Color Demos

Iodine Clock:

- Beaker, 250 mL
- Solution A
- Solution B

Solution Preparation:

- **Solution A (0.02 M KIO_3)–** Dissolve 4.3 g of KIO_3 (potassium iodate) in 1 L of DI water.
- **Solution B (4000 ppm starch; 1 mM $Na_2S_2O_5$; 5 mM H_2SO_4)**–
- Make a paste of 4 g of soluble starch in a small amount of warm water. Stir the paste into 800 mL of DI water in a 1 L beaker. Boil for 10 minutes, and then cool the solution. Add 0.2 g of $Na_2S_2O_5$. Add 5 mL of 1.0 M sulfuric acid. Dilute to 1 L.
- **Test the solutions!!** It should take 15 – 20 secs. for the solution to turn blue. Add more acid to Solution B if the reaction is too slow, or dilute Solution B if the reaction is too fast.

Put equal amounts of solutions A and B in a 250 mL beaker. After a few seconds the solution turns dark blue. This reaction can be timed and set up with several beakers that change to dark blue as students count "one-chemistry, two-chemistry..."
The time of the reaction can be adjusted - just add a little more sodium metabisulfite or acid to solution B if the reaction is too slow, or dilute solution B if the reaction is too fast.

Luminol:

- Beaker or Florence Flask
- Solution A
- Solution B

Solution Preparation:

- **Solution A (10% Bleach**)- Dilute 100 mL of bleach with distilled water to 1 L.
- **Solution B (0.1 M NaOH; 2 mM luminol)**– Prepare 0.10 M NaOH by dissolving 4 g of the solid in 1 L of DI water. Add 0.46 g of Luminol (3-aminophthalhydrazide) to 1 L of 0.10 M NaOH.

Mix solutions A and B in equal proportions in a beaker to produce a glowing effect. An interesting variation is to connect clear rubber tubing to the stem of a glass funnel and coil the tubing around a ring stand using several utility clamps. Place the end of the tubing in a flask in the sink. Pour solutions A and B from separate containers simultaneously into the funnel.

Oscillating Reaction:

- 400 mL Beaker
- Stir rod
- Solution A
- Solution B
- Solution C

Solution Preparation:

- **Solution A (12.3% H_2O_2)** – Dilute 410 mL of 30% H_2O_2 to 1 L with DI water.
- **Solution B (0.2 M KIO_3; 0.08 M H_2SO_4)** – Prepare 2.0 M H_2SO_4 by diluting 11 mL of the concentrated acid to 100 mL. Mix 43 g of KIO_3 and 40.0 mL of 2.0 M H_2SO_4 in a 1 L volumetric flask, and dilute.
- **Solution C (300 ppm starch; 0.15 M malonic acid; 0.02 M $MnSO_4$)** – Add 0.30 g of soluble starch (for iodometry) to a small amount of DI H_2O and heat until dissolved. In a 1 L Volumetric Flask, add starch solution, 15.5 g of Malonic Acid, and 3.4 g of $MnSO_4 \cdot H_2O$). Dilute.

Note: Solution C usually must be used within 1 week of its preparation. Sometimes it lasts a little longer. Just test it, in case it still works, before reprepping.

Mix equal amounts of the solutions together in a beaker while stirring. The color will change to yellow, then blue, and back to clear. The oscillations will continue for approximately 15 minutes.

Elephant Toothpaste:

- 30% hydrogen peroxide
- Saturated potassium iodide
- Dish soap
- Large graduated cylinder
- Food coloring
- Gloves

Wear gloves! Add about 100 mL of H_2O_2 to a 1000 mL graduated cylinder. Add some dish soap; it will float on top of the peroxide. Drop some food coloring down the side of the graduated cylinder. Add a few milliliters of saturated KI. The KI is a catalyst for the decomposition of hydrogen peroxide into water and oxygen gas. The solution will foam and shoot out the graduated cylinder. The food coloring gives the foam stripes, resembling toothpaste. To prove that oxygen is given off, light a wood splint until it is glowing hot. Blow it out, and quickly stick it into the foam. The splint should re-light.

Waterlock

- Waterlock (sodium polyacrylate)
- Salt (sodium chloride)
- Styrofoam cups
- Scoopula
- Box of food coloring

Fill two Styrofoam cups ¾ full with water. Put a drop of food coloring in each. In one "empty" Styrofoam cup, sprinkle a layer of waterlock. Have two volunteers compete in a pouring contest. Give each volunteer a cup of water and an "empty" cup, one of which has waterlock. The volunteers should pour as quickly as they can without spilling with their arms at shoulder-level. Have the other students decide the winner. Then have the volunteers pour the water back – one will not because the waterlock has absorbed the water. Waterlock is a super absorbent polymer. It will hydrogen bond with water and absorb up to 800 times its weight in water.

Allow the students to feel the cup with the waterlock. Add salt and stir with a scoopula. The positive ions will prevent the waterlock from absorbing the water.

Magic Sand

- 2 – 100 mL beakers
- Normal sand
- Magic sand
- Paper towels

Half-fill the two beakers with water. Pour normal sand into one, and have the students observe that it sinks. Decant the water, and have students observe that the sand is wet by dumping it on a paper towel. In the other beaker, pour magic sand. Have students observe the odd shapes it makes. Decant the water, and have students observe that the sand is dry by pouring it onto a paper towel. Magic sand has a non-polar coating, preventing it from mixing with the water. It pushes the water out of its way, but does not get wet.