

Name: _____ Period: _____ Seat #: _____ Date: _____

NORTH CENTRAL HIGH SCHOOL NOTE & STUDY GUIDE

CP Biology I

Unit 1-2: Biochemistry

*REQUIRED READING FROM BIOLOGY (MILLER & LEVINE):
CHAPTER 2, THE CHEMISTRY OF LIFE, PG. 26-52*

Additional resources available at
www.mrdocsonlinelab.com

Grade Chart: (For Teacher Use Only)

Part	Description	Grade	Out of
1	Introduction to Chemistry		10
2	Organic/Biochemistry		10
3	Enzymes		10
Test Date	TOTAL		30

NOTES: Introduction to Chemistry



Objectives

- *
- *
- *
- *
- *



Matter

- * Everything in the universe is made up of _____.
- * All matter is made up of tiny particles called _____.
- * Atoms are the smallest unit of an _____ that still retain that element's properties.



Atoms

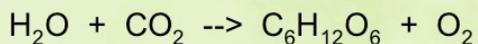
- * Atoms are made up of three **sub-atomic particles**.
 - * **Protons** are positively charged particles and are located in the nucleus.
 - * **Neutrons** have no charge (neutral) and are also located in the nucleus.
 - * **Electrons** have a negative charge, are located on the outside of the atom in the **Electron Cloud**, and are responsible for **bonding**.

Chemical Bonds

- * Atoms can combine with other atoms to form a _____.
- * Like molecules form a _____.
- * There are 2 main types of bonds:
 - _____ occur when atoms share their outermost electrons.
 - _____ occur when atoms gain or lose their outermost electrons.

Chemical Reactions

- * When atoms form or break bonds to become new molecules it is called a _____.
- * The substances that go into a chemical reaction are called _____.
- * The substances that are generated as a result of a chemical reaction are called _____.



Redox Reactions

- * Chemical reactions are responsible for the exchange of energy between an organism and the environment.
- * _____ are reactions in which reactants lose electrons (energy.)
- * _____ are reactions in which reactants gain electrons (energy.)
- * A **redox reaction** is when both oxidation and reduction happen in the same reaction.

Making Reactions Happen

- * Many reactions require the addition of energy to happen.
- * The amount of energy required to make a reaction start is called the _____.
- * Substances known as **catalysts** can reduce the activation energy for a reaction.
- * Catalysts are not used up in the chemical reaction.
- * _____ are biological catalysts.

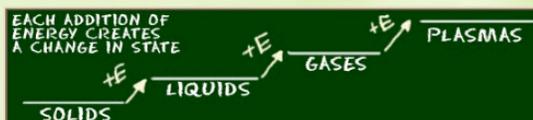
States of Matter

- * _____ states that the particles (atoms and molecules) that make up all matter are constantly in motion.
- * The amount of Kinetic energy (movement) and how close the particles are determines which state of matter the substance is in.

Energy and State

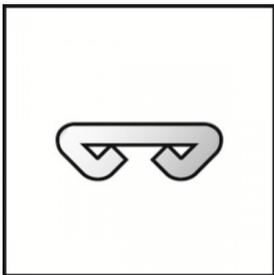
- * Look at the different states of matter and compare the movement.

[Purdue Animation](#)



