**Acid/Base Unit 8A**

***Notes Unit 8A***

* All acids have H+ ions ion common
* All bases have the OH- ion in common
* All salts have formulas: Non-metals and Non-metals
* All other compounds have formulas: organics
* Organic acids have the general formula: COOH
* In terms of the amount particles, concentration means there is a high number of particles
* In terms of amount of particles, dilute means there is a low number of particles
* In terms of ions, weak means there are no ions but all compounds
* Neutralization Reactions:if equal moles amount of acid and base are added together, the resulting solution is neutral

**Acid+ Base → Salt + Water**

* reactions of acids with metals (only three metals do NOT react with acids: Cu, Au, Ag)

**Acid + More Reactive Metal → H2 + A Salt**

* Bronsted Lowry Theory: B.A.A.D Bases Accept Acids Donate
* pH: the pH scale is a measure of the H+ or H3O+ concentration in a solution.

Acid=Low pH Base=High pH

* Acids have a pH range of 0-6 and hydronium ion concentrations between 1x10-1 and 1x10-6
* Bases have a pH range of 8-14 and hydronium ion concentrations between 1x10-8 and 1x10-14
* To obtain the pH of an acid or base, find the power of the hydronium concentration. Therefore, pH can also be known as the “power of the hydronium concentration”
* Increasing or decreasing the pH by 1 changes the [H+] by a factor of 101 (10 times, ten-fold)
* Increasing or decreasing the pH by 2 changes the [H+] by a factor of 102 (100 times, ten-fold)
* Amphoterism: Amphoteric substances can behave as both acids & bases depending on what they are reacting with. If they are reacting with a base, they react like w weak acid. If the react with an acid they react like a weak base.
* Calculations:

[H+]= 1 x 10 -pH  Ka= 1 x 10 -pKa [OH-]= 1x 10 -pOH Kb= 1 x 10 -pKb

pH= -log[H+] pKa= -log[Ka] pOH= -log[OH-] pKb= -log[Kb]

[H+][OH-]= 1 x 10 -14  [Ka][Kb]= 1 x 10 -14  pH + pOH = 14 pKb + Pka = 14

***Practice Questions Unit 8A***

1. Which formula represents a hydronium ion?

(1)H3O+ (2)OH- (3)NH+ (4)HCO3-

2) Which compound is an Arrhenius acid?

(1)H2SO4 (2)NaOH (3)KCl (4)NH3

3) Which compound releases hydroxide ions in an aqueous solution?

(1)CH3COOH (2)HCl (3)CH3OH (4)KOH

4) What is the relationship between pH value and hydrogen ion concentration?

5)Describes what happens to the concentration of hydrogen ions in a solution if the pH is changed from 7 to 5?

6)Suppose you dissolve benzoic acid in a .15M solution. What is…

1. The concentration of benzoic acid? Ka for benzoic acid = 6.3x10^-5 at 25͒C
2. The concentration of hydronium ion?
3. The concentration of benzoate anion?
4. The pH of the solution?

7)A .12M solution of an unknown weak acid has a pH of 4.26 at 25͒C. What is the hydronium ion concentration in the solution and what is the value of its Ka?

8)Calculate the concentration of OH- in a .15M solution of NH3. Kb = 1.8x10^-5

9) Quinoline is a weak base with a pKa value of 4.90. What is the Kb?

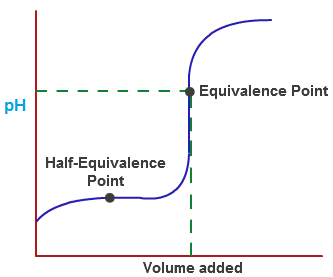
10) For each of the following salts, predict whether an aqueous solution would be acidic, basic or neutral.

