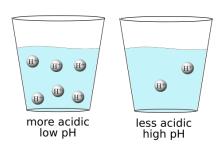
pH Indicators and Titration

- Acids are chemicals that like to drop hydrogen ions (H+) when dissolved in water.
- Bases are chemicals that grab extra hydrogen ions (H+) out of solution.
- The **pH** of a solution measures how many H+ ions
 - Low pH (below 7) means acidic (lots of H+ ions).
 - High pH (above 7) means basic (few H+ ions)
- A pH indicator turns different colors depending on the pH of the solution.



Part 1: pH Indicator

1. Put <u>2 teaspoons</u> of the purple cabbage juice into each of 6 wells in the egg carton.

2. Add <u>1 teaspoon</u> of each of the substances in the table below, one per well. Fill in the table with the color observed, and your best estimate of of the pH.



Substance	Color	pH estimate
water		
vinegar		
Baking soda ($\frac{1}{4}$ teaspoon)		
Lemon juice		
Sprite or 7-up		
Windex		

List the substances from most acidic to most basic:

Part 2: Measuring pH with Titration

- Mixing an acid with a base can neutralize them both the base soaks up the extra
 ions from the acid.
- Titration is used to precisely measure and compare pH.
- A titration involves making a basic solution with a pH indicator mixed in, then slowly adding an acid of unknown pH until the solution changes color. The stronger the unknown acid, the less of it you have to add to get to neutral.
- 1. Put 3 teaspoons of purple cabbage juice into each of 2 clean wells. Add 1 teaspoon of Windex to the 1^{st} well and mix.

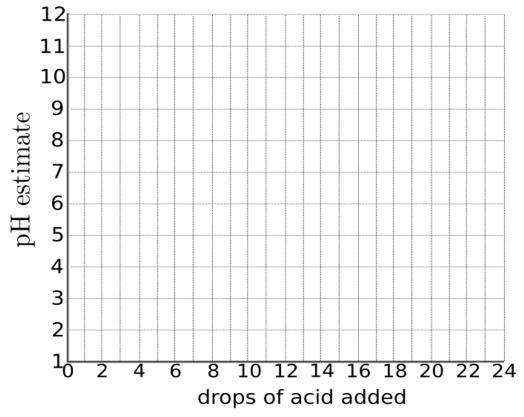
The 2^{nd} well will be your "negative control". It lets you see the color of the indicator when nothing is added, for comparison.

2. Suck up some vinegar in a pipette. Start adding the juice slowly, one drop at a time to Well #1. Use a clean spoon to <u>stir after each drop</u> you add. <u>Count the drops you add.</u> Whenever you notice the color changes enough to correspond to a different pH, write down the number of drops added and the color. Stop when you get to 20 drops.

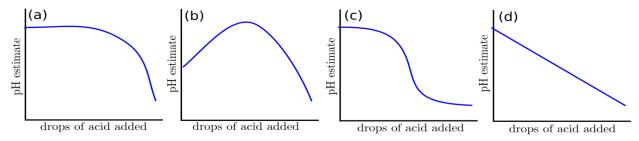
Vinegar titration

# drops added	pH estimate	# drops added	pH estimate
0			

3. Use the data in your table to plot points on the graph below. Connect them with straight lines.



Which of the following looks most like your graph?



Approximately how many drops of vinegar did you need to get a neutral solution?

4. If you have extra time: make another well with 3 teaspoons of cabbage juice + 1 teaspoon of Windex. Repeat the titration, one drop at a time, with lemon juice. Plot on the same graph above.

Approximately how many drops of lemon juice did you need to get a neutral solution?

Which of your substances is more acidic (circle one): vinegar lemon juice