

3-3C Observing Changes in Matter

SkillCheck

- Observing
- Evaluating information
- Predicting
- Explaining systems

Safety



- Be careful around open flames.
- Handle chemicals safely. One chemical is mildly toxic.
- Tie back long hair.
- Wash your hands thoroughly after you finish the activity.

Materials

- calcium chloride solution (CaCl_2)
- two 100 mL beakers
- 100 mL graduated cylinder
- 3 small test tubes, labelled Ca^{2+} ion, Li^+ ion and "unknown ion"
- 3 wooden splints
- lithium carbonate solution (Li_2CO_3)
- ring stand and ring
- funnel
- filter paper
- Bunsen burner
- crucible tongs
- felt pen
- test tube rack

Science Skills

Go to Science Skill 10 for information about how to fold a filter paper.

When the two colourless solutions in this activity are mixed, the chemicals react, producing a white solid and a second, invisible substance that stays dissolved. In this activity, you will separate the two new substances and identify them.

Question

What substances are produced in a chemical reaction?

Procedure

Part 1 Observing a Chemical Change and Separating Products

1. Measure 25 mL of calcium chloride solution into a 100 mL beaker using a graduated cylinder. Pour a small amount of this solution into a test tube labelled " Ca^{2+} ion." Put a wooden splint into the test tube and set the test tube aside.
2. Rinse the graduated cylinder with water. Measure 25 mL of lithium carbonate solution into the second beaker. Pour a small amount of this solution into a test tube labelled " Li^+ ion." Put a wooden splint into the test tube and set the test tube aside.
3. Pour the contents of the beaker containing lithium carbonate into the beaker containing calcium chloride. You should see a cloudy white solid form.
4. Set up a ring stand and funnel. Fold a piece of filter paper as directed by your teacher and place it in the funnel. Rinse the empty beaker with water and place it under the funnel to catch the liquid that passes through.



Step 4



Step 4

5. Pour the contents of the beaker into the filter paper so that the liquid portion can drain through the filter. Not all of the product will drain into the funnel from the beaker.
6. One of your products will be a white solid trapped in the filter. The other product is still in solution and will slowly pass through the filter with the water. If time permits, you may wish to add a small amount of water to the funnel to wash the white product.
7. Once enough solution has passed through the filter to fill a small test tube, pour it into the remaining test tube, labelled "unknown ion."

Part 2 Flame Test to Identify Products

This test will work best in a darkened room.

8. Set up a Bunsen burner and adjust it so that it has a blue flame with very little yellow in it.
9. Place the wooden splint that has been soaking in the test tube labelled " Ca^{2+} ion" into the Bunsen burner flame. Note the colour. This is the colour of Ca^{2+} .
10. Place the wooden splint that has been soaking in the test tube labelled " Li^+ ion" into the Bunsen burner flame. Note the colour. This is the colour of Li^+ .
11. Using metal tongs, pick up some of the white product in the filter and heat it in the Bunsen burner flame. As you observe the colour, decide whether the white powder contains the Ca^{2+} ion or the Li^+ ion. If your products are not completely separated, you may get a mixture of colours. Try to decide which colour is the main one.
12. Place the wooden splint that has been soaking in the test tube labelled "unknown ion" into the Bunsen burner flame. As you observe the colour, decide whether the unknown ion solution contains the Ca^{2+} ion or the Li^+ ion.
13. Clean up and put away the equipment you have used.

Analyze

1. The reactants in this investigation were solutions of lithium carbonate and calcium chloride. From the two chemical names of the reactants, you can write the names of the two products. **Hint:** Each name has two parts, so exchange the parts. Make sure that each product compound has one positive ion and one negative ion.

Conclude and Apply

1. Use your results to identify the white powder and the chemical present in the liquid that passed through the filter.