Name _____

Neutralization

I. Reactions Between Acids & Bases

1. **Define the term neutralization reaction.**

   Neutralization Reaction - reaction in which an acid and a base in an aqueous solution react to produce a salt and water (double-replacement reaction)

2. **A** Salt **is an ionic compound made up of cation from a base and an anion from an acid.**

3. **Identify the acid, base, salt, and water in the following equations.**

   * Know whether all reactants + products in solution are compounds or formula units.

   $Mg(OH)_2 + 2HCl \longrightarrow MgCl_2 + 2H_2O$

   Base Acid Salt Water

   $HCl + NaOH \longrightarrow NaCl + 2H_2O$

   Acid Base Salt Water

4. **Define the term titration.**

   Titration - method for determining the concentration of a solution by reacting a known volume of that solution with a solution of known concentration

5. **To determine the concentration of an acid solution, you would titrate the acid solution with the solution of a base of** Known **concentration.**

6. **To determine the concentration of an base solution, you would titrate the base solution with the solution of an acid of** Known **concentration.**

7. **Define the term equivalence point.**

   Equivalence Point - point at which moles of H^+ ions from the acid equal moles of OH^- ions from the base

8. **The equivalence point for all solutions is 7.0.**

   Circle One : True (False)

9. **Identify the three main steps of the titration process.**

   * Use pH meter to monitor changes

   1. Measured volume of an acidic or basic solution of unknown concentration placed in beaker (initial pH recorded with pH meter)
   2. Buret (graduated tube) is filled with titrating solution of known concentration (called the titrant)
   3. Measured volumes of standard solution added slowly and mixed into beaker solution (pH recorded with pH meter until equivalence point attained)

Name _____

10. Define the term acid-base indicators.

* Many are weak acids.

Acid-Base Indicators - chemical dyes whose colors are affected by acidic or basic solutions (often used rather than pH meter to determine equivalence point)

11. List twelve common types of acid-base indicators and their pH range.

Congo Red (3.0-5.2)

1. Crystal Violet (0.0-1.8)
2. Cresol Red (0.2-8.8)
3. Thymol Blue (1.2-9.6)
4. Methyl Orange (3.2-4.4)
5. Bromcresol Green (3.8-5.4)
6. Methyl Red (4.8-6.0)
7. Alizarin (4.6-6.0)
8. Bromthymol Blue (6.0-7.6)
9. Phenol Red (6.8-8.4)
10. Phenolphthalein (8.2-10.0)
11. Thymolphthalein (8.8-10.5)
12. Universal Indicator (0.8-12.3)

12. Why is it important to choose an appropriate indicator to determine an end point?

- In order to find an indicator that will change color at the equivalence point of titration (and therefore neutralization)

II. Buffered Solutions

1. Define the term buffer.

Buffer - solutions that resist changes in pH when limited amounts of acid or base are added

2. Describe how buffers operate in solutions to avoid neutralization.

1. Buffer is a mixture of a weak acid and its conjugate base or a weak base and conjugate acid.
2. Mixture of ions + molecules in buffer solution resists changes in pH by reacting with H^+ ions or OH^- ions added to solution

3. List the three major buffer systems of the human body.

Maintain proper pH in body for biochemical processes.

1. Carbonic Acid-Bicarbonate Buffer (Blood, Gastric Acids)
2. Phosphate Buffer System (Cellular Fluids)
3. Protein Buffer System (Maintain cellular acidity)

4. Adding an acid to a buffered solution causes equilibrium to shift to the left **and adding a base to a buffered solution causes equilibrium to shift to the** right

5. The amount of acid or base a buffer solution can absorb without a significant change in pH is known as buffer capacity.