew the correct structure.

(b) (i) There were many excellent descriptions of the link between the number of carbon atoms in an alkane molecule and its boiling point. As always, a number of candidates did not read the question carefully and wrote about melting points.

(b) (ii) Candidates gave 'flammability', 'small molecules', 'low viscosity' and 'low boiling point' as the most common correct reasons why all the alkanes in the bar chart are better fuels than triacontane. Viscosity was not always clearly understood, often it was used to mean runny. Many candidates used the word 'gloopy' as a synonym for viscous.

(c) (i) There were a reasonable number of correct answers, but a surprising number of scripts were left blank. Possibly, candidates did not realise that they had to do something to the chemical equation.

(c) (ii) This part was well answered with the most common answers referring to the carbon that is locked up in fossil fuels coming from the atmosphere or dead animals or plants.

(c) (iii) Surprisingly, most candidates failed to appreciate the increasing use of fossil fuels is causing the percentage of carbon dioxide to rise above 0.03 %. Often candidates just mentioned that carbon dioxide came from burning fossil fuels. The second marking point for locked-up carbon or for the inability of the carbon cycle to absorb all the additional carbon dioxide was the more common scoring point. Many candidates used the formula for carbon dioxide in their explanations and there were too many who wrote 'CO2'.

Question 6 *(High Demand)*

A surprising number of scripts were left blank. Good candidates produced cogent, well argued evaluations which scored a maximum of four marks, whereas weaker candidates were unable to do more than simply repeat the information given or use general or vague statements such as 'eco-friendly', 'cause pollution', 'exhaust fumes'. Specific examples were needed for candidates to gain credit.
Very few candidates provided a conclusion for one mark that added value to the rest of their answer. The vast majority were content to just summarise their previous points and then to declare themselves for or against the use of biodiesel. Good examples of conclusions that were seen made reference to the ethics of using land for cash crops rather than for food crops, to the possibilities of research into developing alternative fuel sources, and to the need for education in energy conservation.
Many candidates correctly interpreted the graph and correctly stated the consequences of particulates or acidic nitrogen oxide pollutants, although some confused carbon monoxide with carbon dioxide. However, many failed to notice that it was a percentage *change* so concluded incorrectly that no carbon dioxide was given off.
When discussing the possible disadvantages of using biodiesel, weaker candidates simply reiterated all information that was already given, such as, increased biodiesel use would lead to deforestation, or the use of crops for biodiesel that could be used for food. The stronger candidates gained marks by explaining exactly why deforestation was undesirable, and by referring to possible food shortages if vast areas of land were given over to the production of crops for biodiesel.

Mark Ranges and Award of Grades
Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

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