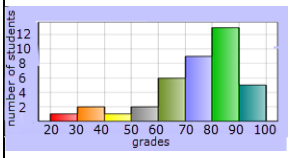
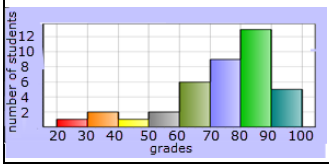
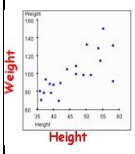
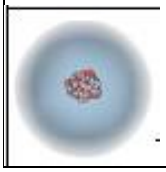
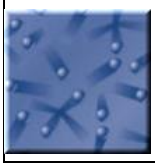
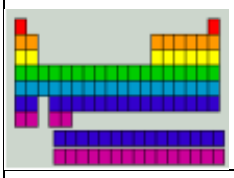
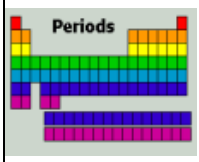
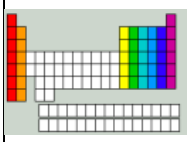
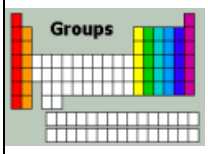
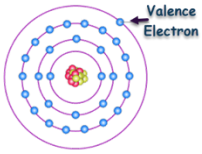
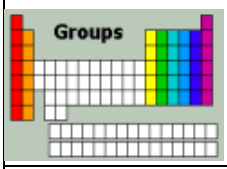
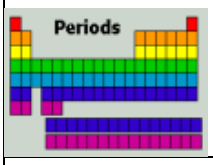
PHYSICAL SCIENCE – 2018 STANDARDS (CURRENT THROUGH 2026)

 Used for making scientific measurements	Probeware
 What is this called and what does it measure?	Spring scale – measures weight (not mass)
 What is this called and what does it measure?	Triple beam balance. Measures mass.
Unit used to measure weight	Newton
1 meter = ? millimeters 1 liter = ? milliliters 1 kilometer = ? meters 1 kilogram = ? grams	1,000 1,000 1,000
1 meter = ? centimeters 1 centimeter = ? millimeters	100 10
 Type of graph?	**Histogram**
 What information does this histogram provide?	The columns in a **histogram** show the number in each category. Categories in this case are grade ranges. So graph tells is that 13 children received grades of 80-90.
 What kind of graph is this and what does it show?	**Scatterplot** – shows the relationship between two variables, in this case, height and weight.
Study of materials at the molecular scale that are **no longer visible** to the naked eye.	**Nanotechnology**

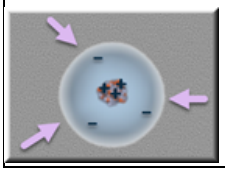
What is a nanometer?	One-billionth of a meter
Often used to establish a standard for comparing the results of manipulating the independent variable	Control
Scientific method always starts with:	A question that is based on observation, evidence or reason
 Metric units for measuring liquid volume.	Liter (milliliter)

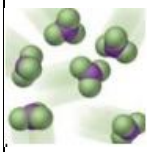
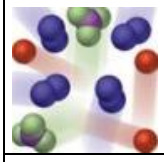
PS.2 MATTER IS COMPOSED OF ATOMS

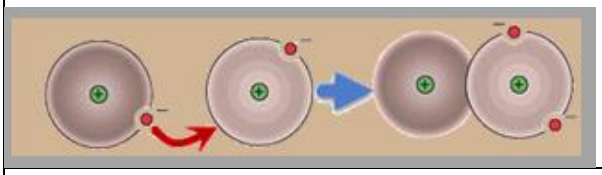
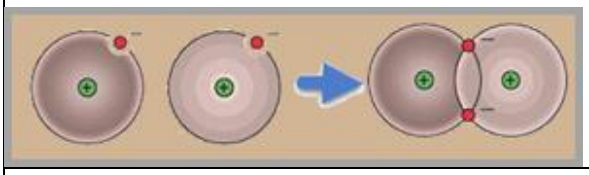
Anything that has **mass** and **occupies space**	**Matter**
Small particles that make up all matter	**Atoms**
Four **states** (phases) of matter	Solid, liquid, gas, & plasma
 Matter found in stars and neon signs	**Plasma**
 Model that does not depict the three-dimensional aspect of an atom, and implies that electrons are in static orbits	The **Bohr** model
 Model that best represents our **current understanding** of the structure of the atom.	The "**electron cloud**" model

