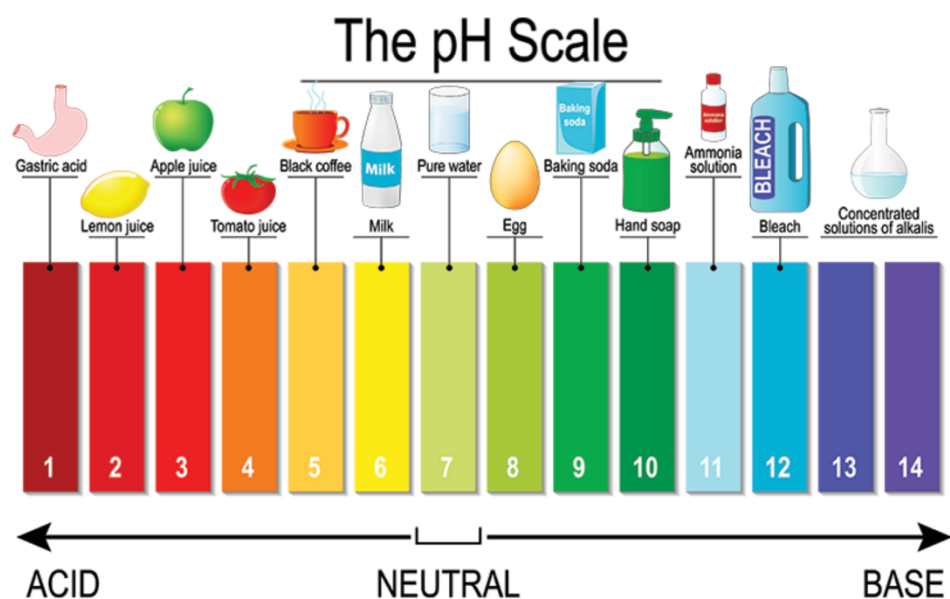


Unit 4: Solutions and solubility

Lesson 5: Arrhenius Acids and Bases (Chapter 10.1 – 10.2)



The Arrhenius Theory of Acids and Bases

- Acid: a substance that dissociates in water to produce hydrogen ions (H^+)
Example: HCl , H_2SO_4 , Carbonated drinks
- Base: A substance dissolved in water to produce hydroxide ions (OH^-)
Example: $NaOH$, $Ca(OH)_2$, baking soda

Properties of Acids:

1. Sour taste
2. Changes the colour of litmus paper from blue to red
3. Reacts with:
 - Metal, such as Zinc and Magnesium to produce hydrogen gas
 - Strong bases to produce water and an ionic compound
 - Carbonate salt, such as $CaCO_3$ to produce carbon dioxide
1. Conduct electricity when dissolved in water (electrolytes)

Examples of acids: Lemon juice, vitamins C (ascorbic acid), vinegar (acetic acid), hydrochloric acid

Properties of Bases:

1. Bitter taste
2. Slippery, soapy feel
3. Changes the colour of litmus paper from red to blue
4. React with acid to produce salt and water



Examples of bases: Ammonia, milk of Magnesia $\text{Mg}(\text{OH})_2$, sodium hydroxide

Acid-Base Indicators

- An indicator is a substance that changes colour depending on whether it is in an acidic or basic solution.

