**Acids and Bases Notes:**

**General Properties of Acids**

1. **Sour Taste**
2. **Acids at H react with metal 🡪 H2 gas + salt**
3. **🡪 color change in acid base indicator**
4. **Turn blue litmus red**
5. **Acid + base 🡪 H2O + salt**
6. **Acids are electrolytes**
7. **Strong acid 100% ionized v.s. weak (not 100 % ionized)**
8. **Naming of Acids for Binary and Ternary (Oxyacids)**
9. **Strong Acids Binary EX. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**or Oxyacids have 2 or more Oxygens than Hydrogens in the formula Examples: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Weak acids are: HF and Organic Acids Ex. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. **Mineral acids contain no carbon e.g. N, P, S, F**
3. **Types of Acids,**
	1. **Arrhenius, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	2. **Bronsted Lowry, \_\_\_\_\_\_\_donor\_\_\_\_\_\_\_\_\_\_**
	3. **Lewis \_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. **Types of Acids, give examples**
	1. **Polyprotic \_\_\_\_\_\_\_\_\_\_\_**
	2. **Monoprotic \_\_\_\_\_\_\_\_\_\_**
	3. **Diprotic \_\_\_\_\_\_\_\_\_\_**
	4. **Triprotic \_\_\_\_\_\_\_\_\_\_**
* **Acids in water**
* **Hydrochloric acid + water 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **Acetic acid in water  \_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**General Properties of Bases**

1. **Bitter Taste**
2. **Slippery**
3. **Change color of an acid base indicator**
4. **Turn red litmus blue**
5. **Bases are electrolytes**
6. **Bases react with Acids 🡪 H2O + salt**
7. **Ammonia, Potassium Hydroxide and amines (CH3NH2) are examples**
8. **Types of Bases, Arrhenius, Bronsted-Lowry, Lewis**
	1. **Arrhenius, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	2. **Bronsted Lowry, \_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	3. **Lewis \_\_\_\_\_\_\_\_\_\_\_\_\_\_**
9. **Strong Bases are from Group IA Ex. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
10. **Weak bases all others**
	1. **Metal hydroxides, Ex. \_\_\_\_\_\_\_\_\_\_\_\_**
	2. **Amines, Ex. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **Bases in water**
* **Ex.**
* **Sodium hydroxide + water** 🡪**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **Ammonia + water** 🡪**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **Methylamine + water** 🡪**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Bronsted-Lowry Acids and Bases**

**Ex.**

1. **Hydrochloric acid + water 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. **Ammonia + water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. **Sulfurous Acid + water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. **Phosphoric Acid + water 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
5. **Phosphorous Acid + water** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
6. **Sulfurous Acid + water** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
7. **Aluminum hydroxide + water** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
8. **Neutralization Reactions:**
9. Process in which an acid and a base cancel or neutralize each other's properties

- Example: HCl + NaOH 🡪 NaCl + H2O

1. Written in ionic form:

H+ (aq) + Cl- (aq) + Na+ (aq) + OH- (aq) 🡪

 Na+ (aq) + Cl- (aq) + H2O (l)

1. In neutralization, the H+1 from the acid and the OH-1 from the base combine to produce water. The positive ion from the base and the negative ion from the acid remain spectator ions in solution. Evaporating the water would produce the crystallized salt.

H+ (aq) + OH- (aq) 🡪 H2O (l)

 (acid) (base) (water)

**Ex.**

**Sodium Hydroxide + Hydrobromic Acid 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Net Ionic**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lithium Hydroxide + Hydroiodic Acid 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Net Ionic**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Ammonia + Hydrobromic Acid 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Net Ionic**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**SALTS**

PROPERTIES

* Salts consist of any + ion (except H+) and any - ion (except OH-)
* There are thousands of salts possible
* There are no "general characteristics" of salts; some are very soluble in water, others are very insoluble in water
* Some ions in salts may have a characteristic color:

Cu+1, Cu+2 blue CrO4-2 yellow

Ni+2 green Cr2O7-2 orange

Fe+3 brown I-1 purple/brown

Hg+1 orange

Salts are named by saying the positive ion first (usually a metal) followed by the negative ion(may be a nonmetal or a polyatomic ion**Hydroxides and Oxides (binary compound with oxygen)**

**I. Basic Anhydride (basic oxide) reacts with water 🡪 alkaline solution**

**Ex. Sodium Oxide + water 🡪aqueous hydroxide**

**II. Acid Anhydride: Oxide reacts with water 🡪 Acid**

**Ex:**

**Sulfur Dioxide + water 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_**

**Sulfur Trioxide + water 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Vocabulary**

**Amphoteric \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Acid Anhydride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Ex. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Basic Anhydride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Chemical Reactions:**

1. **Acids + Metals**
	1. **Zinc + Sulfuric acid🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	2. **Magnesium + Nitric acid 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. **Acids with Metal Oxides**
	1. **Copper (II) oxide + Sulfuric Acid 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. **Acids with Carbonates**
	1. **Calcium Carbonate 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. **Hydroxide with nonmetal oxides**
	1. **Carbon Dioxide + Lithium hydroxide 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
5. **Metal Oxide with nonmetal oxides, no water, dry compounds**
	1. **Magnesium Oxide + Carbon Dioxide 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Next notes from C. 16**









**DETERMINING WEAK FROM STRONG BY FORMULA**

* **Acids:**

Binary: HCl, HBr HI strong all others weak

Ternary: the number of Oxygen atoms exceeds number of H atoms by 2 or more, the acid is strong

Polyprotic acids: donate more than one proton – 2nd and 3rd are always weak e.g. H2SO4 and H3PO4

* **Bases**: hydroxides of IA and IIA are strong (except Be), all others are weak

pH = -log [H3O+]

pOH = -log [OH-]

pKw = pH + pOH

# Titration: MaVa = MbVb

Quantity of one reactant is compared to quantity of another

**Neutralization** reaction: acid + base = water + salt

**Equivalence point** the quantities of acid and base are exactly equal

**Indicators**: dyes that indicate when equivalence point is reached (they are a weak acid or a base)

Hydrolysis

The reaction of a salt with water to produce an acidic or basic or neutral solution

1. If salt is derived from strong acid and strong base, the solution is neutral pH=7, ex: NaCl
2. If salt is derived from weak acid and a strong base, the solution is a base pH > 7, ex: sodium acetate
3. If salt is derived from strong acid and weak base, the solution is an acid pH < 7, ex: ammonium bromide

**Chapter 16**

1. Self-Ionization of water Reaction \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. pH of acid solution \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. pH of basic solution \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. pH of neutral solution \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Define pH scale \_\_\_\_\_\_\_\_\_
6. Define pH (equation) \_\_\_\_\_\_\_\_\_
7. Define pOH (equation) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Using Table 16-3, list 2 acidic substances \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Using Table 16-3, list 2 basic substances \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Calculate pH of a solution of 0.001 M HCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. Calculate pOH of a solution of 0.001 M HCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. Calculate pH of a solution of 0.001 M KOH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
13. Calculate pOH of a solution of 0.001 M KOH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
14. Calculate pH of a solution of 0.0025 M HCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
15. Calculate pOH of a solution of 0.0025 M HCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
16. Calculate pH of a solution of 0.0045 M KOH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
17. Calculate pOH of a solution of 0.0045 M KOH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
18. Define Acid Base Indicator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
19. 2 examples of Define Acid Base Indicators \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
20. pH meter is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
21. Equivalence point is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
22. End point \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
23. Titration is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
24. Determine the Molarity of an unknown acid, if 25.00 ml of it is titrated to its endpoint with 62.5 ml of 0.15 M NaOH. Show calculation. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
25. Draw and label titration curve for strong acid/strong base

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 ml of 0.15 M NaOH

Draw and label titration curve for weak acid/strong base
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 ml of 0.15 M NaOH