Chemical tests transcript

Suppose you have a salt consisting of an unknown positively charged metal ion? Chemists have created a series of chemical tests that will identify which metal ion is present. Similarly, there is another series of chemical tests for negative ions, so that the overall identity of the unknown salt can be discovered.

Many of these tests involve a precipitation reaction in which substances in solution are mixed, and an insoluble product is formed. This insoluble product is known as a precipitate.

In this experiment, you will identify a metal ion present in an unknown solution.

But first you will carry out Task 1 of the experiment to examine the outcome of mixing known metal ion solutions with one of two reagents: sodium hydroxide and ammonia solution.

Your observations will show that each metal ion reacts in a different way with each of the reagents, and so these tests provide a means to allow you to identify which metal ion is present in an unknown solution, which is the second task of this experiment.

This video will show you how to carry out these chemical tests. You should look very carefully at what happens to each metal ion solution when adding a reagent, starting with a few drops and then adding an excess of reagent. And remember that all your observations should be recorded in your laboratory notebook.

On the bench you have all the equipment and chemicals needed for this experiment.

There are:

* aqueous solutions for the following metal ions: zinc, calcium, aluminium, lead, copper, ferrous iron and ferric iron.
* a sodium hydroxide solution
* an ammonia solution
* glass test tubes in a rack
* glass stirring rods
* and solutions containing an unknow metal ion.

All solutions are stored in bottles with dropper pipettes for easy transfer of volumes of liquid into the test tubes.

Once you start the experiment, you will be able to select any metal ion solution and bring the bottle down to the workbench.

You will use its dropper pipette to transfer a small volume of solution into any test tube. Don’t forget to record in your laboratory notebook which metal ion is being transferred to each test tube, these are numbered 1 to 6 for your convenience. The dropper pipette must be returned to its bottle at the end of each use.

For transferring a different metal ion solution into another test tube, you will first need to return the previous selected bottle back to the shelf.

You may continue transferring small volumes of the available metal ion solutions until you run out of the clean test tubes in your rack.

By selecting one of the options in the drop-down menu and then clicking on ‘reset’, you will be able to dispose of the contents of one or more test tubes and replace them with fresh tubes. In the laboratory, test tubes should never be emptied down the sink and this waste should be collected in a container properly labelled as ‘waste metal ion solutions’.

Next you will select one of the reagents: sodium hydroxide or ammonia solution, and use the dropper pipette to initially add just a few drops of your selected reagent to the metal ion solution. Don’t forget to also record which reagent is being added to each test tube.

As you add the reagent to the contents of the test tube, a video will start playing showing you what happens when a few drops of the selected reagent is added to a metal ion solution. Record the results of the test by giving a brief description of what has been observed. One possible change during the test is the formation of a coloured precipitate, such as the one shown here. But don’t be disappointed if you don’t see a change when performing such tests. Remember that negative results are often as important as positive ones, and they should be also recorded in your laboratory notebook.

By returning the pipette to the bottle, it will be refilled, and you could continue adding more reagent to the test tube. The progress bar in the video indicates that reagent is being added in excess.

Once the video finishes, you can record your observation.

Finally, you need to ensure that the metal ion and reagent solutions are mixed well by using a clean glass stirring rod. You will then record your final observations. This step is important as some precipitates may dissolve in excess reagent. To avoid cross-contamination between test tubes, any used stirring rod will be left inside the test tube and for future chemical tests you will always use a clean rod.

Once you have collected observations for all seven metal ion solutions, following the same procedure described in this video, you will be able to identify which metal ion is present in any of the unknow samples. If you need a reminder of the end-point of an experimental step, particularly when you have several test tubes in use, simply click on the test tube of interest to view an image of the outcome of the last step performed.

The colour of an unknown solution may provide a clue in the identification of a metal ion. However, you should always carry out the chemical tests to conclusively confirm which metal ion is present.