What Affects the Color of My Pencils?

Lab Prep Instructions

***GENERAL INFORMATION***

Experiment Day/Date:

Instructions: Write any calculations in the space provided, and check with the lab instructor if you have any questions. Check off each item as you prepare it.

Quantity: Amounts indicated are for 8 pairs of students and include an excess. For 6 or fewer pairs only 100 mL of xylenol orange and aluminum nitrate need to be prepared. **MAKE FOR 15 PAIRS**

***SOLUTIONS***

*\*The HSO4-/SO42- buffer must be prepared before the xylenol orange or aluminum nitrate solutions, as it is needed to prepare those two solutions.*

□ 500 mL of 0.20 M HSO4-/SO42-, pH 2.0 buffer

**Note:** Actual volume needed is 260 mL. If buffer is left from a previous semester or you are only **preparing 100 mL of the other solutions, cut all amounts in half and prepare only 250 mL.**

- slowly add 5.55 mL of 18 M (conc.) H2SO4 to ≈ 450 mL of DI water in a 1-L Erlenmeyer flask (**NOT** a volumetric flask) on a stir plate with a magnetic stir bar

- dangle an electrode attached to a pH meter from a clamp on a ring stand into the Erlenmeyer flask

- slowly add 50% (w/w) NaOH to the stirring solution until the pH of the solution is 2.0 (Note: this should take approximately 9-10 mL)

- transfer to a 500 mL volumetric flask fill to the etched mark with DI water

- stir well once all the water is added and remeasure the pH

□ 125 mL of 6.0 × 10-5 M xylenol orange

- add 0.114 g xylenol orange sodium salt to a 5 mL volumetric flask and dilute with HSO4-/SO42- buffer solution to prepare a 0.030 M xylenol orange stock solution. Mix gently or bubbles may form which are slow to pop making it difficult to bring the solution to final volume

- dilute 200 μL of stock solution to 100 mL with HSO4-/SO42- buffer solution

- dilute 50 μL of stock to 25 mL with HSO4-/SO42- buffer solution

- transfer both to a appropriately sized clear or brown glass bottle and mix

- when experiment is complete discard any unused xylenol orange solutions

□ 125 mL of 1.4 × 10-4 M Al(NO3)3 (aluminum nitrate)

- add 0.150 g aluminum nitrate nonahydrate to a 5 mL volumetric flask and dilute with HSO4-/SO42- buffer solution to prepare a 0.080 M aluminum nitrate stock solution

- dilute 200 μL of stock solution to 100 mL with HSO4-/SO42- buffer solution

- dilute 50 μL of stock to 25 mL with HSO4-/SO42- buffer solution

- transfer both to a appropriately sized clear or brown glass bottle and mix

- when experiment is complete discard any unused aluminum nitrate solutions

***EQUIPMENT & GLASSWARE***

**In Lab Bins**:

□ 30 mL beakers (2)

□ 400 mL beaker (1)

□ 600 mL beaker (1)

□ 16 × 125 mm test tube (1)

□ large insulated coffee cups (2)

□ plastic lid (1)

□ thermometer (1)

□ 5 mL volumetric pipettes (2)

□ pipette bulb or pump (green) (1)

**In Dana 200:**

□ Ocean Optics UV-Visible Spectrophotometer (1/group)

□ Ocean Optics 1-page instruction guide (1/group)

□ Laptop computers (1/group)

□ Kimwipes

□ Plastic transfer pipettes

□ Plastic cuvettes

□ Hot plates (1/group)

□ Ring stand set-up with test tube clamp (1/group)

***WASTE DISPOSAL CONTAINERS***

€ Building: Dana

€ Room #: 200

€ Waste Accumulation Start Date:

€ Date Container Filled: leave blank

€ Date moved to MAA: leave blank

€ Physical State(s): liquid

€ Chemical Waste Composition: xylenol orange (< 1 %), aluminum nitrate nonahydrate (<1 %), sulfuric acid (<1 %), sodium hydroxide, (<1 %), water (~99 %)

€ Hazards: corrosive, oxidizer, toxic

***SPECIAL INSTRUCTIONS***

Wear goggles, gloves, and a lab coat at all times while preparing solutions.

Unless otherwise stated, all chemicals can be prepared with plenty of time before the lab and excess chemicals can be stored after the lab has finished