Chemical Processes 6: Acids and Bases

First 3:35 min

Key Terms

- Acids
- Bases
- Bromothymol blue
- Concentration
- Indigo carmine
- Litmus paper
- Methyl orange
- pH indicators
- phenolphthalein

pH indicators

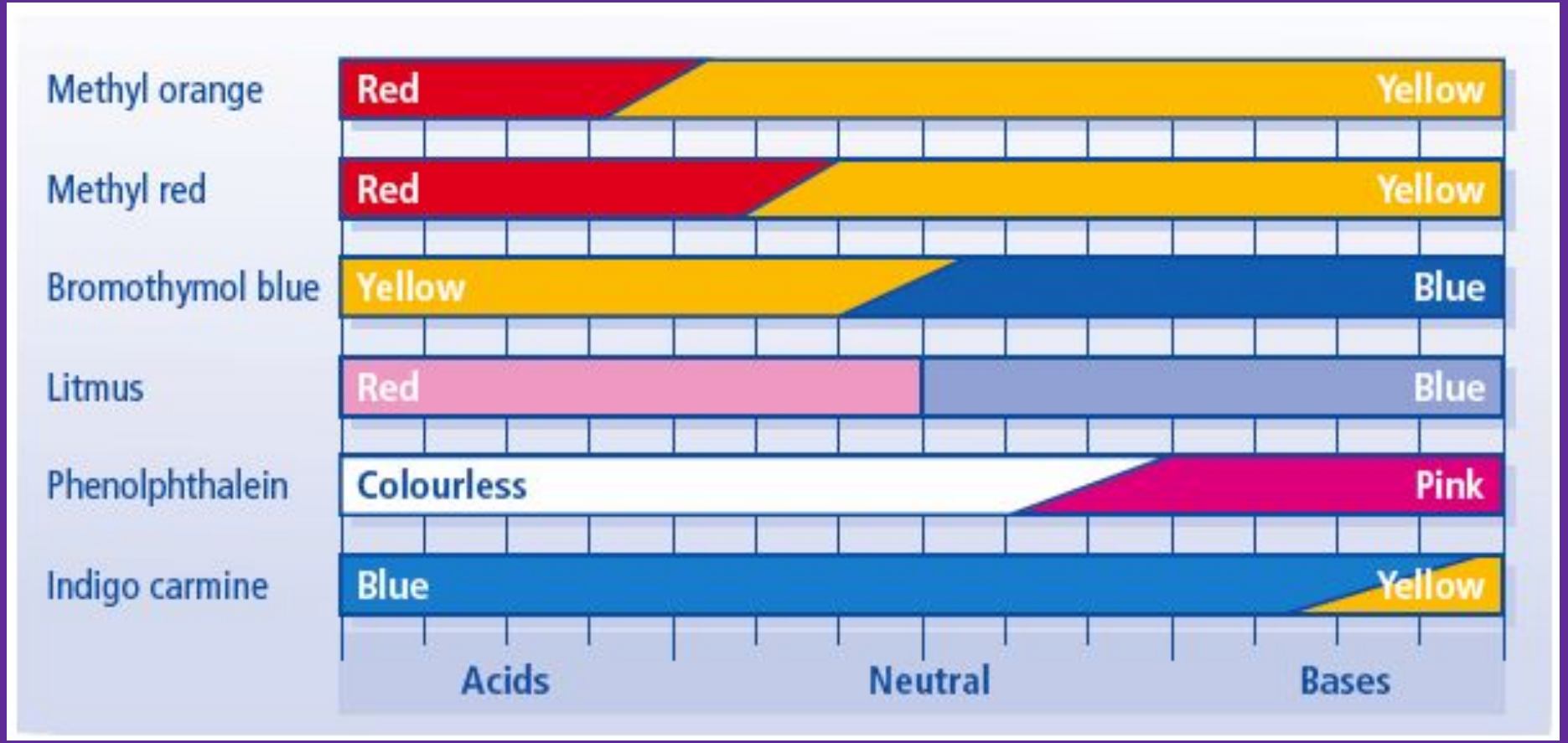
- pH indicators are colour changing chemicals based on the pH of the solution they are placed into.

- On the next slide

- A ph scale is numbered 0-14 and is used to measure how acidic or basic a solution is.

- Acids: pH less that 7
- Neutral: pH 7
- Bases: pH more than 7

pH = [H+] in a solution
Acids have $10^{-1} \rightarrow 10^{-6.9}$ (high [H+])
Neutral have 10^{-7}
Bases have $10^{-7.1} \rightarrow 10^{-14}$ (low [H+])


Methyl orange
Red
Yellow
Methyl red
Red
Yellow
Bromothymol blue
Yellow
Blue
Litmus
Red
Blue
Phenolphthalein
Colourless
Pink
Indigo carmine
Blue
Yellow
Acids
Neutral
Bases

Assignment:
H/O p 85

Production of Ions

- Acids dissolved in water release H^+ ions
- Bases dissolved in water release OH^- ions
- These ions can conduct an electric charge

- pH concentration refers to the concentration of Hydrogen ions
  - High [pH] of H+ ions = acidic solution (low pH)
  - Recall Ex of an acid with pH of 3: 1×10^{-3} $[H^+]$

- H+ and OH- react readily to make water
- An acidic solution and a basic solution can neutralize one another → neutral solution

Properties of Acids and Bases

Assignment:
Handout p 87

Table 5.6 Properties of Acids and Bases

Property	Acid	Base
Taste CAUTION: Never taste chemicals in the laboratory.	• Acids taste sour. Lemons, limes, and vinegar are common examples.	• Bases taste bitter. The quinine in tonic water is one example.
Touch CAUTION: Never touch chemicals in the laboratory with your bare skin.	• Many acids will burn your skin. Sulfuric acid (battery acid) is one example.	• Bases feel slippery. • Many bases will burn your skin. Sodium hydroxide (lye) is one example.
Indicator tests	• Acids turn blue litmus paper red. • Phenolphthalein is colourless in an acidic solution.	• Bases turn red litmus blue. • Phenolphthalein is colourless in slightly basic solutions and pink in moderate to strongly basic solutions.
Reaction with some metals, such as magnesium or zinc	• Acids corrode metals.	• No reaction
Electrical conductivity	• Conductive	• Conductive
pH	• Less than 7	• More than 7
Production of ions	• Acids form hydrogen (H^+) ions when dissolved in solution.	• Bases form hydroxide (OH^-) ions when dissolved in solution.