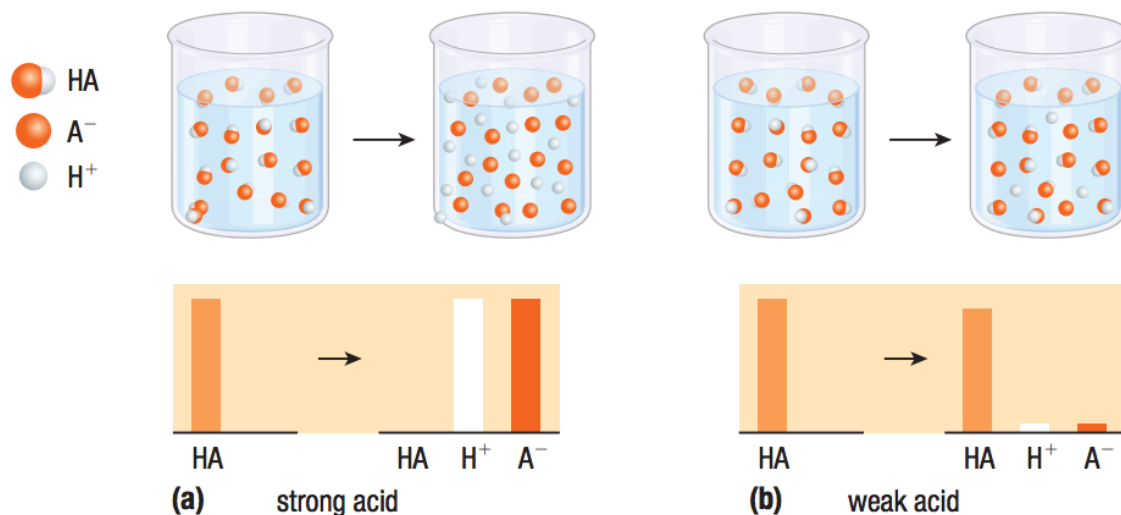
Indicator	Colour in acid (pH < 7)	Colour at pH = 7	Colour in base (pH > 7)
Red cabbage water	red, pink	purple	blue, green, yellow
Red onion water	red	violet	green
Turmeric water	yellow	yellow	red
Phenolphthalein	colourless	colourless	pink, red
Bromothymol blue	yellow	green	blue
Red litmus	red	red	blue
Blue litmus	red	blue	blue
Universal indicator	red, orange, yellow	green	Blue, violet, purple

Strong vs. Weak Acids:

The strength of an acid refers to its ability to ionize in solution

- Strong acids is an acid that ionizes completely in water
- The concentration of hydrogen ions is equal to the concentration to the acid
- Remember the 6 strong acids: _____.
- Weak acid is an acid that ionizes very slightly (partially) in water.

- The concentration of hydrogen ions is always less than the concentration of the dissolved acid.
- Some examples of weak acids are: CH_3COOH (acetic acid), HCN (hydrocyanic acid), H_3PO_3 (phosphoric acid)



Strong vs. Weak Bases

- Strong base is a base that dissociates hydroxide ions in water
- the concentration of hydroxide ions is equal to the concentration of the base
- some common strong bases are: _____.
- weak base is a base that produces relatively few hydroxide ions in water. Only small number of particles dissociate in water.
- Some examples of weak acids are: NH_3 , Na_2CO_3 , $NaCN$, etc...

6 Strong Acids		6 Strong Bases	
HClO ₄	perchloric acid	LiOH	lithium hydroxide
HCl	hydrochloric acid	NaOH	sodium hydroxide
HBr	hydrobromic acid	KOH	potassium hydroxide
HI	hydroiodic acid	Ca(OH) ₂	calcium hydroxide
HNO ₃	nitric acid	Sr(OH) ₂	strontium hydroxide
H ₂ SO ₄	sulfuric acid	Ba(OH) ₂	barium hydroxide

Strong and Weak vs. Concentrated and Dilute

- Strong and weak refer to the ionization or dissociation of particles in water
- Concentrated and dilute refer to the amount of solute in a solvent.

Homework 10.1 – 10.2:

pg469. #2, 3, 4, 6, 7, 8

pg475. #1, 4, 5, 6, 8, 9, 10, 11, 12

Unit 4: Solutions and solubility

Lesson 6: Acid-Base Titration

Part I: Acid-Base Stoichiometry

Example 1: What volume of 1.5 M sulfuric acid is required to neutralize 45 mL of 0.50 M NaOH?

Example 2: 13.2 mL of 0.125 M H_3PO_4 was used to neutralize 15.2 mL of $\text{Ca}(\text{OH})_2$. What is the concentration of the $\text{Ca}(\text{OH})_2$?

Example 3: Stomach acid, HCl, has a concentration of approximately 0.10M. What volume of stomach acid can be neutralized by taking an antacid tablet that contains 100.0 mg of aluminum hydroxide?

Part II: Acid-Base Titration