Final Review Notes

Chemistry

The ***atom*** is composed of protons(+), neutrons, and electrons(-). A ***molecule*** is a group of two or more atoms held together by chemical bonds.

Compounds are formed by chemically combining two or more different elements in a set ratio. A mixture is made of two or more substances that are together in the same place but are not chemically combined.

When elements are chemically combined, they form ***compounds*** having properties that are different from those of the uncombined elements.

States of Matter

In ***liquids***, the atoms and molecules are more loosely connected and can collide with and move past one another. In ***gases***, the atoms and molecules are free to move independently, colliding frequently.

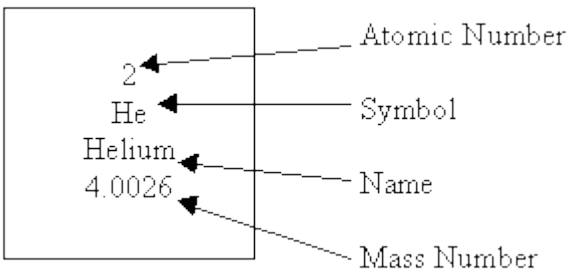
For any given substance, the closeness of the substances atoms or molecules decreases from liquid to gas as thermal energy is increased.

A ***physical property*** of a pure substance is a characteristic that can be observed without changing it into another substance. A ***chemical property*** is a characteristic of a pure substance that describes its ability to change into other substances.

The ***physical properties of metals*** include luster, malleability, ductility, and conductivity.

Most ***nonmetals*** are poor conductors of electric current and heat. Solid nonmetals are dull and brittle.

A substance that undergoes a ***physical change*** is still the same substance after the change. ***Chemical changes*** produce new substances with properties different from those of the original substances.



The ***periodic table of the elements*** gives you information about the number of protons, neutrons, and electrons in the atom of each element.

The ***atomic number*** of an element is the number of protons in the nucleus and electrons in the electron cloud

The properties of an element can be predicted from its ***location in the periodic table in columns (families) or rows.***

The ***reactivity of metals*** tends to decrease as you move from left to right across the periodic table. THE ALKALI METALS ARE THE MOST REACTIVE METALS.

In ***chemical reactions***, the number of atoms stays the same no matter how they are arranged. So, their total mass stays the same.

Energy

Law of Conservation of Energy: When energy is converted from one form to another, energy is not created or destroyed. Energy is conserved.

Potential energy is the energy of position or shape. ***Kinetic energy*** is the energy of motion. In a pendulum, energy is converted between potential energy and kinetic energy.

Matter can change from one state to another if ***thermal energy*** is absorbed or released. For example, absorbing heat can cause a solid to melt.

Kinetic energy is the energy of motion. The **kinetic energy of an object depends on the object's mass and on its velocity.**

Potential energy is stored energy that results from the ***position or shape*** of an object. There are ***two types of potential energy. Gravitational potential energy*** depends on height and weight. ***Elastic potential energy*** is associated with stretched or compressed objects. An object's gravitational potential energy can be calculated using the formula: Gravitational potential energy = Weight Height

Energy comes in many different forms. Mechanical energy is associated with the position and motion of an object. Other forms of energy associated with the particles of objects include ***thermal, electrical, chemical, nuclear, and electromagnetic energy.***

Heat can be transferred through ***conduction, convection, and radiation***. ***Gases*** are good insulators. Double-pane windows use air to slow heat transfer. The vacuum layer in a thermos slows heat transfer.

Convection is the process that transfers heat by the movement of currents within a fluid. A convection current occurs when a heated fluid rises and is replaced by a cooler fluid. Convection currents can be used to transfer heated air throughout a building.

Conduction is the transfer of thermal energy with no overall transfer of matter. Conduction occurs within a material or between materials that are touching. Conduction in gases is slower than in liquids and solids because the particles in a gas collide less often.

Radiation is the transfer of energy through space without the help of matter to carry the energy. All objects radiate energy. As an object's temperature increases, the rate at which it radiates energy increases. The sun's energy is transferred to Earth by the process of radiation.

Force and Motion

The ***average speed*** of an object is the total distance it traveled divided by the total time elapsed. ***Velocity*** is speed in a given direction.

The equation relating distance (*d*), time (*t*), and average speed (*v*) is: ***Speed = distance / time***

A ***change in velocity*** can involve a change in either speed or direction-or both.

