

SALS Activity 9

Precipitation reactions

A precipitation reaction takes place when separate solutions containing soluble ions combine to form an insoluble product, otherwise known as a precipitate.

Materials

- SALS app downloaded onto iPhone or iPad
- SALS probe
- Talking color detector
- Six 15 x 125 mm (14 mL) glass test tubes
 - Test tubes must be at least 10 mm in diameter to accommodate the SALS probe
- Test tube rack
 - Modified with small tactile markers (such as tape) on the two adjacent corners of one of the shorter ends
- Seven small beakers (25 mL) or other containers for chemical stock solutions
- Braille labels
- Sodium carbonate
- Iron (II) sulfate
- Iron (III) nitrate
- Lead (II) nitrate
- Copper (II) sulfate
- Sodium hydroxide pellets or solution
- Silver nitrate
- Water for rinsing the SALS probe
- 10 transfer pipettes (3 mL volume)
- Paper towels
- Chemical waste disposal container
- Metal scoopula or spoonula
- Gloves
- Goggles

Caution

Many of the chemicals in this activity, particularly copper sulfate, are potential irritants and/or toxic. Students must wear gloves and goggles during all steps of the activity.

Directions

Teacher instructions prior to activity

1. Prepare the following chemical stock solutions by adding a rough spatula tip-worth of a salt to 5 mL water in the seven 25 mL beakers or other containers and identify them with large print/braille labels:

- Iron (II) sulfate
- Iron (III) nitrate
- Lead (II) nitrate
- Copper (II) sulfate
- Sodium carbonate
- Sodium hydroxide
- Silver nitrate

2. Place the test tubes in the test tube holder.

3. Number the test tubes 1 through 6 with braille labels or by noting that test tube number 1 is closest to the end of the test tube rack with the tactile markers; number 2 is adjacent to number 1; etc.

4. Add 1 or 2 mL of each of the following stock solutions to the test tubes according to this list using a separate transfer pipette for each chemical solution:

- 1 – Iron (II) sulfate
- 2 – Iron (III) nitrate
- 3 – Lead (II) nitrate
- 4 – Lead (II) nitrate
- 5 – Lead (II) nitrate
- 6 – Copper (II) sulfate

Student Instructions

1. Students must wear gloves and goggles. Under consistent ambient lighting, gently place the SALS probe in each test tube (**one at a time and rinsing with water and drying with a paper towel between each one**) and take tone/Hertz readings of each. Store the tones or record these data for later reference.

2. Make a note of the colors of each of the solutions using the color identifier.

3. Add 1 or 2 mL of the following solutions to each test tube according to this list using a separate transfer pipette for each chemical solution:

- 1 – Sodium carbonate
- 2 – Sodium carbonate
- 3 – Sodium carbonate
- 4 – Copper (II) sulfate
- 5 – Sodium hydroxide
- 6 – Silver nitrate

4. Wait 5 minutes and then under the same ambient light conditions as before, take tone/Hertz measurements of each solution by placing the SALS probe into each test tube, one at a time. **Make sure to rinse the probe off with water and dry with a paper towel between test tubes.** Store or make a note of each measurement.

5. Use the color identifier to check the color of the reaction product in each test tube, and make a note of this as well.

6. Use the metal scoopula to check if a solid precipitate formed in any of the test tubes and make a note of this.

Note: It is helpful to use a method similar to tapping a long white cane with the scoopula in order to detect the difference between solid or semi-solid precipitate and a liquid. If you need a basis for the feel of a pure liquid, fill an empty test tube with water and move the scoopula inside it.

7. Empty the contents of all test tubes into a proper chemical waste disposal container.

Questions to answer

1. Compare the before and after reaction tones/frequencies measured by SALS for each test tube. What do you think caused this difference?

2. How many of these reactions resulted in precipitation? How does this compare to other groups in your class? What might have caused the variation in your answers, if any?