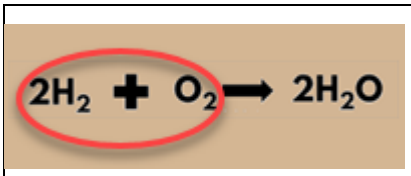
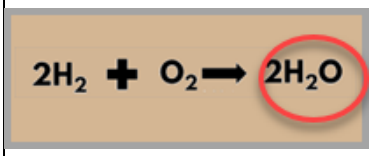
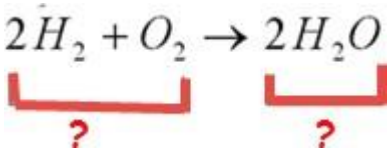
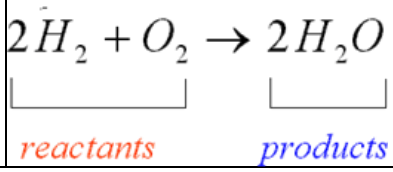
Subatomic particles comprising the atom	**Proton** (positive charge), **neutron** (no charge), **electron** (negative charge)
 **Kinetic Molecular Theory**	States that • atoms and molecules are **perpetually in motion** and have kinetic energy. • Raising **temperature** increases **kinetic energy**
 Used to **organize** information about the **elements**	**Periodic table**
 Horizontal **rows**	 **Periods**
 Vertical **columns** in the periodic table	 **Groups** or **families**
 The basis for the **arrangement** of atoms on the periodic table	Number of **protons**
Electrons in the **outer energy level** of an atom	 **Valence** electrons
 Properties of elements in the same **group**	Contain the **same number of valence electrons** and therefore **similar chemical properties**
 Similarities of elements in the same **period** (row)	Contain the same number of **energy levels**

PS.3 PHYSICAL AND CHEMICAL PROPERTIES

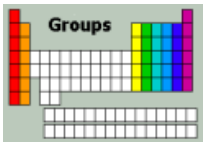
 Forces that hold **atoms** together	**Electromagnetic** forces

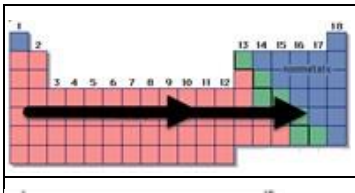
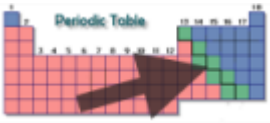
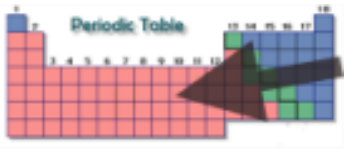
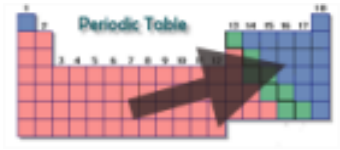
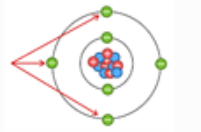
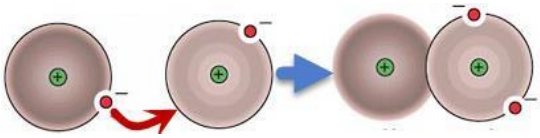
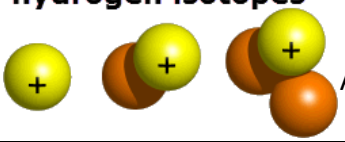
 Four **states** (phases) of matter	Solid, liquid, gas, & plasma
Physical properties of matter	Shape, density, solubility, odor, melting point, boiling point, and color
Chemical properties of matter	Acidity, basicity, combustibility, and reactivity
 Physical properties that allow some metals to be **flattened** or **shaped**	**Malleability**
 Two or more elements that are **chemically combined** in a fixed ratio	**Compound**
 Two or more substances that are **not chemically combined**	**Mixture**
	**Physical** changes
	**Chemical** changes
Physical changes	The chemical **composition** of the substances **does not change** (i.e. phase changes)
Chemical changes	Chemical **composition** of substances **changes** and different substances are formed.
Ways to **separate mixtures**	  **Evaporation** **Filtering**

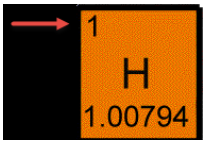
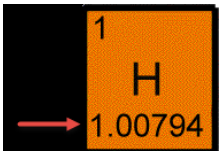
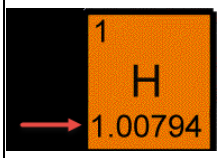
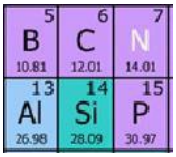
What happens during a **chemical change**?	Chemical **bonds** are **broken** and **made**. Atoms are **rearranged** to form **new substances**
Two types of **chemical reactions**	**exothermic** (energy is **released**) **endothermic** (energy is **absorbed**)
 Type of reaction that **produces heat**	**Exothermic** reaction
 Type of reaction that **requires heat**	**Endothermic** reaction
How to calculate **density**	Mass/volume
What are these and what do they tell us? H_2O_2 $C_6H_{12}O_6$	**Chemical formulas** display the **number of atoms** of **each element** that form a **compound**
	Forming of an **Ionic Bond**
	Forming of a **Covalent bond**
What happens when a **metallic** element reacts with a **non-metallic** element?	Their atoms gain and lose electrons respectively, forming **ionic bonds**
What happens when **two nonmetals** react?	Atoms **share electrons**, forming **covalent bonds**
 What is this and what does it show?	**Chemical equation** – It represents the changes that takes place during a chemical reaction.

