Version 1.0: 0810

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applied Science 8771/8773/8776/8777/8779

SC11 Controlling Chemical Processes

Report on the Examination

2010 examination - June series

Further copies of this Report are available to download from the AQA Website: www.aqa.org.uk

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6E

General Comments

It was clear that a number of candidates were well prepared. However, a significant number were unable to deal with areas of the specification such as equilibria and rates of reaction. The Maxwell-Boltzmann curve seemed to trouble more candidates than previously as did the calculation of reacting quantities. The terms reactant and product were all too often transposed by candidates. Unfortunately, most candidates were unable to rearrange mathematical expressions appropriately.

Question 1

(a) Generally well answered.

(b)(i) A large number wrongly discussed heat loss or the fact energy transfers cannot be 100% efficient. Incomplete combustion was another frequent incorrect answer.

(b)(ii) A significant number of candidates were unable to calculate the required relative formula masses.

(b)(iii) Some candidates calculated the answer correctly for 100% yield but were unable to then scale up their answer appropriately for the final mark.

(c) Many candidates appreciated that surface area needed to be discussed. However, a significant proportion stated that smaller pellets will have a smaller surface area and so could not be awarded the mark.

(d) Generally well answered although candidates are clearly able to identify direct and capital costs more easily than indirect costs.

(e) Most candidates were unable to correctly calculate the oxidation numbers. When the oxidation numbers were calculated correctly the type of reaction was usually correctly identified as oxidation.

Question 2

(a) A significant number of excellent detailed answers. Many candidates discussed 'heat' rather than 'heat energy'. A number incorrectly mentioned heat energy <u>required</u> rather than <u>released</u>.

(b)(i) Well answered. Most candidates were able to list appropriate apparatus even if unable to answer subsequent parts of part (b).

(b)(ii) Some excellent thorough answers were seen. Many candidates referred to the weight of the ethanol rather than the mass. Many failed to identify both of the mathematical expressions required when calculating enthalpy per mole. A significant number gave the expression $Q=mc\Delta T$ but failed to specify that m was the mass of **water**.

(b)(iii) Most candidates made suggestions that improved reliability or precision and so scored no marks here.

(c)(i) Many correct answers seen. Most errors occurred in totalling bond energies. Some candidates subtracted the totals the wrong way around. Some divided them.

(c)(ii) In a good number of answers candidates stated there would be a difference but did not specify higher or lower. Many discussed bond energies being mean values rather than referring to heat loss.

Question 3

(a)(i) Many good answers seen. Unfortunately, some candidates failed to refer to rate.

(a)(ii) Well answered

(b)(i) Generally well answered but a significant number multiplied by 2 instead of squaring the terms.

(b)(ii) Many incorrectly substituted the numbers into their expression from (b)(i). Only a small number demonstrated an ability to rearrange equations. Some omitted to take the square root to give their final.

(c)(i) Many good answers seen. Some candidates failed to identify that Le Chatelier's principle involves an equilibrium. Some confused the terms exothermic and endothermic and others did not include details such as the temperature will be decreased by a shift to the left. Others considered pressure and number of gaseous moles to be the only factors affecting the position of an equilibrium. Unfortunately some candidates discussed other unrelated factors and were awarded zero marks.

(c)(ii) Several good answers seen but many discussed other factors such as the exothermic nature of the reaction.

(d)(i) Generally well answered although several candidates only gave one of the two required answers.

(d)(ii) Well answered but a number of Maxwell Boltzmann curves were seen.

(d)(iii) Several candidates drew the 'no catalyst' curve lower than the original.

Question 4

(a) Many excellent answers seen. Unfortunately some candidates were unable to explain their choice of order appropriately. A significant proportion was unable to determine the correct order.

(b) The rate constant was frequently omitted and some answers resembled an equilibrium constant expression.

(c) Mostly correctly answered.

(d) Although most candidates attempted to calculate the units only a few correct answers seen.

Question 5

(a)(i) Many good answers. There were a significant number of candidates who were unable to label either axis correctly. An even larger number were unable to mark the activation energy on the x-axis.

(a)(ii) Some candidates did not even attempt this part. There was a large variation in the answers seen. Only a few drew a curve which satisfied all three of the marking criteria.

(b) This was generally well answered even when part (a) had not been. Some candidates lost marks because they did not mention collisions.

(c) Most candidates answered correctly although some talked about more particles but failed to mention collisions.

(d)(i) Very well answered. A few candidates confused the terms reactants and products. Some correctly discussed advantages of batch processes but did not define one.

(d)(ii) Again, very well answered. A few candidates did not discuss products being removed **as** more reactants added.

(d)(iii) Generally well answered. Some candidates simply stated the same point twice and so only scored one mark out of two.

Mark Ranges and Award of Grades

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