



General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1F Unit Chemistry 1

Report on the Examination

2012 examination – June series

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

There were six questions on this paper. The first four were targeted at grades G to 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 students to gain marks for showing knowledge, understanding and application of chemistry. The extended response questions caused problems for some students who could not organise their answers. However, students are becoming better at fully answering questions and so many gained more than one mark on the questions that were worth more than one mark.

The majority of students appeared to have sufficient time to complete the paper. A few students used up a lot of space by repeating the question, which really is not needed in an examination and wastes their time. There seemed to be a large number of students whose scripts were difficult to read, either due to poor handwriting or use of pens other than black, or both.

Students were far better at fitting their answers into the space available; there were far fewer additional pages. Still, a few students used additional pages to write very few words, when there was space available on the original paper. Students should be aware that any part of an answer written outside of the clip area is not scanned, so that piece of writing cannot be seen by the examiner.

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 students read and analyse the information provided, then read and understand the question before writing their response.

Students should then read through their answers, especially those that are descriptions or explanations. Many students use 'it' or 'they' without any clear indication of what is being referred to.

This paper produced good differentiation between students with a good spread of marks.

Question 1 (Low Demand)

- (a) The majority of students achieved full marks for identifying the two environmental impacts of quarrying iron ore.
- (b) (i) Very few students achieved the mark because they did not know that pure iron is too soft to have many uses. Many gave answers related to pure – 'it only contains iron atoms' or gave incorrect physical properties such as, 'it is a good conductor of heat/electricity' and 'it has a high melting/boiling point'.
- (b) (ii) Many students correctly suggested that stainless steel is more expensive than pure iron because other metals, chromium and nickel, are used in stainless steel.
- (c) (i) Most students gained the mark for knowing that pure iron is an element.
- (c) (ii) A large majority of students understood that high carbon steel must be hard to be used as a drill bit.
- (c) (iii) Most students knew that stainless steel is used to make cutlery because it is resistant to corrosion.

Question 2 (Low Demand)

- (a) A majority of students gained credit for understanding that in the formula of calcium carbonate there is one carbon atom and there are three oxygen atoms.
- (b) (i) Students should use a ruler to draw lines between boxes. Several students incorrectly thought that the main chemicals in air were nitrogen and carbon dioxide instead of nitrogen and oxygen. Few students gained all three marks.
- (b) (ii) Surprisingly, very few of the students could explain that a mixture of methane and air burns releasing energy to heat the lime kiln. There were many incorrect ideas, such as, 'act as a catalyst', 'blow out the waste gases' and 'react with the limestone to produce quicklime'.
- (c) The majority of students knew that limestone is used as a building material and to make cement.

Question 3 (Low Demand)

- (a) Students should use a ruler to draw straight lines. Far too many students lost the mark because their lines were drawn free-hand and touched 76% or were above 80%. However, a few students did manage to get the mark. The most common mistake was to draw a line at 20%. Several students did not attempt this question.
- (b) (i) The most common mark awarded was for 'there are no trees on Mars'. There were many incorrect ideas, such as, 'Mars has too much carbon dioxide so not enough space for oxygen', 'no humans to use oxygen' and 'Mars has no gravity so there is no atmosphere'.
- (b) (ii) There were very few correct responses indicating that argon is unreactive or that argon is a noble gas. Many stated that argon stays the same because it has no uses.
- (c) Few students stated that the percentage of carbon dioxide had decreased because of 'photosynthesis by plants' or 'absorption by oceans' or 'locked up in fossil fuels' or 'locked up in carbonate rocks'. Many students appeared to have failed to notice the word **not** in the question and answered as if carbon dioxide was increasing. The more common incorrect answers were 'because we burn more fuels' and 'there are more humans breathing out carbon dioxide'.
- (d) The majority of students knew that theories suggest that the Earth's early atmosphere was made by the eruption of volcanoes.