 What is circled?	**Reactants**
 What is circled?	**Product**
What is the **Law of Conservation of Matter**?	It states that regardless of how substances within a closed system are changed, **the total mass remains the same.**
	

PS.4 THE PERIODIC TABLE

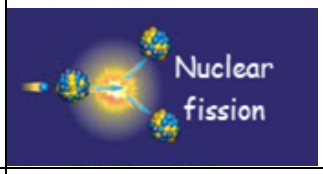
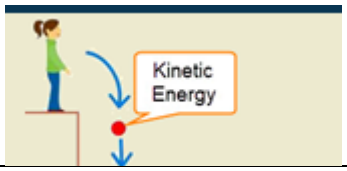
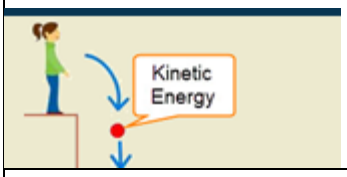
How are the elements on the **periodic table** arranged?	According to their **atomic numbers**, or in other words the number of **protons**.
What determines an element's chemical **properties** and **reactivity**?	The **number of electrons** in the **outermost energy level** (valence electrons)
Why do atoms **gain, lose** or **share** electrons?	To become **stable**
The number of **known elements**	**Over 118**
Elements with an atomic number **over 92**	These elements are **not found naturally** in measurable quantities on Earth
 Elements in the **same column** (family) of the periodic table -	Contain the same **number of electrons** in their **outer energy levels** and have **similar properties**

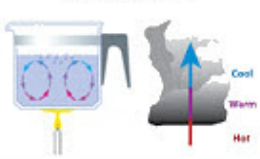
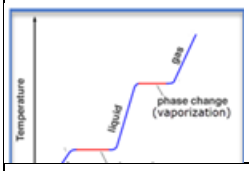
 The elements as one reads from **left to right** across the periodic table	**Increasingly nonmetallic** in character
 Elements along **stair- step line**	**Metalloids**, which have properties of metals and nonmetals
 Elements **left** of the stair-step line.	**Metals**
 Elements to the **right** of the stair-step line.	**Nonmetals**
 Electrons in the **outer energy level** of an atom	**Valence** electrons
These elements tend to **lose electrons** in chemical reactions, forming positive ions	**Metals**
These elements tend to **gain electrons** in chemical reactions, forming **negative ions**	**Nonmetals**
An atom that has **gained or lost an electron**	 **An ion**
An atom that has **gained or lost a neutron**	 An **isotope**
An atom that has **gained or lost a proton**	A **different element**
Atomic mass	equivalent to the number of **protons and neutrons** in the atom of an element.

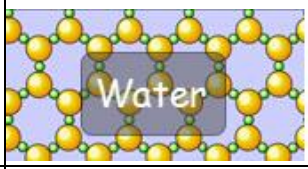
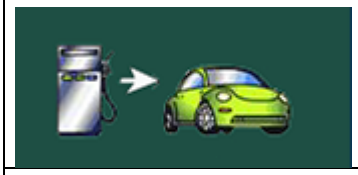
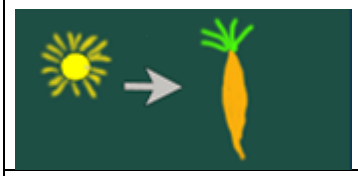
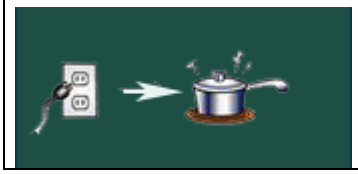
 What is this number?	**Atomic Number** (number of protons)
 What is this number?	**Atomic Mass**
What determines atomic mass?	The number of **protons** plus the number of **neutrons**.
 Why isn't the atomic mass a whole number?	Elements can have **isotopes** with more or fewer neutrons. The atomic mass uses the **average** of the isotopes.
 Carbon (atomic number 6) shown here is carbon-12. Carbon has an **isotope** known as Carbon-14. How is it different?	Carbon 14 has two **more neutrons** than carbon-12.

