**CORNELL NOTES**
Directions: You must create a minimum of **5 questions** in this column per page (average). Use these to study your notes and prepare for tests and quizzes. Notes will be stamped after each assigned sections (if completed) and turned in to your teacher at the end of the Unit for scoring.

# UNIT 1: INTRODUCING BIOLOGY
## Chapter 2: Chemistry of Life

I. Atoms, Ions, and Molecules (2.1)

A. Living things consist of _____ of different **elements**

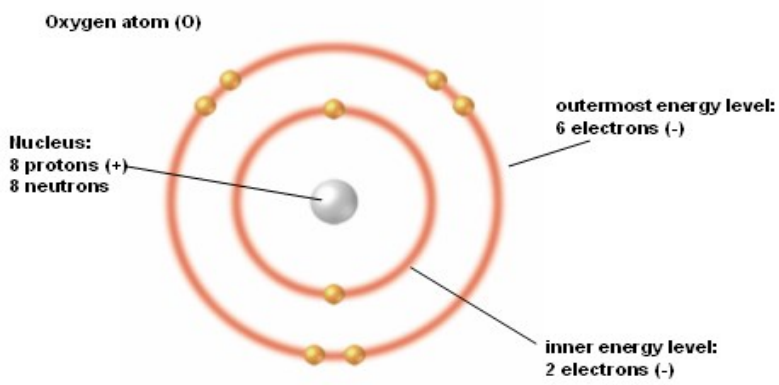
1. An **atom** is the _____ basic unit of _____

2. An _____ is one type of atom

3. An atom has a _____ and **electrons**

a. The **nucleus** has _____ and _____

b. **Electrons** are in energy levels _____ the nucleus




4. A _____ is made of atoms of different elements bonded together

a. Water ($H_20$)

b. Carbon dioxide ($CO_2$)

c. Many other carbon-based compounds in living things.

B. _____ form when atoms gain or lose _____

1. An ion is an atom that has gained or lost one or more electrons

a. **Positive ions -**_____ electron(s)

b. **Negative ions** -_____ electron(s)

2. _____ **bonds** form between oppositely charged ions

C. Atoms **share** pairs of electrons in _____ **bonds**

1. A **covalent bond** forms when atoms _____ a pair of electrons

a. Multiple covalent bonds

b. Diatomic molecules

2. A _____ is two or more atoms held together by covalent bonds.

II. Properties of Water

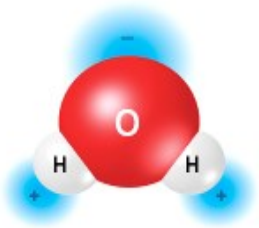
A. Life depends on **hydrogen bonds** in _____

1. Water is a _____ molecule

a. **Polar molecules** have slightly charged regions

b. _____ molecules do not have charged regions

c. Hydrogen bonds form between slightly positive hydrogen atoms and slightly negative atoms.




2. Hydrogen bonds are responsible for **three** important **properties** of water.

a.

b.

c.

B. Many compounds _____ in **water**

1. A solution is formed when one substance dissolves in another

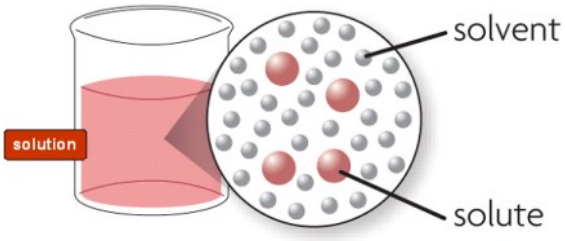
a. A _____ is a homogeneous mixture

b. _____ dissolve other substances

**c.** _____ dissolve in a solvent

2. "**Like dissolves like**"

a. Polar solvents dissolve polar solutes




b. Nonpolar solvents dissolve nonpolar solutes

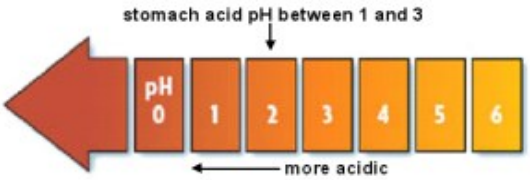
c. Polar substances and nonpolar substances generally remain _____

