Version 1.0: 0209

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Applied Science 8771/8773/8776/8779

SC11 Controlling Chemical Processes

Report on the Examination

2009 examination - January 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 6EX
Dr Michael Cresswell Director General

General Comments

Some very good scripts were in evidence where candidates demonstrated a good level of understanding of the concepts. Many were able to apply those concepts and 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. They might, for instance, have a good grasp of equilibrium but less of an understanding of kinetics. 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 many candidates, although a significant proportion included contradictory statements. Calculations were often performed well and with appropriate precision. Only in a relatively few cases were examples of inappropriate rounding up noticed.

Question 1

(a) Most candidates coped well with this, although not all established that both forward and reverse reactions continue at equilibrium. Same "state" was a relatively frequent replacement for same "rate". Others seemed to think that concentrations at equilibrium were "equal".

(b)(i) The majority of candidates scored well although some candidates added the terms.

(ii) Very few candidates calculated concentration before substituting in the expression, although this was not a pre-requisite for full marks here and many scored 3/3. It was disappointing to see the number who got the Kc expression correct in (b)(i) but then went on to add terms in (b)(ii).

(c)(i) Although a number of candidates clearly understood the need for a closed system, this was not answered well by the majority.

(ii) Again, a number knew this idea, but the majority failed to grasp the idea that the equilibrium has to be quenched before analysis.

(iii) Many candidates described an experiment that was **NOT** a titration even though this was given in the question. Many were unable to produce a logical sequence of stages for the titration although many scored some marks for using correct apparatus and knowing that titrations are repeated so that they are concordant. In the good answers that were seen, candidates knew that alkali/NaOH of known concentration should be in the burette. Only a few used phenolphthalein (with the correct colour change).

(iv) Many candidates gave an imprecise answer and therefore failed to score.

(v) Many realised that the catalytic action of the hydrochloric acid was the key point but many then went on to add incorrect statements concerning the action of catalysts.

(vi) It was disappointing to see so many answers where candidates did not realise that catalysts do not affect the position of equilibrium. The second mark was sometimes lost by a large number of candidates who omitted the key idea that rates of the forward and reverse reactions are increased to the **same** extent.

Question 2

(a)(i) Many correct answers were seen. A significant number of candidates started with an incorrect mathematical expression or an incorrect Hess's Law cycle

(ii) Many knew that elements have zero enthalpies of formation, although a common answer was that oxygen does not combust.

(b)(i) Many candidates answered this well.

(ii) Many correct answers were seen, the most common mistake being to use the mass of ethanol burnt rather than the mass of water in the equation. A significant number of candidates failed to score the units mark.

(iii) Many candidates answered this well.

(iv) Consequential marking allowed candidates to score these marks.

(v) Well known by many, but there is a requirement to compare two answers and some reference to which one was incurring the errors would have made responses more explicit.

Question 3

(a) The majority of candidates scored this mark.

(b)(i) Many answered this well although a number tried to incorporate HI into the expression.

(ii) Generally well answered.

(c)(i) It was clear that many were not well practised in reaction profiles or in completing diagrams of this type. Many did not label reactants and products, some did, but the wrong way round, some had hydrogen as the reactant and iodine as the product whilst others thought it was an endothermic reaction.

(ii) The annotation to show Ea was often ambiguous or simply incorrect.

(d) Often answered correctly.

(e) Many candidates only completed one answer correctly in the table. The third part proved to be particularly discriminating.

(f)(i) Only answered correctly by a few.

(ii) Even fewer candidates could derive the units of k.

(iii) Many simply stated temperature and therefore did not score the mark

Question 4

(a) Answered well

(b)(i) Candidates often lost a mark through imprecise or ambiguous terminology.

(b)(ii) &(iii) In both of these questions requiring the application of le Chatelier's principle most candidates gave a very limited explanation even if they had correctly identified the effect on the yield.

(c) Generally well answered

(d)(i) Whilst full marks were often seen here, some candidates were penalised for inaccuracies in their graphs. Most, but not all, started at the origin, but a number left the line at high energies in mid air rather than drawing an asymptote. The correct general shape of the curve also proved elusive. Some drew two or even three curves.

(ii) Answered well although some candidates are still incorrectly discussing the heat altering the activation energy.

Question 5

(a)(i) The idea was known well but not always expressed in sufficient detail. Some candidates gave the definition of a batch process here.

(ii) Labour costs were often correctly quoted with energy costs a close second. Those who scored poorly, generally did not concentrate sufficiently on saving costs.

(iii) Answered well.

(b)(i) Answered well.

(ii) Many correct answers seen, some gave incorrect units or no units at all.

(iii) Many candidates answered well but some were unaware of what was required in this question and were not well practised in these calculations.

Mark Ranges and Award of Grades

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