

Can't Judge a Powder by Its Color



Event Description

- Purpose is for students to make and record observations.
- Students will test and characterize one pure substance.
- Based only on data they collect, answer a series of questions.
- Do **not** have to identify substance



Competition Format

- A team of up to 2 students
- 50 minutes time
 - 25 – 35 minutes for testing
 - 25 – 30 minutes for questions
 - Clean up time in between



Safety Requirements

- Students must bring and wear:
 - Aprons or lab coats that **cover the knee**
 - Pants or skirts that cover the legs to the ankles
 - Sleeved shirt
 - Closed-toed shoes
 - OSHA approved splash goggles with indirect vents
- No **tasting or touching** of powders is allowed
- Do not **smell** raw powder



Safety Goggles

- Chemical splash proof



Students Should Bring



- pHydrion paper
- Hand lens
- 9V conductivity tester (no testers that run on 120V)
- Beral pipettes or eye droppers
- Containers for testing conductivity and solubility
 - One or two 50 or 100 mL beakers
 - Clear plastic spot plate
- Test tube holder and rack if using test tubes
- Spatula
- Stirring rod

Equipment

- Spatulas



- Conductivity tester



Parts from Radio Shack

http://www.uncwil.edu/chem/Courses/Reeves/OnLineLabs/solubility_Conductivity/Make%20A%20Conductivity%20Tester.htm



Event Leaders will Provide

- Definitely:
 - The powder
 - 1.0 M NaOH
 - 1.0 M HCl
 - Distilled water
 - Two different colored writing implements
- MAY be provided:
 - Thermometer
 - Balance
 - Hot plate
 - Observation sheet
 - Anything else the supervisor decides to distribute (other reagents)

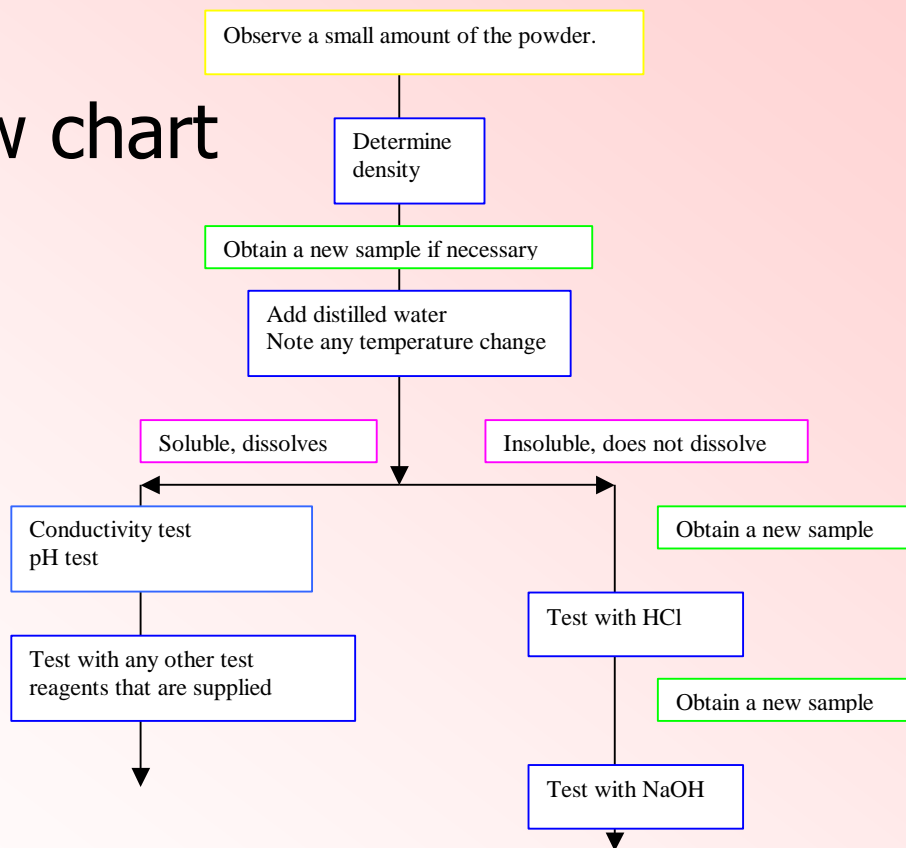


Announcements

- Whether refills of the solid will be provided (don't count on this)
- Whether there are any additional reagents and how to use them
- Waste disposal rules
- Clean up procedure

Flow Chart

- Only write down what you know happened – no conclusions
- Practice using a flow chart





Testing the Solid

- First tests should be those that use entire sample
 - If balances are available, weigh entire sample
 - Be familiar with different types of balances
- Solubility
 - Start with a very small amount
 - Test the solubility in every solvent available



Physical Properties

- Look at the solid with a lens
- Is it a powder or a crystal?
- Can you tell the shape of the crystal
- What is the color?
- What is the texture?

pH Testing

- Test the pH of the distilled water before testing the pH of the solutions
- When you dissolve the powder in **water**, what is the pH?
- Bring the solution to the pH paper
- Know the difference between a base and an acid





Conductivity

- Does the solution conduct electricity?
 - If so, it contains ions and is an electrolyte
 - Know the difference between a strong and weak electrolyte
 - Know what a non-electrolyte is
 - Test water first – should be a non-electrolyte
 - Only need to do if powder dissolved in **water**

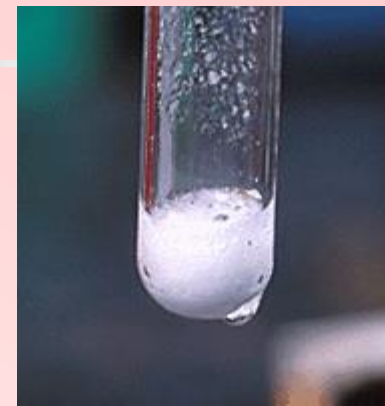


Thermodynamics

- Measure the temperature of the water first
- When dissolving the substance in water, the temperature may go up or down
- If no thermometer, hold test tube and see if change is apparent
- Take temperature readings at intervals
 - Exothermic – temperature will rise
 - Endothermic – temperature goes down

Gases

- Some solids give off gases when HCl is added
 - Most common are the carbonates which give off carbon dioxide
 - Others are sulfites, sulfides, and nitrates
- Notice the color of the gas and odor
 - Use proper technique for odor
- Know how to measure the pH of a gas
 - To test for HCl gas, put wet pH paper in the test tube, as the gas is evolved. The color of the pH paper should change accordingly.





Precipitation

- Some ions in water cause other ions to precipitate or form a solid
- What are the characteristics of the solid?
- Be aware that some precipitates will go back into solution as more reagent is added





Saturation

- How much solid you have to add to make the solution saturated.
 - Take 10 ml of distilled water and slowly add your solid while stirring
 - You will see solid floating when you cannot dissolve anymore.
 - Some solids dissolve more slowly than others.



Competition

- Students should number their data sequentially as it is collected
- Points are given based on the **quality** of the observation
- Wrong answers have no points
- Answers given to questions that cannot be backed by an observation are given minimum point value



Practice

- Practice using household powders
 - Salt, Sugar, Baking soda, Epsom salts, Borax
- Divide up the work
 - Have the same student do the same work for each powder
- Make a table of your data
 - Check to see if you are consistent
- Start learning vocabulary
- Use the Merck Index to check the properties of the powders you are testing