

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, & gass.
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** _____
- B. **6H₂O** _____
- C. **5C₆H₁₂O₆** _____
19. Calculate the number of atoms of each element present in the following compounds.
- A. **H₂O** H _____ O _____
- B. **6H₂O** H _____ O _____
- C. **5C₆H₁₂O₆** C _____ H _____ O _____

Chemical Changes & Chemical Bonds

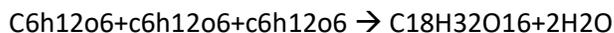
20. Chemical Reaction: When atoms or molecules interact with each to form new combinations, a _____ Chemical Reaction _____ takes place.
Ex: $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
21. **Name** the reactants in the above reaction. _____ Hydro chloric acid _____ & _____ 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. ___ An 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.
___ proteins _____
waters ___ molecules can “stick” together with _____ hydrogen _____ bonds.

30. Chemical Reactions in Biology: 1 _____ Dehydration ___ synthesis _____

2. _____ Hydrolysis _____

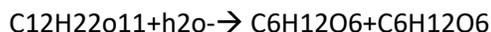
Dehydration synthesis – When ___two_____ small molecules are ___joined_____ to form a larger molecule. A molecule of ___water_____ is released. (de = remove; hydro = water; synthesis = combine)

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 .

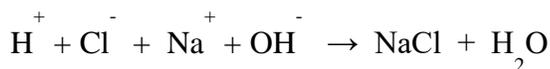


Acids, Bases, and Salts

31. ___ACID___: Ionic compounds that release ___Hydrogen_____ ions___(H⁺) into a solution
Example: ___hydrochloric acid_(HCl), _____sulfuric acid_(H₂SO₄) _____

32. ___ Base ___: Compounds that release ___hydroxide___ ions___(OH⁻) into a solution.
Ex. _____Sodium hydroxide ___ (NaOH), ammonia (NH₃)

33. Salts: Neither acids nor bases; Salts are formed when an ___ACID _____ is mixed with a ___
BASE _____. Ex. HCl + NaOH → NaCl + H₂O



34. ___Nuetralization_____: it is a chemical process that occurs when acids and bases react to form
_____salt___ & ___walter_____.

35. Define pH. _____The degree to which a solution is acidic or basic is represented by a quality 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.

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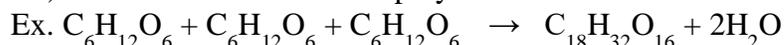
36. Molecules that do not contain carbon atoms are classified as _____inorganic_____ molecules.
An example of an inorganic molecule is

- A. C₆H₁₂O₆ B. C₁₂H₂₂O₁₁ **C. HCl** D. C₁₈H₃₂O₁₆

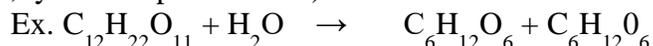
37. ___ Organic ___ Molecules ___ are complex structures, containing **carbon atoms**, arranged in ___ rings ___ or ___ chains ___.

Macromolecules of Life

38. ___ macromolecules ___ are very large organic molecules. Organic molecules are composed of subunits (___ monomers ___) that are attached to each other forming a ___. The monomers in a polymer are usually combined by a ___ Dehydration ___ synthesis ___ reaction. (de = remove; hydro = water; synthesis = combine). monomer + monomer = polymer + water



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



40. The most important organic compounds found in living things are: ___ carbohydrates ___ , ___ proteins ___ , ___ nucleic acids ___ , & ___ lipids ___ .

Carbohydrates

41. 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. $C_6H_{12}O_6$, $C_5H_{10}O_5$. 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

42. They are made of monomers known as ___ . These organic molecules contain ___ in addition to carbon, hydrogen and oxygen. The amino acids bond together by ___ to form proteins. Proteins are destroyed or ___ , when exposed to excessive heat. Proteins are part of the ___ . ___ 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 (DNA) ___ and ___ ribonucleic acid (RNA) ___

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 ___ water insoluble ___ molecules that are

similar to fats but contain __phosphate ____ groups____ (PO₄). Phospholipids are a major part of the _____ Cell membrane _____. Steroids are __lipids _____ molecules. They often serve as _____ hormones _____ that aid in regulating body processes.

