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General Certificate of Secondary Education

Science A 4405 / Chemistry 4402

CH1FP Unit Chemistry 1

Report on the Examination

2012 examination – June series

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Science A / Chemistry
Foundation Tier CH1FP

General

This was the second paper for the new specification. The paper was out of sixty marks and the students had one hour in which to complete it. There were eight questions on this paper. Questions seven and eight were common to Foundation and Higher Tiers. They were targeted at grades D and C. The first six questions were targeted at grades G to E.

This paper was more difficult for students than previous papers on core chemistry. This reflects the requirements of the new GCSE subject criteria and the new specification. Half of the marks on the paper are for application of skills, knowledge and understanding in practical and other contexts and for analysing and evaluating evidence, making reasoned judgements and drawing conclusions. Students should be prepared to expect that they will be given unfamiliar contexts and information that assess these objectives. Familiar contexts are those mentioned in the specification and assess recall, selection and communication of students' knowledge and understanding.

Most students followed the instruction to draw a ring around the correct answer to complete the sentence, although a few students did select more than one word.
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.

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 as it does not gain them any credit. There were a large number of students whose scripts were difficult to read, either due to poor handwriting or the use of pens other than black, or both. 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 familiar and in unfamiliar 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.

Question 1 *(Low Demand)*

(a) (i) The majority of students achieved the mark for knowing that the nucleus is at the centre of an atom.

(a) (ii) The majority of students achieved the mark for knowing that the centre of an atom contains neutrons and protons.

(b) About half the students managed to gain the mark here. The most common incorrect answer was to state that there is no overall electrical charge on an atom because the number of protons is equal to the number of neutrons.

(c) More students than expected did not attempt this question; however of those that answered the question most got the element, nitrogen, correct. A common error was to confuse mass number and atomic number so a common incorrect answer was lithium.

(d) Surprisingly, very few of the students related the number of electrons on the outer energy level to the group of the periodic table. Many of the students who correctly identified B and C simply repeated the stem of the question stating that they were in the same group, so only gained one mark. The answer B and D was the most common incorrect option; the explanation was that they both had 'two rings' or they are 'the same size'.

Question 2 ***(Low Demand)***

(a) The majority of students achieved full marks for knowing that the core is at the centre of the Earth, the next layer is the mantle and the outside layer is the crust.

(b) Very few students obtained both marks on this question. Most common correct answers stated that carbon dioxide dissolves in or is absorbed by water or that plants use carbon dioxide for photosynthesis. Many students answers were not credited because they used terms such as 'water takes in' rather than 'water dissolves' or that plants 'breathe' or 'suck' in carbon dioxide. Students often incorrectly referred to carbon dioxide being 'trapped' in sedimentary rocks, rather than being 'locked up' in sedimentary rocks.

Question 3 ***(Low Demand)***

(a) Most students achieved full marks for identifying the two reasons why aluminium is better than steel for car bodies.

(b) (i) In describing an alloy, students must use the word mixture. An alloy is not formed when metals are simply 'put together'. Most students did not gain the mark because they answered in terms of possible physical or chemical properties of alloys, such as 'harder', 'lighter', 'stronger' or 'does not rust'.

(b) (ii) Few students managed to gain the mark by stating that pure metals are too soft or weak to be used for car bodies. However, many incorrectly stated that a pure metal 'is too heavy', 'will corrode' or 'is too expensive' to use.

(c) (i) The vast majority of students achieved the mark for knowing that petrol is made from crude oil.

(c) (ii) The majority of students achieved the mark for knowing that petrol is a mixture of hydrocarbons.

(c) (iii) The majority of students achieved the mark for knowing that in the car engine petrol reacts with oxygen to produce carbon dioxide and water.

(d) (i) This part was poorly answered. Very few students could work out that the car with the aluminium alloy body was burning hydrogen as a fuel. The most common incorrect answers were diesel, petrol or bio-fuel.

(d) (ii) About half of the students managed to gain the mark here. Very few students made the simple correct statement that only water is produced. Most of the correct answers stated that there was no carbon dioxide produced.

Question 4 *(Low Demand)*

(a) (i) Several students managed to gain the mark for stating that it was reacting, some even stated that carbon dioxide was produced. The most common incorrect response was 'increase' or 'rise' because this related to the trend in the graph.

(a) (ii) Most students who managed to gain a mark here did so for stating 'stayed the same', 'the reaction had stopped' or 'neutralised'. Very few students could explain why they thought it was staying the same. The tablets have done their job or the stomach ache was gone were popular incorrect explanations.

(a) (iii) Many students did not attempt this question. The few students who knew the correct test scored both marks here. There were very few students who only gained one mark for use of limewater as the test. There was a range of other gas tests given of which the most common was the 'pop test'.

(b) Most students achieved full marks for correctly identifying an advantage and a disadvantage of quarrying limestone. Several students did not follow the instructions to tick one advantage and to tick one disadvantage; many ticked several in each column and did not gain any credit.

Question 5 *(Low Demand)*

(a) (i) This part was poorly answered. Most students did not understand that olive oil and vinegar separates because olive oil does not dissolve in vinegar.

(a) (ii) A minority of students knew that the olive oil, vinegar and mustard do not separate because an emulsion forms or that mustard is an emulsifier.

(b) (i) The majority of students achieved the mark for knowing that unsaturated compounds contain double carbon-carbon bonds.

(b) (ii) This part was poorly answered. Most students did not understand that only one line was to be drawn between the correct test to detect unsaturated compounds and the correct result. Many students drew a line from each 'test' to a 'result of test'.

(c) (i) It was surprising how many students think that a 'carbon neutral fuel' would release no carbon dioxide into the atmosphere. The vast majority of students did not appreciate that the carbon dioxide released by burning olive oil had been absorbed by the plants that were grown to produce olive oil.

(c) (ii) Most, and there were only a few, of the correct answers were linked to olive oil being a food or there was not enough olive oil available to be used as a biodiesel fuel.

Question 6 *(Standard Demand)*

(a) A majority of students gained one mark, usually for knowing that O was the chemical symbol for oxygen. Most students could not use the formula of ethanol to work out that there are six atoms of hydrogen in its formula. The most common incorrect number was five.

(b) (i) Most students achieved full marks for identifying the two conditions needed to crack a hydrocarbon.

(b) (ii) There were many correct completions of the displayed structure of ethene. The most common errors were to draw a single bond between the carbon atoms, to add extra bonds from the carbons to the hydrogens or to add extra elements to the structure.

(b) (iii) This was not well known. Many students incorrectly stated that oxygen, hydrogen or hydroxide were added. Only very few managed to get water as the substance added to ethene to produce ethanol.

(c) (i) Many students did not appear to recognise the process as fermentation and did not know that the gas produced is carbon dioxide.

(c) (ii) Many students did not attempt this question. Only a few students were able to obtain one of the two marks by stating filtering. A surprising number of students thought that water could be removed by filtering. Most students that attempted this question just gave a description of the experiment to make alcohol. Often students described evaporation rather than distillation to separate the two liquids. Many students thought that the water would evaporate first, leaving the pure ethanol behind.

Question 7 *(Standard Demand)*

(a) Very few students gained the mark here. Those that did stated that the extraction took several stages or the extraction used more energy. A significant number of students were confused and thought that titanium was expensive because the metal could only be extracted by electrolysis, rather than reduction using carbon. A large number of incorrect answers related cost to availability of the ore and to reactivity of the ore.

(b) The majority of students realised that carbon dioxide was the only waste product on the flow chart. A few students did not gain the mark due to an incorrect representation of the formula of carbon dioxide.

(c) Many students did not attempt this question. There were a few students, who identified magnesium chloride as the example of recycling, but descriptions were poor and so the student did not gain any credit. The answer required was that the magnesium chloride was electrolysed into magnesium and chlorine, which were then reused in the process.

(d) Many students did not attempt this question, which was poorly answered. It was not well known that argon is unreactive. In fact students often stated that argon is more reactive than air. Many students incorrectly thought that argon cooled the reaction, kept the reaction under control or speeded the reaction up.

(e) Many students did not attempt this question and only a few students managed to calculate the correct answer of 240 kg.

(f) Many students did not attempt this question, which was poorly answered. Determination of the mass of waste rock proved very difficult, despite the fact that it was just the difference between the two lines.

Question 8 *(Standard Demand)*

(a) (i) Most students do not fully understand the process of the fractional distillation of crude oil. Most students did attempt this question but only a few students managed to gain both marks.

(a) (ii) Most students only gained one mark here for stating carbon dioxide, carbon or carbon monoxide. Often the mark given for the product water was not awarded because most students stated hydrogen instead of water.

(b) This is the QWC question and as such it was marked holistically. Many students gained no credit because they did not add to the information given in the stem of the question. Students found difficulty not only in expressing themselves clearly and organising the information but also in using scientific terms correctly. Most were poor quality level 1 answers. Usually there was no expansion of the points made by the students which meant that the vast majority did not reach level 2. The most common answers were reusing and recycling of the plastic bags but there was no detail of what the bags could be reused for or recycled into. It was not clear from the answers whether many knew the difference between reuse and recycle. Many students focused on employment of people to make plastic bags and profit for the shops. Only rarely did students give examples of specified problems caused by litter. Vague expressions such as 'cause pollution' and 'environmental damage', should be avoided.

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA website

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