

Scientific Method: Color Spectrum

Recommended for Chapter(s): 1

Demo #006

Materials NOT in box

1. Safety goggles.

Procedure

1. (Prep) Put the following in the appropriate labeled beaker.

Beaker	Phenolphthalein	p-nitrophenol	thymolphthalein
1 (red)	6 drops	4 drops	
2 (orange)	1 drops	8 drops	
3 (yellow)		4 drops	
4 (green)		8 drops	2 drops
5 (blue)			4 drops
6 (violet)	6 drops		4 drops

2. Line up the beakers in numerical order in front of the class. The beakers will already have the indicators in them which will cause them to change to the different colors.
3. Ask a student to pick a beaker by the number, then ask them what color they think the solution will turn after adding the clear liquid (~0.02 M NaOH).
4. Add approximately 100 ml of the clear liquid to the beaker that they selected.
5. Repeat the process until the students realize that the order of the colors are the same as in a rainbow.
6. (Optional) Have 10 mL of 3.0 M HCl in a 1000 mL beaker. Pour all of the beakers of colored solution into the 1000 mL beaker. The solution will turn clear again.

Safety

1. Wear safety goggles.

Clean Up

1. All solutions can be poured into the waste container.
2. Return the materials to the cart in the demonstration library room.

Stockroom Notes

7. Pour the waste down the drain with plenty of water.
8. Wash and dry out the beakers. Make sure that these beakers are kept for this demonstration because they are numbered.

9. Return the beakers to the demonstration tube.
10. If needed refill any materials that have been used up. Use the following instructions to make the indicator solutions.
 - a. Phenolphthalein: 0.75 g phenolphthalein in 50 ml ethyl alcohol
 - b. p-nitrophenol: 2.5 g in 50 ml ethyl alcohol
 - c. thymophthalein: 0.75 g thymophthalein in 50 ml ethyl alcohol
 - d. ~0.02 M NaOH: Mix 1 NaOH pellet per 200 ml of DI water
11. Return items to demonstration tub.
12. Return tub to the demonstration library.
 - a. Return the goggles to the goggle box.

Discussion

This demo is used to demonstrate the scientific method. First a hypothesis is made. The hypothesis is then checked by experiment. The demonstration also reveals that scientists draw on previous knowledge (*ex.* knowing the order of colors in the rainbow) to help them draw conclusions or revise their hypothesis. You can also have them discuss what color the solution will turn with other class members. Some students will figure out the color scheme quicker than others and will convince the other student that they are right. This will simulate collaborations between scientists.

To see a video of a demo very similar to this go to

<http://www.chem.uiuc.edu/kelterdemos/demos.htm>

Click on scientific method color spectrum

If you wish you can mix all of the solutions together with a small amount of acid and the solution will turn clear again.

Materials in box

1. 6 250 ml beakers labeled 1 through 6.
2. 1000 ml beaker
3. 3.0 M HCl
4. 0.5% Phenolphthalein in dropper bottle
5. n-nitrophenol in dropper bottle
6. thymolphthalein in dropper bottle
7. ~0.02 M NaOH (make sure there is at least 700 ml)
8. Waste bottle