Acids:

- Can be identified by their chemical formula
  - Examples: - HCl (hydrochloric acid)
    - HNO_3 nitric acid

- Special cases: when an acid contains carbon, the H is written on the right side.
  - Example: CH_3COOH

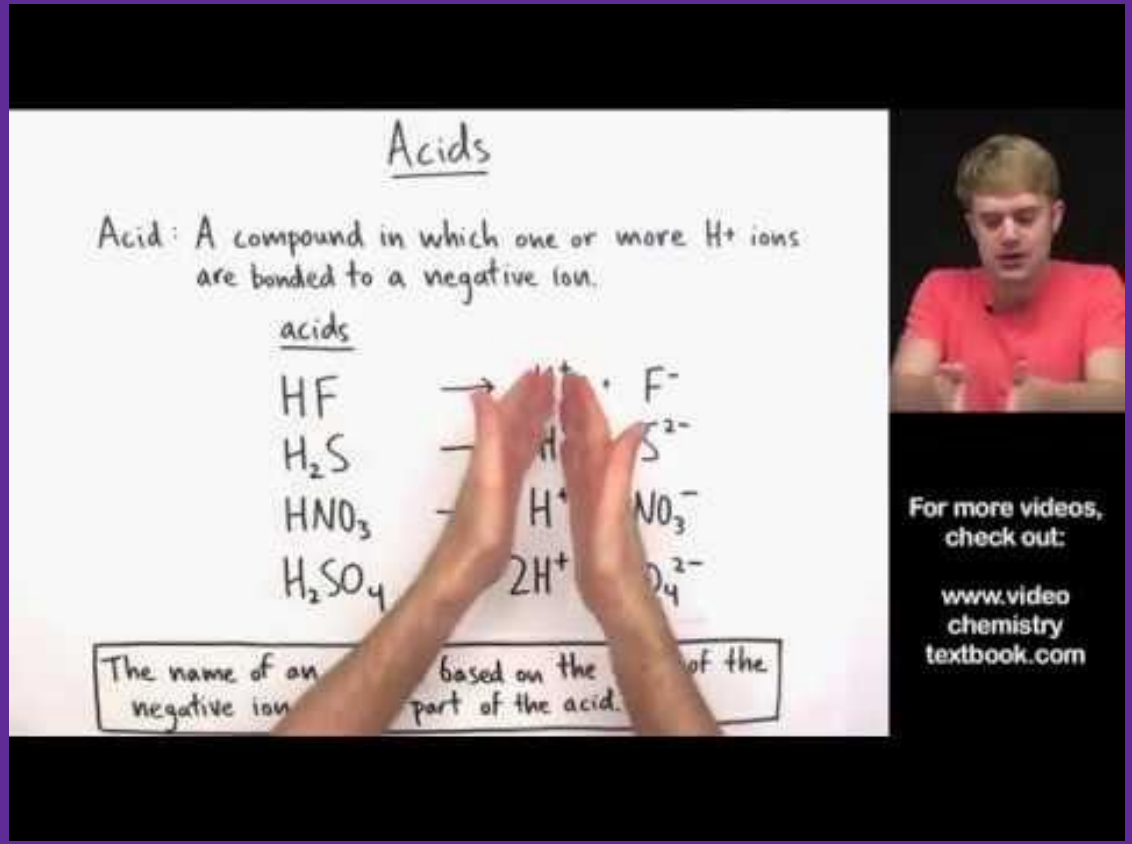
Naming Acids Notes

- Acids in an aqueous state end in “ic” acid
  Ex: HCl Hydrogen chloride becomes Hydrochloric acid
  H_2SO_4 Hydrogen sulphate becomes sulphuric acid

- Oxygen containing acids with hydrogen, and ending with “ate”- drop hydrogen and end with “ic”
  Ex: H_2CO_3 hydrogen carbonate = H_2CO_3 (aq) carbonic acid

- If the name begins with hydrogen and ends with the suffix “ite” change ending to “ous” acid
  Ex: H_2SO_3 hydrogen sulphite = H_2SO_3 (aq) sulphurous acid

Naming Acids



Naming Bases

- Contain OH (hydroxide), is found on the right of the formula

- Some are safe enough to ingest
  - $Mg(OH)_2$ an antacid is used to neutralize stomach acid

- Some bases are extremely dangerous and reactive with human skin and tissue, these are referred to as caustic.
  - Examples: drain cleaner and oven cleaner.

Assignment:
Handout p86/91

Important Exceptions

ACIDS	IONS	ACID NAME
H_3PO_4	phosphate (PO_4^{3-})	phosphoric acid
H_3PO_3	phosphite (PO_3^{3-})	phosphorous acid
H_2SO_4	sulfate (SO_4^{2-})	sulfuric acid
H_2SO_3	sulfite (SO_3^{2-})	sulfurous acid
CH_3COOH	acetate (CH_3COO)	Acetic acid

- Cabbage lab