



**General Certificate of Education (A-level) Applied
January 2012**

Applied Science

SC11

**(Specification
8771/8773/8776/8777/8779)**

Unit 11: Controlling Chemical Processes

Report on the Examination

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General Comments

It was clear that a number of students were well prepared.

Some students appeared not to have read questions carefully or to have ignored indications such as “Apart from”

The terms ‘reactant’ and ‘product’ were still transposed by a significant number of students. Diagrams, energy profiles, and Maxwell-Boltzmann curves frequently lacked care, accuracy and clarity.

Unfortunately, mathematical skills again caused difficulties. Excessive rounding led to errors for some, whilst standard form and rearranging equations continue to be problematic.

Question 1

- (a)(i) Many students answered this well but it was disappointing to see a number of answers which were ambiguous.
- (a)(ii) Students often ignored the instruction to ignore cost-related issues.
- (b)(i) Generally well answered.
- (b)(ii) This was generally well answered.
- (b)(iii) Students seem to be far more familiar with oxidation states than in previous papers.
- (c)(i) This proved challenging for most but some very well phrased answers were seen.
- (c)(ii) Extremely well answered.

Question 2

- (a) Many excellent answers seen. Unfortunately, a significant number referred to ‘heat energy required’ and some omitted to specify that the combustion must be complete.
- (b)(i) Very well answered, although some referred to a spirit burner.
- (b)(ii) Some excellent and thorough answers were seen but most lacked essential details and so could not gain full merit. Some students incorrectly described heating the butane in the calorimeter using a Bunsen burner. It would be expected that a sensible volume of water would be quoted, a copper calorimeter would be used (not boiling tubes, not glass beakers), that the calorimeter would be clamped, not placed on a tripod (with or without gauze) and that the temperature rise would be sensible and avoid too much heat loss at higher temperatures (therefore not boiling).
- (b)(iii) Some good answers were seen. Many students identified repeating but a good proportion of answers were too general. ‘Use more accurate equipment’ did not score.

- (c) Although some students scored full marks, many failed to identify the temperature rise accurately and some used the enthalpy change rather than the mass of water. Most did not go onto calculate the number of moles of butane at all. Most did not correctly identify a valid assumption and simply stated how many moles would be needed.
- (d)(i) Whilst many were able to calculate this correctly, a significant proportion transposed the numerator and denominator.
- (d)(ii) Generally well answered although some divided by 22.4 rather than multiplied by it.

Question 3

- (a)(i) Extremely well answered. Some partial answers omitted reactants and products.
- (a)(ii) Well answered.
- (b)(i) Generally well answered. Many students scored one mark as they only referred to a reaction rather than an equilibrium.
- (b)(ii) Reasonably well answered. A significant number lost one mark as they failed to state that the equilibrium was reducing the temperature. Some students incorrectly simply described effect on number of collisions.
- (b)(iii) Only a limited number realised that there would be no effect as the number of gas molecules was the same on the reactants and products side. Many incorrectly mentioned temperature in their explanation.
- (c)(i) The majority of students successfully calculated this. Some substituted incorrectly, others thought that squared meant multiplied by 2, some used volume incorrectly, others rounded too much during their calculation instead of only at the end.
- (c)(ii) Answered well.

Question 4

- (a)(i) Many answered this well but a significant proportion incorrectly transposed subtraction. A correct Hess's Law cycle would have still gained credit but most only partially completed such a cycle.
- (a)(ii) Answered very well.
- (a)(iii) Once again answered well.
- (a)(iv) Many students identified the difference but gave answers that were too brief such as 'mean bond enthalpies are averages'.
- (b) Answered very well.
- (c)(i) Generally answered well. A significant number were unable to label either axis correctly. Incorrect horizontal labels included 'rate of reaction' and 'progress of reaction'. The vertical axis was often labelled as 'energy'.

- (c)(ii) Whilst a good number of students seemed to know the general shape required, their curves were drawn inaccurately and so often only scored one mark out of the two. The lack of care was especially noticeable at the high energy end of the curve where it becomes asymptotic and marks were often lost here as the drawn line crossed the original curve or joined the axis.
- (c)(iii) Many approached this well, if somewhat lacking in the logical sequencing of points that is needed to approach the higher marks. The impression is that many students 'wrote as they thought' as opposed to planning their answer first and organising the scientific points they wished to include into a coherent, logical sequence before committing pen to paper. Worryingly, a significant number discussed the temperature altering the activation energy for a reaction and so lost a substantial number of the marks.

Question 5

- (a) Generally well answered although a surprising number failed to add the indices.
- (b)(i) This proved a challenge for many students. It seems that a good number would benefit from greater practice of the use and manipulation of rate data.
- (b)(ii) Mostly well answered but some thought this was the equilibrium constant.
- (b)(iii) Many students were unsuccessful here. It seems the rearrangement proved to be the problem.
- (b)(iv) Only a small proportion of students answered this successfully.
- (c)(i) Some excellent answers were seen. A large proportion of students seem to be under the misapprehension that a catalyst does not get involved in the reaction it is catalysing.
- (c)(ii) This was mostly answered well although some Maxwell-Boltzmann curves were drawn here.
- (c)(iii) Answered well.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA website.