

PROPERTY OF:

BIOLOGY – UNIT 1 – CHAPTER 2b NOTES

BIOCHEMISTRY

Organic Molecules

- Organic Molecule = a chemical that contains carbon
Carbon can form 4 covalent bonds
- Polar molecule = a chemical that contains an electronegative atom (oxygen)
- Non-Polar molecule = a chemical that does not contain electronegative atoms (oxygen)
- Water-soluble = a chemical that can mix with water (also called hydrophilic)
polar chemicals are water-soluble (they have oxygen)
Why? Water is also a polar chemical
“LIKE DISSOLVES LIKE!”
- Not Water Soluble = a chemical that cannot mix with water (also called hydrophobic)
non-polar chemicals are not water-soluble (they have little or no oxygen)
- Saturated molecule = a molecule with all the carbons surrounded by hydrogen atoms
- Unsaturated molecule = a molecule that does not have all the carbons surrounded by hydrogens

Questions

- | | | | |
|----|------------|---------------------|-----------------------|
| 1. | C_3H_8 | Is it polar? (____) | Is it organic? (____) |
| 2. | C_3H_7OH | Is it polar? (____) | Is it organic? (____) |
| 3. | $NaCl$ | Is it polar? (____) | Is it organic? (____) |
| 4. | H_2O | Is it polar? (____) | Is it organic? (____) |

Chemical Reactions

- Smaller molecules are joined together using dehydration synthesis reactions.
A water molecule is produced (released).
- Larger molecules are broken down using hydrolysis reactions.
A water molecule is split (used up).

Carbohydrates

- Chemical Formula of glucose: $C_6H_{12}O_6$
- Sugar always have the formula: $C_nH_{2n}O_n$
- If you reduce the numbers in the sugar formula, you get: $C-H_2O$ (literally carbon and hydrate)
- Is it polar? (yes) Is it organic? (yes)
- 3 categories of carbohydrates:
monosaccharide = 1 simple sugar
disaccharide = 2 simple sugars joined together
polysaccharide = many simple sugars joined together

- 7 types of carbohydrates:

1. glucose = blood sugar (water-soluble; monosaccharide)
2. fructose = fruit sugar (water-soluble; monosaccharide)
3. sucrose = table sugar (water-soluble; disaccharide)
4. lactose = milk sugar (water-soluble; disaccharide)
5. cellulose = gives toughness + structure to plants (not water-soluble; poly)
6. glycogen = energy source for animals, stored in the liver (water-soluble; poly)
7. starch = energy source for plants (water-soluble; polysaccharide)

Lipids

- 3 categories of lipids:

1. triglyceride = 3 hydrocarbon chains that are linked together at the top
(organic = yes, polar = no, water-soluble = no)
2. phospholipid = 2 hydrocarbon chains that are linked at the top and have a polar "phosphate group"
(HEAD: polar = yes, water-soluble = yes; TAIL: polar = no, water-soluble = no)
3. steroid = 4 fused ring structures made of carbon and hydrogen
(organic = yes, polar = no, water-soluble = no)

- 3 types of lipids:

1. adipose = fat tissue, energy storage (not water-soluble)
2. phospholipids = found on the cell membrane, creates a barrier around the cell
(heads are water-soluble, tails are not water-soluble)
3. steroid = found in cholesterol, produces sex hormones (not water-soluble)
(testosterone = male sex hormone; estrogen = female sex hormone)

Proteins

- structure of amino acids:

1. central carbon atom, amino group acid group, R group
2. The R group is different for each amino acid.
3. R groups can be large or small, polar or non-polar, charged or neutral.
4. The structure of the R group determines the function of the amino acid.

- levels of protein structure:

1. primary structure = the amino acid sequence connected by covalent bonds.
2. secondary structure = the amino acids fold into helices or sheets and are held together by H-bonds
3. tertiary structure = the folded structures combine into a single 3-dimensional subunit and may or may not be functions
4. quaternary structure = the functional protein containing all necessary subunits

- 8 categories of proteins:

hormonal proteins = relays messages throughout the body

receptor proteins = used to receive messages from other cells

contractile and motor proteins = used for muscle contractions or for cellular movements

structural proteins = gives shape and protection to cells

enzymatic proteins (enzymes) = used to speed up chemical reactions

defensive proteins (antibodies) = used to destroy foreign pathogens (immune system)

storage proteins = used to store amino acids for a growing organism

transport proteins = used to carry molecules across a cell membrane or through the blood