



## **General Certificate of Education**

### **Applied Science**

**8771/8773/8776/8777/8779**

**SC11      Controlling Chemical Processes**

## **Report on the Examination**

*2010 examination - January series*

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## General Comments

Many candidates demonstrated a good level of understanding of the concepts, were able to apply those concepts, had also clearly revised well for the examination and were precise in their terminology and explanations.

There were instances where candidates performed well in certain topic areas, but poorly in others. In many cases, the basic principles had been learnt, but the application of those principles proved to be more demanding.

Definitions and explanations of the meanings of scientific terms were handled well by a significant number of candidates but a proportion could not recall these correctly. Calculations were often performed well and with appropriate precision.

## Question 1

- (a) A surprisingly small number of candidates were able to recall this definition.
- (b)(i) Many candidates simply stated that this was a constant which was not enough to gain the mark.
- (ii) Some candidates managed to calculate the initial rate of reaction correctly but only a few also calculated the initial concentration of sodium hydroxide.
- (iii) A significant number were unaware of what was required to determine the overall order of the reaction.
- (c)(i) Many were able to ascertain that the order was zero but were unable to explain why.
- (ii) This was very poorly answered with only a few correct answers seen. Candidates must be aware of the relationship between the order with respect to each substance and the rate equation. Many candidates gave an expression that resembled an expression for the equilibrium constant.
- (d)(i) Most candidates clearly knew what arithmetic was required but some failed to score full marks because incorrect bond energies were used. A large number subtracted the wrong way (i.e. bonds made – bonds broken) and some even added the two numbers together.
- (ii) Many incorrectly discussed heat loss or incomplete combustion.

## Question 2

- (a)(i) Many correct answers were seen. A significant number of candidates did not draw their distribution curve carefully and so failed to gain marks.
- (ii) Answered well although some candidates omitted the 'minimum'
- (iii) This was not well answered. There were many different areas of the curve shaded by candidates.
- (b)(i) Very few candidates realised there was no effect. Some made a correct statement such as 'there will be less particles that possess the activation energy' but failed to answer the question.

- (ii) Many answered this well but a significant proportion were unable to discuss this correctly.
- (c)(i) Well answered but some incorrectly put units of grams on these.
- (ii) Most candidates got part way through this calculation. A large number failed to calculate 24% of their answer for the final mark. Units were frequently incorrect.
- (d) A significant proportion of candidates did not suggest a quantitative analytical technique.

### Question 3

- (a)(i) Many candidates failed to identify that if enthalpy was being determined a thermometer would be required. Only some stated their apparatus in their design.
- (ii) Some candidates gave extremely good answers here. Unfortunately, the majority of candidates described a titration.
- (b) Generally well answered.
- (c) Many knew the correct equation. However some only stated the right hand side and completely omitted the energy and consequently scored no mark. There are still many candidates who do not identify the 'm' in the equation and so did not score the second mark.
- (d) Most candidates sketched the general shape correctly but many did not label reactants and products. Some did, but the wrong way round whilst others thought it was an endothermic reaction.

### Question 4

- (a)(i) Generally answered well but some candidates were unable to define this appropriately.
- (ii) Answered well although some stated 'costs less' which is insufficient without stating what cost i.e. energy, labour.
- (iii) Some candidates made a statement but failed to identify an advantage as the question required.
- (b)(i) Not well answered. Most candidates simply talked about a reactant.
- (ii) Whilst full marks were often seen here, some candidates were unable to identify one of the types of costs correctly.
- (c) Many candidates were unable to correctly balance the equation.
- (d) A proportion of candidates answered this very well. Many, however, were unable to correctly determine oxidation numbers/states.

### Question 5

- (a) A large number of candidates did not substitute the correct enthalpy for each substance. Many candidates who did manage the correct substitution incorrectly subtracted products from reactants.
- (b) Many candidates failed to state that the condition required was a closed system and simply discussed the consequences of equilibrium.
- (c) Generally answered well.
- (d) Many were able to state Le Chatelier's principle although several omitted to talk about the system being in equilibrium. A large number of candidates were unable to apply the principle to the pressure question. Many identified the wrong side as having the fewest moles.
- (e)(i) Many correct answers, but still a significant number upside down or with the wrong indices.
- (ii) Most were able to substitute correctly but a significant number failed to divide by the volume of the vessel to calculate concentrations.
- (iii) Very few candidates calculated this correctly.
- (f) A large number of candidates answered this correctly although there was a significant proportion who failed to state that it was **all** substances.

## **Mark Ranges and Award of Grades**

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