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Unit 12 Acids and Bases- Guided Notes

Properties of Acids and Bases	
Acids	**Bases**
• pH of _____ • Taste _____ • Turn litmus paper _____ • Neutralizes a _____ to produce _____ and _____ • Proton _____ • High concentration of _____ ions • Electrolyte (Conducts electricity in _____) • Reacts with some _____ to produce _____	• pH of _____ • Taste _____ • Turn litmus paper _____OR_____ • Neutralizes a _____ to produce _____ and _____ • Proton _____ • High concentration of _____ ions • Electrolyte (Conducts electricity in _____) • Feels _____
• <u>Examples:</u>	• <u>Examples:</u>

- Examples:
  - Monoprotic acid-
  - Diprotic acid-
  - Triprotic acid-
  - Monobasic-
  - Dibasic-
- Strong vs. Weak Facts:
  - Strong=
  - Weak=
  - A strong acid/base does NOT become a weak acid just because it is diluted.
    - In other words, concentrated HCl and diluted HCl are both _____ because both _____ in water.
  - Strong acids/bases of the same molarity will react at _____ with the same metal
  - Strong acids/bases conduct electricity _____; whereas weak acids/bases conduct electricity _____.

Strong Acids	**Weak Acids**
• _____ ionized • _____ of the acid separates into _____ in water • Usually has a pH from _____ • 7 Strong Acids=	• _____ ionized • _____ of the acid separates into _____ in water and some of the acid stays as molecules • Usually has a pH from _____ • Examples:
Strong Base	**Weak Base**
• _____ ionized • _____ of the acid separates into _____ in water • Usually has a pH from _____ • 8 Strong Bases=	• _____ ionized • _____ of the base separates into _____ in water and some of the base stays as molecules • Usually has a pH from _____ • Examples:

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- Acid/Base Theories
  - **Arrhenius**
    - **Acids** produce _____ in H_2O whereas a **base** produces _____ in H_2O.
    - _____ produce neither H^+ nor OH^- ions in water
    - Good for describing _____ acids and _____ bases
  - **Bronsted-Lowry**
    - H+ is a _____
    - _____ is a proton donor (H+) where as a _____ is a proton acceptor
    - When an acid or a base reacts with water, _____ can act as an acid or base.
- Conjugate Pairs
  - Using _____ definition of acids and bases
  - Conjugate Acid/Base pairs: A pair of species that are related to each other by _____
  - The Acid makes a _____ and the Base makes a _____
  - The acid and base are on the _____ side of the equation
  - The conjugates are on the _____ of the side of the equation
  - When an _____ reacts with water it produces _____ (hydronium ion, considered the _____) and a _____ (everything left over once the H^+ ion is removed)
  - Example: $HCl + H_2O \leftrightarrow H_3O^+ + Cl^-$
  - _____ + _____ ↔ _____ + _____
  - The Acid makes a _____and the _____ makes a CA
  - The CA and the CB can _____ to make the parent Acid and Base
    - Therefore the reaction is _____ which is indicated by _____.
  - General Format: $HA_{(aq)} + H_2O_{(l)} \leftrightarrow H_3O^+_{(aq)} + A^-_{(aq)}$
  - _____ + _____ ↔ _____ + _____
  - $HA + H_2O \rightarrow H_3O^+ + A^-$
  - The conjugate base of a strong acid is a _____ base than water
  - The conjugate base of a weak acid is a _____ base than water
  - The conjugate acid of a weak base is a _____ acid than water
  - The conjugate acid of a strong base is a _____ acid than water
  - Label the conjugate pairs: $H_2SO_4 + H_2O \leftrightarrow HSO_4^- + H_3O^+$ _____ + _____ ↔ _____+ _____
  - Practice: Name the CB of these acids
    - HNO_3 _____
    - H_2O _____
    - H_3O^+ _____
    - H_2SO_4 _____
    - HCO_3^- _____
  - Practice: Name the CA of these bases
    - OH^- _____
    - H_2O _____
    - HCO_3^- _____
    - SO_4^{-2} _____
    - ClO_4^- _____