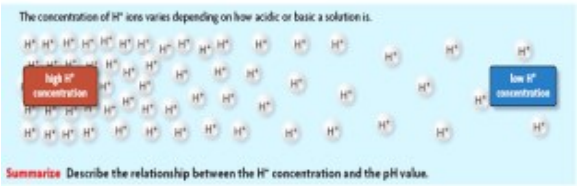
C. Some compounds form _____ and _____

1. An **acid** releases a _____ ion when it dissolves in water

a. **High** _____ **concentration**

b. **pH** _____ than **7**

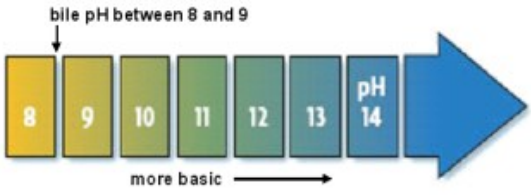


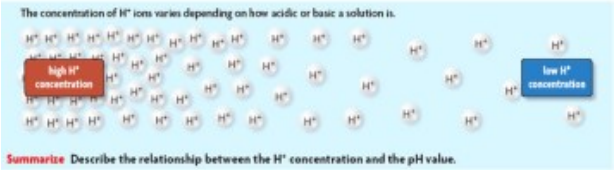




2. A **base** removes hydrogen ions from a solution

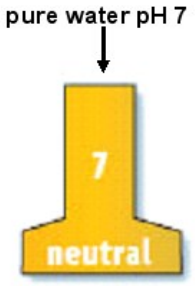
a. **low** _____ **concentration**

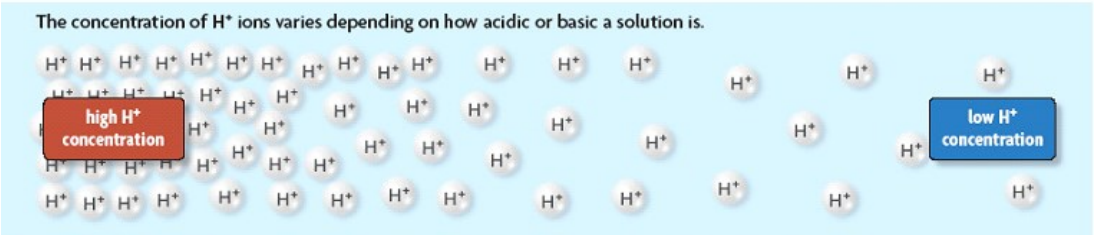
b. **pH** _____ than **7**



3. A **neutral solution** has a **pH of** _____




III. Carbon-Based Molecules (2.3)

A. Carbon atoms have **unique** _____ properties

1. **Carbon** forms _____ _____ with up to four other atoms, including other carbon atoms.

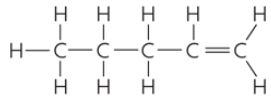
2. **Carbon-based molecules** have <u>three</u> general types of structures

a. Straight chain

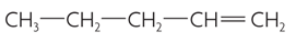
b. Branched chain

c. Ring

Straight chain

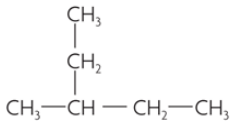


A simplified structure can also be shown as:



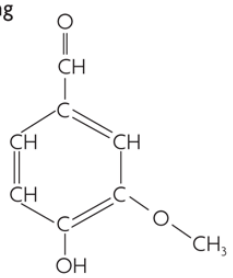
Pentene

Branched chain



Hexane

Ring

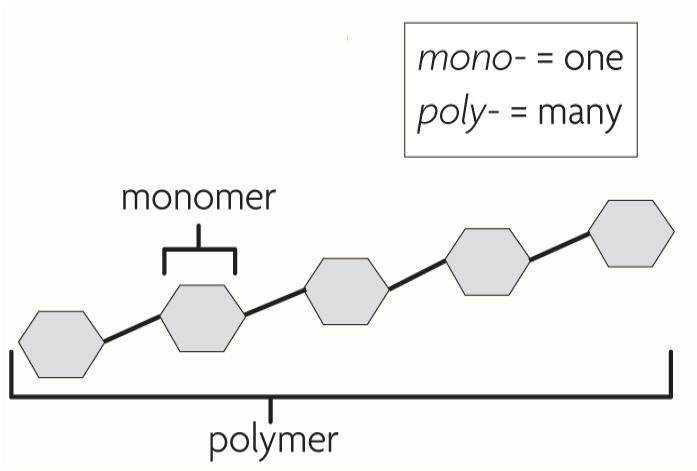


Vanillin

B. Many carbon based molecules are made of many small subunits bonded together

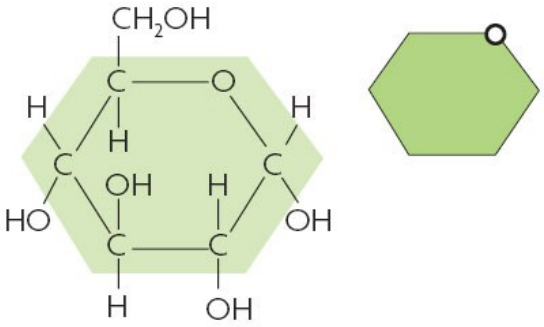
1. _____ are the individual subunits

2. _____ are made of many monomers




B. _____ main types of carbon-based molecules are found in living things.

1. _____ are made of carbon, hydrogen, and oxygen




Glucose ($C_6H_{12}O_6$) can be ring shaped and is often shown as a simplified hexagon.

a. Carbohydrates include **sugars** and **starches**

b. _____ are simple sugars

c. **Polysaccharides** include _____, _____, and _____

d. Carbohydrates can be broken down to provide _____ for cells

e. Some carbohydrates are part of cell structure

2. _____ are nonpolar molecules that include fats, oils, and cholesterol

a. Many contain carbon chains called **fatty acids**

b. Fats and oils contain _____

bonded to _____.

c. Lipids have several different functions

1). Broken down as a **source of** _____

2). Make up _____ _____

3). Used to make **hormones**

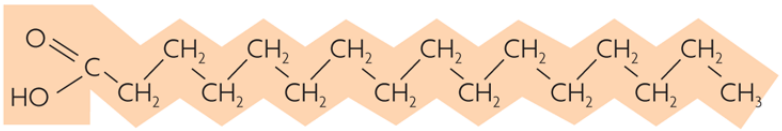
d. Fats and oils have different types of fatty acids

1). _____ fatty acids

2). _____ fatty acids

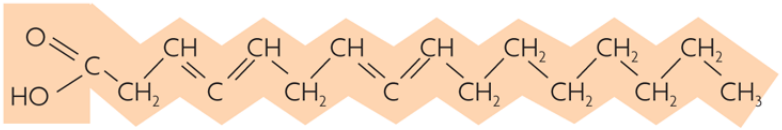
e. **Phospholipids** make up all _____ **membranes**

Saturated fatty acid



Saturated fats contain fatty acids in which all carbon–carbon bonds are single bonds.

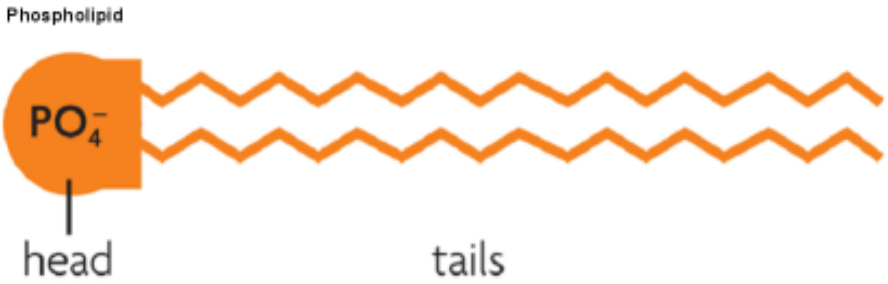
Unsaturated fatty acid



Unsaturated fats have fatty acids with at least one carbon–carbon double bond.

1). **Polar** phosphate "_____"

2). **Nonpolar** fatty acid "_____"




3. **Proteins** are polymers of _____ monomers

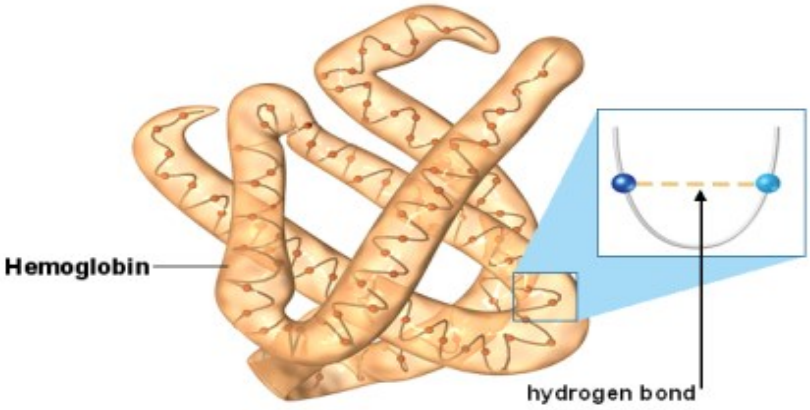
a. _____ different amino acids are used to build proteins in organisms

