

Chemistry, Matter and Life

Basic Concepts

- Chemical reactions are responsible for all the body's physiologic processes
- Chemistry = the study of matter and its interactions
- Matter = anything that has mass and occupies space
- 3 states of matter – what are they?
- What are their shape and volume??

Elements

- Consist of only 1 type of atom
- Over 100 elements (92 occur naturally)
- 75% of the elements are metals
- Examples:
 - Oxygen
 - Carbon
 - Hydrogen
 - Nitrogen

Atom – Element - Compound

- ⦿ Atom = the smallest portion into which an element can be divided and still retain its properties
- ⦿ Compounds = two or more different types of elements H₂O NaCl
- ⦿ Molecules = smallest particle of a substance composed of one or more atoms
- ⦿ The atoms might be the same (element) or different (compound)
- ⦿ O₂ or H₂O

Types of Molecules

- Polar = contain an electrical charge and cause water movement
- Examples – electrolytes – sodium and chloride
- Non-polar = without charge
- Examples – lipids and waste products

Water

- ◉ Universal Solvent
 - ◉ Essential for all chemical reactions
 - ◉ Transports nutrients/wastes to/from cells
 - ◉ Changes temperature slowly
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- ◉ Solvent = the substance present in mixture in greatest quantity
 - ◉ Solute = substance present in mixture in smaller quantities

Mixtures

- ◉ Solution

- ◉ Suspension

- ◉ Colloid

- ◉ Do Mini - Lab

Forms of Energy

- ◉ Chemical – ATP – most abundant
- ◉ Electrical – Movement of electrons or charged ions. – Membrane potential

Chemical Bonds

- Keep 2 or more atoms closely associated to form molecule or compound
- Attraction between + and – electrical charges
- Different physical characteristics
- Examples $C_6H_{12}O_6$ and H_2O

Chemical Bonds

IONIC BONDS

- Attraction between cation and anion
- One is + and other is – so stand next to one another
- Weaker bond
- Electrolyte
- Disassociates into ions and conducts current in solution

COVALENT BONDS

- Sharing of electrons
- Electrons orbit around both atoms
- Not weakened in aqueous solution
- Do not conduct electric current

Acids and Bases

- Acids = electron pair acceptors
- Bases = electron pair donors
- pH scale = scientific scale capable of measuring acidity and alkalinity of any solution
- 1 (acidic) – 14 (basic or alkaline)
- 7-7.9 is neutral – blood is 7.4
- Change of one pH unit is 10 fold increase or decrease in H^+ concentration

Acids

- ⦿ Increased concentration of H^+ in water
- ⦿ In solution, a pH of 7 or less

- ⦿ pH of 1 is a strong acid – pH of 6 is a weak acid

- ⦿ Examples: HCL strong Citric Acid weak

Bases

- ⦿ Increased number of OH^- ion and decreased number of H^+ ion in solution
- ⦿ In solution, pH of 8 or more
- ⦿ Examples: Lye, ammonia, detergents, soap

Buffers

- Groups of chemicals preventing drastic changes in pH by reacting with strong acids or strong bases
- Most reactions involving buffers take place in fraction of a second
- Kidneys and respiratory system

Organic Compounds

- Found in all living things
- Contain Carbon and Hydrogen
- Carbs
- Proteins
- Lipids

Carbohydrates

- ◉ CHO
- ◉ Energy Source
- ◉ Breaks down = glucose
- ◉ Stored at glycogen
- ◉ Disaccharides – sucrose, lactose, maltose
- ◉ Polysaccharides – starch, cellulose

Lipids

- Steroids, cholesterol, etc.
- Break down = fatty acids
- Stored as fat
- Insulated eyes and kidneys
- Saturated – solid at room temp. = bad
- Unsaturated – liquid = better

Proteins

- ◉ CHO and N
- ◉ Breaks down = amino acids
- ◉ Repair and replace cells etc.
- ◉ Deficiency – skin is dry/scaly, weight loss, easier to get infections
- ◉ Enzymes are important proteins – always end in –ase
- ◉ DNA and RNA are also important in making proteins