NAME: _____

REGENTS CHEMISTRY: THE PHYSCIAL SETTING KEY WORDS FOR MASTERY

UNIT ONE: MEASUREMENT AND TOOLS OF THE CHEMIST

- Average Kinetic Energy: temperature
- Absolute Scale: Kelvin scale where the temperature scale in which the freezing point of water is 273k and the boiling point is 373k with 0k as absolute zero.
- Absolute Zero: lowest possible state at which matter can exist which is 0k equivalent to -273.15°C
- Accuracy: how closely a measured value agrees with the correct value
- Atmospheres: a unit of pressure
- Calorimeter: a measuring instrument that determines quantities of heat
- Calorimetry: measurement of heat flow
- Charge: a charge can be negative, like an electron, or positive, like a proton. Objects with opposite charges attract one another, while objects with like charges repel one another.
- Concentration: the mass of solute in a given volume of solution, or mass/volume
- Density: mass per unit volume. (mass/volume)
- Erlenmeyer Flask: flat bottomed lab flask with narrow neck
- Mass: a measure of the amount of matter in an object
- Milli: thousandth
- Volume: the amount of space an object takes up
- Volumetric Flask: used to prepare solutions. A flat bottomed bulb with a long neck
- Joule: si unit of energy
- Kelvin: si unit of temperature
- Kelvin Scale: the temperature scale that defines absolute zero as 0 degrees
- Kilo: thousand
- Kilopascals: unit of pressure (kPa)
- Liter: basic unit for liquid volume

- Meniscus: the curve at a liquid's surface by which one measures the volume of the liquid.
- Nano: billionth
- Percent Error: the approximation error in some data is the discrepancy between exact value and measured value.
- Pico: trillionth
- Precision: accuracy
- Significant Figures: the certain digits and the first uncertain digits of a measurement
- Standard Temperature: 273k or 0°C
- Standard Pressure: 1atm
- Temperature: average kinetic energy of individual particles
- Theory: an explanation using an integrated set of principles that organizes and predicts observations
- Thermometer: instrument used for measuring temperature
- Uncertainty in Measurement: the differences in the value of repeated measurements, caused either by the measuring device or by the person doing the measurement, or both.

UNIT TWO: MATTER AND ENERGY

- Aqueous: solution in which water is the solvent
- Boiling Point: the temperature at which a substance changes from a liquid to a gas
- Chemical Change: a reaction in which the composition of a substance is changed
- Chemical Property: a property used to characterize materials in reactions that change their identity
- Cooling Curve: heat is removed, changing gas to liquid to solid
- Compound: a substance made up of two or more elements that are chemically combined in definite proportions by mass
- Conductivity: a measure of the ability of an electric current to flow through a substance
- Condensation: an exothermic process in which a gas changes to a liquid

- Condensation Point: temperature at which a gas becomes a liquid
- Chromatography: the process of separating mixtures into its individual substances
- Crystalline: an orderly, repeating arrangement of atoms or molecules in a solid
- Distillation: process that separates the substances in a solution based on their boiling points
- Deposition: the process in which a gas changes directly into a solid
- Ductile: a metal that is pliable, malleable and able to be drawn into wire
- Element: substance that cannot be broken down or decomposed into simpler substances by chemical means
- Endothermic: a chemical reaction that absorbs heat, producing with more potential energy than the reactants
- Energy Flow: movement of energy
- Evaporation: the process by which molecules in the liquid phase escape into the gaseous phase. A change from liquid to gas
- Exothermic: a chemical reaction that releases heat, producing products with less potential energy than the reactants
- Filtration: the process that separates a solid from the liquid in a heterogeneous mixture
- Freezing Point: the temperature at which both the solid and liquid phases of a substance exist in equilibrium; the same temperature as the melting point
- Gas: no defined volume nor defined shape
- Heat: energy transferred from one substance to another
- Heating Curve: heat is added, changing solid to liquid to gas
- Heat of Fusion: the amount of heat needed to convert a unit mass of a substance from a solid to a liquid at its melting point
- Heat of Sublimation: heat absorbed by a unit mass of a substance when I changes from a solid to a gas
- Heat of Vaporization: the amount of heat needed to convert a unit mass of a substance from a liquid to a vapor at its boiling point
- Heterogeneous: non-uniform composition
- Homogenous: uniform composition

