

Describing Chemical Reactions

Introduction and Purpose

In this experiment you will observe examples of the five basic types of chemical reactions. You will learn to write balanced equations, including the role of energy, to effectively communicate the chemistry of the reactions.

Procedure

Carry out the reactions using the approximate quantities of reagents suggested. Unless otherwise stated, use test tubes. When heating reagents in test tubes, slant the test tube so that the opening is pointed *away* from people. Heat the test tube at the surface of the material and work down towards the bottom of the tube. Discard solutions down the drain, wash and rinse your glassware. Discard solid waste in the waste cans on the lab tables.

In the data section you will balance the equation, write the word equation and record your observations.

A. Combination reactions:

1. Grasp a strip of magnesium ribbon in crucible tongs and ignite it in the burner flame. Hold it over a watch glass. Do not look directly at the flame! Add a few drops of distilled H₂O to the ash. Stir with a stirring rod and place a drop of the solution on red litmus paper. Red litmus turning blue is evidence for the presence of a base.
2. Heat a piece of copper metal strongly in the Bunsen burner flame for about 30 s. Remove the copper from the flame and note the change in appearance. Discard the product in the solid waste can.

B. Decomposition reactions:

1. Place about 1 scoopful of solid sodium hydrogen carbonate NaHCO₃ into a dry test tube. Mass the test tube with the powder. Heat the sodium hydrogen carbonate in the test tube strongly for 2 minutes. Observe any changes that occur during the heating. Toward the end of the heating, light a wood splint and insert the flaming splint into the mouth of the test tube. Note what happens to the splint. Once the tube has cooled, mass the tube and contents again.

C. Single replacement reactions:

1. Place a strip of copper in a test tube with enough 0.1M AgNO₃ to cover it. Set this test tube aside, then observe the surface of the metal after 5-10 minutes.
2. Place a couple of pieces of mossy zinc metal in a test tube approximately 1/4 full of 3M HCl. Place a stopper loosely in the tube. After a few minutes, light a wood splint and insert the flaming splint into the mouth of the test tube. Hold the test tube in your hand to feel if the temperature has changed.

D. Double replacement reactions:

1. Add 0.1M AgNO_3 to a test tube to a depth of about 1 cm. Add a similar quantity of 0.1M CaCl_2 solution. Observe the reaction.
2. Place a scoopful of solid Na_2CO_3 in a test tube to a depth of about 1 cm. Add a dropperful of 3M HCl . While the reaction is occurring, test with a flaming splint as in part B.
Check to see if the temperature of the mixture has changed.

E. Combustion reactions:

Place about 10 drops of isopropyl alcohol, $\text{C}_3\text{H}_7\text{OH}$, in a small evaporating dish. Ignite the alcohol from the top of the liquid with a Bunsen burner. Hold a cold watch glass well above the flame and observe the condensation of water on the bottom. The formation of the mist will be fleeting; watch closely.