Catalyst Idea Exchange

Chemistry 9/10

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Source: Internet

Countertop Chemistry Experiment 24
The Witches' Potion

This demonstration shows that phenolphthalein is an acid/base indicator.

Materials	**Substitutions**
2-500 mL beaker	2 large, clear containers
4-250 mL beakers	4 tall glasses
phenolphthalein	
3 M ammonia clear	colorless household ammonia
3 M acetic acid	vinegar
water	

Procedure

1. Prepare four 250-mL beakers and label them 1-4.
   - In 1 and 3, put 5 drops of phenolphthalein.
   - In #2 and #4 put 5 drops of ammonia

   If you prepare these ahead of time, cover them to reduce evaporation.

2. In one of the large beakers, put 20 drops of vinegar. Fill the other large beaker with water.

3. Choose 5 volunteers: 4 witches and someone to read the poem.

   Read : "Four witches made quite a commotion
   When I invited them to create a potion.
   Into four glasses went the magic brew,"
   STOP

   (Fill each glass 1/4 - 1/2 full with water. All will be clear and colorless).

4. Read:
   "And into a rage the first witch flew: She shrieked,
   'There's no magic in this drink.
   To cast a spell, it must be pink!'
   The second witch laughed, 'The pink is here.
   Pour your brew in–the color will appear!'"
   STOP

   (Have Witch #1 pour her water into the glass of Witch #2. The phenolphthalein will react with the ammonia and turn bright pink, indicating the presence of a base.)

5. Read:
   "The third witch shrieked, 'We need more!'
   And gave her brew to Witch number Four."
   STOP

   (Have Witch #3 pour her water into the glass of Witch #4. The phenolphthalein will react with the ammonia and turn bright pink, indicating the presence of a

1. base).

2. Read:
"Now there are two glasses of pink,
But no one asked me what I think!
I'll invoke my powers to make it clear-
'Be Gone Pink!' 'Watch it disappear!!'"
END

(Pour both glasses with the pink solutions into the glass container with vinegar. The acid will neutralize the base and the liquid will be colorless again).

Teacher's Notes

Phenolphthalein is an indicator that turns pink in the presence of a base, but it is colorless in an acid. Because the phenolphthalein solution is made with alcohol, it will evaporate easily. You should plan to put the solutions in beakers just before the demonstration to reduce evaporation.

Disposal

The solutions can be flushed down the sink.

Chapter 8: Making an Indicator Lab

Overview:

When we think of acid-base indicators, we think of chemical compounds like litmus and phenolphthalein. However, many natural compounds are indicators. In this mini-lab, your students will make an indicator from red cabbage.

Estimated time to complete this lab: 45 minutes

Equipment:

- 6-250 mL beakers
- 6 hot plates
- 6 beaker tongs
- 2 L distilled water
- Large screw-top storage bottle
- 6 dropper bottles of 1 M HCl
- 6 dropper bottles of 1 M NaOH
- 2 red cabbages
- 12 watch glasses
- Goggles for all

About the lab:

In this lab your students will be making an acid-base indicator out of red cabbage. Frequently, this lab is followed by the question, "What do we do with this cabbage indicator when we're done with it?" If you want to do titrations or determine if a compound is acidic or basic, this indicator works well. Just because it's homemade doesn't make it less effective than other indicators. At the end of the lab, students test its color in acid (purple) and base (green/yellow).

Here are some other ideas you might want to try:

- Study the properties of the cabbage indicator. Does cabbage work effectively as an indicator for all acids and bases? (It works best for strong acids and bases). When your students have finished this lab, you can have them write up a paper characterizing cabbage extract as an indicator.

- Study the indicator properties of other dyes. Boil other vegetables and determine whether the resulting juices can be used as acid-base indicators. I've never tried this experiment, but I have the sneaking suspicion that your students would find it interesting, particularly if you admit to them that you don't know what the results will be. Kids love the act of discovery, and you might find yourself more engrossed in this lab than you thought possible.

Safety:

I'd recommend preparing your cabbage indicator in a well-ventilated room or fume hood due to its unpleasant smell. Take the normal precautions for working with NaOH and HCl ("safety", p. 30), even though the quantities are very small.

