

Ch 3: Chemistry of Life

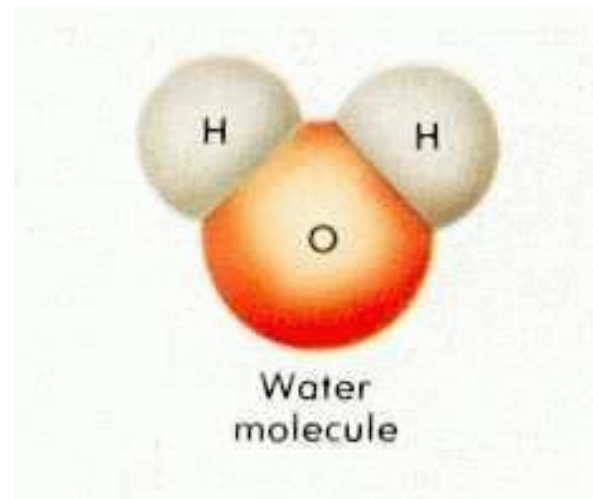
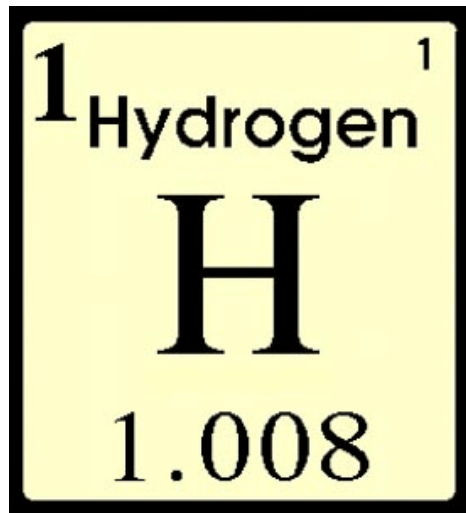
Chemistry

Water

Macromolecules

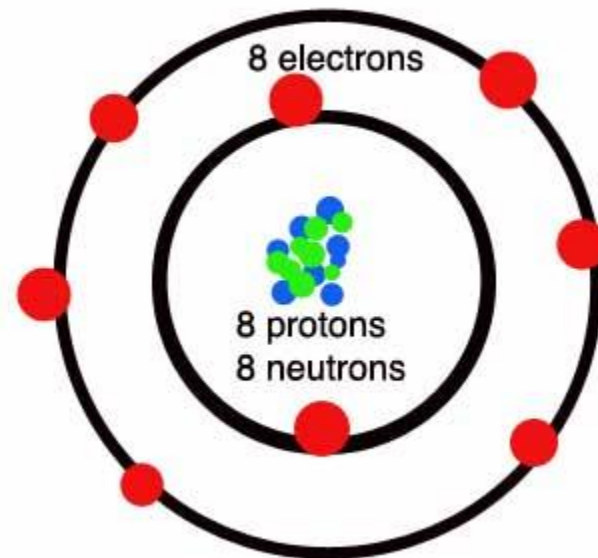
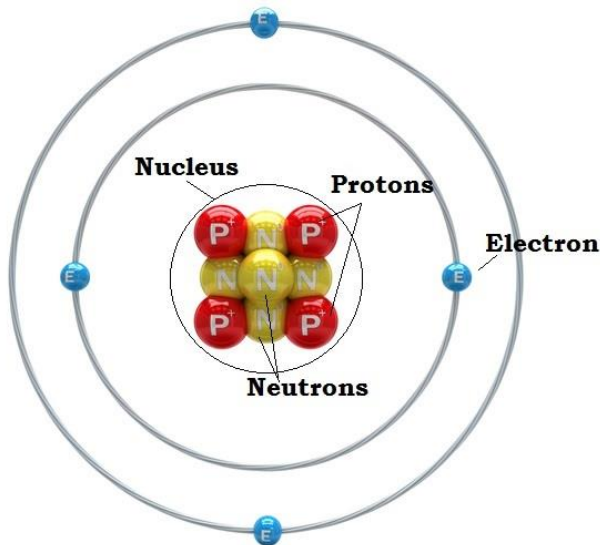
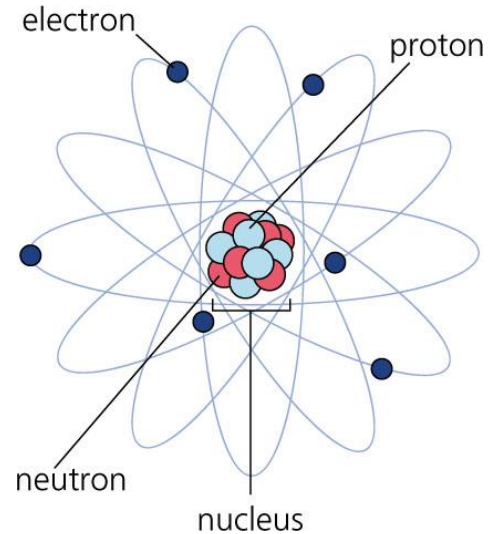
Chemistry