- Kinetic Molecular Theory: a theory used to explain the behavior of gasses in terms of the motion of their particles. Particles of matter are always in motion
- Kinetic Energy: energy of motion
- Liquid: definite volume but no definite shape
- Malleable: property of metal that is capable of being shaped or drawn out
- Matter: anything that has mass and volume
- Melting Point: he temperature at which both the solid and liquid phases exist in equilibrium; the same temperature as the substance's freezing point
- Mixture: a substance consisting of two or more substances mixed together
- Molecule: the smallest unit of covalently bonded substance that has the properties of that substance
- Particle Diagram: a drawing or representation of what an element, compound, or mixture looks like
- Physical Change: a change that does not alter the chemical properties of a substance
- Physical Property: any characteristic of a material that can be observed or measured without changing the composition of the substances in the material
- Potential Energy: energy stored due to an object's position or arrangement
- Pure Substance: a compound or an element; a material in which the composition is the same throughout
- Solid: definite shape and volume
- Specific Heat Capacity: the amount of heat energy required to raise the temperature of one gram of substance by one degree Celsius
- Sublimation: the process in which a solid changes directly into a gas
- Substance: matter that has a uniform and definite composition
- Uniform Composition: a homogenous mixture that is same throughout

UNIT THREE: ATOMIC THEORY

- Atom: the smallest particle of an element that can enter into a chemical reaction
- Atomic Theory: all matter is composed of atoms

- Atomic Mass Unit: unit of mass for expressing masses of atoms or molecules
- Atomic Number: the number of protons in the nucleus of an atom
- Average Atomic Mass: weighted average of the atomic masses for the isotopes of an element
- Bohr Model: model of an atom that shows electrons in circular orbits around the nucleus
- Bohr Diagram: a diagram of an atom which includes protons, neutrons, electron shells and electrons
- Bright Light Spectra: distinct lines of color given off by an element when viewed through a spectroscope
- Electron: negatively charged particle; located outside the atomic nucleus
- Electron Configuration: arrangement of electrons in an orbital
- Electron Cloud Model: model of atom in which the electrons seem to form a cloud as they move around the nucleus
- Energy Level: the specific amount of energy an electron has
- Excited State: the condition that exists when the electrons of an atom occupy higher energy levels while lower energy levels are vacant
- Flame Test: testing chemicals by burning a compound to look at its flame color
- Ground State: the condition of an atom or ion in which the electrons occupy the lowest energy levels
- Ion: an atom that has gained or lost one or more electrons and has a negative or positive charge
- Ionization Energy: the amount of energy needed to remove the most loosely bound electrons from a neutral gaseous atom
- Isotopes: atom of an element that has a specific number of protons and neutrons
- Lewis Dot Diagram: illustrates valence electrons as dots around an element
- Mass Number: the total number of protons and neutrons of an atom
- Neutron: no charge
- Octet: 8 valence electrons

- Orbital: a region in an atom where there is a high probability of finding electrons
- Percent Abundance: the percentage amount of each isotope of an element in a naturally occurring sample of the element
- Polyatomic Ion: a covalently bonded group of atoms that have a net electric charge
- Principle Energy Level: the major energy levels of an atom
- Proton: positively charged particle located in the nucleus of an atom
- Rule of Eight: all electrons need 8 electrons to fill the outer shell. The first orbital can only hold 2
- Spectra: colors produces when wave lengths of light are separated
- Spectral Lines: the wavelengths where a specific element can absorb or emit light
- Subatomic Particles: protons, neutrons and electrons
- Rutherford's Gold Foil Experiment: atoms volume is empty space and core of the nucleus is positively charges
- Valence: number of electrons in the outermost energy level of an atom
- Valence Electrons: an electron that is in the highest occupies energy level of an atom
- Wave Mechanical Model: modern model of the atom, atoms have electrons in the orbitals that are like clouds around the nucleus
- Weighted Average: average of data that takes other factors such as the number of incumbents into account

