THE CHEMISTRY OF LIFE

Chemistry:

- The science that deals with the study of _____, their compounds, the chemical _____ that occur between elements and compounds and the molecular structure of all matter
- _____chemistry – chemistry of _____ organism

CHEMICAL ELEMENTS

- _____ – occupies space and has mass
- _____ – amount of matter in something
- _____ – cannot be broken down into a simpler form by ordinary means
- Chemical _____ – One or two letters of the element's name in English, Latin or another language
- 26 elements present in the body
- 96% body mass: C, H, O, N (_____ elements), others trace elements
- Table 2.1

ATOMIC STRUCTURE

- _____ are the smallest particles of elements that maintain all the characteristics of that element and enter into chemical reactions.
- An atom consists of a nucleus containing positively charged _____ (p+) and _____ neutrons (n0).
- _____ (e-) have a negative charge and orbit in a "cloud" around the nucleus of an atom in levels at some distance from the compact heavy nucleus.

ATOMS

- Atomic _____ – number of _____
- _____ (weight) number – protons + neutrons
- Electron _____ – regions where electrons are found
- Ion- formed when an atom gives up an electron (_____) or gains (_____) an electron

ELEMENTS, ISOTOPES, COMPOUND

- An element is a substance whose atoms all contain the _____ number of protons and same number of electron. Atoms are electrically neutral.
- A _____ is a combination of the atoms of two or more elements.
- An isotope is a different kind of atom of the same element where the number of n_____ in the nucleus varies. If unstable, may give off radiation in the form of alpha, beta, gamma

ELEMENTS, ISOTOPES, COMPOUND

- _____arbon is the element found in all living matter.
- The periodic _____ of the elements arranges elements in categories with similar properties.
- _____ – 2+ elements share electron
- Molecular formula – indicate the number and type of atoms
- Free _____ electrically charged ion or molecule that has an unpaired electron in outermost shell
  -superoxide, O:
- _____ substances that inactivate oxygen-derived free radicals; Zn, Se, beta – carotene, Vitamin C and E

BONDS AND ENERGY

- Atoms combine chemically with one another to form bonds by gaining, losing, or sharing Valence electrons. _____ Rule
- Ionic bond – one atom gains electrons while other atom loses electrons. The opposite _____ are attracted to each other. Crystals.
- Ionically bonded molecules disassociate when immersed in water, _____ (solution conducts electricity). Mineral salts form ionic bonds.

MOLECULE - COMPOUND

BONDS AND ENERGY

- A covalent bond is formed when atoms _____ electrons. Carbon, oxygen, hydrogen and nitrogen form covalent bones. These bonds do NOT dissociate when placed in water.
- Single covalent – share 1 electron pair; Double covalent – share 2 electron pairs; Triple covalent – share 3 electron pairs. Structural formula
- _____ covalent bond – unequal sharing of e-. Nonpolar is equal
- Hydrogen bonds are _____ bond. They help hold water molecules together and bind other molecules into 3 – D shapes. DNA

CHEMICAL REACTIONS

- Energy – the ability to do work
- Potential- _____ energy, bond
- Kinetic – energy of _____
- Chemical energy – form of potential energy that is stored in the _____
- Energy is released when bonds are broken
- Adenosine triphosphate (_____) – energy stored in body
- Reactants – starting materials, products – material formed after reaction

REACTION TYPES

- _____: A+B-> AB; anabolism
  -amino acids to protein
- _____: AB -> A+B; catabolism
  -Starch to glucose
- Exchange: AB + CD -> AD + BC
- Reversible: AB ⇌ A+B
- Whatever is written above or below the arrows indicates the condition needed for the reaction to occur, (_____).

COMMON SUBSTANCES IN LIVING SYSTEMS

- Inorganic Compounds – lacks carbon
- Organic Compounds – contains _____
- Water (_____)– 60 – 80 % of cell is water. It's polar with Hydrogen having partial positive and Oxygen have partial negative.
- In the _____, takes part in reactions, solvent for others to occur in, transportation, absorb and release heat, maintain body heat, protects, and lubricates.

