Version 1.0: 0208

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applied Science 8771/8773/8776/8779

SC11 Controlling Chemical Processes

Report on the Examination

2008 examination - January series

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

Copyright © 2008 AQA and its licensors. All rights reserved.

COPYRIGHT
AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

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 6EX
Dr Michael Cresswell Director General

General Comments

In general, most candidates seemed well prepared for the examination in terms of coverage of the specification.

Some excellent, high scoring scripts were in evidence, demonstrating excellent knowledge and understanding and also the ability to apply knowledge to the contexts used in the questions. However, it was apparent that a significant number of candidates, whilst perhaps having appropriate levels of knowledge, were unable to express their answers in sufficiently precise and/or unambiguous scientific terminology. This group of candidates also tended not to address all the specific demands of the question and were prone to including contradictory statements in their answers.

Questions involving recall and application of le Chatelier's principle proved to be demanding as did those concerned with oxidation states, the interpretation of rate data and rate equations, balancing electrolysis half equations.

Question 1

(a) Whilst most candidates seemed to know what a batch process was, they were sometimes non-specific, and frequently failed to score the second mark available for indicating that the process can be repeated with fresh batches of reactants.

(b) The idea that carbon dioxide does not, itself, undergo combustion or is stable was missed by most candidates. Some answers in terms of inability to undergo further oxidation were also seen.

The majority of candidates approached part (ii) via a simple energy cycle, although many missed the factor of two involved in the combustion of ethanol and/or inverted the signs.

(c) Some candidates gave the definition of a batch process to explain what a continuous process is and therefore scored no marks.

Many knew an advantage over a batch process. Answers in terms of scale or amount of product or cost were seldom qualified appropriately and applied to the case in point.

In (iii), there were good answers from many candidates. Some candidates found it difficult to identify the number and type of all the correct bond enthalpies involved in bond breaking and/or bond making. Another relatively common error was to invert the signs of the two bond enthalpy sums.

(d) Surprisingly few candidates recognised either that the fermentation route relied on a renewable source or answered in terms of the relative energy demands of the two processes. Many stated that fermentation did not produce carbon dioxide despite it being shown as a product in the equation provided.

(e) As might be expected, there were many correct answers evident. A significant number of candidates failed to label the diagram. Many candidates, who did provide labels, confused reactants with products.

Question 2

(a) Use of a gas syringe was the most common response despite the fact there was no gaseous product.

(b) This was answered well by most candidates, although a significant number claimed that catalysts are not involved/used in the reaction.

(c) Few completely correct rate equations were seen. A number of candidates confused the rate constant, *k*, with an equilibrium constant, K_c. Those with correct rate equations found part (ii) straightforward, but many found it difficult to predict the effect on the rate of tripling one concentration.

(d) There were some good answers evident, with concise, accurate explanations. However, a significant number of candidates found it difficult to interpret the quantitative data. Others, with correct answers to the orders, failed to gain further marks with poor or incorrect explanations.

(e) This was well answered by the majority of candidates.

(f) Many candidates failed to label the axes correctly and also went on to draw very imprecise curves with little recognition of the shape, start point or asymptotic nature of the curve at high energies.

(g) Although well answered in the main, the omission of “minimum” energy was fairly widespread.

(h) There were many good answers evident, although a significant number failed to achieve full credit. Many incorrect statements such as ‘the increase in temperature lowers the activation energy’ were seen.

Question 3

(a) Many candidates found balancing difficult and failed to score any marks.

(b) The flammability of hydrogen, toxicity of chlorine and the need to take appropriate precautions when handling chlorine were not well known.

(c) The vast majority of candidates correctly calculated molecular masses, although many were unable to apply them to the reacting masses calculation.

(d) Only a few candidates were able to perform these calculations.

(e) Many candidates scored well.

(f) Only the best candidates were able to correctly calculate oxidation numbers.

(g) Again, only a very few candidates scored full marks here.

Question 4

(a) Candidates tended to provide a long list of apparatus, but often omitted vital pieces such as the means to measure accurately the volume of water, and/or included inappropriate pieces such as a gauze and a spirit burner. Many used "scales" instead of a balance and a beaker in place of a copper calorimeter.

(b) Here, a logical approach to the required measurements was frequently absent, and few scored full marks.

(c) Many answers were not sufficiently specific.

(d) Many candidates could recall the required mathematical relationship for the heat evolved in the reaction, although a significant minority confused heat evolved with ΔH. Even more common was the suggestion that "m" was the mass of butane, and, ultimately, few scored full marks on this section.

Question 5

(a) This was generally well answered.

(b) A disappointing number of candidates could not correctly recall this definition.

(c) In (i) a significant minority confused exo and endothermic, whilst others merely stated heat change, thereby losing credit.

In (ii) candidates demonstrated a better recall of this standard definition. However many did not mention that it related to a system at equilibrium.

Part (iii) proved challenging for many although a large number could identify the difference in the number of gaseous moles.

Part (iv) proved to be straightforward for a large number of candidates, although few could then calculate units correctly in (v).

Mark Ranges and Award of Grades

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