Chemistry Notes Bio.SOL.3 Chapter 6 Page 145

Section 1

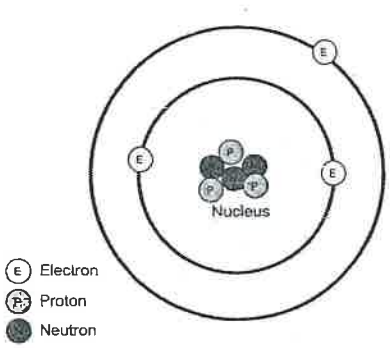
MATTER: is composed of tiny particles called atoms

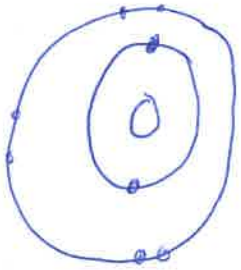
ATOMS: are the building blocks of matter

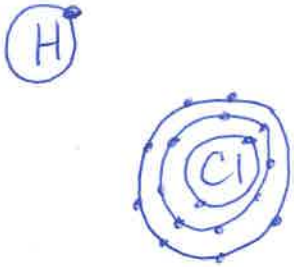
All atoms have the same Kind of particles. There are 3 different types:

Name of Particle	Definition	Location	Charge
1. PROTON	positively charged particle	nucleus	p+
2. NEUTRON	neutral particle	nucleus	n°
3. ELETRON	negatively charged particle	Energy cloud	e-
What is the nucleus?	center of atom		

How to draw the structure of an atom:







Electrons constantly move around an atom's nucleus in energy levels. The basic structure is based on the result of the attraction between p+ & e-.
Atoms contain an = # of p+ and e- so the overall charge of an atom is zero.

Elements: a pure substance that cannot be broken down into other substances by physical or chemical means
Elements are made up of only 1 type of atom

Periodic table
It is organized into vertical columns called groups and horizontal rows called periods.
How are the elements grouped? similiar physical & chemical properties

Each element is represented by a letter (s).
How do you write an element? The first letter is capital Second letter is lowercase
Examples: H O Fe Ca Cl Na S

ISOTOPE: atoms of the same element that have different number of neutrons
How are they identified? adding number of protons + neutrons
Where are these used? radiometric dating
Ex: Carbon-14

Compound: a pure substance formed when 2 or more different elements combine

Examples of compounds include: H_2O, NaCl, CH_4

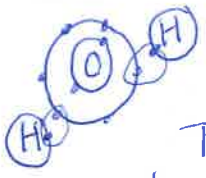
Explain how compounds are made?

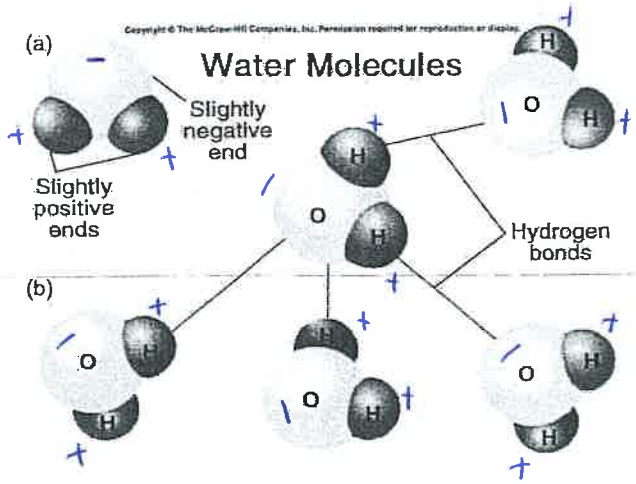
- formed from a specific combo of elements in a fixed ratio $H + H + O = H_2O$
- Compounds different physically & chemically from original elements
- cannot be broken down by physical means (crush, tear)

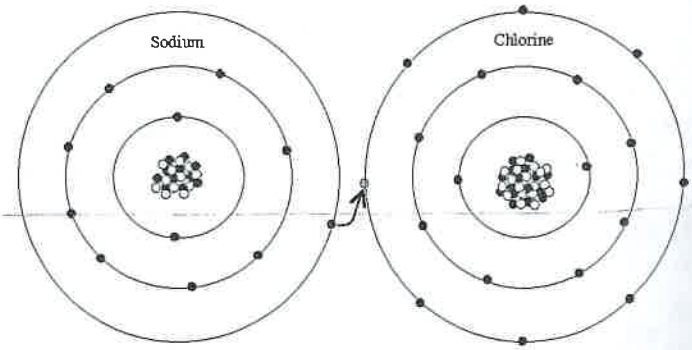
Explain how Chemical Bonds form:

force that holds compounds together

Types of Bonds

Covalent Bond	Ionic Bond
• e- are shared • wants to fill each energy level • explain how water (H_2O) is a type of covalent bond:  H only has $1e^-$ } in outer ring O has $6e^-$ Thus 2 H's are needed to share with O's 6 - this makes 8 for oxygen and 2 for H in outer ring • a **molecule** is a compound in which the atoms are held together by covalent bonds Examples: H_2O	• e- are donated or accepted • ion: an atom that has lost or gained 1 or more e^- • explain how salt (NaCl) is a type of ionic bond Na has $1e^-$ } in outer energy (valence) level Cl has $7e^-$ } Na will donate its $1e^-$ to fill Cl^-'s outer level Na becomes +1 Cl becomes -1 Examples: NaCl





Na donates $1e^-$ becomes +1

Cl^- accepts $1e^-$ becomes -1

Section 2 – Chemical Reactions page 156

Chemical reactions allow living things to grow, reproduce and adapt

Chemical Reaction: the process by which atoms or groups of atoms in substances are reorganized into different substances

Chemical Change	Physical Change
alters composition to make new substance	alters apperance but not composition
rusting, burn, digesting, cook	gas → liquid → solid cut, fold

Chemical Equations

Reactants → Products

reactant is the starting substance(s)
product is the substance(s) formed during the reaction
→ means yields

Explain how the conservation of mass occurs in chemical reactions? matter is not created or destroyed
- both sides must be balanced (reactant atom amount = product atom amount)

Energy of Reactions:
The key to starting a chemical reaction is energy

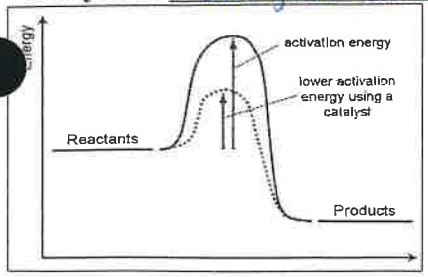
Activation Energy: the minimum amount of energy needed for reactants to form products in a chemical reaction "push for rxn to start"

Endothermic reactions	Exothermic reactions
- absorb heat energy - higher energy in products than reactants melting	- released energy in form of heat - lower energy in product than reactant (sweating, freezing)

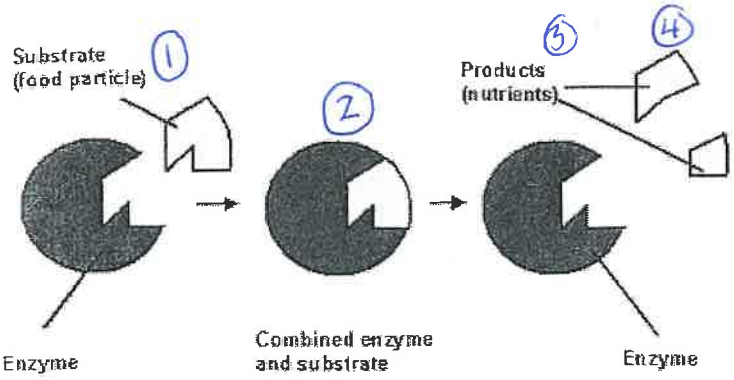
Enzymes
All living things are chemical factories driven by chemical reactions. However these chemical reactions proceed very slowly when carried out in the lab because the activation energy is high. To be useful, additional substances are needed to reduce the activation energy to allow the reaction to proceed quickly.

Catalyst: a substance that lowers activation energy needed to start a chemical reaction
Does not increase product amount
Does not get used up in the reaction

Enzymes: biological catalyst that speed up the rate of chemical rxns in biological processes



A type of protein
Essential to life
An enzymes name describes What it does
Substrate: reactants that bind to the enzyme
Active site: specific location where a substrate binds on an enzyme



How enzymes break down food into nutrients

How an enzyme functions:

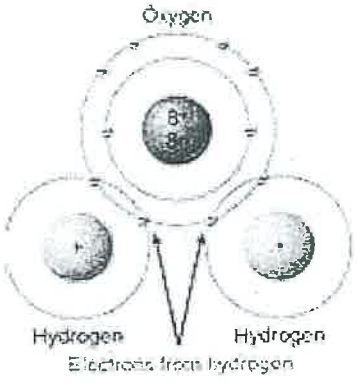
1) Substrate binds to the active site on the enzyme
2) active site changes shape and forms the enzyme-substrate complex
3) Substrate reacts to form products
4) The enzyme then releases the products

Factors that affect enzyme functioning are pH and temp

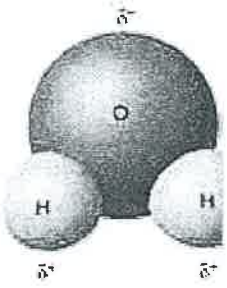
Section 3- Water and Solutions Page 161

The properties of water make it well suited to help maintain homeostasis in an organism. Water accounts for about 70% of a cell's mass. It is one of the most important molecules of life.

