

Module 2 Class Notes (Krc)

The Basics of Life

Organic Molecules-The Molecules of Life

Instructions: Complete the class notes from the ppt slides. Use MS Words to fill in the blanks.

The Basics of Life

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Matter, Energy, and Life

1. All living things are composed of chemicals. These chemicals are known as Matter.
2. Matter is anything that has mass and occupies space.
3. Energy is the ability to do work or cause things to Move.
4. Energy at Rest is Potential Energy.
Energy at Motion is Kinetic Energy.

Phases of Matter

5. Three phases of matter are Solid, Liquid, & Gas. 6.
- Solids- Strong attractive forces, Low kinetic energy, little to no Molecular Movement.
7. Liquid-enough Kinetic energy to overcome the attractive forces; more molecular movement.
8. Gas- high kinetic energy, little to no attractive forces; maximum movement.

The Nature of Matter

9. Basic building block of matter is Element.
Ex. . OXYGEN (O), HYDROGEN (H), SODIUM (Na), CHLORINE (Cl), NITROGEN (N)
10. The PERIODIC TABLE OF ELEMENTS lists all elements in order of increasing atomic number.
11. Two or more elements may combine together in a certain proportion to form a Compound. Ex. $\text{Na} + \text{Cl} \rightarrow \text{NaCl}$
12. Each unit of a compound is called a Molecule.

Atomic Structure

13. An Atom is the smallest unit of an element.
14. It consists of 3 particles.
 - a. Protons: located in the nucleus (center); positively charged particles.
 - b. Neutrons: located in the nucleus; with no charges (neutral).
 - c. Electrons: move in orbits or shells around the nucleus; negatively charged.
Atomic # = # of Protons.

15. Each atom with the same element with a different number of neutrons is called an _____ Isotope _____ of that element.
16. Radioactive Isotope: AN ATOM WITH UNSTABLE NUCLEUS _____
17. **Electron Distribution.** _____ Electrons _____ move in orbits or shells around the nucleus. These shells are now called _____ Energy _____ Levels _____. **A Rule to Remember:** 2, 8, 8,.....

In Class Activity 18- 19

18. Calculate the number of **molecules** present in the following compounds.
- A. **H₂O** _____ 1 _____
- B. **6H₂O** _____ 6 _____
- C. **5C₆H₁₂O₆** _____ 5 _____
19. Calculate the number of atoms of each element present in the following compounds.
- A. **H₂O** H _____ 2 _____ O _____ 1 _____
- B. **6H₂O** H _____ 2 _____ O _____ 1 _____
- C. **5C₆H₁₂O₆** C _____ 6 _____ H _____ 12 _____ O _____ 6 _____

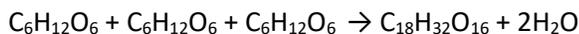
Chemical Changes & Chemical Bonds

20. Chemical Reaction: When atoms or molecules interact with each to form new combinations, a _____ chemical reaction _____ takes place.
Ex: $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
21. **Name** the reactants in the above reaction. _____ Hydrochloric acid _____ & _____ sodium hydroxide _____
22. Name the products in the above reaction. _____ sodium chloride _____ & _____ water _____
23. _____ Reactants _____ -substances that are _____ changed _____, usually on the _____ left _____ side of the _____ equation _____.
24. _____ Products _____ -new chemical substances _____ formed _____, usually on the _____ right _____ side of the _____ equation _____.
25. Name the three kinds of chemical bonds. _____ Ionic bonds _____, _____ Covalent Bonds _____, & _____ Hydrogen bonds _____.
26. Atoms with charge are called _____ ions _____.
27. _____ Ionic bond _____ : the attraction between oppositely charged ions.
_____ Ionic _____ Compounds _____ are formed after atoms transfer electrons to achieve a full outermost energy level.
28. _____ Covalent _____ Bond _____ is a chemical bond formed by the **sharing** of a pair of electrons.
29. Hydrogen Bond: The force of attraction between _____ Molecules _____. EX. The positive hydrogen end of one polar molecule is attracted to the negative end of another polar molecule. This attraction is a _____ hydrogen _____ bond _____.
Hydrogen bonds are very important in biology. They stabilize the structure of _____ DNA _____ and proteins.
_____ Water _____ molecules can “stick” together with _____ hydrogen _____ bonds.
30. **Chemical Reactions in Biology: 1** _____ Dehydration _____ _____ Synthesis _____

2. Hydrolysis

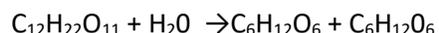
Dehydration synthesis – When two small molecules are joined to form a larger molecule. A molecule of water is released. (de = remove; hydro = water; synthesis = combine)

Give ONE chemical equation of **Dehydration synthesis** in the box below.