Part I: Introduction to Chemistry

- _____ 1. Atoms are composed of
- protons with a positive charge.
 - neutrons with no charge.
 - electrons with a negative charge.
 - All of the above
- _____ 2. The smallest particle of carbon that can retain the chemical properties of carbon is
- a carbon molecule.
 - a carbon macromolecule.
 - a carbon atom.
 - the nucleus of a carbon atom.
- _____ 3. A substance that is composed of only one type of atom is called a(n)
- nucleus.
 - cell.
 - element.
 - molecule.
- _____ 4. The electrons of an atom
- are found in the nucleus along with the protons.
 - orbit the nucleus in various energy levels.
 - have a positive charge.
 - are attracted to the positive charge of neutrons.
- _____ 5. Which of the following states of matter contain(s) particles that are tightly linked together in a definite shape?
- solid
 - liquid
 - gas
 - solid and liquid
- _____ 6. An atom that has gained or lost electrons is called a(n)
- molecule.
 - nucleon.
 - ion.
 - element.
- _____ 7. Atoms become more stable when they form compounds because
- they always lose electrons when they form compounds.
 - their outer orbitals become filled when they form compounds.
 - they always gain electrons when they form compounds.
 - their nucleus loses extra protons when they form compounds.
- _____ 8. Which of the following statements most accurately describes the difference between an ionic bond and a covalent bond?
- Atoms held together by ionic bonds separate when placed in water, while atoms held together by covalent bonds do not separate in water.
 - Ionic bonds hold together atoms of two different types, while covalent bonds hold together atoms of the same type.
 - Electrons are exchanged between atoms held together by an ionic bond, but they are shared between atoms held together by a covalent bond.
 - Ionic bonds form between atoms that carry opposite charges, while covalent bonds form between uncharged atoms.
9. Substances that are changed when they become involved in chemical reactions are called _____, while the new substances that are formed are called _____.
10. Explain the connection between chemical reactions, chemical bonds, and energy.



LANDING PAGE 1

**STAPLE THE FOLLOWING ASSIGNMENTS
HERE WHEN YOU GET THE BACK (GRADED)
FROM YOUR TEACHER.**

1. HWQ 1-2-1
2. VIDEOLAB: BNSG'S ATOMS & MOLECULES
3. ACTIVITY: ATOMIC ORGANIZER
4. (OTHERS AS DIRECTED BY YOUR TEACHER)

NOTES: Organic/Biochemistry



Objectives

- *
- *
- *
- *
- *



Organic Compounds

* All compounds can be classified into two categories:

- * _____: These compounds are carbon based.
- * _____: These compounds do not contain carbon (with few exceptions.)



The Carbon Atom

* The carbon atom is unique because it can bond with 4 different atoms or even to another carbon atom.

Functional Groups

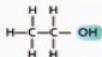
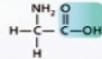
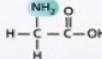
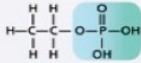
* There are some clusters of atoms that are often used to influence the characteristics of molecules.

* The presence these

_____ determines how and what a molecule does.

Functional Groups

TABLE 3-1 Common Functional Groups

Functional group	Structural formula	Example
Hydroxyl	$-\text{OH}$	
Carboxyl		
Amino		
Phosphate		

Monomers & Polymers

* Many carbon compounds are built from _____, which are simple carbon based molecules that can serve as building blocks for more complex molecules.

* Monomers combine to form _____.

* Large polymers can also be called _____.

A little Greek:

mono = _____, poly = _____, micro = _____, macro = _____

Molecules of Life

* There are four essential macromolecules for life and each plays a specific role in the chemistry of the specific organism.

* They are:

- * _____
- * _____
- * _____
- * _____

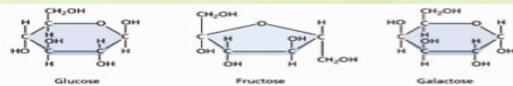
Carbohydrates

* **Monomer:** _____
(Glucose, Fructose, Galactose)

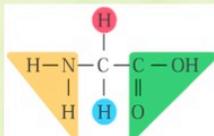
* **General Formula:** CH_2O (1:2:1 Ratio)

* **Polymer:** _____

* **Primary Use:**



Proteins



* **Monomer:** _____

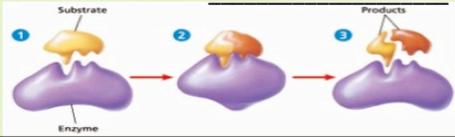
* **General Formula:** Carbon bonded to 1 Hydrogen, 1 carboxyl Group, 1 amino group, and a "R" group.

