Qualitative Analysis: Household Compounds

The purpose of this experiment is to identify several household chemicals based on their physical and chemical properties. The compounds to be used are: boric acid, and sodium hydroxide

Sodium Chloride (NaCl) – table salt
Sodium Bicarbonate (NaHCO₃) – baking soda
Sodium Carbonate (Na₂CO₃) – baking powder
Calcium Sulfate (CaSO₄) – dry wall board
Magnesium Sulfate (MgSO₄) – Epsom Salts
Sucrose (C₁₂H₂₂O₁₁) – cane sugar
Fructose (C₆H₁₂O₆) – fruit sugar
Calcium Carbonate (CaCO₃) – antacid tablets
Cornstarch ((C₆H₁₀O₅)ₙ) – laundry starch
Boric Acid (H₃BO₃)
Sodium Hydroxide (NaOH) – Drain Opener

Most of the reagents used in the experiment are also available as the primary ingredient in a household material.

One important feature to good work will be the logical construction of an analytical scheme that distinguishes between the above compounds with the minimum fuss and bother. We suggest that you work with known materials and perform the reactions as outlined. Then from the information that you gather, develop an efficient analytical scheme and identify your unknown; ending with a unique identification for each known compound.

Precautions: Do not taste any of the chemicals!
Make sure that all your test tubes are clean and rinsed with water.

Procedure: Each of the following tests is to be done with known substances. The amount of solid to use is about the size of a pea; use the tip of the scoopula to obtain this amount - not more!

1. Solubility in water: In separate test tubes place a small amount of each compound. To each add about 5 mL of water, stopper and shake. Your compounds should be separated
into those that are soluble and those that are insoluble. Now you should begin creating a flow chart. If your compound is insoluble, continue with Step 2; otherwise go to Step 3.

2. a) If the compound is insoluble, add 2 drops of tincture of iodine, stopper and shake. Use your observations to extend your flow chart and continue to b).

b) If the iodine solution with the insoluble material remains yellow-brown, clean your test tube, obtain a fresh sample of your compound, and add about 1 mL of vinegar. Look for bubbling, which indicates the release of carbon dioxide. You are now done testing insoluble compounds.

3. a) If the compound is soluble, clean your test-tube and obtain a fresh sample of the compound and add about 1 mL of vinegar. Remember if bubbling occurs, CO₂ gas is formed. Use your observations to extend your flow chart. If the compound releases carbon dioxide continue to b); otherwise continue with c)

b) If the compound releases carbon dioxide, clean your test tube and obtain a fresh sample of the compound, dissolve it in a few mL of water, and add 2 drops of phenolphthalein. Use your observations to extend your flow chart.

c) If the compound did not release carbon dioxide, clean your test tube and obtain a fresh sample of your compound, add about 1 mL Benedict's Solution to the test tube, stopper and shake. This reaction may be slow and you should remove the stopper and place the tube in a beaker of hot water for about three minutes. Use your observations to extend your flow chart and continue to d).

d) If nothing happens with Benedict's Solution, clean your test tube, obtain a fresh sample of your compound, dissolve it in a few mL of water, and add about 4 drops of silver nitrate to the test tube. You are now done testing soluble compounds.

4. Be sure your flow chart completely distinguishes each of the compounds. You should not have two compounds that have all the same reactions.

5. Perform the appropriate tests on your unknowns to determine what is in each.

The flow chart and the identity of your unknown complete the laboratory