- Atom = smallest unit of matter that cannot be broken down by chemical means
- Element = substances that have similar properties and made up of atoms
- Compound = substance made of 2 or more different bonded elements

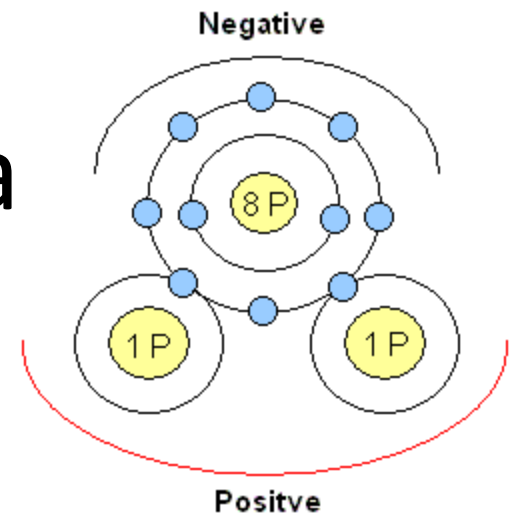


Structure of Atoms

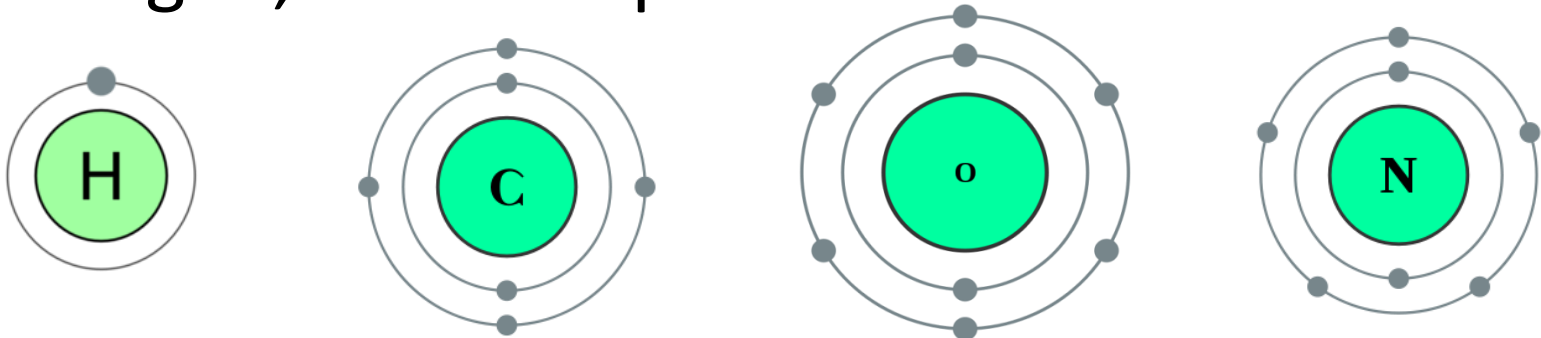
- Parts:
 - Nucleus and Energy levels
 - Protons = positive charge
 - Neutrons = neutral charge
 - Electrons = negative charge



