**Chemistry**

**A. Review of Definition**

* + - * Matter
* **Atom**: Smallest particle that cannot be broken down by ordinary means. All matters (living and nonliving) are made up of atoms.
* **Element**: Made up of one kind of atom.

Example: Hydrogen is made up of hydrogen atoms.

* **Molecule**: Made up of one or more atoms combined.

Example: water (H2O) is made up of 2 hydrogen atoms and 1 oxygen atom

B. Periodic Table of Elements

* Periodic Table Trends - Highlight the metalloids B, Si, Ge, As, Se, Sb, Te, At
* Metal - Any element left of the ladder
* Nonmetal - Any element right of the ladder.

C. Chemical composition of the Human Body

Oxygen 64%
Carbon 18%
Hydrogen 10%
Nitrogen 3%
Phosphorus 1%
Sulfur 0.75%

How about the air we breathe? What is the most abundant gas in the atmosphere?

D. Atomic numbers and Masses

An atom is made up of
-proton(+), electron (-), neutron (0)

Atomic Number = Number of Proton
Atomic Mass = # of Proton + # of Neutron

E. Isotope - same element with different number of neutrons **example**: Hydrogen and Deuterium

F. Rutherford and Bohr Model of atoms

G. Type of Bonding

 i. Ionic Bonding (Ionic Compound)

Transfer of electrons

Metal (+) + Nonmetal (-)

 Example: **NaCl, CaCl2, LiBr**

* metal always written first.
* To name ionic compounds, name the metal then add – ide to non-metal.

**(**

 ii. Covalent Bonding (molecule)

 Sharing of electrons

 Nonmetal + Nonmetal

 Polarity due to electronegativity

 Example: CO, CO2, H2O

**Use Prefixes and add -ide**

One – Mono, Two – Di, Three – Tri, Four - Tetra

H. Properties of Water

 Hydrogen Bonding (Polarity of water)

1. High Heat of Vaporization

2. Adhesion

3. Cohesion

4. High Heat Capacity

5. Capillary Action

I. Mixture

- homogeneous vs. heterogenous (penny lab)

- solution: unsaturated, saturated, and super-saturated (lollipop lab)

J. Activation Energy

K. Enzyme - protein that acts as a catalyst by reducing activation energy.

Catalyst- A substance that increases the rate of a chemical reaction without itself undergoing any permanent chemical change.

L. Factors that affect Reaction Rate

Temperature, pH, concentration, surface area

**Biochemistry**

Define organic compounds

Monomer – simple carbon compounds &

Polymer – monomers bonded together

# Macromolecules

1. Carbohydrates
	1. Monosaccharides – Benedict Solution Test (blue to brownish red ppt)
* Example: blood sugar (glucose) fructose, galactose, maltose C6H12O6

Insulin: a protein (hormone) that stimulates the cells to take up glucose.

Type I diabetes: immune system attack pancreas that makes insulin (fatal)

Type II diabetes: pancreas cannot keep up with the demands for insulin

🡪sugar is not readily taken up by the cells so you are tired.

* 1. Disaccharide
* Example: table sugar (glucose and fructose), lactose in milk (glucose and galactose)
* Bond formed by condensation reaction(or dehydration synthesis) = loss of water



* 1. Polysaccharides

Break down of complex molecule is done by hydrolysis reaction ( addition of water)

* Example:

a. Glycogen (chain of glucose used for quick release of energy) – carb load night before a long race or competition

b starch and cellulose (plant store carbs this way) Starch is in form of a lot like glycogen but branched and cellulose is what makes up wood.



1. Proteins – Biuret solution
	1. Dipeptides and polypeptides (=protein)



* 1. function is determined by shape of protein
		1. storage, structure, signal, contractile, defensive, enzyme, transport, transcription regulatory.
		2. enzymes speed up chemical reactions by lowering activation energy
* lock in key model (substrate bind to the enzyme and breaks down by hydrolysis)
* induced fit model



1. Lipids (fats and oil) – Sudan IV solution
	1. Fatty acid and glycerol are building blocks of lipids (do not dissolve in water)
* long term energy storage (larger number of C & H bonds than carbs)
	1. Triglycerides: 3 fatty acids and 1 glycerol (vegetable oil and animal fat)
	2. Phospholipid: 2 fatty acids and 1 glycerol (cell membrane)
	3. Steroid: not fatty acid but four fused carbon rings
* Example: cholesterol
	1. Wax : 1 long fatty acid chaing + alcohol
	2. Saturated vs. Unsaturated fats

-saturated solid (animal) and unsaturated liquid (plant)

- single bonds (bad) vs. double bonds (good)

D. Nucleic Acid – methylene blue

a. DNA – Deoxyribonucleic Acid (genetic information)

b. RNA – Ribonucleic Acid (carries out gene info to cell)

nucleotides (nitrogenous base, sugar, phosphate) are basic unit that make up DNA

A, T, G, C and discovered by Watson & Crick