



General Certificate of Education

Applied Science

8771/8773/8776/8779

SC11 Controlling Chemical Processes

Report on the Examination

2009 examination - June series

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General Comments

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

A significant number of candidates, however, showed a lack of preparation.

Definitions and explanations of the meanings of scientific terms were handled well by many candidates, although a significant proportion included contradictory statements.

Many candidates answered most of the experimental design (AO3) question well but were unable to suggest ways to improve accuracy.

Candidates must realise that multiple guesses when just one answer is required will gain no mark.

Question 1

- (a) Many candidates have learnt this definition well but there are still a significant number who are unable to recall it or gave the definition for a batch process instead.
- (b) The majority of candidates scored well although some candidates were less successful with the indirect costs.
- (c)(i) Answered well.
- (ii) Again, answered well.
- (d)(i) Many candidates scored 1 out of 2 and had clearly attempted to calculate the oxidation numbers.
- (ii) Answered well.
- (iii) A significant number failed to gain any credit here and many of the rest omitted the factor of 6.
- (iv) Generally answered well but some discussed energy.

Question 2

- (a) A few correct answers were seen and few candidates gave the correct mathematical expression.
- (b) Most labelled the axes correctly but most then drew a curve which would be appropriate for an increase in temperature. Many of the candidates that drew a higher peak and a curve skewed to the left failed to gain the latter mark as their curve tended towards the x-axis at a higher point than the original curve.
- (c) Many correct answers were seen but equally many candidates failed to gain a mark as they did not state the **minimum** energy.

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- (d) Some candidates answered the question as if an increase in temperature had been asked about. Few gave a full answer. A significant number included contradictory statements.
 - (e) Generally answered well but candidates must realise that catalysts do change during a reaction. Many incorrectly stated that catalysts were not used.
 - (f)(i) Many answered well but some didn't discuss energy at all.
 - (ii) Most answers showed the curve lower than the original.

Question 3

- (a) Most candidates were unable to recall the correct definition. Many talked about it being the heat energy needed when combustion is clearly going to involve a release overall. It must be stated that the enthalpy change is for one mole of the compound.
- (b) Worryingly, a significant number of candidates believed a positive enthalpy change indicated an exothermic reaction.
- (c)(i) A large number of candidates were unable to balance the equation. Once again, a significant number simply missed the task out.
- (ii) Most candidates gave an appropriate list.
- (iii) Often answered correctly. Candidates must discuss measuring the mass of water. 'Amount of water' is too unspecific.
- (iv) Some candidates correctly identified that mass x specific heat capacity x temp change needed calculating but failed to say this was equal to energy released in experiment and so still failed to gain the mark. Mass must be identified as mass of water. Only a few candidates divided the energy released by the number of moles.
- (v) Candidates should be aware that repeating ensures reliability not accuracy. Several candidates made the same point three times instead of giving three different suggestions. Repetition of the same point also gains no further marks.

Question 4

- (a) Answered well although some candidates failed to state reactants and products
 - (b) Many candidates answered this correctly. A significant number seem unaware that a closed system is required for dynamic equilibrium to be established.
 - (c)(i) A significant number of candidates failed to put all the products as the numerator and the reactant as the denominator. Some had a mixture of reactants and products in the denominator, and some gave the expression totally upside down.
 - (ii) Some candidates substituted the numbers but then doubled them instead of squaring them as appropriate.
 - (iii) Some candidates gave the units as kJmol^{-1} .
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- (d) This was answered reasonably well. Candidates must ensure that they give a full explanation. Often only two out of three marks were scored as points were missed.
- (e) Most candidates identified the significance of the number of moles. Many stated that the higher number of moles was on the wrong side of the equation and some discussed temperature change.
- (f)(i) Most candidates attempted this question but used an incorrect number of bonds and therefore failed to gain several of the available marks.
- (ii) Most gave incorrect answers discussing heat loss or incomplete combustion.
- (g)(i) A large number failed to divide by 2.
- (ii) Consequential marking using answers given in (g)(i) allowed many candidates to score this mark.

Question 5

- (a)(i) The definition was recalled well.
- (ii) Generally well answered. Some candidates discussed which process was best for large or small scale but did not answer the question.
- (b) Answered well.
- (c)(i)
&(ii) Many correct answers seen.
- (iii) Many candidates answered well but some answers were unstructured and lacked the explanation.
- (iv) Many answered only temperature, or simply change in temperature. Neither of which gained credit.
- (v) Calculation of units appears to need more practise for most candidates.

Mark Ranges and Award of Grades

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