b. Proteins differ in the _____ and

_____ of amino acids.

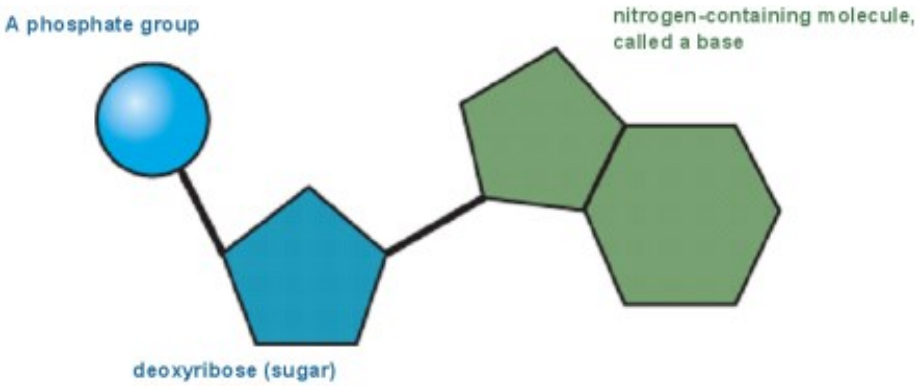
1). Amino acids interact to give a protein its _____

2). Incorrect amino acids change a proteins structure and function




4. _____ _____ are polymers of monomers called **nucleotides**

a. _____ are made of **sugar**, **phosphate group**, and a **nitrogen base**.




b. _____ stores **genetic information**

c. **RNA** builds _____

IV. Chemical Reactions (2.4)

A. Bonds break and form during chemical reactions.

1. _____ are changed during a chemical reaction

2. _____ are made by a chemical reactions.

B. **Bond energy** is the amount of energy that _____ a bond

1. _____ is <u>added</u> To **break bonds**

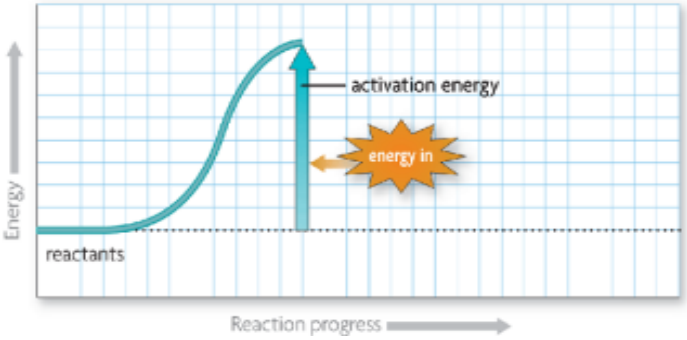
2. **Energy** is _____ when **bonds form**

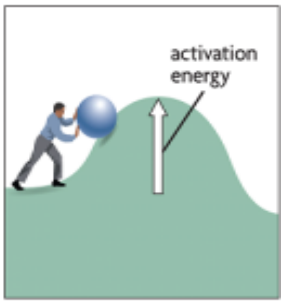
C. A reaction is at _____ when reactants and products form at the same rate.

$$CO_2 + H_2O \rightleftharpoons H_2CO_3$$

D. Chemical reactions release or absorb energy

1. **Activation energy** is the <u>amount of energy</u> that needs to be _____ to <u>start a chemical reaction</u>.

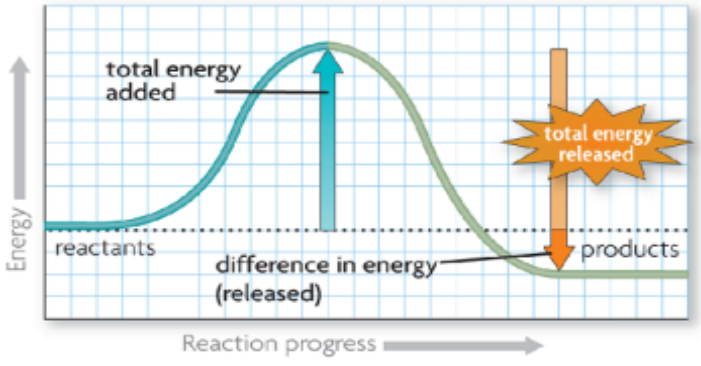



2. **Exothermic** reactions _____ more energy than they absorb.

