



## **General Certificate of Education**

# **Applied Science**

## **8771/8773/8776/8779**

**SC11          Controlling Chemical Processes**

# **Report on the Examination**

*2008 examination - January series*

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## General Comments

A substantial proportion of candidates were well prepared for the examination and their answers demonstrated a good understanding of the concepts. Questions involving application of Le Chatelier's principle proved to be demanding for most.

Once again, many candidates gained few marks on the question which required experimental design (AO3).

### Question 1

- (a) Many candidates answered the questions related to costs well. A significant number could not distinguish between indirect and capital costs.
- (b) Many incorrect answers involved collection of a gas or colorimetry.
- (c) This section was generally well answered.
- (d) Many candidates were unable to state the correct rate equation or to calculate the initial rate.
- (e) Whilst a good number of candidates were able to define zero order a larger number were unaware of the meaning of this term.
- (f) There was a significant improvement in the standard of particle explanations of the effect of an increase in temperature this year.
- (g) Awareness of hazards was well answered.

### Question 2

- (a) A significant number of candidates did not gain this mark for balancing the equation.
- (b) Some candidates described the neutralisation experiment well. However, many suggesting burning the phosphoric acid and a significant number seemed unaware that measuring enthalpy would involve temperature measurement.
- (c) This was well answered by a good proportion of the candidates with many mentioning reducing heat losses and repeating the experiment.
- (d) Only a few candidates were able to determine the temperature rise accurately.
- (e) Well answered by some candidates though many used 30 g as the mass of water.

### Question 3

- (a) Many candidates failed to identify that bond enthalpy involved heat energy change.
- (b) Many candidates calculated this successfully. However, many also reversed the subtraction or used an incorrect number of bonds.
- (c) Some calculated this correctly. Most used reactants and products in an incorrect order as they simply used the order that the data had been provided in the table.

- (d) A few identified that mean bond enthalpies are averages and not for specific molecules.

**Question 4**

- (a) Only a few candidates were able to identify that this was an oxidation reaction.
- (b) Many candidates calculated this correctly except that they had failed to divide by the total volume of the vessel so that they were using concentrations. A significant number could calculate units correctly.
- (c) Many candidates relied on simple graphical analysis to decide how the yield changed. Application of Le Chatelier's principle was not attempted by a significant number. A significant proportion did answer competently.

**Question 5**

- (a) Many simply restated the information given in the question and therefore did not gain the mark.
- (b) A much greater proportion of candidates are now dealing with the Maxwell–Boltzmann distribution curve confidently. Many made the error of sketching a curve appropriate for an increase in temperature.
- (c) Many answered this well.
- (d) A large number of candidates defined activation energy although some talked about starting the reaction rather than successful collisions. The explanation was also well answered.

**Question 6**

- (a) Many answered this well.
- (b) Again, the majority of candidates scored highly on this section. Some need to be more careful when calculating relative molecular masses.

**Question 7**

- (a) Although many answered this well, a worrying proportion seemed unaware of the meanings of these terms.
- (b) Most answered this correctly.
- (c) Many identified the correct direction of equilibrium shift and the correct number of molecules on each side but failed to apply Le Chatelier's principle.
- (d) Many answered this correctly.
- (e) The majority of candidates discussed the increase in surface area but did not mention the implication of this in terms of particles or collisions.
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## **Mark Ranges and Award of Grades**

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