CARBON DIOXIDE

- Carbon dioxide (CO_2) is produces as _____ of cellular respiration
- _____ use for photosynthesis – converts solar energy into chemical energy
- All carbon comes directly or indirectly from CO_2

OXYGEN

- Molecular oxygen (O_2) is required by all organisms that breathe air.
- It is needed for cellular _____
- Comes from plants in the photosynthesis process

AMMONIA

- Ammonia (NH_3) is produced as a by-product of the _____ of amino acids.
- Amino acids contain _____ and are the building blocks of proteins.
- Ammonia, which is toxic, is converted to harmless _____ by enzymes in our liver.

MINERAL SALTS

- Calcium (Ca^+), Phosphate (PO_4^-), chloride (Cl^-), sodium (Na^+), Potassium (K^+)
- _____lcium is needed for muscle contraction and strong bones
- _____hosphate is needed to make ATP
- Sodium, potassium and chloride are necessary for muscle contraction and nervous transmission.

PH

- _____ – is the negative logarithm of the hydrogen ion concentration in a solution; -log [H]
- Acids – substance dissociates and forms excess H^+ ion; pH value _____ than 7
- Neutral – distilled pure water, value of _____
- Base / alkaline – combines with H^+ ions when dissolved in water (OH^-); value of _____ than 7
- Blood ph (7.35 -7.45)– alkalosis (7.5 to 7.8), acidosis (7.0 – 7.3)

BUFFERS

- Special substances that acts as reservoirs for _____ ions, donating them to a solution when their concentration falls and a solution when their concentration falls and taking them form a solution when their concentration rises.
- Help maintain homeostasis with cells in regard to _____ levels, keeping them fairly close to ____

CARBOHYDRATES

- Carbohydrates are composed of __arbon, __ydrogen, and __xygen in a 1:2:1. classified by _____ – mono, di, poly - saccharide
- Important 5-C sugars are deoxyribose and ribose
- Important 6-C sugars are glucose and fructose
- Used for _____ storage and structural strengthening of the cell.

LIPIDS

- _____ – major type with 95% of fat as triglycerols – made of glycerol and fatty acids.
- Saturated fat – single covalent bonds
- _____saturated – _____ covalent bonds
- Source of energy, insulators, steroid, _____

PROTEINS

- Proteins – C, O, H, N, and _____-sulfur
- _____ acids – base issue, building block
- Source of energy, _____ – actin / mysion, cell membrane
- Enzyme – protein _____ that make chemical reaction occur in cells.
- Immune system based on proteins.
- Primary – normal, secondary – H bond between, Tertiary – Sulfur bonding, Quaternary : _____ - folding

NUCLEIC ACIDS

- _____ – Deoxyribonucleic acid – genetic material in cell
- _____ – Ribonucleic acid – Protein synthesis
- Nucleotide – sugar, phosphate, base
- Bases: purines – __denine, __uanine; Pyrimidine – ___hymine, ___ytosine, sometimes (___racil – in RNA only)

ADENOSINE TRIPHOSPHATE

- ATP – high – energy molecule.
- Ribose sugar, adenine, 3 phosphate groups.
- Energy stored in the _____ bonds
- Breakdown of the glucose molecule and other nutrients provides _____ to make ATP molecules.

DIFFUSION

- Movement of molecules from _____ concentration to _____ concentration
- Random collision of diffusing molecules called _____ movement
- Increasing _____erature accelerates the rate of diffusing molecules
- Ex. Uptake oxygen into blood, carbon dioxide into lungs

OSMOSIS

- Special kind of diffusion where the movement of water molecules through a selectively permeable membrane.
- _____tonic solution (.9% salt) – where solute outside a cell is the same as inside the cell
- _____tonic – (water) – where solute concentration is less outside a cell than inside; swell – hemolysis
- _____tonic - (5%) – where solute concentration is more outside a cell than inside; shrink - crenation

ACTIVE TRANSPORT

- Where material is transported _____ a concentration gradient; low to high
- _____ energy in the form of ATP