UNIT FOUR: PERIODIC TABLE

- Alkali Metals: elements in Group 1. Metals that have only one electron in their outer shell and are malleable and good conductors of heat and electricity
- Alkaline Earth Metals: elements in Group 2. Metals that have an oxidation number of +2
- Atomic Radius: size of an atom which is the half distance between the nuclei of identical atoms bonded together
- Electronegativity: a measure of the attraction of electrons. Increase as you move left to right and bottom to top on the Periodic Table of Elements

- Family: groups of the Periodic Table that have similar properties example of families are alkali metals, alkaline earth metals, halogens and noble gases
- Group: vertical columns of elements that have the same number of valence electrons and share similar chemical properties
- Halogen: elements in Group 17. Halogens form salts when reacted to metals, contains nonmetals and 7 valence electrons
- Ionic Radius: the distance from the nucleus to the outer energy level of the ion
- Ionization Energy: the amount of energy required to remove an electron from an atom
- Inert Gas Group: former name of Group 18 noble gases
- Metal: element whose atoms loose electrons in chemical reactions to become positive ions. Good conductors of heat and electricity, malleable and ductile
- Metalloid: an element that has both metallic and nonmetallic properties.
- Noble Gas: a nonreactive element that is in group 18 and has full set of valence electrons
- Nonmetal: elements whose atoms will gain or share electrons in chemical reaction. Poor conductors of heat and electricity, brittle and not malleable or ductile
- Periodic: s elements are arranged according to their atomic number
- Periodic Law: the properties of elements are periodic functions of their atomic numbers
- Second Ionization Energy: energy required to remove a second outermost electron from a ground state atom.
- Shielding: the reduction of the attractive force between a positively charged nucleus and its outermost electrons due to the cancellation of some of the positive charge by the negative charges of the inner electrons
- Transition Metals: element in groups 3-12. 1-2 electrons in the outer energy level, less reactive than alkali-earth metals, good conductor of thermal energy and electrical current, high density
- Trends: atomic radius: decrease across, increase down. Ionization energy: increases across, decreases down. Electronegativity: increase across a period, decrease down a group

UNIT FIVE: BONDING AND INTERMOLECULAR FORCES

- Allotrope: one of two or more different forms of an element in the same phase
- Asymmetrical Molecule: a molecule that lacks identical atomic structure on each side of an axes
- Binary Compound: compounds composed of two elements
- Binding Energy: the force holding neutrons and protons together in a nucleus
- Chemical Bond: a force of attraction that holds two atoms together
- Chemical Formula: indicates the relative numbers of atoms of each kind in a chemical compound by using atomic symbols and numerical subscripts
- Conservation: the principle that properties such as mass, volume, and number remain the same despite changes in the forms of objects
- Covalent Bond: a bond formed by the sharing of electrons between nonmetals
- Covalent Radius: distance from the nucleus to the outer shell when it's involved in a covalent bond
- Dipole: a molecule that has two poles, or regions with opposite charges
- Dipole-Dipole Interaction: Type of intermolecular force in which opposite poles of neighboring dipole molecules are drawn together.
- Double Bond: the sharing of two pairs of electrons between two nuclei
- Electronegativity Difference: the difference in electronegativity between two atoms in a bond; < 0.5 = covalent bond; > 1.5 = ionic bond; 0.5 - 1.5 = polar covalent bond
- Empirical Formula: the simplest integer ratio in which atoms combine to form a compound
- Hydrogen Bonding: the attraction of a hydrogen atom in one molecule for an oxygen, nitrogen, or fluorine atom in another molecule
- Ionic Bonding: a bond formed by the transfer of electrons from one atom to another between a metal and a nonmetal
- Ionic Solid: solids composed of oppositely charged ions