Chemical Formula



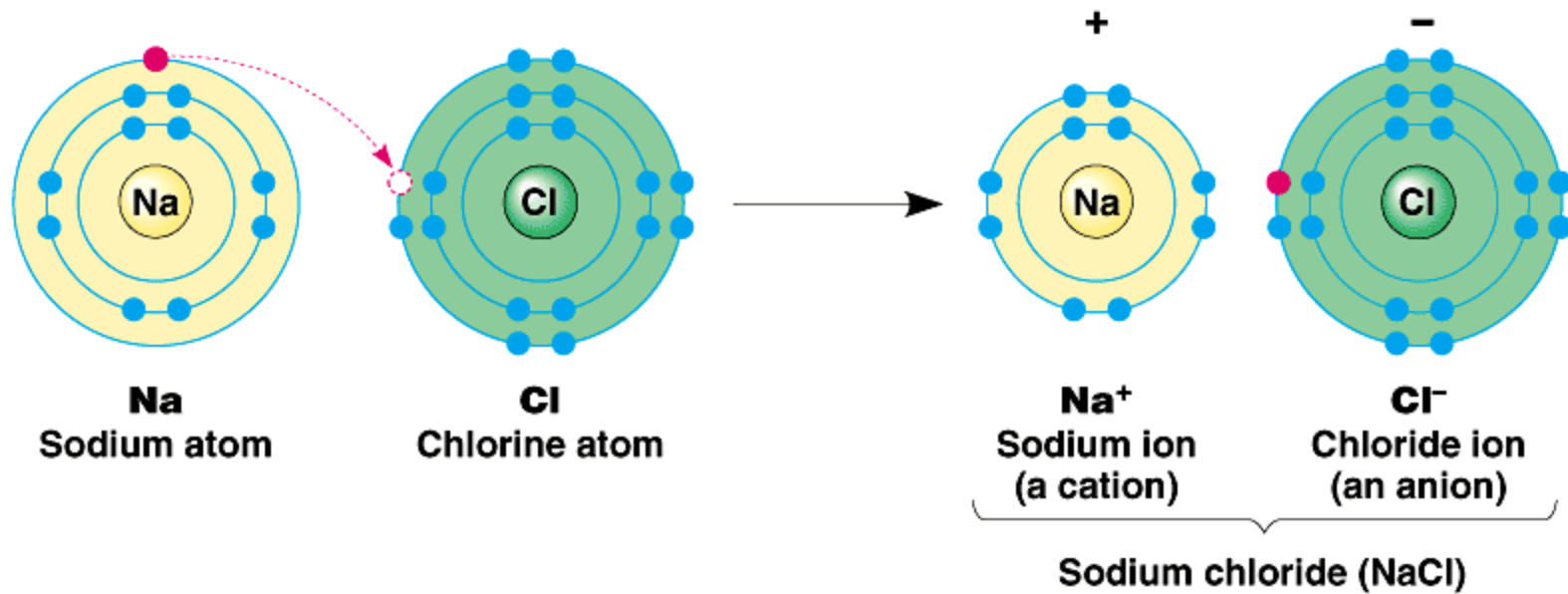
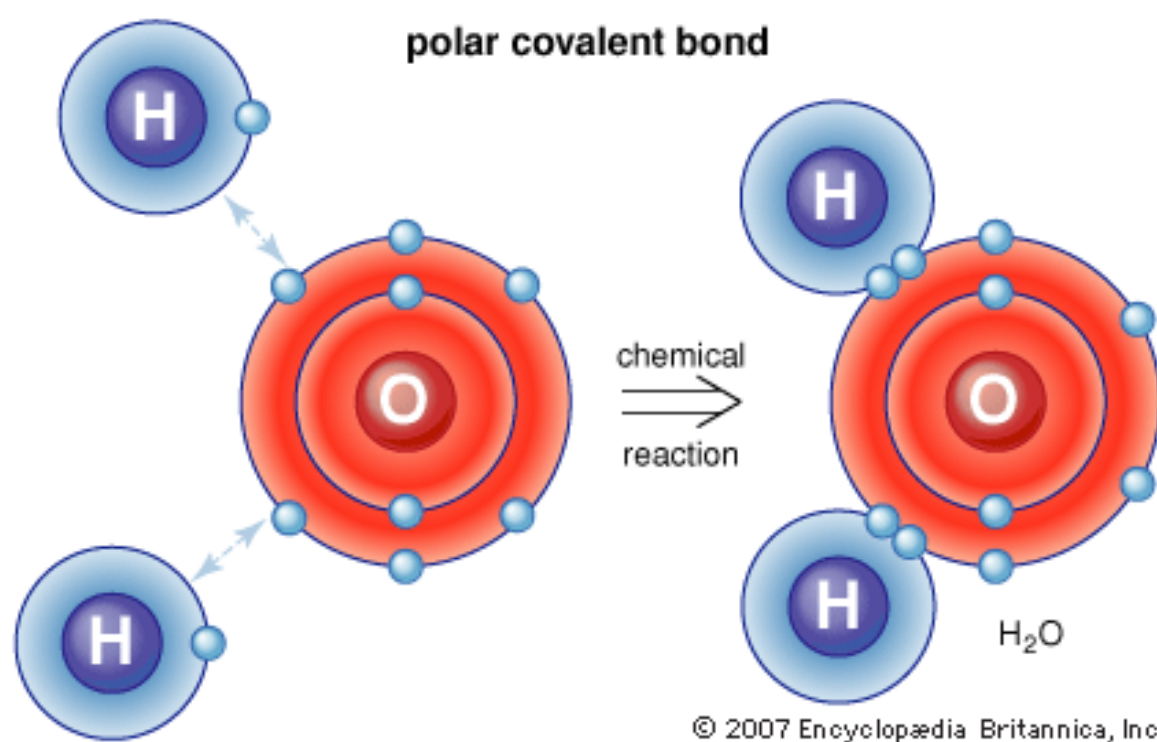
- H_2O = 2 Hydrogen and 1 Oxygen
- Polarity = one side is more positive and one side is more negative
- Main elements: Hydrogen, Carbon, Oxygen, Nitrogen, and Phosphorous



