

Acid Base Color Chase Lab name: _____ (40/1200)

Chemists discovered that certain solutions are acids while some are bases. They also discovered chemicals that will change colors in the presence of an acid or base. These chemicals are called acid base indicators. We need to recognize the indicators listed in Table M of the reference tables.

Pure water is neither acid or base, it is said to be NEUTRAL. The number of hydrogen ions is very small, and exactly balanced by the few hydroxide ions that dissociate. The scale that measures acids and bases is called the pH scale. Water has a pH of 7.0 exactly. Acids have a pH value less than 7.0 while bases have a pH higher than 7.0. The scale runs from ZERO (very strong acids) to 14 (very strong bases).

Each whole number change in pH amounts to a 10X change in the hydrogen ion concentration since pH is an exponential scale. Acids with a pH of 2.0 are 10X than acids of pH 3.0. Each jump in a whole number of pH is a TEN TIMES in strength change in strength. For example: a pH of 5.5 is 10X less acidic than an acid with a pH of 4.5.

Indicators will be different colors in solutions of different pH. They will allow us to get a qualitative measure of acid/base strength. Let's examine some of these and how they might react in acid or base solutions.

PROCEDURE:

1. Tap water in our school runs about 6.0 pH, so we will only use the deionized water. Obtain about 60 mL deionized water in a clean beaker. Put about 10 mL of the water into a second, smaller beaker.
2. Observe the water, and in the chart, write what color you see (it's clear silly). Follow the directions in order. For each step, write the color changes you see.
3. You must do each step in order. Each trial has a different order, pay attention!
4. The acid we are using is VERY STRONG hydrochloric acid (6.0 Molar). The base is also very strong 6.0 M. DO NOT SPILL THIS ON YOUR SKIN!
5. Goggles at ALL TIMES, and only use 1-2 drops at a time of acid or base.
6. You can do these FIVE TRIALS in any order, each is separate from the other.
7. Use colors from table M, don't imagine you see "fuchsia" or any colors NOT listed on table M. Red may be light red but do not call it something funky.

TRIAL ONE Water plus METHYL ORANGE Indicator		
Step	Add to Beaker	color
1	10 mL deionized water	
2	Add 2 drops of METHYL ORANGE indicator	
3	Add 1-2 drops HCl - ACID	
4	Add 2-3 drops NaOH - BASE	
	repeat acid and base AGAIN	Rinse out reaction beaker

TRIAL TWO Water plus PHENOLPHTHALEIN Indicator		
Step	Add to Beaker	color
1	Water only	colorless
2	add 2 drops PHENOLPHTHALEIN indicator	
3	Add 1-2 drops NaOH - BASE	
4	Add 2-3 drops HCl - ACID	
	repeat and add base again, then acid again	rinse

TRIAL THREE Water plus BROMTHYMOL BLUE Indicator		
Step	Add to Beaker	color
1	Water only	colorless
2	add 3 drops BROMTHYMOL BLUE indicator	
3	Add 2 drops NaOH - BASE	
4	Add 2-3 drops HCL - ACID	
	repeat add base then acid again	Rinse, smile

TRIAL FOUR Water plus BROMCRESOL GREEN Indicator		
Step	Add to Beaker	color
1	Water only	colorless
2	Add 2 drops BROMCRESOL GREEN indicator	
3	Add 1- 2 drops HCl - ACID	
4	Add 2-3 drops NaOH - BASE	
	repeat with acid, then base again	Rinse, smile

TRIAL FIVE Water plus Litmus Indicator		
Step	Add to Beaker	color
1	Water only	colorless
2	Add 2 drops litmus indicator	
3	Add 1- 2 drops acid	
4	Add 2-3 drops base	
	repeat	Rinse, smile

Color Chase Lab Questions, do on these pages. (NO conclusion necessary)

A. Of what use or purpose are acid base indicators? Explain in 2-3 sentences.

B. For each of these solution-indicator combinations, tell which color should be, use your Table M and **page 584** in the text book to do this.

number	solution	indicator	color
example	black coffee	methyl orange	yellow
1	HCl, pH = 1.0	methyl orange	
2	ammonia	phenolphthalein	
3	vinegar	phenolphthalein	
4	lemon juice	litmus	
5	NaOH, pH = 13.5	litmus	
6	black coffee	bromthymol blue	
7	milk	thymol blue	
8	0.2 Molar NaOH	thymol blue	
9	pure water	phenolphthalein	
10	pure water	thymol blue	

For each of these solutions listed, label each on as: acid (A), base (B), or neutral (N).
DO NOT GUESS, look the pH up!

- ___gastric juices ___milk ___ammonia ___black coffee ___tomato juice
 ___ orange juice ___extremely weak sodium hydroxide ___sugar water
 ___ocean water ___aqueous calcium hydroxide ___vinegar ___blood
 ___1.0 M HCl ___12.0 M NaOH ___lemon juice ___Alka Seltzer
 ___TUMS ___pure water ___pineapple juice ___diet coke

For each full number change in pH, there is a 10X change in strength because the pH scale is a logarithmic scale. An acid with a pH of 2.0 is TEN TIMES stronger than an acid with a pH of 3.0.

A base of pH 8.5 is 10X LESS BASIC than a base with pH = 9.5

An acid of pH 1.0 is 1000X more acidic than an acid of pH = 4.0

Fill in this chart	solution 1 pH	solution 2 pH	#1 is ____ X more ____ than #2
example A	3.7	4.7	#1 is <i>10X more acidic than</i> #2
example B	9.3	12.3	#1 is <i>1000X less basic than</i> #2
2	1.0	3.0	#1 is _____ than #2
3	1.9	5.9	#1 is _____ than #2
4	7.5	12.5	#1 is _____ than #2
5	10.8	12.8	#1 is _____ than #2
6	7.1	11.1	#1 is _____ than #2
7	11.1	9.1	#1 is _____ than #2
8	0.5	6.5	#1 is _____ than #2