- Intermolecular Forces: attraction between molecules. Examples from strong to very weak: hydrogen bonds, dipole-dipole forces and van der waal dispersion/London dispersion forces
- Metallic Bond: a bond formed by the attraction between positively charged metal ions and the electrons around them
- Molecular Formula: the actual ratio of the atoms in a molecule
- Nonpolar Molecule: molecule that shares electrons equally and does not have oppositely charged ends
- Nonpolar Covalent Bond: a bond formed by the equal sharing of a pair of electrons between two nuclei
- Polarity: a property of a molecule with oppositely charged ends
- Polar Covalent Bonds: a bond formed by the unequal sharing of electrons between two nuclei
- Polar Molecule: molecule with an unequal distribution of charge, resulting in the molecule having a positive end and a negative end
- Prefix System: mon-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, deca-
- Salt: the product of a neutralization reaction; an ionic substance consisting of a metallic cation and anion other than the hydroxide ion
- Single Covalent Bond: only one pair of electrons is shared between two atoms
- Stock System: solves the problem of the difficulty of having a compound with too many oxidation numbers by simply stating the oxidation number by using Roman numerals after the name of the metal
- Symmetrical Molecule: a molecule with identical atomic structure on each side of an axis
- Ternary Compound: a compound composed of three elements
- Triple Bond: the sharing of three pairs of electrons between two nuclei
- Vander Waals: a slight attraction that develops between the oppositely charged regions of nearby molecules

<u>UNIT SIX</u>: MATH OF CHEMISTRY

- Avogadro's Number: the number of representative particles in one mole of a substance

- Chemical Equation: a representation of a chemical reaction that uses symbols to show the relationship between the reactants and the products
- Coefficient: the number placed before a formula indicating the number of units of that substance
- Combustion: an exothermic reaction with oxygen, releasing heat
- Crucible and Cover: container in which metals are heated until they melt
- Crucible Tongs: used to pick up and hold a crucible and small hot objects
- Decomposition: a chemical reaction in which a compound a broken down into simpler substances
- Double Replacement: a chemical reaction in which ions exchange places
- Gram Formula Mass: the formula mass expressed in grams instead of atomic mass units
- Hydrate: the crystalline form of an ionic substance that contains a definite number of water molecules
- Hydrated Salt: salts that have absorbed water attached to them
- Empirical Formula: the simplest integer ratio in which atoms combine to form a compound
- Percentage Composition: the composition of a compound as a percentage of each element compared with the total mass of the compound
- Product: a substance formed in a chemical reaction, shown to the right of the arrow in an equation
- Reactant: a starting substance in a reaction, shown to the left of the arrow in an equation
- Single Replacement: a reaction in which an element replaces a less reactive element in a compound
- Synthesis: a reaction in which two or more substances combine to form one product
- Subscript: the number written after a chemical symbol in a formula indicating the number of atoms present

UNITE SEVEN: GAS LAWS

- Combine Gas Laws: states the relationship among pressure, temperature, and volume of a fixed amount of gas
- Ideal Gas: pressure low and high temperature

- Nonvolatile Gas: strong intermolecular, low vapor pressure and does not evaporate easily
- Pressure: is the application of force to a surface, and the concentration of that force in a given area
- Vapor: the gaseous state of a substance that is normally a liquid at room temperature
- Vapor Pressure: the pressure that a vapor excerts
- Volatile Gas: weak intermolecular force, higher vapor pressure and evaporates easily

