**Vocabulary**

For each word, provide a short but specific definition from YOUR OWN BRAIN! No boring textbook definitions. Write something to help you remember the word. Explain the word as if you were explaining it to an elementary school student. Give an example if you can. Don’t use the words given in your definition!

Acid: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Base: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Salt: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Electrolyte: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Molarity: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Neutralization: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Titration: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

End Point: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Amphoteric: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Video 11.1 Acids and Bases**

* Behavior of many acids and bases can be explained by the Arrhenius theory. Arrhenius acid and bases are electrolytes.
* An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is a substance which, when dissolved in water, forms a solution capable of conducting an electric current. The ability of a solution to conduct an electric current depends on the concentration of ions.
* Arrhenius acids yield \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as the only positive ion in an aqueous solution. The hydrogen ion may also be written as H3O+ (aq), hydronium ion.
* Arrhenius bases yield \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_as the only negative ion in an aqueous solution.

*1. Properties of acids*: 1. Contain the \_\_\_\_\_\_\_\_ ion *Bases:* 1. Contain the \_\_\_\_\_\_ ion

2. Tastes\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. Tastes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. pH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 3. pH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Found on Table \_\_\_\_\_ 4. Found on table \_\_\_\_

2. Acids and Bases are known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because when dissolved they conducted electricity.

3. Neutralization reactions involved acids and bases that react to form a salt and \_\_\_\_\_\_\_\_\_\_\_.

4. Label the following as an acid, base, or salt. Then name the compound (don’t forget your tables!):

HCl NaOH HBr NaI

HF LiOH NH3 H2SO4

CaS Ca(OH)2 H2SO3 CH3COOH

HNO3 H3PO4 LiBr H2CO3

5. In the following neutralization reactions, predict the salt formed. (Remember it is just a double replacement reaction- but check your ions. Drop and swap!) Then balance your reaction if necessary.

NaOH + HCl 🡪 H2O + \_\_\_\_\_\_\_\_\_\_ Ca(OH)2  + HI 🡪 H2O + \_\_\_\_\_\_\_\_\_\_

KOH + HF 🡪 H2O + \_\_\_\_\_\_\_\_\_\_ Mg(OH)2 + H2CO3 🡪 H2O + \_\_\_\_\_\_\_\_\_\_

LiOH + H2SO4 🡪 H2O + \_\_\_\_\_\_\_\_\_\_ LiOH + HNO3  🡪 H2O + \_\_\_\_\_\_\_\_\_\_

**Video 11.2 Alternate Acid Base Theory**

* There are alternate acid-base theories. One theory states that an acid is an H+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and a base is an H+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. The alternate theory has an acronym BAAD. What does it stand for?
2. Acids and bases are said to exchange H+ ion or protons. Explain why these are actually the same thing.
3. Which of the following are amphiprotic? (There may be more than one answer)
   1. H3PO4 b. H2PO4- c. HPO4-2 d. PO4-3
4. Explain the difference in strength versus concentration using the examples 12M acetic acid (vinegar) and 0.12M HCl (stomach acid).

HCl(aq) + H2O (l) 🡪 H3O+(aq) + Cl-(aq) (1)

HCl(aq) + NH3(aq) 🡪 NH4+(aq) + Cl-(aq) (2)

NH4+(aq) + OH-(aq) 🡪 NH3(aq) + H2O (l) (3)

H2PO4(aq) + H2O (l) 🡪 HPO42-(aq) + H3O+(aq) (4)

1. In the reactions above, list the acids in the first half of the equation and explain what they all have in common.
2. In the reactions, list the bases in the first half of the equation and explain what they all have in common.
3. If you reverse the equations, list the new acids and bases.

**Acids: Bases**:

1. Now you can see, that each acid on the left hand side produces a corresponding base on the right hand side. The base is called the **conjugate base**. Similarly, a base on the right hand side will produce a **conjugate acid**. These pairs are known as **conjugate acid-base pairs**. List the conjugate acid-base pairs for equations (1) and (2).
2. Is HPO42- and acid or a base? Explain.

10. Write the acid-base reaction for NH3 reacting with HNO2 and identify the acid, the base, the conjugate acid and the conjugate base.

**Video 11.3 pH and Indicators**

* The acidity or alkalinity of a solution can be measured by its \_\_\_\_\_ value. The relative level of acidity or

alkalinity of a solution can be shown by using indicators.

* On the pH scale, each decrease of one unit of pH represents a tenfold increase in hydronium ion

Concentration.

Directions: For each indicator, color or record in the color it will be at each pH value.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Methyl orange |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bromothymol blue |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| phenolphthalein |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| litmus |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bromocrescol green |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Thymol blue |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

1. If KOH is tested with litmus paper, what color will it be?
2. At what pH will thymol blue turn yellow?
3. What type of solution will turn methyl orange, yellow?
4. At what pH will both methyl orange turn yellow and litmus turn red?
5. Why won’t thymol blue be good at determining the difference between an acid and a base?
6. Which indicator is the best to test the difference between a strong and weak acid?
7. What color change will be seen if NaOH is added to HCl with bromocresol green?
8. What color change will be seen if nitric acid is added to lithium hydroxide using methyl orange?
9. What is the pH range for all acids? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Bases? \_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. An acid is added to a solution with a pH of 6.0 and the hydronium concentration increased by 1000 times. What is the new pH?
11. A base is added to a solution with a pH of 8.0 and the hydronium concentration decreased by 10 times. What is the new pH?

**Video 11.4 Titrations**

* In the process of neutralization, an Arrhenius acid and an Arrhenius base react to form a \_\_\_\_\_\_\_\_\_\_\_\_\_\_and water.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a laboratory process in which a volume of solution of known concentration is used to determine the concentration of another solution.

1. Describe neutralization in terms of acids, bases, and salts.
2. What happens to the pH during a standard titration?
3. What is the formula for a titration question?
4. What is the molarity of NaOH if 250.mL of 2.00M HCl is titrated with 400.mL of NaOH?
5. What is the molarity of 300.0mL HCl if it is neutralized by 150mL of 3.0M NaOH?
6. What is the molarity of a solution of LiOH if 0.825L of it is titrated with 0.250mL of 4.5M H2SO4?