* **Polymer:**

* **Primary Use:**

Enzymes (Proteins)

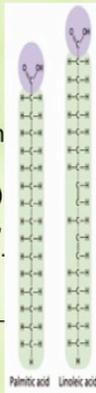
- * Enzymes are a specific type of protein that act as a catalyst to breakdown certain substances (_____).
- * Once a substrate comes in contact with the _____ of an enzyme, it is broken down.



Lipids

- * **Monomer:** _____
- * **General Formula:** Long Carbon chain with carboxyl group on one end and an "X" group.
- * **Polymer:** _____ (X=alcohol)
_____ (X=phosphate),
_____ (X=Alcohol chain).
- * **Primary Use:**

- * **NOTE:** The carboxyl end of a lipid is **hydrophilic** (attracted to water) and the other end is often **hydrophobic** (water fearing.)

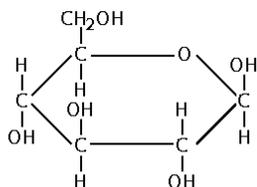


Nucleic Acids

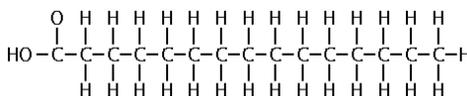
- * **Monomer:** _____
- * **General Formula:** Phosphate group, a Carbon sugar, & Ring-shaped nitrogenous base.
- * **Polymer:** _____ (_____) & _____ (_____)
- * **Primary Use:**

PART II: Organic/Biochemistry

- _____ 1. All organic compounds contain the element
a. C. c. Ca.
b. N. d. Na.
- _____ 2. Carbon is different from many other elements in that
a. it has four electrons in its outermost energy level.
b. it readily bonds with other carbon atoms.
c. it can form single, double, or triple bonds with other atoms.
d. All of the above
- _____ 3. Which of the following is a carbohydrate?
a. DNA c. wax
b. insulin d. sucrose
- _____ 4. Polysaccharides are
a. carbohydrates. c. proteins.
b. lipids. d. unsaturated fats.
- _____ 5. Amino acids are monomers of
a. disaccharides. c. nucleotides.
b. proteins. d. steroids.
- _____ 6.



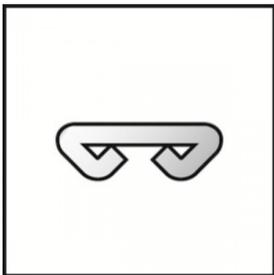
Molecule 1



Molecule 2

Refer to the illustration above. Molecules like molecule 2 are found in

- a. carbohydrates. c. nucleic acids.
b. lipids. d. proteins.
- _____ 7. All of the following are examples of lipids *except*
a. saturated fats. c. cholesterol.
b. starch. d. earwax.
- _____ 8. Which organic molecule below is most closely related to lipids?
a. amino acids c. nucleotides
b. CH₂ chains d. sugars
- _____ 9. Which organic molecule below is most closely related to nucleic acids?
a. amino acids c. nucleotides
b. CH₂ chains d. sugars
- _____ 10. Nucleic acids include
a. chlorophyll and retinal.
b. DNA and RNA.
c. lipids and sugars.
d. glucose and glycogen.
- _____ 11. Carbon atoms can bond together to form all of the following *except*
a. ring structures. c. straight chain structures.
b. inorganic structures. d. branched structures.
12. Because carbon atoms have four electrons in their outermost energy level, they usually form four _____ bonds with other atoms.



LANDING PAGE 2

STAPLE THE FOLLOWING ASSIGNMENTS
HERE WHEN YOU GET THE BACK (GRADED)
FROM YOUR TEACHER.