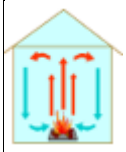
PS.5 ENERGY IS TRANSFORMED AND CONSERVED

Definition of **energy**	The ability to **cause change**
Energy exists in these **two states**	**Potential** and **kinetic**
Potential energy	Energy based on its **position** or **chemical composition**
Forms of **potential energy**	**Chemical, nuclear, elastic, gravitational**
What is **chemical energy**? Give examples	 Potential energy in **molecular bonds**- energy in **food**, **fossil fuels**, **batteries**

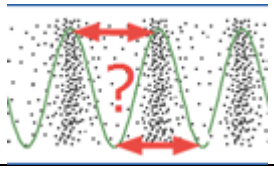
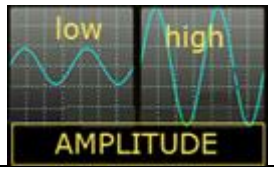
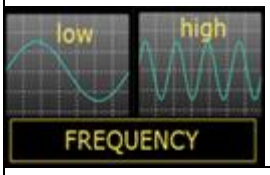
What is **elastic** energy?	 **Potential energy** in objects with a **restorative force**, like **springs** or **rubber bands**
What is **gravitational** energy?	 Potential energy based on place or **position** (affected by **gravity**). Objects on a shelf or held off the ground.
What is **nuclear** energy?	 Potential energy held in the **nucleus** of an atom.
Kinetic energy	 The **energy of motion**
 Kinetic energy examples	**Waves**, **electrons**, **molecules** are in constant motion. **Objects** have kinetic energy when in **motion**.
Forms of energy (list 5)	**Radiant, thermal, chemical, mechanical, nuclear**
 What kind of energy is **visible light**?	A form of **radiant** energy
 What kind of energy is **sound**?	A form of **mechanical** energy
Some examples of **nonrenewable** energy sources	
Some examples of **renewable** energy sources	
The **law of conservation of energy**	states that **energy cannot be created nor destroyed** but only changed from one form to another.

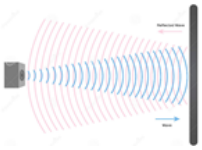
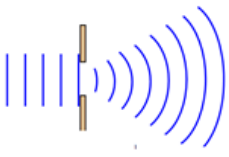
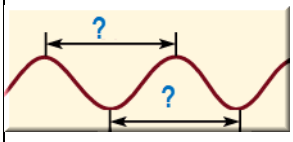
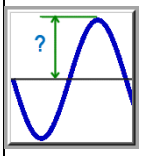
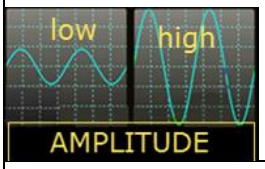
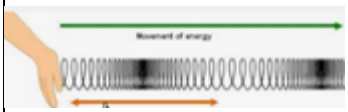
In any energy transformation, some **energy is lost** into the environment as:	Thermal energy (**heat**)
How is **thermal energy transferred** (3 ways)?	**Conduction, convection, radiation**
What is **conduction**?	 **Direct transfer** of thermal energy (a pan sits on a hot burner, you touch the pan).
What is **convection**?	 Energy is transferred in water and the atmosphere by the circular rising **movement caused by**
What is **radiation**?	 Energy transferred by **electromagnetic radiation** (the sun).
What is **heat**?	The **transfer of thermal energy** between substances due to a **difference in temperature**
How is **kinetic** energy measured?	**Kelvin scale -** . 0 **Kelvin** is the temperature at which atoms and molecules do not move.
In general, as **thermal energy is added**, the **temperature** of a substance **increases**. What are the exceptions?	There is **no change in temperature during a phase** change (freezing, melting, condensing, evaporating, boiling, vaporizing) as this energy is being used to make or break bonds between molecules .
 This graph shows how energy input causes temperature to increase. What are the flat sections?	Points where melting and vaporization occurs, and energy is being used to break bonds.
What is **temperature**?	The **average kinetic energy** of molecules in a substance.
Kelvin scale	Temperature scale designed so that **zero** degrees K is defined as **absolute zero**

