Analysing inorganic unknowns

As part of your practical work, you will be asked to carry out a series of tests on a salt and record your findings. The emphasis is on your ability to follow instructions carefully, to work cleanly and to record complete and accurate observations. You will generally be expected to go further and to make deductions from your observations, and then to use your knowledge of inorganic reactions to explain what you have seen (see also Section 5.11 in Student Book 1).

Carrying out the tests

Always follow the instructions carefully. Use small quantities of solids. Dilute solutions do not contain much of a chemical, so if you add a lot of a solid you can easily hide the effect that you are looking for.

When using a dropping pipette to add a solution, hold the tip of the pipette just above the open end of the test tube to avoid contaminating the reagent when you put the pipette back in the bottle.

When heating, always start by warming gently while shaking to keep the contents of the test tube moving. Be very careful to avoid sudden boiling (bumping), which can eject chemicals from a test tube in a hazardous way.

Make sure that you can test for gases reliably using either a teat pipette or a delivery tube.

**TIP**

When heating substances in a test tube always use a test-tube holder and not tongs or your fingers.

Always be careful to mix chemicals thoroughly. Work cleanly to avoid false results.

Recording observations

Write down all that you observe: temperature changes, solids dissolving, precipitates forming, colour changes, vapours with a distinctive smell, gases bubbling off and the results of tests to identify any gases.

**TIP**

Record everything, even if, at the time, you cannot explain what is happening. If there is a colour change, always record the colour before and after the test.

Take care not to confuse observations and deductions. Suppose you add sodium hydroxide solution to a colourless solution of a salt. What you see is a white precipitate forming at first, but which does not dissolve again on adding more sodium hydroxide solution. This is what you record as your observations. Under ‘Deductions’ you should then suggest that the solution might contain magnesium, or possibly calcium, ions.

**TIP**

Do not confuse ‘colourless’ (no colour) with ‘clear’ (transparent). A solution can be both coloured and clear. If a solution turns ‘white’ during a test, this generally means that a white suspension of a fine precipitate has formed.

Making inferences and drawing conclusions

Draw on your knowledge of the inorganic reactions of Groups 1, 2 and 7 elements and their compounds (see Chapter 4 in the Student Book) to interpret your observations. For the alkaline earth metals in Group 2 you should know, for example:

* the solubilities in water of the hydroxides, sulfates and nitrates
* the behaviour in water and dilute acids of the metals, metal oxides, metal hydroxides and metal carbonates
* the effects of heat on the carbonates and nitrates.

For the halogens in Group 7 you should know, for example:

* what happens on adding sodium hydroxide to aqueous halogens
* the effect of warming solid halides with concentrated sulfuric acid
* the displacement reactions when aqueous halogens are added to aqueous halide ions.

You can also refer to data sheets giving details of common preliminary tests, gas tests, tests for cations and tests for anions.

You may sometimes be asked to test a compound that contains ions which you have not worked with before. In this case, although you may not be able to explain all that you observe, you can draw general conclusions.

**TIP**

Often you will find that individual tests are not conclusive. Take care not to read more into the results of a test than can be justified.