Question 4 (Low Demand)

- (a) (i) Many students realised that the compounds of hydrogen and carbon in crude oil are called hydrocarbons. Several students did not attempt this question.
- (a) (ii) The majority of students gained the mark for knowing that crude oil is separated into fractions, such as naphtha, using fractional distillation.
- (b) (i) The majority of students knew that the process to turn liquid naphtha into a gas is called vaporising.

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- (b) (ii) A majority of students knew that the process of passing naphtha gas over a hot catalyst to produce alkenes is called cracking.
- (c) Most students gained credit for correctly identifying that B was the displayed structure of an alkene.
- (d) (i) The majority of students gained the mark for knowing that recycling used plastic bags is good for the environment because new plastic products are made from the used plastic bags.
- (d) (ii) Less than half of the students understood that burying used plastic bags in landfill sites is not good for the environment because poly(ethene) is not biodegradable. Vague incorrect answers included 'causes pollution' or 'gives off gas'.
- (d) (iii) Many students did not follow the instructions and ticked more than one box on each side. Several students appeared to have failed to notice the word 'burning' in the question. Most of these students answered as if the word was 'recycling' and incorrectly ticked 'new plastic bags can be produced' as the advantage, and so only a few students gained maximum marks.

Question 5 (*Standard Demand*)

- (a) (i) Most students found it difficult to draw a curve of best fit. Many drew a straight line or joined the points dot-to-dot. Using a black pen to answer all questions created problems for those students who tried to improve their line.
- (a) (ii) The concept of viscosity challenged most of the students. A few students recognised that the viscosity of petroleum diesel was unaffected by temperature. Many students incorrectly concluded that the viscosity of biodiesel increased as temperature increased. Most students gained one mark by relating their answer to time or rate of flow of one of the diesels. A large number of students' answers only referred to 'diesel', so it was difficult to decide whether these students were referring to biodiesel or to petroleum diesel.
- (a) (iii) Very few students were able to translate the viscosity of the biodiesel into the way it would flow in a practical situation. At lower temperatures the biodiesel would flow slowly into the fuel tank or into the engine and may even solidify or block pipes. Some students correctly suggested that the fuel would be difficult to ignite.
- (b) (i) Very few students correctly identified global dimming. There was the usual range of incorrect answers including, global warming, acid rain and damage to the ozone layer.
- (b) (ii) This question was poorly answered. The main incorrect answers were 58% or 44%.
- (b) (iii) Many students recognised that using biodiesel would increase the amount of nitrogen oxide formed. Most of these students did not link this to (an increase in) acid rain. Many answers just stated 'increase pollution'. Again there were a large number of incorrect answers including global warming, global dimming and damage to the ozone layer.
- (b) (iv) This question was poorly answered. The stem informed students that a carbon neutral fuel does not add extra carbon dioxide to the atmosphere. So it was surprising how many students think that a 'carbon neutral fuel' would release no carbon dioxide

into the atmosphere. Most students did not appreciate that the carbon dioxide released by biodiesel had been absorbed by the plants that were grown to produce biodiesel. Some responses suggested that carbon dioxide was released when the plants were burnt rather than when the biodiesel was burnt. Other students believe that carbon neutral means zero carbon emissions and do not make the link to photosynthesis by plants.

Question 6 (Standard Demand)

- (a) Surprisingly, only about half of the students gave the correct reason that colourings are added to improve the appearance of the sweets. Many students thought that the colouring was added to improve the taste of the sweets or to provide an energy boost or even to preserve the sweets. Several students also thought that it was a good idea to add colourings because it would make children hyperactive.
- (b) About half of the students correctly identified X.
- (c) There were very few answers that earned all three marks. Most students had difficulty interpreting the chromatogram. Many students incorrectly thought that W, X, Y and Z were also sweets. A comparison of the number of colourings and the types of colourings in each sweet was required. The most common marks awarded were for 'the sweets may cause hyperactivity', 'both sweets contain W and Y' and 'sweet S contains more colourings than sweet P'. Very few students mentioned the actual number of colourings in each sweet or mentioned that both sweets did not contain X and Z.

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

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