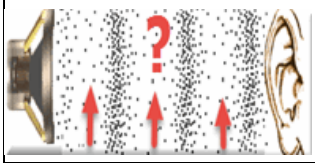
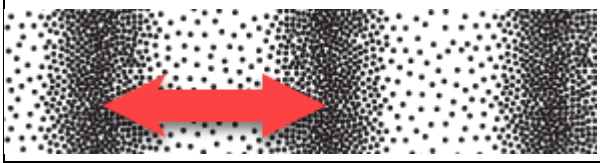
Celsius scale	Temperature scale designed so that **freezing point** is taken as **0** degrees and the **boiling point** as **100** degrees
What is **absolute zero**?	The temperature -**273 C** or **0 Kelvin** is the theoretical temperature at which **molecular motion stops**
Which substance is unusual in that it **expands** when **frozen**, while most expand when heated?	 Due to the formation of crystals, **water** expands when frozen.
 What is **electrical energy**?	It is produced from other energy sources through a series of **transformations** and is a way to **store**, **move**, and **deliver** energy.
What are two kinds of **nuclear** energy?	**Fusion** - **joining nuclei** together (used in power plants) **Fission** - **splitting nuclei** (still experimental)
What is an advantage of **nuclear** energy?	A very **small amount** of material produces a **large amount of energy**
What is a possible **negative** effect of **nuclear** energy?	The danger of **accidents** that could release radiation into populated areas. The danger of radioactive nuclear **waste storage** and disposal
 Describe this energy transformation	**Chemical** energy from fossil fuels is transformed into **electrical** and **mechanical** energy that run the car.
 Describe this energy transformation	**Radiation** from the sun is transformed into **chemical** energy (potential) in food through photosynthesis
 Describe this energy transformation	**Chemical** energy in a battery is transformed into **light** energy (radiant).
 Describe this energy transformation	**Electrical** energy is transformed into **thermal** energy

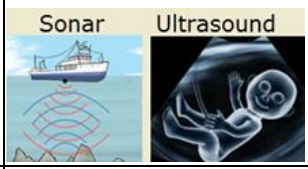
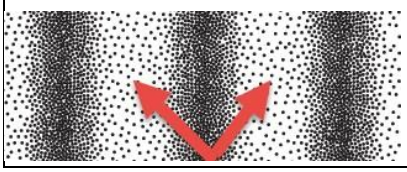
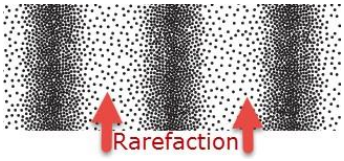
 Describe this energy transformation	**Chemical** energy in food is transformed into **mechanical** energy of a moving bicycle
 What kind of **thermal transfer** is shown here?	**Conduction** - Molecules transfer thermal energy by colliding with adjacent molecules
 What kind of thermal transfer circulates heat around a room and powers weather in the atmosphere?	**Convection** – A method of transferring thermal energy by heating a substance and then allowing the substance to move, carrying the thermal energy with it.
 What kind of thermal transfer is shown here?	**Radiation** - Transfer of thermal energy by **electromagnetic waves** through space

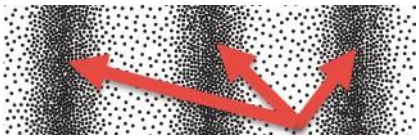
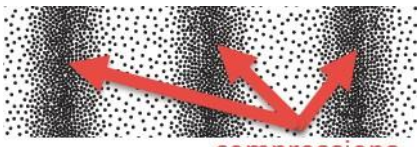
PS.6 LONGITUDINAL (SOUND) AND TRANSVERSE WAVES

What **waves** do?	Waves **transmit energy** from one place to another without a permanent transfer of mass
Wavelength	 Measured from any point on a wave to the corresponding point on the next wave
What happens as the energy of a wave increases?	 The **amplitude increases** and with a compression wave, the sound will be **louder**.
Wave **frequency**	The number of waves produced over a given period
 Relationship between **wavelength** and **frequency**	**Inverse** relationship - As **wavelength** increases, **frequency** decreases
Refraction	 Occurs when a wave passes through **different materials**, resulting in a **change in the speed** of the wave.

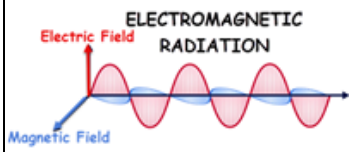
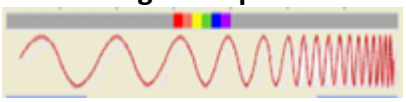
Reflection	 Occurs when a wave **bounces** from a surface back toward its source causing an **echo**.
Diffraction	 Occurs when a wave encounters **irregular surfaces** or **openings**.
Results of **diffraction**	Causes waves to change direction and be scattered. This allows sound waves to **bend** around small obstacles and to **spread** beyond openings like open doors.
 Type of wave?	**Transverse** wave
 Type of wave?	**Longitudinal** wave
Radiant energy including light travels as this kind of wave	**Transverse** wave
	**Wavelength** of transverse wave
	**Amplitude** of a transverse wave
 Which wave carries **more energy?**	The **high amplitude** wave
 What kind of wave?	**Longitudinal** wave
 What kind of wave	**Transverse** Wave