UNIT EIGHT: SOLUTION CHEMISTRY

- Boiling Point Elevation: the difference in temperature between the boiling point of a solution and the boiling point of the pure solvent
- Colligative Property: a property of a solution that depends only upon the number of solute particles, and not upon their identities; boiling-point elevation, freezing-point depression, and vapor-pressure lowering are colligative properties
- Concentrated: solutions that contain relatively large amounts of solute
- Concentration: the mass of solute in a given volume of solution, or mass/volume
- Dilute: solutions contain relatively small amounts of dissolved solute in a large amount of solvent. To weaken by adding water to a solution
- Dissociation: the temporary or reversible process in which a molecule or ion is broken down into smaller molecules or ions
- Electrolyte: a substance whose water solution conducts an electric current
- Freezing Point Depression: the difference in temperature between the freezing point of a solution and the freezing point of the pure solvent
- Immiscible: incapable of mixing
- Insoluble: material with a low solubility
- Miscible: capable of mixing
- Non-electrolyte: a substance that dissolves in water to give a solution that does not conduct an electric current
- Parts Per Million: the ratio between the parts of solute per million parts of solution

- Percent by Volume: the concentration of a solution expressed as the ratio between the volume of the solute and total volume of the solution, expressed as a percent
- Percent by Mass: the concentration of a solution expressed as the ratio between the volume of the solute and total volume of the solution
- Saturated: a solution containing the maximum amount of solute that will dissolve at a given temperature
- Soluble: capable of being dissolved in some solvent
- Solute: the substance being dissolved
- Solution: a homogeneous mixture of substances in the same physical state
- Solvent: the substance that dissolves the solute
- Spectator Ion: an ion that appears on both sides of an equation and is not directly involved in the reaction
- Standard Solution: a solution of a known concentration
- Supersaturated: a solution that contains more solute than would dissolve in a saturated solution at a given temperature
- Unsaturated: a solution which more solute can be dissolved at a given temperature

UNITE NINE: KINETICS AND EQUILIBRIUM

- Activation Energy: the amount of energy needed to form an activated complex from reactants
- Activated Complex: the temporary, intermediate product in a chemical reaction
- Catalyst: are substances that increase the rate of a reaction by providing a different and easier pathway for a reaction. Unchanged when the reaction is complete
- Chemical Equilibrium: equilibrium occurs when opposite reactions occur at the same rate
- Chemical Kinetics: study of reaction rates
- Collision Theory: for a chemical reaction to occur, reactant particles must collide
- Heat of Reaction: the difference between the potential energy of the reactants and products(ΔH)

- Effective Collision: a collision between reactant particles that results in a chemical reaction taking place
- Entropy: a measure of the disorder or randomness of a system
- Enthalpy: a tendency in nature to change to a state of lower energy
- Le Châtelier's Principle: a system at equilibrium will react to reduce a stress
- Equilibrium: the rates of the forward and reverse reaction are equal
- Potential Energy Diagram: illustrates the potential energy change that occurs during a chemical reaction
- Reaction Rate: rate at which reactants change into products over time
- Reaction Coordinate: progress of the reaction
- Reverse Reaction: the reaction that forms reactants from products
- Spontaneous: occurs without being driven by some outside force
- Stirring: increases the rate at which particles dissolve
- Surface Area: as you increase surface area you increase the reaction speed

UNIT TEN: ACIDS, BASES AND SALTS

- Arrhenius Theory: this theory states that acids are substances that ionize in water to give h+ ions, and bases are substances that produce oh- ions in water
- Arrhenius Acid: a substance that produces hydronium ions(H_3O^+) as the only positive ions when dissolved in water
- Arrhenius Base: a substance that produces hydroxide ions (OH^-) as the only negative ions when dissolved in water
- Alternative Theory: another acid-base definition that expand upon the Arrhenius definition of acids and bases
- Brønsted Base: bases accept H+
- Brønsted Acid: acids donate H+
- Diprotic Acid: the H+ molarity is twice the molarity of the acid solution
- Dihydroxy Base: the OH- molarity is twice the molarity of the base solution
- Hydrogen Ion: a hydrogen atom without its electron consisting solely of a proton
- Hydronium ion: (H_3O^+) formed by the combination of water with a a hydrogen ion