1. Sodium nitrate NaNO3
2. Ammonium iodide NH4I
3. Sodium bicarbonate NaHCO3
4. Ammonium cyanide NH4CN
5. Sodium hypochlorite NaOCl
6. Potassium acetate KCH3CO2

**Acid/Base Unit 8B**

***Notes***

* Titrations are procedures used to determine the concentration (M) of an acid or a base. You combine together an acid and base knowing the volume of each and the concentration of only one of them.
* To solve either molarity/concentration or volume added, use the formula: **MAVA = MBVB**
* where MA = molarity of H+ , VA = volume of the acid , MB = molarity of OH- , V**B** = volume of base
* The equivalence point, or EQPT, is the point at which chemically equivalent quantities of acid and base have been mixed. In other words, the moles of acid are equivalent to the moles of base.



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| --- |
| SA/SB:1- Find moles of acid & base. 2- subtract small from big for excess. 3-divide moles of excess by total liters. |

-The buffer region on the diagram is located on the plateau before the curve

EQPT= 7 when strong acid & strong base

EQPT= >7 when when weak acid & strong base

EQPT= <7 when weak base & strong acid

pH calculations: pH=pKa+log(salt/acid)

* **Strong acid solution** → determine [H+], calculate pH
* **Strong base solution** → determine [OH-], calculate pOH, calculate pH
* **Weak acid solution** → determine [H+] using ICE box, calculate pH
* **Weak base solution** → determine [OH-] using ICE box, calculate pOH, calculate pH
* **Salt of a weak acid** → write hydrolysis, calculate Kb, determine [OH-] using ICE box, calculate pOH, calculate pH
* **Diprotic acid solution** → assume all [H+] from first ionization, determine [H+] using ICE box, calculate pH
* **Mixture of acid & base** → calculate moles of H+ & OH-, determine moles of excess H+ or OH-, determine total volume, calculate [H+] or [OH-], calculate pH
* **pH of a buffer with equal concentrations of donor [HA] and acceptor [A-]** → pH=pKa or pOH=pKb
* **pH of a buffer with unequal concentrations of donor [HA] & acceptor [A-]** → hasselbach equation
* Buffers: a solution that resists changes in pH when acid or alkali is added to it. Buffers typically involve a weak acid or alkali together with one of its salts.
* conjugates, preserves pH
* Ksp: A substance's solubility product, Ksp, is the product of its dissolved ion concentrations raised to the power of their stoichiometric coefficients.

***Practice Questions Unit 8B***

1. The distinction between strong acids and weak acids is most closely related to:

(a)the number of moles present per liter

(b)the pH of the solutions

(c)the pH will be less than 7, but the solution will be neutral

(d)the pH will be less than 7, the pOH will be less than 7, and the solution will be acidic

2) What is the pH of a solution made by adding 400mL of distilled water to 100mL of .050M HNO3?

(a)2.0 (b)2.30 (c)2.70 (d)3.0 (e)1.7

3) “1 freed us from water,2 freed us from hydrogen”

The acid-base theories which correspond to 1 and 2 are:

(a)Bronsted, Lewis (b)Arrhenius, Bronsted (c)Bronsted, Lowry (d)Lewis,Bronsted

4) The acid-base theory which is used to describe the equation below is:

AlCl3 + Cl- ---> AlCl4-

(a)Behavioral theory (b)Arrhenius (c)Bronsted-Lowry (d)Lewis

5) a. What is the pH of 100 mL of pure water at 25͒C?

b. What would the pH of this 100 mL water sample be if 0.10 mL of 12M HCl was added to it? (assume the volume doesn't change)

c. Calculate the pH of a buffer solution composed of 0.20M ammonia and 0.20M ammonium chloride.

d. Calculate the pH of 100 mL of this buffer solution if 0.10 mL of 12M hydrochloric acid is added to it. (assume the volume doesn't change)

6) 0.200 moles of HC2HCO3 reacted with 0.125 moles of NaOH. Final volume is 250.0 mL.

7) Jenna has .400 moles of shit on her car.It rained for 2 hours leaving over 9 thousand ml of water.Solve for what ever you want.