1. HWQ 1-2-2
2. ACT: ORGANIC ORGANIZER
3. LAB: FOOD ANALYSIS, PART I (Carbohydrates)
4. LAB: FOOD ANALYSIS, PART II (Proteins & Lipids)
5. (OTHERS AS DIRECTED BY YOUR TEACHER)

NOTES: Enzymes



Objectives

- * _____
- * _____
- * _____
- * _____



Before We Get to Far...

- * It is important to remember that in biology, and elsewhere, _____
- * This means that the shape of something will directly determine what it does.
- * If the shape of something changes it often means

◆ EXAMPLE:



Reaction Rates

- * The rate of a reaction is a measure of how long it takes for the reaction to occur.
- * Some body processes can take too long to occur, so the body uses proteins called _____ to speed up the reaction rate.
- * An enzyme is a biological catalyst, which increases the speed at which a reaction will occur.

Where Can I Find Enzymes?

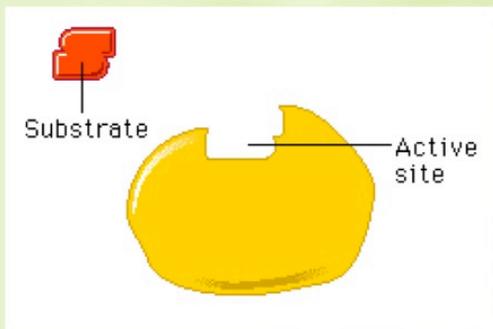
* Enzymes play a crucial role in :

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- many more...

How do Enzymes Work?

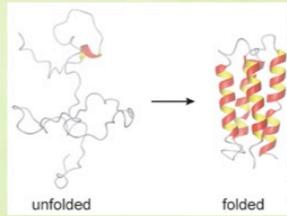
- * Enzymes work using the _____
- * The enzyme has a place on its surface called the _____
- * The _____, the materials the enzyme will work with, fit onto the active site because their shapes are complimentary.
- * Once the substrate is on the active site, the enzyme can connect them or break them apart as needed.

The Induced Fit Model



Denaturing Proteins

- * The shape of the enzyme can be changed by several factors.
- * If the shape of the protein that makes up the enzyme, or the substrate changes then _____
- * _____
- * _____ can alter the shape of proteins.



Enzymes and Digestion:

Enzymes and DNA:

Specificity of Enzymes

- * The active site of an enzyme has a _____
- * The substrate has a _____
- * The substrate must fit into the active site _____
- * This means that enzymes can only work with _____

Part IV: Enzymes

_____ 1. Enzymes

- a. are able to heat up molecules so that they can react.
- b. provide CO₂ for chemical reactions.
- c. are biological catalysts.
- d. absorb excess heat so that reactions occur at low temperatures.

_____ 2. A single organism may contain

- a. thousands of different enzymes, each one specific to a different chemical reaction.
- b. one enzyme that plays a role in thousands of different chemical reactions.
- c. approximately 100 kinds of enzymes, each one specific to a different chemical reaction.
- d. one enzyme that is specific to photosynthesis and one enzyme that is specific to cellular respiration.

_____ 3. A model of enzyme action is the

- a. induced fit model.
- b. lipid bilayer model.
- c. activator action model.
- d. active site model.

_____ 4. Without enzymes, the chemical reactions in the body would

- a. happen too fast.
- b. occur at much the same rate as they do with enzymes.
- c. require a different pH.
- d. occur too slowly to support life processes.

5. A substrate attaches to the _____ of an enzyme.

6. Describe how an enzyme works using the following terms (underline them as they appear in your answer): *enzyme, substrate, active site, induced fit, form, function, reaction rate.*



LANDING PAGE 3

STAPLE THE FOLLOWING ASSIGNMENTS
HERE WHEN YOU GET THE BACK (GRADED)
FROM YOUR TEACHER.

1. HWQ 1-2-3
2. ACT: MODELING W/ ENZYMES
3. LAB: ENZYMES
4. (OTHERS AS DIRECTED BY YOUR TEACHER)