- Hydroxide ion: the polyatomic anion produced by the ionization of a water molecule
- Indicator: a substance that undergoes a color change that can be used to determine when a reaction is complete
- Ion: a charged particle, atom or molecule
- Mobile Charged Particles: are needed for a substance to conduct electricity
- Monoprotic Acids: the H+ molarity equals molarity of the acid solution
- Monohydroxy Base: the OH- molarity equals the molarity of the base solution
- Neutralization: the reaction between an acid and a base to produce water and a salt
- Neutal: pH of 7
- pH: the negative logarithm of a solution's hydrogen ion concentration
- Proton: the positively charged particle in the nucleus of an atom
- Proton Donor: acid
- Proton Acceptor: base
- Titration: the process of determining the concentration of an unknown solution by a reaction with a solution of known concentration
- Triprotic Acid: The H+ molarity is three times the molarity of the acid solution
- Salt: the product of a neutralization reaction; an ionic substance consisting of a metallic cation and anion other than the hydroxide ion

UNIT ELEVEN: REDOX

- Anode: the site in an electrochemical cell where oxidation occurs
- Cathode: the site in an electrochemical cell where reduction occurs
- Electrode: the site at which oxidation or reduction occurs; an anode or a cathode
- Electrolysis: a process in which an electric current forces a nonspontaneous redox reaction to occur
- Electrolytic Cell: a cell that requires electricity to cause a nonspontaneous chemical reaction to occur

- Net Ionic Equation: an equation for a reaction in solution that shows only those particles that are directly involved in the chemical change
- Electroplating: the process of coating a metal, usually of iron, nickel, or copper, with another metal. the base metal is placed in water, and is gradually coated with particles of another metal
- Galvanic Cells: electrochemical cell that uses spontaneous redox reaction between the electrodes to do work. the anode is negative and the cathode is positive
- Half Cell: half of an electrochemical cell, at which oxidation or reduction occurs
- Half Reaction: a reaction that shows either the oxidation or reduction portion of a redox reaction
- Oxidation: the loss of electrons and an increase in oxidation state
- Oxidation Number: number assigned to keep track of electron gain or loss in redox reactions
- Oxidation-Reduction Reaction: the atom that has shown an increase can be identified as the one that has undergone oxidation. The atom that has a decrease in oxidation number has undergone reduction.
- Oxidizing Agent: the substance reduced in a redox reaction
- Redox: an oxidation- reduction reaction
- Reduction: the gain of electrons and the loss of oxidation number
- Reducing Agent: the substance oxidized in a redox reaction
- Salt Bridge: a part of a voltaic cell that connects two containers and allows the flow of ions
- Voltaic Cell: an electrochemical cell in which a spontaneous chemical reaction causes a flow of electrons
- Voltmeter: a device used to measure voltage, or electrical potential energy difference

UNIT TWELVE: ORGANIC CHEMISTRY

- Addition Polymerization: joining of monomers of unsaturated compounds
- Addition Reaction: an organic reaction in which a substance such as hydrogen or a halogen is added to the site of a double or triple bond