Hydrolysis -HYDROLYSIS (hydro = water; lyse = to split or break). When a larger molecule is broken down into smaller parts. Opposite of a dehydration synthesis

Give ONE chemical equation of **Hydrolysis** in the box below .



Acids, Bases, and Salts

31. Acid: Ionic compounds that release hydrogen ions (H^+) into a solution

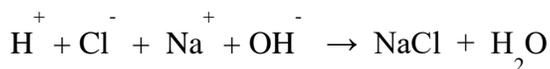
Example: hydrochloric acid (HCl), sulfuric acid (H_2SO_4)

Base: Compounds that release hydroxide ions (OH^-) into a solution.

Ex. Sodium hydroxide (NaOH), ammonia (NH_3)

32. Salts: Neither acids nor bases; Salts are formed when an Acid is mixed with a Base.

Ex. $HCl + NaOH \rightarrow NaCl + H_2O$



33. Neutralization: it is a chemical process that occurs when acids and bases react to form Salt & Water.

34. Define pH. The degree to which a solution is acidic or basic is represented by a quantity known as pH.

pH 7 is Neutral. The lower the pH, the more Acidic the substance is. The higher the pH is the more Basic the substance is.

Organic Molecules-The Molecules of Life

35. Molecules that do not contain carbon atoms are classified as Inorganic molecules.

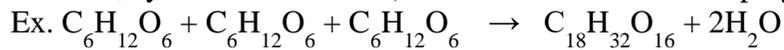
An example of an inorganic molecule is

A. $C_6H_{12}O_6$ B. $C_{12}H_{22}O_{11}$ C. HCl D. $C_{18}H_{32}O_{16}$

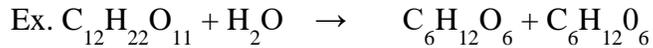
36. Organic Molecules are complex structures, containing **carbon atoms**, arranged in Rings or Chains.

Macromolecules of Life

37. ___Macromolecules___ are very large organic molecules. Organic molecules are composed of subunits (___monomers___) that are attached to each other forming a ___polymer___. The monomers in a polymer are usually combined by a ___Dehydration___ ___Synthesis___ reaction. (de = remove; hydro = water; synthesis = combine). monomer + monomer = polymer + water



38. The reverse of a dehydration synthesis reaction is known as ___Hydrolysis___ (hydro = water; lyse = to split or break).



39. The most important organic compounds found in living things are: ___Carbohydrates___, ___Proteins___, ___Nucleic Acids___, & ___Lipids___.

Carbohydrates

40. Carbohydrates are composed of carbon, hydrogen, and oxygen atoms. The monomers are called ___Simple Sugars___ or ___Monosaccharides___. They have an equal # of carbons and oxygen and twice as many hydrogen. Ex. $\text{C}_6\text{H}_{12}\text{O}_6$, $\text{C}_5\text{H}_{10}\text{O}_5$. Cell energy is furnished by ___Carbohydrates___. **Complex carbohydrates** are formed by the union of several units of ___Simple___ ___Sugars___, such as glucose, fructose, etc. Important components of nucleic acids ___DNA___ & ___RNA___

Proteins

41. They are made of monomers known as ___Amino___ ___Acids___. These organic molecules contain ___Nitrogen___ in addition to carbon, hydrogen and oxygen. The amino acids bond together by ___Peptide___ ___Bonds___ to form proteins. Proteins are destroyed or ___Denatured___, when exposed to excessive heat. Proteins are part of the ___Cell___ ___Membrane___. ___Enzymes___ are made of proteins, which speed up chemical reactions.

Nucleic Acids

42. ___Nucleic Acids___ are complex organic polymers that store and transfer genetic information within a cell. There are TWO types of nucleic acids: ___deoxyribonucleic acid___ and ___ribonucleic acid___ DNA serves as ___genetic___ ___material___. RNA plays a vital role in manufacturing ___protein___ The monomers that make the nucleic acids are called ___nucleotides___.

Lipids

43. Lipids do not dissolve in ___water___ easily. They are also composed of ___carbon___, ___hydrogen___, and ___oxygen___.

List the three main types of lipids: A. ___true fats___, B. ___phospholipids___ & C. ___steroids___ The building blocks of a fat are a ___glycerol___ molecule and ___fatty acids___. Phospholipids are a class of water ___insoluble___ molecules that are similar to fats, but contain ___phosphate___ ___groups___ (PO_4). Phospholipids are a major part of the ___Cell Membrane___. Steroids are ___lipid___ molecules. They often serve as ___hormones___ that aid in regulating body processes.

