

## Solutions

What's the Wow?: You will see how densities, conductivities and solubilities change with a variety of solutions

### Procedure:

#### A. Density<sup>1</sup>

1. Into a 100 mL glass graduated cylinder, add in order 5-10 mL of each of the following:
  - a. Pancake syrup (brown)
  - b. Antifreeze (green)
  - c. Dishwashing detergent (blue)
  - d. Shampoo (gold)
  - e. Water with food coloring (red)
  - f. Oops paint remover (colorless)

What can you say about the densities of these liquids?

Try adding some different solids to this column of liquids:

- a. Penny
- b. Teflon
- c. Rubber stopper
- d. Cork

Try mixing the column of solutions. Return the solids to the appropriate container.

2. Note the water filled container at the front of the room containing the “Dr. Pepper” and the “Diet Dr. Pepper”. What can you say about their densities? By the way, these are ordinary cans straight from the grocer’s shelf!

#### B. Intermolecular Forces<sup>2</sup>

Pour 100 mL of distilled water into a 250 mL beaker and dip the wires of the conductivity apparatus into the water. **Under No Circumstances Should You Touch the Wires!** Turn the switch to the variac on and then off after making observations. Remove the beaker and stir about a teaspoon of the salt into the water and dip the wires again turning on/off the variac. Rinse the wires with distilled water each time into a waste beaker before dipping them into the next solution (DI water and sugar). The remaining substances below are already in solution so there is no need to dissolve them in water.

- Sodium Chloride (salt)
- Sucrose (sugar)
- Acetic Acid (1 M - vinegar)
- Ammonia (1 M – window cleaner)
- Hydrochloric acid (1 M – stomach acid)
- Sodium Hydroxide (1 M - draino)
- Alcohol (return this to the original container when finished)
- Tap water

<sup>1</sup> Adapted from *Chemical Demonstrations: A Handbook for Teachers of Chemistry*, Volume 3, B.Z. Shakhshiri, University of Wisconsin Press, Madison, WI, 1989.

<sup>2</sup> Adapted from <http://chemlearn.chem.indiana.edu/demos/Conducti.htm>

**C. Concentrated Solutions<sup>3</sup>**

Add ~150 mL of 95% ethanol and 30 mL of saturated calcium acetate simultaneously into a clean, dry 250 mL beaker. Do not stir and after 10 seconds invert the beaker. Using a scoopula, remove some of the material and put into an evaporating dish. Add a pinch of boric acid and light this on fire.

**Waste**

Nothing generated in this lab is harmful to the environment and all liquids can go down the drain (except the alcohol that has been returned).

---

<sup>3</sup> Adapted from *Chemical Demonstrations: A Handbook for Teachers of Chemistry*, Volume 3, B.Z. Shakhshiri, University of Wisconsin Press, Madison, WI, 1989.