What causes **longitudinal** waves?	**Vibrations** carried through a substance
A **substance** (solid, liquid, gas) through which **longitudinal** waves travel	**medium**
How particles move in a longitudinal wave	Particles of the medium **vibrate** back and forth along the same path the wave travels, but the particles themselves do not move along the wave. **Only energy travels** from one place to another
Other names for a longitudinal wave	**Compression** wave, **mechanical** wave, **sound** wave
	**compressions**
	**rarefactions**
	**wavelength**
Amplitude of longitudinal wave	the largest distance the particles vibrate from their rest (starting) positions.
Wave with **greater amplitude** …	Carries more energy, is **louder**
A type of mechanical energy produced by **vibrations**	**Sound**
 How **vibrating strings** cause sounds	**Vibrating** strings bump molecules in air (medium) which bump other molecules causing a **chain or wave** of vibrating molecules which reach the ear

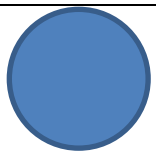
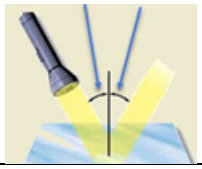
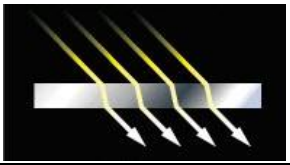
What affects the **speed** of a longitudinal wave?	Sound travels **slowest through air** and **fastest through solids**. Sound does not travel through a vacuum (empty space).
How does **temperature** affect the speed of sound?	The **warmer the medium**, the **faster** sound travels.
Higher frequency waves create…	**High pitched** sounds
Greater amplitude waves create….	**Louder** sounds
Sound travels as this type of wave	A **compression wave** (matter vibrates in the same direction in which the wave travels)
The tendency of a system to **vibrate at maximum amplitud**e at certain frequencies	**Resonance**
 Reason for the Tacoma Narrows Bridge collapse	High amplitude vibrations caused by **resonance**
 How **resonance** creates music	The shape of instruments produces resonance within, and instruments playing the same note produce additional resonance and a louder sound.
Technologies associated with **reflected sound** waves	
Determines **speed** of sound	The **medium** through which the waves travel and the **temperature** of the medium.
 **?**	

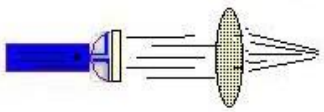
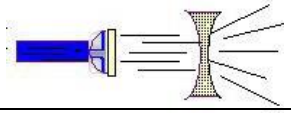
 ?	 compressions

PS.7 ELECTROMAGNETIC RADIATION INCLUDING LIGHT

How **radiant energy** travels-	 In **transverse waves**
What **electromagnetic radiation** consists of-	 changing **electric** and **magnetic fields**
At what **speed** do all types of electromagnetic radiation travel at?	All types travel at the **speed of light**
The **sun** gives off **radiant energy** in a various __?__ which are shown in the electromagnetic spectrum.	**frequencies / wavelengths**
Electromagnetic waves are arranged according to **wavelength** and **frequency** on the -	**electromagnetic spectrum** 
Electromagnetic radiation may be **converted** to **other forms of energy** only after -	it is **absorbed by matter**
The **electromagnetic spectrum** includes -	gamma rays, X-rays, ultraviolet, visible light, infrared, microwaves, radio waves
The **lowest energy waves** with the **longest wavelength** and **lowest frequency** -	**Radio waves**
The **highest energy waves** with the **shortest wavelength** and the **highest frequency-**	**Gamma waves**

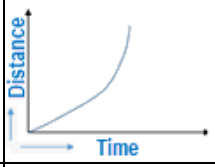
What falls in the **middle** and makes up a **small portion** of the spectrum?	**Visible light**
List the types of **waves on the spectrum** from **longest to shortest wavelength**-	**Radio, microwaves, infrared, visible light, ultraviolet, x-ray, gamma rays**
List the types of **electromagnetic radiation**, from **highest to lowest frequency**	**Gamma** rays, **X-rays**, **ultraviolet**, **visible light**, **infrared**, **microwaves, radio** waves
Describe **radio waves**	**Lowest energy** waves with the longest wavelength and the lowest frequency
Describe **gamma** rays	The **highest energy** waves with the **shortest wavelength** and the **highest frequency**
Relationship between **frequency** and **wavelength**	**Inverse** – when one increases, the other decreases
How electromagnetic waves are arranged on the **electromagnetic spectrum**	By **wavelength**
Radiant energy travels in-	**Straight lines**
When **radiant energy**, which travels in **straight lines**, strikes an object, this happens	It can be **reflected**, **absorbed**, or **transmitted**
 When a material **absorbs** the radiant energy that strikes it, this happens	The energy of the wave is **transformed** into another type of energy, usually **thermal energy** (heat)
 When a material **transmits** the wave that strikes it -	It allows the wave to **pass through**