- Alcohol: an organic compound containing the hydroxyl group (OH-) as the functional group
- Aldehyde: an organic compound in which the carbonyl group (-C=O) is at the end of a carbon chain
- Alkane: one of a homologous series of saturated hydrocarbons
- Alkene: one of a homologous series of hydrocarbons that contain one double covalent bond
- Alkyne: one of a homologous series of hydrocarbons that contain one triple covalent bond
- Amide: the product obtained from the reaction of an organic acid with an amine
- Amine: an ammonia derivative in which one or more of the hydrogen atoms are replaced by an alkyl group
- Amino Acid: an organic compound containing both the amine group (-NH2) and the carboxylic group (-COOH)
- Aromatic Hydrocarbon: a hydrocarbon that contains one or more benzene rings that are characteristic of the benzene series of organic compounds
- Carboxylic Acid: are compounds which contain a -COOH group
- Condensation Polymerization: the bonding of monomers by removing water from hydroxyl groups and joining the monomers by an ether or ester linkage
- Cracking: breaking up large hydrocarbon molecules into smaller and more useful bits. This is achieved by using high pressures and temperatures without a catalyst, or lower temperatures and pressures in the presence of a catalyst
- Ester: the organic product of an esterification reaction containing –COOC- as the functional group
- Esterification: a chemical reaction between an alcohol and an acid to produce an ester and water
- Ether: an organic compound in which oxygen is bonded to two carbon atoms
- Fermentation: an organic reaction in which ethanol and carbon dioxide are produced from a carbohydrate
- Functional Group: the atom or atoms that replace a hydrogen atom in a hydrocarbon and give a class of organic compounds characteristic properties
- Halide: a salt that includes a halogen

- Homologous Series: a group of related compounds in which each member differs from the one before it by the same additional unit
- Hydrogenation: the reaction between an alkene and molecular hydrogen
- Inorganic: compounds not containing hydrocarbon groups
- Isomers: compounds with the same molecular formula but different structural arrangement
- Ketone: an organic compound in which the carbonyl group(-C=O) is joined to two other carbon atoms
- Monomer: each individual unit of a polymer
- Organic Acid: an organic compound containing one or more carboxyl groups (-COOH)
- Organic: compound contains carbon
- Polymer: organic compound made up of chains of smaller units bonded together
- Polymerization: an organic reaction in which many small units are joined together to form a long chain
- Saponification: the reaction of an alkali and a fat to produce glycerol and a soap
- Saturated Hydrocarbon: a hydrocarbon in which all the bonds between carbon atoms are single bonds
- Structural Formula: a chemical formula showing the linkage of the atoms in a molecule
- Substitution Reaction: one or more hydrogen atoms is removed from a saturated hydrocarbon and replaced by another atom
- Unsaturated Hydrocarbon: a hydrocarbon in which one or more of the bonds between carbon atoms is double or triple

<u>UNIT THIRTEEN</u>: NUCLEAR CHEMISTRY

- Alpha Decay: an unstable nucleus emits an alpha particle. Atomic number, number of protons and neutron decrease by two and mass number decrease by four
- Alpha Particle: is a helium nucleus composed of two protons and two neutrons

- Artificial Transmutation: a transmutation caused by bombarding a nuclear with high-energy particle, such as a neutron or an alpha particle
- Beta Decay: a nucleus that emits a beta particle. Atomic number and number of proton increase by one. Number of neutron decrease by one and mass number remains the same.
- Carbon Dating: a chemical analysis used to determine the age of organic materials based on their content of the radioisotope carbon-14
- Chain Reaction: a reaction that results in a product necessary for the continuance of the reaction
- Half-Life: the length of time for half of a given sample of a radioisotope to decay
- Isotope: atom of an element that has a specific number of protons and neutrons
- Natural Decay: unstable radioisotopes decay releasing gamma rays, alpha particles, and beta particles
- Nuclear Reactor: a device in which the energy released by the fission of nuclei of uranium or another element is used to produce steam to run an electrical generator or other device
- Particle Accelerator: a machine that moves atomic nuclei at higher and higher speeds until they crash into one another, sometimes forming heavier elements
- Radioactivity: the spontaneous emission of radiation by an unstable atomic nucleus
- Radioisotope: an unstable nucleus that is radioactive
- Tracer: a radioisotope used to track a chemical reaction
- Transmutation: the changing of a nucleus of one element that of a different element