a. **Reactants** have _____ <u>bond energy</u> than **products**

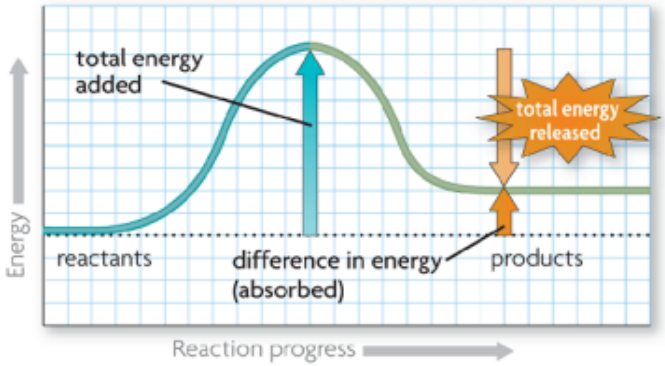
b. **Excess energy** is <u>released</u> by the _____




3. _____ reactions **absorb** more energy than they release.

a. **Reactants** have _____ bond energy than **products**

a. **Energy** is _____ by the reaction to make up the difference.



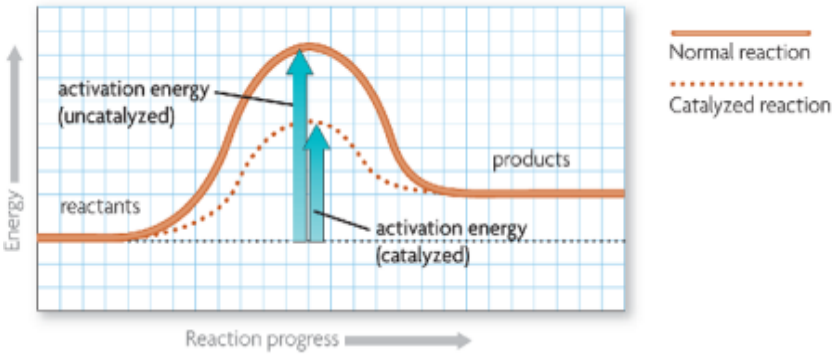

V. **Enzymes** (2.5)

A. A _____ lowers **activation energy**

1. **Catalysts** are substances that _____ **chemical reactions**

a. Decrease _____ **energy**

b. Increase **reaction** _____




B. Enzymes allow chemical reactions to occur under tightly controlled conditions.

1. **Enzymes** are **catalysts** in _____ _____

a. Enzymes are needed for almost all **processes**

b. Most **enzymes** are _____

C. Disruptions in _____ can prevent enzymes from functioning.

1. Enzymes function best in a <u>small range</u> of conditions

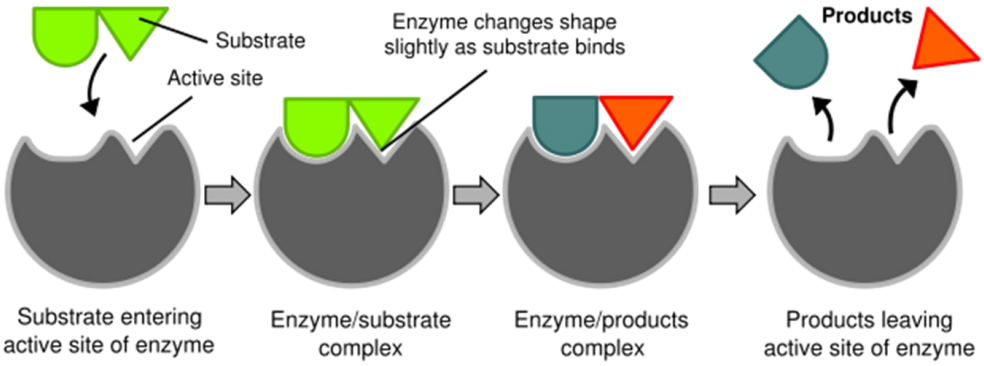
2. Changes in _____ and _____ can break hydrogen bonds.

3. An enzyme's **function** <u>depends</u> on its _____

D. An enzyme's <u>structure</u> allows only certain **reactants** to <u>bind</u> to the **enzyme**

1. Substrates (_____)

2. Active Site (_____ of enzyme)




E. The _____-_____-_____ **model** helps illustrate how enzymes function