



General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1F Unit Chemistry 1

Report on the Examination

2011 examination – June series

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Science B / Chemistry
Foundation Tier CHY1F**General**

There were seven questions on this paper. The first five were targeted at grades G, F and E. The last two were common to Foundation and Higher Tiers. They were targeted at grades D and C.

The mark scheme was designed to allow candidates to gain marks for showing knowledge, understanding and application of chemistry. The majority of candidates appeared to have sufficient time to complete the paper and very few questions were not attempted. Most candidates followed the instruction to draw a ring around the correct answer to complete the sentence, although a few candidates selected more than one word.

Candidates often do not appear to understand the meaning of these basic terms: 'atom', 'compound', 'heat', 'temperature', 'combustion', 'decomposition', 'chromatography', 'distillation', 'evaporating', 'boiling', 'melting', 'condensing' and 'cracking'.

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. Many candidates would have gained better marks had they been able to express clearly what they appear to understand. Candidates should read through their answers, especially those that are descriptions or explanations.

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.

Question 1 (Low Demand)

- (a) Most candidates knew the names and order of the layers that make up the Earth.
- (b) (i) The majority of candidates were able to calculate that the percentage of argon in the Earth's atmosphere was 0.97%.
- (b) (ii) It was surprising that nearly half of the candidates did not identify carbon dioxide as the compound from the table of gases in the Earth's atmosphere.

Question 2 (Low Demand)

- (a) The majority of candidates knew that sulfur dioxide can cause acid rain.
- (b) Less than half of the candidates knew that carbon particles in the Earth's atmosphere cause global dimming. Many candidates may have misread 'carbon particles' as 'carbon dioxide' and incorrectly chose global warming.
- (c) It was surprising that many candidates did not know that oxygen is needed for oil or wood to burn. The most common incorrect answer was carbon dioxide.
- (d) Most candidates managed to state that 'oil is a limited resource' or that 'oil is running out'. There were the usual vague answers, for example, 'causes pollution' or 'releases harmful gases'. Suggestions about specific types of pollution from power stations burning oil were acceptable.
- (e) Most candidates found this concept difficult to explain. The release of carbon dioxide by burning wood was often omitted but a small number of candidates did appreciate the

importance of photosynthesis or the idea that 'trees take in carbon dioxide'. Common misconceptions about the term 'carbon-neutral' were that 'wood is natural', 'wood comes from trees and trees don't contain carbon', 'wood produces less/no carbon dioxide when it burns', 'wood can be replaced' or 'trees can be replanted'.

Question 3 (*Low Demand*)

- (a) Most candidates correctly ticked 'to improve the appearance of the drink' and 'because they are permitted colours' as the two reasons why a manufacturer of orange drinks uses coloured additives. The most common incorrect reason chosen was 'to make the drink healthier'.
- (b) (i) The majority of candidates knew that the test used to find out if the orange drink contained these coloured additives was called chromatography.
- (b) (ii) Most candidates used the chromatogram correctly to state that the orange drink contained three coloured additives. The most common incorrect answers were 'one' and 'six'.
- (b) (iii) Quite a few candidates managed to gain both marks for stating that E102 was the only coloured additive that matched one in the orange drink. Most candidates gained one mark for identifying that the orange drink contained E102 but did not explain why the scientist could make that conclusion. However, there were several candidates who just referred to health, for example, 'too many/3 additives would cause too much hyperactivity' or cost, for example, 'more additives make the drink more expensive'. A misinterpretation of the chromatogram was to identify E110 as the additive present in the orange drink because it had travelled furthest up the paper.

Question 4 (*Low Demand*)

- (a) Most candidates correctly identified that the formula ZnCO_3 contains one carbon atom and three oxygen atoms.
- (b) (i) Most candidates realised that zinc carbonate must be heated for it to decompose.
- (b) (ii) Most candidates understood that carbon dioxide is produced when zinc carbonate decomposes.
- (c) (i) Candidates were confused as to whether the reaction between carbon and oxygen was 'combustion' or 'decomposition'.
- (c) (ii) Less than half of the candidates understood that for carbon to react with zinc oxide then carbon is more reactive than zinc.
- (c) (iii) Most candidates had difficulty interpreting the information provided. Very few candidates gained two marks. Many gained one mark for recognising that 'lead melts' or that 'zinc has a lower boiling point than lead' or that 'zinc and lead have different boiling points'. The idea that zinc had boiled to form a gas was rarely suggested by most candidates. These candidates appear to have a poor understanding of changes of state. Some of the incorrect answers were 'lead is less reactive than zinc', 'zinc is more reactive to heat', 'zinc burns faster than

lead' or 'lead is heavier than zinc'. In their explanations many candidates confused 'boiling point' and 'melting point'.

Question 5 (Standard Demand)

- (a) (i) Most candidates gained the mark. The word 'distillation' presented many candidates with a spelling problem.
- (a) (ii) The word 'condense' was not well known, so most candidates who gained the mark here did so for mentioning that the fractions have different boiling points. Many candidates stated incorrectly that the fractions 'have different melting points', 'have different reactivities', 'burn at different temperatures', or 'heat at different rates'.
- (b) A few candidates ticked only one property. Generally this part was well answered. Almost half of the candidates correctly ticked both 'contains hydrocarbons' and 'has a high boiling point'. The majority of candidates gained at least one mark.
- (c) A slight majority of candidates were able to use the general formula C_nH_{2n+2} to identify that the correct formula of the alkane with five carbon atoms is C_5H_{12} .

Question 6 (Standard Demand)

- (a) (i) Most candidates correctly identified that Fat A had the lowest melting point.
- (a) (ii) This question was well answered with a majority of candidates realising that as the percentage of unsaturated fat increases, the melting point decreases or vice versa. 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) Most 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 lots of 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'. Many candidates just stated that 'the melting point changes' or stated incorrectly that 'the colour/taste changes', 'it changes from a solid to a liquid', 'it takes longer to melt' or 'it reduces in mass/size'.
- (c) Most candidates gained the mark for indicating that scientists are not able to stop people eating unhealthy fat.

Question 7 (Standard Demand)

- (a) (i) This part was poorly answered with very few candidates gaining two marks. There were lots of blank answer spaces here, which was disappointing. Most candidates that gained one mark did so by stating that for cracking the hydrocarbon was heated, and there were a few that then went on to correctly state that it was heated with a catalyst. There was the usual confusion with 'hydrogenation' and 'fractional distillation'. A common error by candidates was to

answer the question by describing what happens when a hydrocarbon is cracked.

- (a) (ii) There were lots of blank answer spaces here, which was disappointing. The equation was challenging. There were lots of guesses, several giving 'VC', 'PVC', 'VCI' or named elements. 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) Lots of blank answer spaces here and very few 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 poorly answered by most candidates. Several candidates correctly realised that changing the size of the PVC sample would affect the results. However, many just stated that it would 'not give accurate/precise results' or it would 'not be a fair test'. It was disappointing that so few candidates made reference to control variables.
- (b) (ii) Many candidates again just wrote about 'accurate/precise results' or 'fair test'. Many candidates did link repeating the test to reliable results and gained the mark. There were a few candidates who mentioned 'anomalous results' or 'the need to calculate a mean/average'. The word 'anomalous' presented many candidates with a spelling problem.
- (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. Many candidates just guessed and gave answers like '22.5', '19.5' or forgot to divide and gave '84'.
- (b) (iv) Many 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. Some candidates thought that the uPVC needed to be flexible so that it could be moulded or fitted into the required shape. There were quite a few candidates who did realise from the results of the experiment that the uPVC would not bend or flex very much.

Mark Ranges and Award of Grades

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