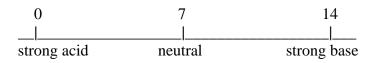
# **CHEMISTRY LAB:** pH Testing

WHAT TO TURN IN:	Data Table (	Questions # 1-15

#### Introduction

pH is the measure of the acidic or basic (alkaline) qualities of a substance. The pH range is as follows:

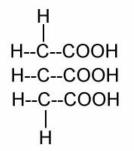


Acids are generally sour, and bases are generally slippery and bitter. Both acid and base solutions (water mixtures) of high concentration can be harmful if not handled properly. Neutral substances are neither acid nor base.

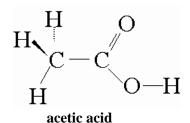
You will be using indicator papers and indicator dyes. Color changes will be noted and generalizations can be made as to the pH of the substances.

In this lab, you will be testing these substances to estimate their pH:

- 1) NaOH (aq)
- 2) HCl (aq)
- 3)  $HC_2H_3O_2$  or  $CH_3COOH$  (aq)
- 4)  $NH_4OH(aq)$  ammonia solution
- 5)  $C_6H_8O_7$  (aq) citric acid, in lemon juice (see diagram below)
- 6) NaHCO<sub>3</sub> (aq) baking soda solution
- (NOTE:  $HCO_3^- \rightarrow CO_2 + OH^-$ )
- 7) tap water, from the sink



citric acid (bond angles not correct)



**Purpose:** write one! (see question #1)

#### **Materials**

Safety glasses Spot plate Dropper bottles containing a variety of indicator dyes Solutions of NaOH, HCl, and HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub> Forceps Distilled water Paper towels

## Procedure

- 1) One person in the lab group must make sure his or her hands are clean and dry. That person should obtain a piece of red litmus paper, blue litmus paper, and wide-range pH paper.
- 2) The papers should be gently torn into three pieces each.
- 3) Obtain a spot plate. If it is clear, place it on top of a clean white sheet of paper. The spot plate should be clean and dry.
- 4) Add one drop of solution and one drop of indicator to a spot plate depression.
- 5) Observe color changes, if any, and write the colors in the data table.
- 6) If you run out of spaces on the spot plate, clean the spot plate thoroughly and rinse with distilled water before re-using. *Do not dump the pieces of indicator paper in the sink. Fish them out of the depression with forceps and deposit them in the trash.*

### Questions

- 1) What is the purpose of this lab?
- 2) What is pH? How does it apply to this lab?
- 3) Which of the test solutions used were acids? Name them and give the formulas.
- 4) Which of the test solutions used were bases? Name them and give the formulas.
- For #5-7, use this format for acid and base dissociation:  $HA \rightarrow H^+ + A^- = BOH \rightarrow B^+ + OH^-$ 
  - 5) Write the equation for the dissociation of NaOH in water.
  - 6) Write the equation for the dissociation of HCl in water.
  - 7) Write the equation for the dissociation of  $HC_2H_3O_2$  in water.
  - 8) How can you tell if a chemical formula could be an acid just by looking at it?
  - 9) How can you tell if a chemical formula could be a base just by looking at it?
  - 10) What advantage does "wide-range" pH paper have over blue or red litmus paper?
  - 11) Using your data from the wide-range pH paper, what are the approximate pHs of the test solutions?
  - 12) Now that you have completed the lab activity, explain WHEN (not WHY) red litmus paper changes color.
  - 13) Distilled water is neutral. Considering the formula of water is  $H_2O$  or HOH, why does this make sense?
  - 14) Why does "acid rain" cause problems for the environment?
  - 15) Were there any results that surprised you or any member of your lab group? Explain.

DATA TABLE: COLORS OF SOLUTIONS WITH INDICATORS								
	NaOH	HCl	HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	NH <sub>4</sub> OH	C <sub>6</sub> H <sub>8</sub> O <sub>7</sub>	NaHCO <sub>3</sub>	H <sub>2</sub> O	
Blue litmus paper								
Red litmus paper								
Wide- range pH paper		Color: pH #:	Color: pH #:	Color: pH #:	Color: pH #:	Color: pH #:	Color: pH #:	
Alizarin Yellow								
Bromo- thymol Blue								
Bromo- crescol Green								
Congo Red								
Methyl Red								
Orange IV								
PHTH (phenol- phthalein)								