 When a material **reflects** the wave that strikes it -	The wave **bounces off**
Different **colors** of visible light have different -	**frequencies**
What makes an object appear a certain **color**?	The object **reflects** the light of that **color** (wavelength) back to your **eye** while absorbing the other color wavelengths
An object that appears **black** - 	absorbs **all wavelengths** of visible light
A blue ball is **blue** because - 	It **reflects** blue light wavelengths back to your eye, while **absorbing** the other wavelengths of visible light
These **reflect light** -	 **mirrors**
The **law of reflection** states that-	 the **angle of reflection** is equal to the **angle of incidence**
 These mirrors **diverge light** and produce a **smaller, upright image**	**Convex** mirrors
 These mirrors **converge light** and produce an **upright, magnified** image if close and an inverted, smaller image if far away	**Concave** mirrors
 Results when visible light travels through **different media** (for instance air to water)	 **Refraction** (bending) due to a change in speed

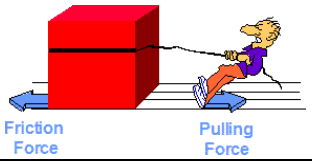
What **lenses** do	**Refract** light
What visible light does when it enters a lens -	It **bends** toward the **thickest part** of the lens
Lenses that **converge** (narrow) light 	**Convex**
Lenses that **diverge** (spread) light 	**Concave**
Name some **instruments** that use **lenses** to **change the path of light rays** to produce a specific type of image -	Cameras, telescopes, binoculars, and microscopes
Electromagnetic radiation used for **communication** -	The **lower frequency waves like radio** waves, **microwaves**, **infrared** radiation, **visible** light
Electromagnetic radiation used in **medicine**	 **x-rays**
Types of waves that can be **harmful** to humans -	**High frequency waves** like **x-rays** and **gamma** rays (nuclear energy)

PS.8 WORK, FORCE, MOTION

The **change in position** of an object per unit of **time**	**Speed**
The **speed** an object moves is -	**Velocity**

Velocity can be positive or negative depending on -	The **direction** of the change in position
The **change in velocity** per unit of time	**Acceleration**
Acceleration of an object moving with **constant velocity**	**No acceleration**
A **decrease in velocity**	**Negative acceleration** or deceleration
Shape of a **distance-time graph for acceleration**	 A **curve**
Why objects moving with **circular motion** are constantly accelerating	Because **direction** (and hence **velocity**) is constantly **changing**
Newton's three laws of motion	Describe the **motion** of all common objects
Newton's **first law of motion**	An object at rest will **remain at rest** unless acted on by an unbalanced force. An object in motion **continues in motion** with the **same speed** and in the **same direction** unless acted upon by an unbalanced force. This law is often called "**the law of inertia**"
Newton's **second law** of motion	**Acceleration** is produced when a **force acts on a mass**. The **greater the mass** (of the object being accelerated) the **greater the amount of force** needed (to accelerate the object)
Newton's **third law** of motion	For every action there is an **equal and opposite re-action**
The amount of **matter** in a given substance	**Mass**

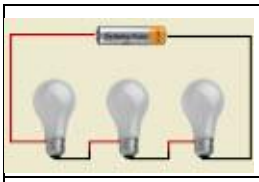
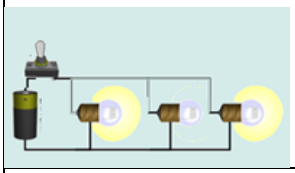
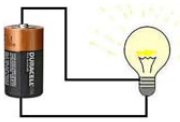
A **measure of the force** due to **gravity** acting on a mass	**Weight**
Weight - unit of measure	**Newton**
Mass – unit of measure	**kilograms**
Force - unit of measure	**Newton**
A **push or pull**	**Force**
What determines the **motion** of an object?	the **sum of the forces** acting on it
A device that makes **work easier**	A **simple machine**
distance/time	**Speed** (s = d/t)
mass × acceleration	**Force** (F = ma)
force × distance	**Work** (W = Fd) 
work/time	**Power** (P = W/t)

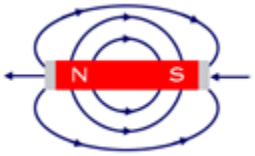
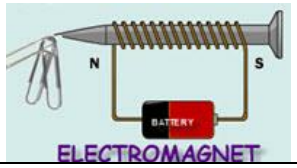
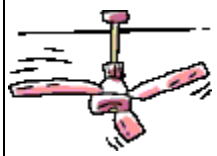
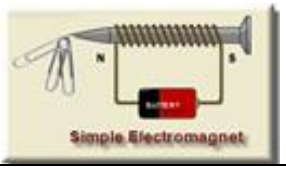
Concept that **simple machines** make work easier	**Mechanical advantage**
The **work** put into a machine is always **greater** than the **work output** due to this.	**Friction** 
The ratio of **work output** to work **input**	**Efficiency**