Types of Bonds

- Covalent = sharing electrons between 2 elements
- Ionic = transfer electrons and bond forms between positive and negative charge
 - Ion = element with a charge
- Hydrogen = bond between hydrogen of 1 molecule and another negative element on a different molecule

polar covalent bond

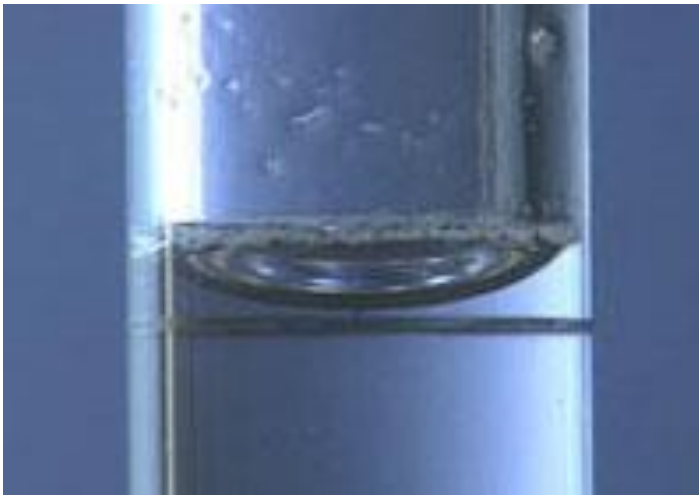
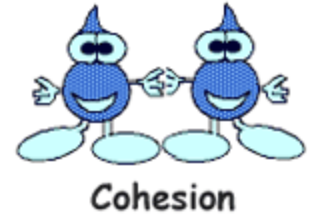