Acceleration = Final Vel - Initial Vel / Time

Acceleration refers to increasing speed, decreasing speed***, or changing direction.***

The combination of all forces acting on an object is the ***net force***. The net force determines whether an object moves and in which direction it moves.

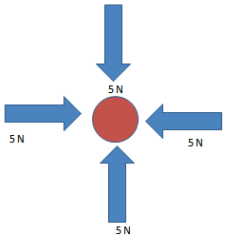
The ***gravitational force*** exerted on a person or object is known as ***weight.***

The magnitude of the force of ***friction*** depends on the types of surfaces involved and on how hard the surfaces push together.

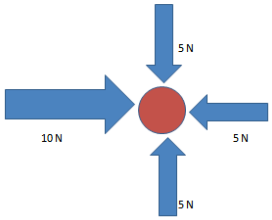
Inertia is the tendency of an object to resist a change in motion.

NEWTON'S FIRST LAW: An object at rest tends to stay at rest. An object in motion tends to stay in motion and move with the same speed and in the same direction unless acted upon by an unbalanced force. The tendency of an object to resist change in motion is call inertia. The greater an objects mass the greater an objects motion.

- An balanced force is described as equal forces acting on an object from opposite directions

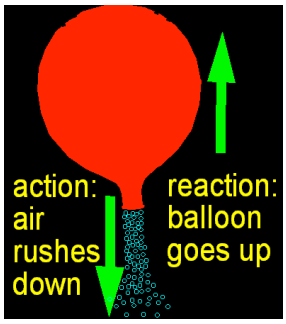


- An unbalanced force is a force that produces a greater amount of force from one area on the object that produces movement.



NEWTON'S SECOND LAW: The law states that acceleration depends on the objects' mass and the net ***force.***

NEWTON'S THIRD LAW: For every action, there is an equal and opposite reaction



There are six basic kinds of simple machines: *the inclined plane, the wedge, the screw, the lever, the wheel and axle, and the pulley*.

A ***lever*** is a rigid bar that is free to rotate around a fixed point (the fulcrum). First-class levers always change the direction of the input force. Second-class levers increase force, but do not change its direction. Third-class levers increase distance, but do not change the direction of the input force.

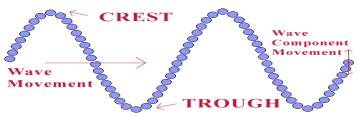
A ***wheel and axle*** is a simple machine that consists of two disks or cylinders fastened together that rotate around a common axis. The object with the larger axis is called the wheel and the object with the smaller axis is called the axle.

A pulley is a simple machine made of a grooved wheel with a rope or a cable wrapped around it. A fixed pulley changes the direction of a force but not the amount of force applied.

A movable pulley decreases the amount of input force needed but not the direction of the force.

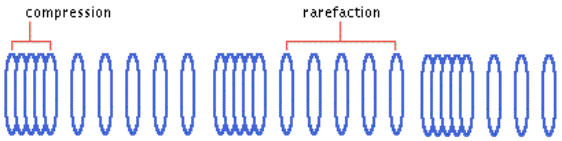
Waves

Waves are disturbances that ***transfer energy from place to place.***



Transverse waves move the particles in a medium at right angles to the direction in which the waves travel.

Longitudinal waves move the



particles parallel to the direction in which the waves travel.

Waves that require a ***medium*** through which to travel are called ***mechanical waves.***

***Light is a f*orm of electromagnetic radiation**, as are radio waves, X-rays, and gamma rays.

The ***electromagnetic spectrum*** shows the forms of radiation in order of increasing frequency and decreasing wavelength.

The ***color of visible light*** goes from red to violet as frequency increases***.***

Sunlight has a variety of wavelengths and includes visible, ultraviolet, and infrared rays.

An ***electromagnetic wave*** is a transverse wave made up of changing electric and magnetic fields.

Like mechanical waves, ***electromagnetic waves*** carry energy that can be transferred when they interact with matter.

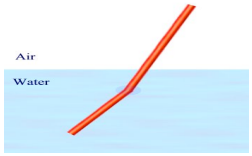
Unlike mechanical waves, electromagnetic waves do NOT require a medium through which to travel.

When a wave hits a surface through which it cannot pass, it bounces off, or is **reflected.**

The ***angle of incidence*** is equal to the angle of reflection for all waves and reflecting surfaces.