Clean up:

Due to the small quantity of waste, everything can safely go down the sink.

Source: http://misterguch.brinkster.net/17.pdf

Preparing an Indicator from Red Cabbage

Though acid-base indicators are usually man-made chemicals, the first indicators were naturally occurring compounds. It is said that this phenomenon was first discovered when a trail of ants was discovered walking over rose petals. Because some ants secrete formic acid from their feet, the red in the rose petals turned white where they walked because the red coloring is an indicator.

Procedure for making an indicator from red cabbage:

1) Pull a few leaves of red cabbage into very small chunks with your fingers.

2) Fill a 250 mL beaker halfway with the torn cabbage leaves and add water until the beaker is about two-thirds full. Place the beaker on a hot plate at medium heat.

3) You should notice that the water turns purple as the cabbage boils. When the water is very purple, remove the beaker from the heat with beaker tongs and let cool. The purple juice you made is an acid-base indicator!

4) To find the color of your indicator in acid, add one drop of indicator to one drop of 1 M hydrochloric acid in a watch glass.

    Record the color of the indicator in acid ____________________

5) To find the color of your indicator in a base, add one drop of indicator to one drop of 1 M NaOH in a watch glass.

    Record the color of the indicator in base ____________________

Chapter 16: Chemistry Races

Chemistry class isn't all labs and fun activities. Sometimes students have to buckle down and do a worksheet. Typically, neither students nor teachers find worksheets to be the most exciting activity in the world.

If you can't get away from doing worksheets, you can at least put a new face on them. Instead of giving your students another page of problems, have them do a race! All of a sudden, a boring activity is an exciting contest! Maybe they'll even win!

To make a chemistry race, give a regular worksheet a title like "Molar Mass Race" so your students know it's something new and different. Though they are not actually doing anything more exciting than usual, it will feel exciting to them. A sample race is on page 64.

The rules for running these races are simple. Divide the students into groups of three. The first group of students to correctly answer all of the questions is the winner. It never hurts to give a token amount of extra credit to the students who win as an incentive. Though you might think only one student in each group will actively work, I've found that even students who aren't good with calculations pitch in, solving the easier problems while mathematically-inclined students solve the harder ones.

Some pieces of advice about chemistry races:

- Don't check to see if the answers are correct every time they solve a problem. It's best if you can check the answers every three problems or so for long problems (stoichiometry) or just once for very short problems (molar masses). If the students have answered a problem incorrectly, don't tell them which one. The uncertainty will cause them to reexamine how they think about solving problems.
- Even if it's not true, shout out encouraging comments that suggest a close race. It adds to the excitement and is a good motivator.
- Be enthusiastic! The races really are kind of fun, even if they are just reformatted worksheets.

Answer key for the sample formula writing race (page 64):

1) $CuCl_2$
2) $NaC_2H_3O_2$
3) $ZnCl_2$
4) N_2O_3
5) MgO
6) $Mn(SO_4)_2$
7) Fe_3N_2
8) $GaAs$
9) F_2
10) $V_3(PO_4)_5$
11) CCl_4
12) $AgNO_3$
13) NH_3
14) $Ca(OH)_2$
15) $Co(NO_2)_3$
16) CH_4

Formula Writing Race

In this activity, your group will be competing against the rest of the class to determine who the champion formula writers are.

Here's how it works: Your group should come up with chemical formulas for the sixteen compounds below. After the first eight questions, bring your paper up for grading. If you have answered all eight correctly, you may move on to the next eight. If you have any incorrect answers, you will be told to go back and try again. You will be informed of how many problems you've missed, but not which ones. The winners of the race will earn extra credit.

1) copper (II) chloride ____________________

2) sodium acetate ____________________

3) zinc chloride ____________________

4) dinitrogen trioxide ____________________

5) magnesium oxide ____________________

6) manganese (IV) sulfate ____________________

7) iron (II) nitride ____________________

8) gallium arsenide ____________________

9) fluorine ____________________

10) vanadium (V) phosphate ____________________

11) carbon tetrachloride ____________________

12) silver nitrate ____________________

13) ammonia ____________________

14) calcium hydroxide ____________________

15) cobalt (III) nitrite ____________________

16) methane ____________________