

The Red Plague

Safe Laboratory Practices



Introduction

Use this extraordinary classroom activity as a good ice-breaker during the first week of school. This fun activity uses acid–base chemistry to teach a valuable safety lesson.

Concepts

- Acid–base indicator
- Chemical contamination

Materials

Phenolphthalein indicator solution, 0.5%, 10 mL in a dropper bottle

Sodium hydroxide solution, NaOH, 0.1 M, 5 mL

Water, distilled or deionized

Pipets, thin-stem, 32

Rubber bands, 30

Stoppers, solid, to fit culture tubes, 30

Test tubes, rimless, 13 × 100 or other small size, 60

Test tube racks, 15

Safety Precautions

Dilute sodium hydroxide solution is corrosive to skin and eyes. Wear chemical splash goggles and chemical-resistant gloves. Phenolphthalein indicator solution contains alcohol and is flammable; avoid heat and open flames. Wash hands thoroughly with soap and water before leaving the laboratory. Follow all laboratory safety guidelines. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.

Preparation

1. Place approximately 5 mL of deionized water in each of twenty-nine test tubes and stopper the test tubes.
2. Place approximately 5 mL of 0.1 M sodium hydroxide solution into one test tube and stopper the test tube.
3. Pair each filled test tube with an empty test tube and secure the two together with a rubber band.
4. Place a thin-stem pipet into each empty test tube.

Procedure

1. Hand out the pairs of test tubes, one set to each student.
2. Instruct students to remove the stopper and use the pipet to draw about half of the liquid out of the filled test tube.
3. Transfer the liquid to the empty test tube. Replace the stopper back into the first test tube. Lower the stoppered test tube and always work from the upper, open test tube for the exchanges that follow.
4. Ask students to find a student in the group they do not know and then exchange a joke, discuss a book or movie, or describe the best thing that happened to them over the summer.
5. After 1–2 minutes, ask students to stop their discussion and exchange liquid from their open test tubes.
6. Using a pipet, each student should simultaneously draw about half of the liquid from their open test tube and then transfer the liquid to their partner's open test tube.
7. Have students find a second partner by random movement throughout the classroom. After introducing themselves, students should again exchange liquid from their open test tube with the new partner.
8. Repeat the process a third time.
9. Ask students to line up and discuss the safety requirements for cleaning up a chemical spill.

10. Pass the dropper bottle containing the phenolphthalein solution to each student. Each student should add 1–2 drops of phenolphthalein solution to each of their two test tubes.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. Collect the solution into one waste container. If the phenolphthalein solution in the waste container is colorless or yellow, the solution may be disposed of down the drain with excess water following Flinn Suggested Disposal Method #26b. If the phenolphthalein in the waste container is pink or red, add a few drops of an acid, such as 1 M hydrochloric acid, stir the solution with a glass stirring rod and note the color. Continue to add acid, a drop at a time, until the solution just turns colorless or yellow. Flush the neutralized solution down the drain with excess water.

Tips

- Phenolphthalein is an acid–base indicator that reacts with the basic sodium hydroxide solution to form a red or pink color.
- Students should be cautioned at the onset to exchange solutions carefully and avoid spillage. Spills should be absorbed with a damp paper towel immediately.
- Use test tubes that are small enough that the pipet cannot fall into the test tube.
- With students milling about, it is important to prevent horseplay in the lab—pipets should never be used by students to squirt each other. The possibility of eye or skin contact with dilute sodium hydroxide must be strictly avoided.
- Deionized water can become slightly acidic over time. Ensure that the dilute sodium hydroxide will cause the deionized water to become basic so that the phenolphthalein indicator changes color when added to the test tubes.

Discussion

At the end of the class activity, one student will have two pink solutions, a large number of students will have just one pink solution, and the rest will have no pink at all. Ask the students to explain what took place and who initially started with a sodium hydroxide solution that turned pink when the indicator was added.

In a chemical spill scenario this student spilled a chemical and did not clean the spill properly. Ask the initial student to have his or her partners stand. In the event of a chemical spill these students would have come in direct contact with residual chemical that was not properly cleaned. Ask these contaminated students to identify each student they came in contact with after they were “exposed” to the chemical spill. In a chemical spill scenario these students might have touched a contaminated notebook or borrowed a contaminated pen from the second set of students. Discuss how chemical contamination can even travel home if proper chemical cleanup and personal hygiene are not practiced in the chemistry lab.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12

Evidence, models, and explanation
Constancy, change, and measurement

Content Standards: Grades 5–8

Content Standard B: Physical Science, properties and changes of properties in matter
Content Standard F: Science in Personal and Social Perspectives, personal health

Content Standards: Grades 9–12

Content Standard B: Physical Science, chemical reactions
Content Standard F: Science in Personal and Social Perspectives, personal and community health

Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of *The Red Plague* activity, presented by Penney Sconzo, is available in *Welcome to Chemistry* and *Safe Laboratory Practices*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

Materials for *The Red Plague* are available from Flinn Scientific, Inc.

Catalog No.	Description
P0115	Phenolphthalein Indicator Solution, 0.5%, 100 mL
S0149	Sodium Hydroxide, 0.1 M, 500 mL
GP7036	Test Tubes without Rims, 13 5 100, Pkg. of 250
AP1677	Test Tube Rack, Polypropylene, Submersible
AP1444	Pipets, Thin-stem, pkg. of 500
AP2219	Stoppers, Rubber, Solid, Size 00, 1 Pound
AP1818	Rubber Bands, Medium, Pkg. of 750

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.