

LESSON 13 ACIDS & BASES

- Some chemicals can be classified as either an acid or a base.
- Both acids and bases are corrosive, which means they can burn your skin/eyes.

Acids

- Chemicals that produce **hydrogen ions** (H^+) when dissolved in water; the **more** H^+ ions, the **stronger** the acid.
- Bronsted-Lowry Acid: A species that **donates** a proton (H^+)
- Acids take on acidic properties when **dissolved** in water $\rightarrow$ referred to as **aqueous** solutions. e.g., $HCl \rightarrow H^+(aq) + Cl^-(aq)$ (Note that it is the free H^+ that produces the acidity).
- **Conductive** due to the hydrogen ions and anions.
- Most acids can be identified by their chemical formula starting with an “**H**”
 - e.g., HCl , H_2SO_4 , H_3PO_4 . (Exception: H_2O is not an acid!)
- Many acids show up in household products such as vinegar – **acetic acid**, pop – **carbonic acid**, lemons – **citric acid**, etc. The **sour** flavour in these foods is due to the acid.
- Many acids show up in industrial applications such as **paper bleaching** and **automobile batteries**.
- Some animals and plants use acids as a defense mechanism such as stinging nettle and various types of ants.

Bases

- Often classified as chemicals that produce **hydroxide ions** (OH^-) when dissolved in **water**; the more OH^- ions, the stronger the base. e.g., $NaOH$, $Mg(OH)_2$
- **$NaOH \rightarrow Na^+(aq) + OH^-(aq)$**
- **Conductive** due to the hydroxide ions and cations.
- Bronsted-Lowry Base: any species that accept a **proton**
- Many bases used in the home are **cleaners**; many feel **slippery and are bitter to taste**. (e.g. soap, oven cleaner, etc.)
- Bases are frequently used in industrial applications such as **pulp and paper**. E.g., $NaOH$ is used to soften lignin in wood. **Lignin** is like a glue that holds cellulose fibers together. **Cellulose** needs to be separated in order to make high quality paper.

pH Scale

- The pH scale is used to identify the **strength** of an acid or base
- Numbered scale ranging from 0 (**very strong acid**) to 14 (**very strong base**) that increases by a factor of 10 for each whole number change on the scale
 - Each jump of 1 means the acid or base is **10 times** stronger
 - An acid with a pH of 3 is **10** times stronger than an acid with a pH of 4 and **100** times stronger than an acid with a pH of 5
- A pH of **7** is neutral (i.e., not acidic or basic).

pH Indicators

- pH indicators are chemicals that react with acids and bases to produce a known **colour change**.
- Example: Litmus paper → changes to **red** in acids and to **blue** in bases.
- Other indicators are: methyl orange, methyl red, bromothymol blue, phenolphthalein and indigo carmine. See colour indicators page from data pages.