

Properties of Acids and Bases, and the pH Scale

Properties of Acids

- Taste sour
- React with metals to produce hydrogen gas
- React with bases to produce salt and water
- Corrosive to metals and skin
- Good conductor of electricity
- Contain H^+ ions



Formulas for Acids

- Acids usually begin with a Hydrogen atom in the front.
 - Sulfuric Acid is H_2SO_4
 - Hydrochloric Acid is HCl

Common Strong Acids

- Hydrochloric Acid (HCl)
- Hydrobromic Acid (HBr)
- Sulfuric Acid (H₂SO₄)
- Nitric Acid (HNO₃)
- Perchloric Acid (HClO₄)

Common Weak Acids

- Phosphoric Acid (H₃PO₄)
- Acetic Acid (CH₃COOH)
- Carbonic Acid (H₂CO₃)

Properties of Bases



- Taste bitter
- Feel slippery
- React with acids to produce salt and water
- Good conductors of electricity
- Usually have an OH⁻ ion present
 - Ammonia (NH₃) is an exception

Formulas for Bases

- Most bases contain the hydroxide ion (OH^-)
 - Sodium Hydroxide is NaOH
 - Calcium Hydroxide is $\text{Ca}(\text{OH})_2$
- Substances that contain the bicarbonate ion (HCO_3^-) are also bases as they react with water to form OH^- ions.
 - Sodium Bicarbonate is NaHCO_3

Common Strong Bases

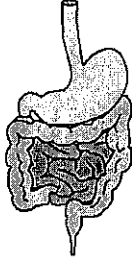
- All alkali metal hydroxides
 - Lithium Hydroxide (LiOH)
 - Sodium Hydroxide (NaOH)
 - Potassium Hydroxide (KOH)
- Some alkaline earth metal hydroxides
 - Calcium Hydroxide ($\text{Ca}(\text{OH})_2$)
 - Strontium Hydroxide ($\text{Sr}(\text{OH})_2$)
 - Barium Hydroxide ($\text{Ba}(\text{OH})_2$)

Common Weak Bases

- Ammonia (NH_3)

The pH Scale

- Represents how acidic or how basic a solution is.
- Has a range from 0 – 14
- A neutral solution has a pH of 7.
- An acid solution has a pH that is less than 7.
- A base solution has a pH that is greater than 7.
- The further the pH is from 7, the stronger the acid/base.



Indicators

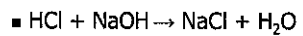
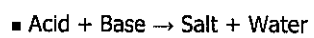
- An indicator is a chemical dye whose color will change when exposed to an acid or a base.

Common Indicators

Indicator	Color in Water	Color in Acid	Color in Base
Red Litmus Paper	Red	Red	Blue
Blue Litmus Paper	Blue	Red	Blue
Phenolphthalein	Clear	Clear	Pink
Bromothymol Blue	Blue	Yellow	Blue

Neutralization

■ A neutralization reaction is a reaction in which an acid and a base react in aqueous solution to produce a salt and water.



Homework

■ Properties of Acids and Bases

■ #1 - 9



Properties of Acids and Bases

1. Identify each of the following as either an acid or a base.
 - a) KOH
 - b) $HClO_3$
 - c) $Mg(OH)_2$
 - d) HNO_3
 - e) NH_3
 - f) HCl
 - g) CH_3COOH
 - h) $NaOH$
2. Write the corresponding name for the substances in question 1.
3. If you had a clear, colourless, odourless solution and knew that it could be an acid or a base, describe two tests that could be done to identify it properly.
4. In your own words, explain the meaning of pH.
5. What would you expect as an approximate pH value for each of the following?
 - a) A very concentrated base that dissociates completely.
 - b) A basic solution that only partially ionizes.
 - c) An acid that dissociates completely.
 - d) An acid solution that only partially dissociates
 - e) Tap water.
6. How much more acidic is a solution with a pH of 4.5 than a solution with a pH of:
 - a) 5.5
 - b) 6.5
7. How much more basic is a solution with a pH of 12.5 than a solution with a pH of:
 - a) 10.5
 - b) 8.5
8. What happens to the pH of an acid when water is added to it?
9. Toothpastes are often slightly basic. Why does this make sense?