Properties of Water

A) Water molecules stick to each other and other things

- Cohesion = attraction of same particles
- Adhesion = attraction of different particles

- Surface tension = ability of water to hold its shape because of hydrogen bonds



Properties of Water

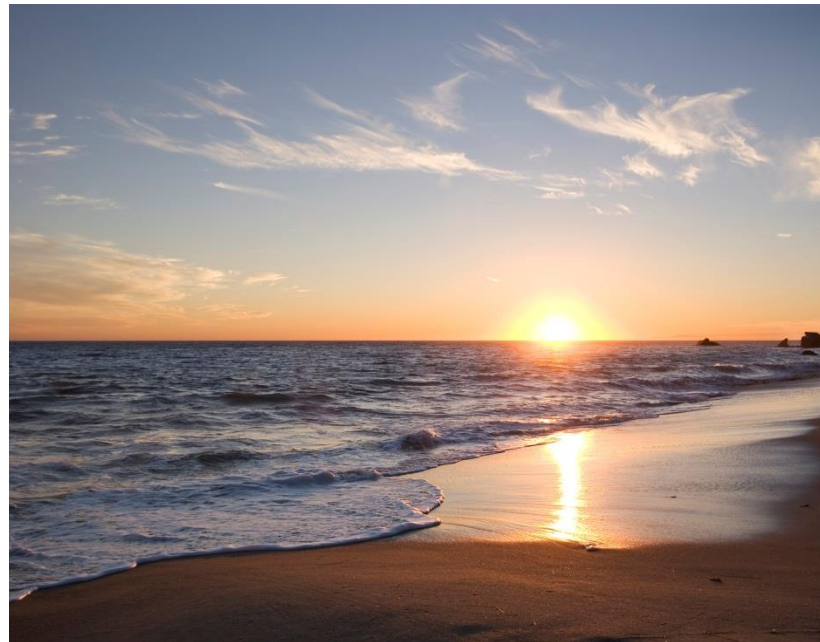
- B) Water molecules are polar (negative and positive sides)
- Works as a solvent to dissolve substances and do chemical reactions in the body



