

## Strengths Of Acids & Bases

### I. Strengths Of Acids

1. Differentiate between the terms strong acid and weak acid.

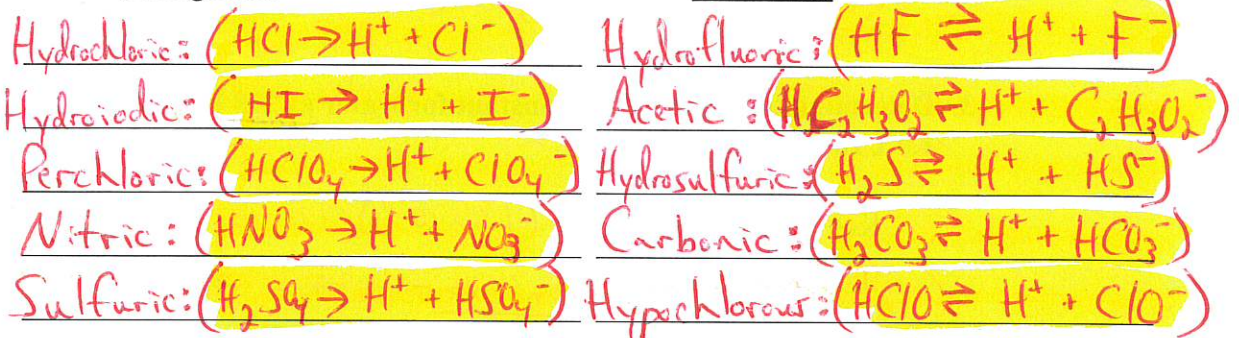
Strong Acid : acids that ionize completely (good conductors)

Weak Acid : produce fewer ions (ionizes partially)

2. List five examples of strong and weak acids and their ionization equations.

Strong Acid

Weak Acid



3. Strong acid reactions tend to react until completion, whereas weak acid reactions tend to reach chemical equilibrium.

Circle One :  True  False

4. What is the generic equation for an acid ionization constant ( $K_a$ )?

$$K_a = \frac{[\text{Conjugate Acid}][\text{Conjugate Base}]}{[\text{Acid}][\text{Base}]} = \frac{[\text{H}_3\text{O}^+][\text{X}^-]}{[\text{HX}][\text{H}_2\text{O}]} = \frac{[\text{H}_3\text{O}^+][\text{Y}^-]}{[\text{HY}][\text{H}_2\text{O}]}$$

(Acid)                      (Base)

5. The weakest acids tend to have the smallest  $K_a$  values.

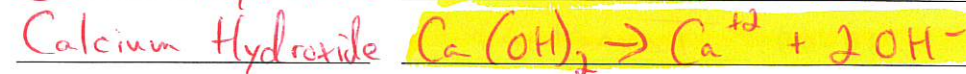
### II. Strengths Of Bases

1. Differentiate between the terms strong base and weak base.

Strong Base : base that dissociates entirely into metal ions + hydroxide ions

Weak Base : ionizes only partially in dilute aqueous solutions

2. List five examples of strong bases and their dissociation equations.



3. What is the generic equation for a base ionization constant ( $K_b$ )?

$$K_b = \frac{[\text{Conjugate Acid}][\text{Conjugate Base}]}{[\text{Acid}][\text{Base}]}$$

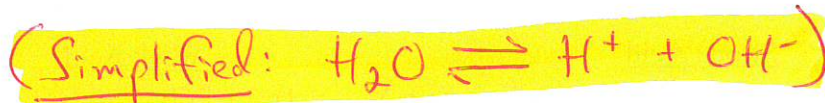
4. The weakest bases tend to have the smallest  $K_b$  values.

**III. Ion Product Constant For Water**

1. Water self-ionizes into equal concentrations of
- $H^+$
- and
- $OH^-$
- ions.

Circle One : True False

2. Write the equation for the self-ionization of water molecules.



3. Determine the ion product constant for water
- at 298 K
- with
- $H^+$
- and
- $OH^-$
- ions equal to
- $1.0 \times 10^{-7} M$
- .

$$K_w = [H^+][OH^-] = (1.0 \times 10^{-7})(1.0 \times 10^{-7}) = 1.0 \times 10^{-14}$$

(Le Chatelier's Principle - system reacts to relieve stress)

**IV. pH and pOH**

1. Chemists use the
- pH
- Scale to assess the acidity of solutions (
- $H^+$
- ions) and
- pOH
- Scale to assess the alkalinity (basicity) of solutions (
- $OH^-$
- ions).

2. The pH Scale and pOH Scale are based on common logarithms and therefore have a
- tenfold
- change in ion concentration.

3. Indicate the type of solution present using the pH and pOH Scales. (@ 278 K)

	pH Scale	pOH Scale
Below 7.0	<u>Strong Acid</u>	<u>Basic</u>
7.0	<u>Neutral</u>	<u>Neutral</u>
Above 7.0	<u>Strong Base</u>	<u>Acidic</u>

4. List familiar substances associated with their pH values.

0.0 - 0.9 : <u>Hydrochloric Acid (HCl)</u>	7.0 - 7.9 : <u>Human Blood, Tears</u>
1.0 - 1.9 : <u>Stomach Acid</u>	8.0 - 8.9 : <u>Baking Soda (<math>NaHCO_3</math>)</u>
2.0 - 2.9 : <u>Lemon Juice</u>	9.0 - 9.9 : <u>Toothpaste</u>
3.0 - 3.9 : <u>Soft Drinks</u>	10.0 - 10.9 : <u>Milk of Magnesia</u>
4.0 - 4.9 : <u>Tomatoes</u>	11.0 - 11.9 : <u>Ammonia (<math>NH_3</math>)</u>
5.0 - 5.9 : <u>Coffee</u>	12.0 - 12.9 : <u>Lime (<math>Ca(OH)_2</math>)</u>
6.0 - 6.9 : <u>Milk</u>	13.0 - 13.9 : <u>Oven Cleaner</u>
7.0 : <u>Pure Water</u>	14.0 : <u>Drain Cleaner (<math>NaOH</math>)</u>