Measuring enthalpy changes

Practical procedures

The methods and apparatus used to measure the energy given out, or taken in, by reactions are described in Chapter 8 in Student Book 1. The procedures are based on measuring the temperature change for a known volume of water contained in a suitable calorimeter.

A metal can is suitable as a calorimeter for measuring the energy given out from a burning fuel. A polystyrene cup can be used for reactions in solution. A lid helps to limit exchange of energy with the surroundings. Using two cups, one inside the other, helps to improve the insulation.

It is particularly important to use a thermometer graduated to measure changes to the nearest tenth of a degree, because the temperature changes are often small.

Analysing and drawing conclusions

Recording results

It is often appropriate to record results in a table, making sure that there is a clear heading for each column or row. Always include the units with measurements.

The calculation

Write the balanced equation for the change and use it to identify the limiting reagent which has controlled the extent of change.

**TIP**

The extent of change is often controlled by a limiting reagent. Other reactants are in excess. It is only necessary to determine the amount, in moles, of the limiting reagent.

State the assumptions you are making in carrying out the calculation.

Set out the calculation clearly, step-by-step, with a few words at the start of each line to show what it means (as in the examples in Section 8.3 in Student Book 1). Include the units with all measurements.

Calculate the energy change for the amounts used in the experiment and then scale up to the amounts in the balanced equation.

Check that you present your final answer with an appropriate number of significant figures.

**TIP**

Remember that ∆*H* refers to the amounts in the equation. Make sure that you show the correct sign for ∆*H*.

Evaluation

Estimating uncertainty

Follow the guidelines in Practical skills sheet 5 to estimate the measurement uncertainty associated with your experiment. Identify the main sources of error in both the measurements and the procedure (see also Section 8.3 in the Student Book).

Commenting on the apparatus and procedure

Look critically at the method you followed and suggest ways of minimising errors and increasing reliability. Suggest improvements that could be made to the experimental procedures. Comment on the assumptions made in calculating the results and state whether or not you think that the assumptions are justified (see the examples in Section 8.3 in the Student Book).