When a wave ***moves from one medium into another medium at an angle, it changes speed***, which causes it to bend, or be ***refracted.***

Light reflected from objects makes the objects visible.



Refraction is the bending of light that occurs when light passes into a new medium.

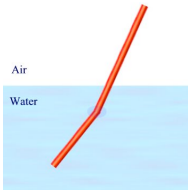
The more the light bends when it enters a new medium, the higher the ***index of refraction.***

Mechanical waves, such as sound and seismic waves, are produced when a source of energy causes a medium to vibrate. Sound waves travel through the air; seismic waves travel through the earth's layers.

Electromagnetic waves, such as light, transfer electric and magnetic energy and do not need a medium to travel through.

Light waves travel faster in air than in water. They travel slower in glass than in water.

When light enters a medium where its speed changes, it bends. This is called refraction. →



Sound travels through a medium as longitudinal waves.

Longitudinal waves carry mechanical energy in the form of compressions of the particles of a medium.

All forms of sound, including speech and music, are *formed by vibrations of physical mediums.*

The **Doppler Effect** is the *apparent* change in the pitch of a sound as the source or observer move relative to one another.

Sound waves carry energy through a variety of mediums (including air, solids, and liquids) at different speeds.

Sound is a form of energy that travels as longitudinal waves through a vibrating material.

The ***pitch of a sound*** depends on the ***frequency*** of the wave. The loudness depends on the ***amplitude*** or height of the wave.

Wavelength is the distance between two corresponding parts of a wave.

Frequency is the number of complete waves that pass a certain point in a certain amount of time. It is ***measured in hertz (Hz),*** or ***number of waves per second***.

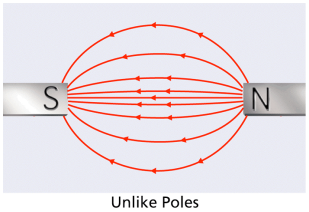
The ***pitch of a sound*** that you hear depends on the ***frequency*** of the sound wave.

Amplitude is the maximum distance the particles of a medium carrying a wave move from their rest positions.

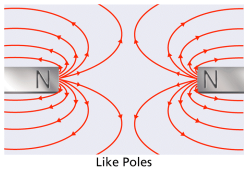
Magnetism

Magnets attract iron and materials that contain iron. Magnets attract or repel other magnets. In addition, one part of a magnet will always point north when allowed to swing freely.

Magnetic poles that are unlike attract each other, and magnetic poles that are alike repel each other.



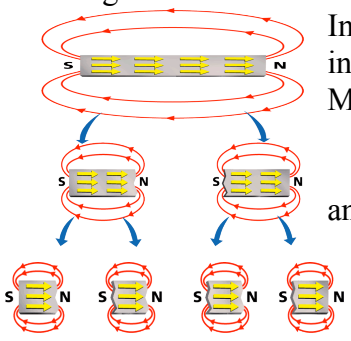
Unlike Poles



Like Poles

Magnetic field lines spread out from one pole, curve around the magnet, and return to the other pole.

Each piece of a magnet retains its magnetic properties after it is cut in half. No matter how many times you break a magnet in half, you will have a North and South pole for each piece as well as a magnetic field



In a magnetized material, all or most of the magnetic domains are arranged in the same direction.
Magnets can be made, destroyed, or broken apart.

Just like a bar magnet, Earth has a magnetic field surrounding it and two magnetic poles.

Since Earth produces a strong magnetic field, Earth itself can make

magnets out of ferromagnetic materials.

Earth's magnetic field affects the movements of electrically charged particles in space.

Electricity

Charges that are the same repel each other. Charges that are different attract each other.

An electric field is a region around a charged object where the object's electric force is exerted on other charged objects.

In static electricity, charges build up on an object, but they do not flow continuously.

There are three methods by which charges can be transferred to build up static electricity: charging by friction, by conduction, and by induction.

When a negatively charged object and a positively charged object are brought together, electrons transfer until both objects have the same charge.

To produce electric current, charges must flow continuously from one place to another.

A conductor transfers electric charge well. An insulator does not transfer electric charge well. Voltage causes a current in an electric circuit.

All electric circuits have the same basic features.
First, circuits have devices that are run by electrical energy. They are represented as resistors in a circuit. Second, a circuit has a source of electrical energy. Third, electric circuits are connected by conducting wires.

In a series circuit, there is only one path for the current to take.

In a parallel circuit, there are several paths for current to take.