Lab #14

Concentration and conductivity – Part 1

Goal: Classify how liquid solutions affect passage of current

Procedure:

- Create a saturated salt water solution by dissolving as much salt in a small beaker of water as possible. Stir vigorously until no more salt will dissolve
- Pour a thin layer of water into a shallow dish (around ½ inch deep)
- Hook wires to each terminal of the battery and place the other end of one wire in the pool of water.
- Clamp the free end of the other wire around the metal part of the light bulb.
- Gently lower the bulb toward the surface of the water until just the tip contact of the bulb is touching the water. The bulb should begin to glow.

  Explain why the light bulb is glowing when in contact with the water.

  Do you think this would work with plain water? Why or why not?

- Test your hypothesis by trying to create an electrical circuit through plain water. It is not really good for the light bulbs to be in the water so we will modify the system used above. Instead of touching the bulb to the water, put the bulb into a socket and connect one terminal to the battery and the other terminal to a wire with one end in the water. This should create a complete circuit.

  Does the bulb light? Why or why not?

- Do you think that the bulb would light if you used a saturated solution of sugar water?
- Test your hypothesis using the modified version of the circuit above.

Explain why some of the solutions were good conductors and others were not. Why does sugar behave so differently from salt?

modified from:
http://galileo.phys.virginia.edu/outreach/8thGradeSOL/ChemSwitchFrm.htm

Concentration and conductivity – Part 2

Goal: Classify how concentrations of ionic solutions affect passage of current

Procedure:

- Place 200 ml of plain water into a beaker.
- Set up the battery/light bulb system so that a complete circuit is created that requires the current to pass through the water in the beaker.
- Test for conductivity of the solution by observing whether or not the bulb is lit. (hopefully not)
- Observe the pattern of bubbles forming within the solution. Do the bubbles form equally at each wire or are there more bubbles at one of the wires? If so, which one? Record this information on the chart on the back of this page.
- Remove the wires from the water. Add 5.0 grams of NaCl (table salt) to the water and stir vigorously until it dissolves.
- Calculate the concentration of your solution using the equation:

$$\text{concentration} = \frac{\text{grams of solute (NaCl)}}{\text{volume of solvent (water)}}$$

- Record the information in the table on the back of this sheet.
- Replace the wires and test for conductivity.
- Repeat this process, adding another 5.0 grams of NaCl. Keep repeating until the concentration is strong enough to conduct electricity.
- Continue adding salt and observe whether the bulb glows more brightly as the concentration increases. Stop the process when you can no longer see a difference in the brightness of the bulb.

Describe how concentration affects the conductivity of the solution. Explain why you think it has this effect.

total grams of NaCl in solution	concentration (g/ml)	Did bulb light?	bubble pattern description
0 grams	0 g/ml (pure water)		

What is causing the bubbles to form? Is the H_20 changing phase to water vapor or is it being broken down into its component gases (H and O_2)?

Hopefully you observed an uneven distribution of bubbles on the ends of the wires. There should be around twice as many bubbles on one of the wires. What is the charge of the more bubbly wire? Why would the wire with this charge produce more bubbles?

Acids and bases

Goal – To determine the pH of various common substances.

Procedure:

1. Examine the variety of substances provided and predict their pH. Write them in the table below in order of most acidic (lowest pH) to least acidic (highest pH).

2. Use pH strips to determine the actual pH of each substance. Do 2 pH readings, one with the Universal strip to get a rough estimate, and a second reading with a more detailed strip.

substance	general pH	specific pH

Were your predictions correct?

Several of the substances were drinks. What characteristics of the drinks serve as indicators of acidity?