Properties of Water

C) Water absorbs and releases heat without a large change in temperature

- High specific heat = able to take in heat without changing overall temperature



Properties of Water

D) Ice floats on water

- Allows organisms to live under water in cold temperatures

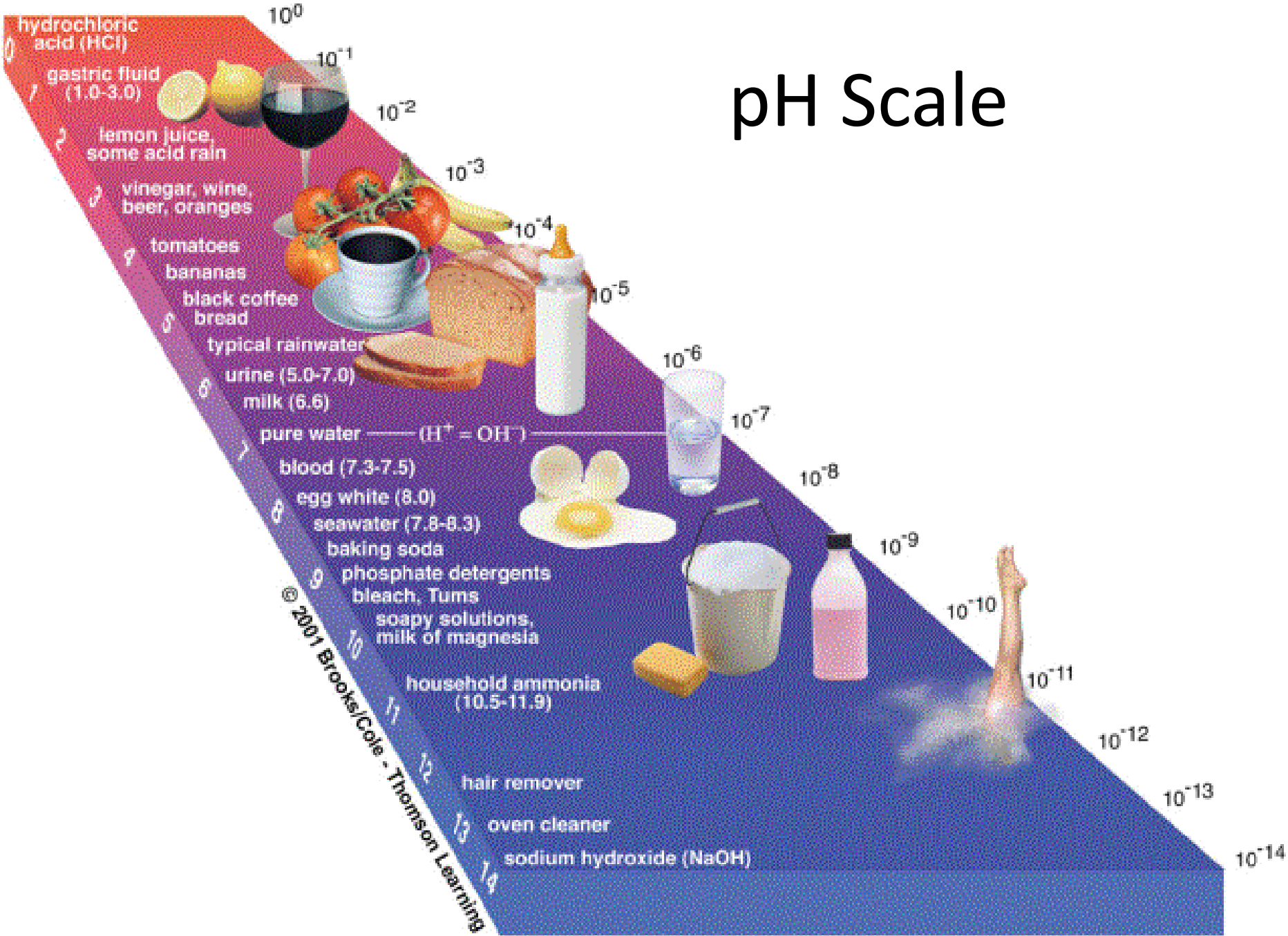


Photo: J. van Franeker, IMARES

Solutions

- Solution = solute + solvent
- Change in the amount of H^+ creates: acids and bases
- Acids – more H^+ , 1 - 6.9 pH
 - orange juice, battery acid
- Base – less H^+ , 7.1 – 14 pH
 - Soap, shampoo
- Neutral – 7 pH
 - Water