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- Practice: Determine the Acid, Base, CA, and CB for the following reactions.
  - $HBr + H_2O \leftrightarrow H_3O^+ + Br^-$
  - $NH_3 + H_2O \leftrightarrow NH_4^+ + OH^-$

- Water
  - Water is the most common _____ substance (a substance that can act as both an _____ or a _____)
  - Ionization of water:
    - $H_2O + H_2O \rightarrow H_3O^+ + OH^-$
  - Water is both accepting a _____ and donating a _____
    - (depends on the other reactant)
  - Water will act as a _____when reacted with an acid
  - Water will act as an _____ when reacted with a base
  - Water has a pH of 7 and is considered _____
  - H_3O^+ is called a _____ ion (often times abbreviated to just _____)
  - _____ concentration determines pH of a substance

End Video 1----------

- Calculating pH
  - To help deal with small numbers chemist came up with the _____
  - The pH scale evaluates the concentration of _____
  - Square brackets [ ] indicate _____
  - The pH scale ranges from _____
  - Because it is a scale, pH is not measured in _____
  - $pH = -\log [H_3O^+]$ and $[H_3O^+] = 10^{-pH}$
  - A _____ pH is more acidic (has a _____ concentration of hydronium ion) than a higher pH
  - Remember _____ ions and _____ ions are used interchangeably
  - Example: Find the pH of a 0.0025 M HCl solution.

  - Example: What is the concentration of hydrogen ions in a solution that has a pH of 4.3?

- Calculating pOH
  - A similar logarithmic scale has been created to calculate the concentration of the _____
  - $pOH = -\log[OH^-]$ and $[OH^-] = 10^{-pOH}$
  - Example: What is the pOH of a solution that has a hydroxide ion concentration of 4.82×10^{-5} M?

  - Example: What is the concentration of hydroxide ions in a solution that has a pOH of 12.2?

- Another way to calculate pH and pOH
  - The pH and the pOH or the concentration of the H^+ ion or the concentration of the OH^- ion can be determined using the following equation: **pH + pOH = 14.00**
  - Example: A solution has a pOH of 11.76. What is the pH of this solution?

  - Example: What is the $[H^+]$ when the pOH is 5?

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- Testing for pH
  - pH meters and probes- _____ determine pH
  - pH paper, Litmus paper- paper indicators use _____ to indicate pH
  - Liquid Indicators (listed below): change _____ based on pH
- Neutralization Reactions
  - When an acid reacts with a base a _____ occurs
  - In a neutralization reaction _____ and a _____ are always produced
  - A neutralization reaction does NOT always result in a _____
  - It results in a *more* neutral substance but not always completely neutral
  - When a strong **acid reacts** with a **strong base** it will produce a _____ salt and water
    - Example: NaOH + HCl → HOH + NaCl
  - When a **strong acid** reacts with a *weak base* it produces an _____ salt and water
  - When a **strong base** reacts with a *weak acid* it produces a _____salt and water
  - When a *weak acid* reacts with a *weak base* it produces a _____, _____, or _____ salt
- Titrations
  - Titration- an _____ way to determine the concentration of an acid or a base
  - A _____ reaction that reacts an unknown concentration of acid or base with a known concentration of base or acid
  - _____ -point at which titration is complete
    - At the endpoint, the _____ will change color
  - Data is then used to create a graph called a _____
  - _____- point at which there are equal moles of acid and base
    - Shown on the _____
  - The titration curve is then used to calculate the _____ of the unknown acid/base

- Buffers:
  - _____- A solution that resists change in pH
  - A buffer consists of a _____ and its conjugate base in _____ amounts
  - The buffer solution is continuously converting between acid and its conjugate base to keep the pH of the solution the _____
  - Used to maintain _____ pH
  - Example: