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General Certificate of Secondary Education

Additional Science 4463 / Chemistry 4421

CHY1H Unit Chemistry 1

Report on the Examination

2009 Examination – January Series

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Additional Science / Chemistry Higher Tier CHY1H

General

There were six questions on the 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 and A*.

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. There were a noticeable number of questions that were left un-attempted.

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, and then read the question before writing their response.

Question 1 *(Standard Demand)*

It was surprising in part (a)(i) how many candidates did not know the name of the polymer made from ethene.

In part (a)(ii) the idea of 'carbon cost' was understood by nearly all candidates. There were many good answers in terms of the use of fossil fuels to provide the heat energy for cracking. However, many candidates focused on the products, rather than the process, of cracking. Others answered in terms of transport of the reactants or the products. A surprising number of candidates thought that carbon dioxide was used in the process, or that the ethene and pentane were themselves burnt in the process.

There were many candidates in part (b) who found it difficult to understand and then apply the information given in the flow diagram. The mark scheme was broad in scope to reward the varied suggestions that the candidates gave. There were a lot of excellent ideas, either developing one aspect of the problem in depth or looking at covering the breadth of the issues involved. A few candidates suggested inappropriate solutions, such as, 'sending all the used plastic bottles to Asia', 'drinking less water' and 'putting all the used plastic bottles into landfill'. Very few responses suggested reusing the empty plastic bottles or drinking tap water instead of bottled water.

Question 2 *(Standard Demand)*

The majority of candidates in part (a)(i) understood that as the number of carbon atoms increased the boiling point of the hydrocarbon increased.

In part (a)(ii) most candidates could use the information they were given to suggest the lowest temperature needed to vaporise all the hydrocarbons shown in the table.

In part (a)(iii) most candidates did not appreciate that the temperature of boiling and of condensing are the same for dodecane.

Most candidates understood the concept of supply and demand in part (b)(i). A few candidates suggested that crude oil is running out and that is why there is not enough petrol.

There were many correct suggestions in part (b)(ii), such as the oil company should use cracking to convert some of the excess diesel into petrol. Others suggested correctly that the prices of the two fractions should be adjusted to balance the supply and demand for the two fuels.

Question 3 *(Standard Demand)*

In part (a) most candidates worked out the correct percentages of chromium and nickel in this stainless steel.

In part (b)(i) a slight majority of candidates could state what is meant by an element.

Most candidates in part (b)(ii) could explain why pure iron would not be suitable for a hip replacement joint. Some candidates were let down by their examination technique; for example, giving 'soft' as a reason for not using pure iron for hip replacements, when they were told exactly that in the stem.

In part (b)(iii) most candidates could explain how the comparative properties of pure metals and their alloys depended on the layers of atoms.

Question 4 *(Standard Demand)*

Most candidates in part (a) scored at least one mark on this question. Candidates were provided with information on the Richter scale chart that they could use to suggest why most earthquakes in the UK are not reported. Those candidates that used numbers from the Richter scale frequently stated that these earthquakes were about 5 instead of 3 or below.

A very common misconception in part (b) seems to be that the plates are moving and earthquakes happen when they collide with each other, a little like 'bumper cars'. The explanation required was that tectonic plates are moving as a result of slow convection currents in the mantle, caused by the release of heat energy from radioactive decay deep inside the Earth. Credit was also given for the idea that plates which have 'stuck together' can break apart suddenly or with a jerk, causing shockwaves to spread through the Earth.

In part (c) many candidates wrote about the 'random' nature of earthquakes, but this is not an explanation. Some candidates' explanations were based on the assumption that scientists do not want to make predictions which are wrong and could cause unnecessary panic. Few candidates scored well on this question. The expected explanation was the idea that it is very difficult to know what is happening under the Earth's crust. Earthquakes cannot be predicted because it is not possible to tell exactly where the pressure between tectonic plates is building up nor can this pressure be measured, let alone knowing when it will be enough to cause the tectonic plates to 'break apart'.

Question 5 *(High Demand)*

In part (a)(i) many candidates had problems with this, because they thought that both the carbon dioxide and nitrogen were left over from the air or that nitrogen is produced in the burning of methane. Some candidates did not realise that the methane was there because it was the fuel for the thermal decomposition of calcium carbonate.

Most candidates in part (a)(ii) correctly completed the symbol equation.

There were many varied and acceptable suggested reasons in part (b) for the company to use a new fuel. Most were based on economy, efficiency or lack of emissions.

In part (c)(i) many candidates realised that the sensors needed to be downwind and nearer the area where the local residents lived.

A majority of candidates in part (c)(ii) stated correctly that a low average concentration of particles was the evidence used by scientists to conclude that there was no risk to health.

In part (c)(iii) there was a lot of confusion between concentration in ppm and particle size in mm. Too many candidates went back to the positioning of the sensors, ignoring the fact that the concentration of particles was an average and there could be undetected, smaller hazardous particles.

Question 6 (*High Demand)*

Most candidates in part (a)(i) found it difficult to express themselves in this part of the question. Many seemed to think that because Sudan 1 is a dye it is not an additive, rather than that the missing E number simply meant that it was not approved for use in Europe.

In part (a)(ii) many candidates found it difficult to interpret simple chromatograms. The commonest misconceptions were that the unidentified colour in the red chilli powder must be Sudan 1, or that one of the safe colourings was Sudan 1.

The majority of candidates in part (b)(i) gave correctly the range of percentage unsaturation for the oils as 23 to 59 or 36.

Surprisingly, in part (b)(ii) the use of bromine as the test for unsaturation was not so well known, with very few candidates scoring both marks.

In part (b)(iii) the majority of candidates did not understand that 11.2 is an obvious anomalous volume and suggested that an average of all three results had been taken; some even decided that the answer was wrong.

Many candidates in part (b)(iv) made no attempt at this part, and most of those who did could not calculate the percentage unsaturation. However, there were some very good answers reflecting a synthesis of mathematical and scientific ideas.

Mark ranges and award of grades

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