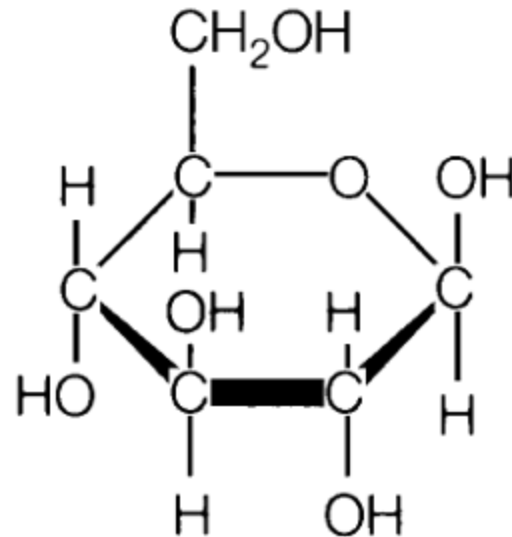
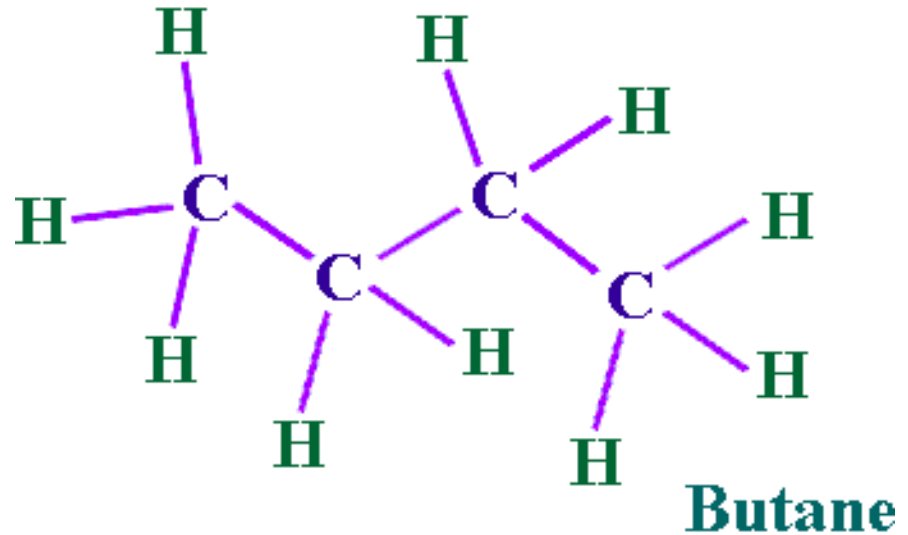
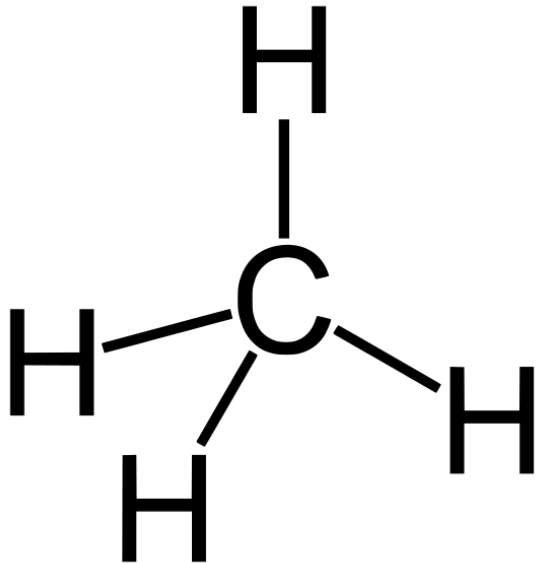
pH Scale



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Carbon (Organic) Compounds

- Carbon = basic unit of macromolecules



4 Main Type of Macromolecules (Organic molecules or Biomolecules)

- Carbohydrates
- Lipids
- Proteins
- Nucleic Acids

Carbohydrate

Elements: C, H, O with a ratio of 1:2:1

Polymer: polysaccharide (saccharide = sugar)

Monomer: monosaccharide (glucose)

Function: Immediate energy and Structure

Examples:

Plants = cellulose and starch

Animals = glycogen

Lipids

Elements: C, H, O with C-H chains

Polymer: no true polymers

Monomer: fatty acid

Function: Stored energy, Structure, and Protection and insulation

Examples:

Triglyceride = fat

Phospholipid = part of cell membrane

Wax

Hormones, Steroids, and Cholesterol

Protein

Elements: C, H, O, N

Polymer: polypeptide

Monomer: amino acid

Function: Structure, Chemical reactions,
Movement, Transport oxygen, Immunity
(defense)

Examples:

transport proteins, enzymes, muscle
proteins, hemoglobin, antibodies

Nucleic Acid

Elements: C, H, O, N, P

Polymer: DNA, RNA, ATP

Monomer: nucleotide

Function: Genetic information – stores and transports

Examples: Same as polymers