WATER PROPERTIES



(a) Electron shells in a water molecule

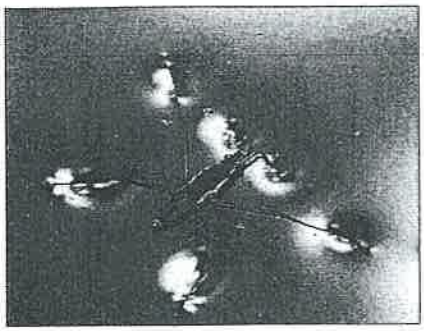


(b) Distribution of partial charges in a water molecule

- Water makes a covalent type of bond.
- There is an unequal distribution of electrons
- Oxygen's end has a negative charge
- Hydrogen's end has a positive charge
- Polar molecules: have an unequal distribution of charges - have oppositely charged sides
- Polarity is the property of having 2 opposite poles
- They act like magnet
- Hydrogen bond: a weak interaction involving a H atom and a F, O, or Nitrogen atom

COHESION

Water molecules are attracted to each other (things don't get wet)
This creates surface tension
Causing water to form droplets (linked as H bonds)
Allows things to float, rest on water



ADHESION

Forms H-Bonds with molecules on other surfaces

This creates capillary action

Water can travel up stems and seeds will swell and germinate

Ex: - straw in liquid
- paper towels ability to absorb

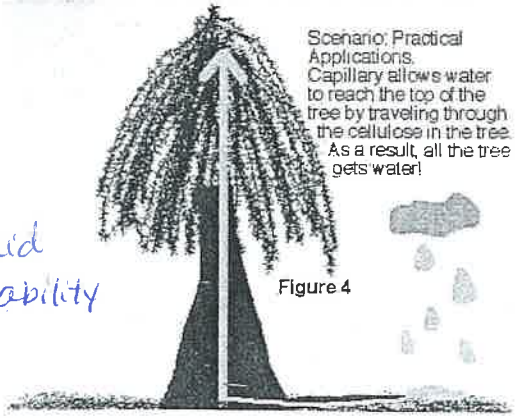
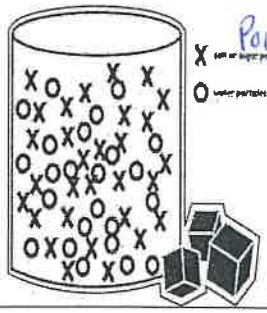
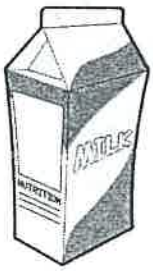


Figure 4

MIXTURES

Mixture: Compo of 2 or more substances in which each substance retains its individual characteristics & properties

Homogeneous mixtures (AKA) SOLUTION	**Heterogeneous mixtures**
- uniform composition throughout	All components remain distinct
Solvent: The substance that is doing the dissolving	**Suspension:** particles will settle (sand + water)
Solute: The substance that is dissolved	**Colloid:** particles do not settle
Ex: saltwater, air, saliva	
Kool-Aid	
 X = Powder mix, O = water	Suspension  Colloid  fog, smoke, butter, mayo, paint, ink, blood

ACIDS & BASES

If WATER is broken down it forms hydrogen ions & hydroxide ions

H2O → H^+ + OH^-

ACIDS

Will release H^+ when dissolved in H2O

Examples:

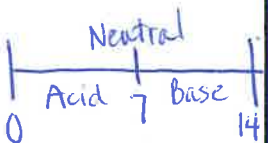
0-6.9 on pH scale
sour; tingle
corrosive

BASES Alkaline

Will release OH^- when dissolved in H2O

Examples:

7.1-14 on pH scale
bitter; slippery



The measure of concentration of H^+ in a solution is called pH

BUFFERS: a mixture that reacts with an acid or base to keep the pH within a particular range

Section 4 – The building blocks of life page 167

Organisms are made up of Carbon molecules

Organic means: comes from living things and must contain Carbon
Examples: carbs, protein, lipid, nucleic acid

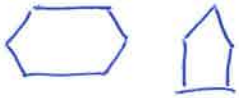
Inorganic means: does not come from living things and does not contain Carbon
Example: water

Macromolecule: a large molecule formed by joining smaller organic molecules together
Polymers: molecules made of repeating units of monomers

There are four categories of macromolecules compounds.

