

Redox and Organic Reactions

What's the Wow?: Very exothermic and colorful changes can happen with redox reactions.

Procedure:

Safety Note: The elements Li, Na, and K are caustic and care should be taken when handling these. Use a tweezers and wear gloves, as they like to eat skin. The metals are covered in an organic solvent (usually toluene or kerosene) to prevent their reactions with atmospheric gases (usually N₂, O₂, and water).

A. Reactions of Elements with Water

1. In a 600 mL beaker, pour 200 mL water and several drops of phenolphthalein indicator into it.
2. Obtain a piece of lithium the size of a pencil eraser – if you didn't cut it, try to do so and notice the color of the freshly cut surface.
3. In the hood behind a closed sash, drop this into the beaker with water and observe.
4. Repeat the steps above with sodium.
5. Obtain a 5 cm strip of a magnesium ribbon and buff it clean (rid it of its' oxide coat) and put it in a 250 mL beaker with 100 mL of water.
6. Repeat step 5 with a chunk of calcium. If cloudiness appears here, try adding 25 mL of 1 M HCl to it. Does this clear it up?
7. Try reacting the magnesium in 10 mL of 1 M HCl.

Waste: Everything here can go down the drain.

B. Burning Mg in CO₂¹

Safety Note: Burning Mg gives off a very bright light. Do not stare at it.

- a. Add several small pieces of dry ice to 250 mL beaker and cover it with a watch glass.
- b. Obtain a strip of Mg and buff it to remove its' oxide coating.
- c. Holding it with a tongs, light the end of it and continue holding it in the CO₂ filled beaker. Try not to touch the sides of the beaker with the ribbon.

Waste: Everything here can go in the garbage or down the drain.

C. Decomposition Reaction: Sugar Goes Up in Smoke²

Safety Note: Do not inhale the vapor in this experiment and perform it in the hood! Sulfuric acid is very caustic and great care should be used in handling it. Do not touch the resulting black mass.

1. Place about 20 mL of sucrose into a 100 mL beaker.
2. Carefully add 5 mL of concentrated sulfuric acid

Waste: Pour the contents of the beaker into the garbage (once cooled).

D. The Breathalyzer Test³

Safety Note: Sulfuric acid is caustic and very hygroscopic. If this gets on your skin or clothing, wash it thoroughly.

1. Add 10 mL of 0.1 M potassium dichromate and 5 mL of 6 M sulfuric acid to a test tube.
2. Put a couple of drops of ethyl alcohol into a flask with a 2 - hole stopper and tubing into both of the holes in the stopper. Blowing in one side sends alcohol vapors out the other side. The other end should be placed into the solution prepared above.

Waste: Pour the contents of the tube into the container marked "Chromium Waste"

¹ Adapted from *Chemical Demonstrations: A Sourcebook for Teachers, Vol. 2.*, L.R. Summerlin, C.L. Borgford, J.B. Ealy, ACS, Washington, D.C., 1987.

² Adapted from *Chemical Demonstrations: A Sourcebook for Teachers*, L.R. Summerlin, J.L. Ealy, Jr, ACS, Washington, D.C., 1985.

³ Adapted from <http://chem.lapeer.org/Chem1Docs/Breathalyzer.html>