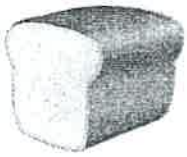
1. Carbohydrates
2. Lipids
3. Proteins
4. Nucleic acid

This is the General information about each organic compound (pages 167-171)

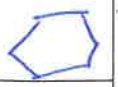
Organic Molecule	Food Source(s)	General Purpose	Basic building block AKA monomer	Elements it contains	Structure
 CARBOHYDRATE	bread grain rice fruit veggie candy	store energy "quick" provide structural support	monosaccharide	C H O	
LIPID 	butter oil beeswax lard	store energy (high source) provide barriers	fatty acid glycerol	C H O	
PROTEIN 	Beans eggs milk fish meat poultry	fight disease transport substances speed rxn's provide structural support make hormones	amino acid	C H O N	
NUCLEIC ACID 	None	-heredity info -helps to make proteins	nucleotide	C H O N P	

~Now go back to each section and get a little more detail~

~CARBOHYDRATES~



The basic building block is called a Monosaccharide

Name of Monosaccharide	Comes from	Structure
Glucose	plants / animals	$C_6H_{12}O_6$ 
Fructose	fruit	
Galactose	milk (dairy)	

If two basic building blocks of carbohydrates bond together it is called a disaccharide (2 monomers)

Name of Disaccharide	Comes from	What monosaccharaides make it up?
Sucrose	plants	Glu + Fru
Lactose	milk (dairy)	Glu + gal
Maltose	plants	Glu + glu

If three or more basic building blocks of carbohydrates bond together it is called a polysaccharide

Name of Polysaccharides	Function
Cellulose	structural support in cell walls of plants "fiber"
Starch	storage of energy in plants (potato)
Glycogen	- energy storage form of glucose found in liver + skeletal muscle (mammals)
Chitin	- structural support of hard outer covering of shrimp, lobster, insects, fungi

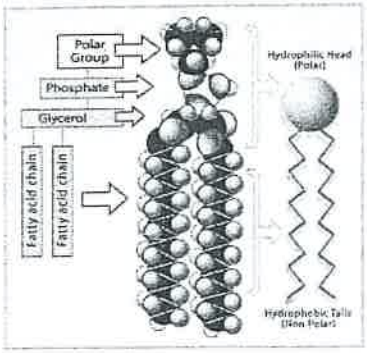
~Lipids~

Composed of fatty acid + glycerol
Function: store energy
Triglyceride: main type of lipid
Organisms need lipids to function properly
What is the difference between a saturated fat and unsaturated fat?

Saturated
white
from animals
single bonds
solid
"Bad"

Unsaturated
double bonds
yellow
from plants
liquid
"Better"

Phospholipid



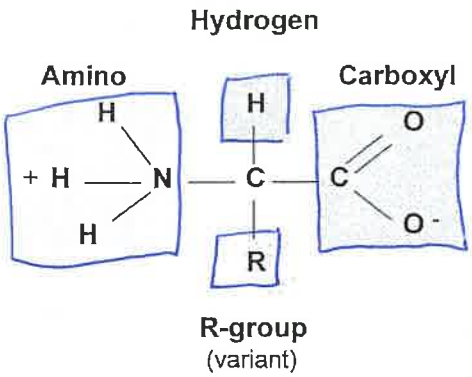
- structure & function of cell membrane
- hydrophobic
  ↳ don't dissolve in water

Steroids
↳ Cholesterol
hormones

~Proteins~

What is the building block of **Proteins?** amino acids

Amino Acid Structure



Types of protein	Purpose/function
enzyme	Speed up chemical reactions
collagen	Make up structure in your hair/nails/skin
hemoglobin	Transport blood
Antibodies	Helps fight disease

When 2 amino acids bond together this creates a peptide bond
This bond is between amino group and carboxyl group of the 2 amino acids
Proteins make up 15% of your total body mass and are involved in nearly every function of your body

CHON P

~Nucleic Acids~

What is the basic building block of nucleic acids? nucleotide

Name the made 3 parts of the basic building block
- sugar
- base
- phosphate group

DNA	RNA	ATP
stores genetic info - double stranded	produces protein single strand	energy for cell - 3 phosphates