PS.9 ELECTRICITY AND MAGNETISM

 What is **static electricity**?	An **imbalance is static electrical charges** build up on an object which can discharge quickly causing a **spark**.
 What often causes **static** electricity?	**Friction** can cause **electrons** to be **transferred** from one object to another.
 Gives some examples of **static** electricity	**Lightning** (atoms bump together in clouds) Touching metal after rubbing **feet on carpet** Pulling clothes that have been rubbing each out of **dryer**
A material that transfers an **electric current** well.	 A **conductor**
A material that **does not transfer** an electric current	An **insulator** 
A property of matter that affects the **flow of electricity**	**Resistance**
More resistance (less flow of electricity) can be caused by:	A more **narrow** wire A **longer** wire Type of **material**

More **resistance** causes:	**Less flow** of electricity
The potential **difference in charge** between two points is called:	 **Voltage**
What is **current**?	The **flow of electrons** through a **circuit**
A measure of the degree to which an object **opposes** the **passage of an electric current** is:	**Resistance**
What is **voltage?**	The **force** making electrons **flow between two points** The **potential energy** between two points
The complete **pathway** through which **electrons** flow	A **circuit**
To flow through a circuit, electrons must receive **energy from a source**. This is :	**voltage**
Electrons move around the **circuit**, traveling from **high to low potential**. This is :	**current**
What is the purpose of a **circuit**?	Electrons moving through the circuit **transfer energy** in order to do some **work.**
When energy flows through a circuit, what gets **transferred to the surroundings**?	**Thermal energy (heat)**
What are some components of a **circuit**?	Electirc current flows through **wires** as well as **transistors** and **diodes**.

 What kind of **circuit** is this?	**Series** – If one light goes out, the circuit is broken and all go out.
 What kind of circuit is this?	**Parallel –** If one light goes out, the circuit will travel through other wires and other lights will continue to that.
 What knd of circuit is this?	**Open circuit –** no flow of current
 What kind of **circuit** is this?	**Closed circuit –** current can flow
 In between a **conductor** and an **insulator**.	A **semiconductor**
 A **semiconductor** device that acts like a **one way valve** to **control the flow** of electricity in electrical circuits	**Diode** 
Made of **semiconductor diodes** that produce direct current (DC) when visible light, infrared light (IR), or ultraviolet (UV) energy strikes them	**Solar cells** 
 Emit **visible light** or **infrared** radiation when current passes through them.	 **Light emitting diodes** (LED)
Some examples of **technologies that us LEDs**.	 TV remote; LED TV or notebook computer screen
 **Semiconductor devices** used to **amplify electrical signals** (in stereos, radios, etc.) or to act like a **light switch** turning the flow of electricity on and off.	**Transistors**
Related to **electricity**	**Magnetism**

What is the difference between **electronic** and **electrical** circuits?	An **electric** circuit simply powers machines with **electricity**. However, an **electronic** circuit can **interpret a signal** or an instruction, and perform a task to suit the circumstance. **Electronic** components tend to be very **small**.
Can produce a **magnetic field** and cause iron and steel objects to act like magnets.	**Electricity**
What are **magnetic fields?**	 **Magnets** create forces that act **at a distance**
Electromagnetic forces can-	**Attract** or **repel**
What are **electromagnets?**	 **Moving electricity** can produce a **magnetic field** and cause **iron** and **steel** objects to act like **magnets**.
How are **electromagnets different** from other magnets?	They are **temporary** magnets that lose their magnetism when the electric current stops.
What is **electromagnetic induction?**	**Changing magnetic fields** can produce electrical **current** in conductors
 A device that uses a magnet to convert **mechanical** energy into **electrical** energy	A **generator**
How does a **generator** work?	Steam, wind, or water drive the **turbine** (a large propeller) and, in turn, rotate the copper coils of the **generator**. As the copper coils spin within the magnets, **electricity is produced.**
 Uses magnetism to onvert **electrical** energy into **mechanical** energy that is used to do work	**Electric motors**
Temporary magnets that lose their magnetism when the electric current is removed	 **Electromagnets**

Examples of devices with **motors**	Many **household appliances** including blenders, washing machines, fans.
How are **motors** different from **generators**?	**Motors** convert **electircal** energy into **mechanical** energy. **Generators** do the opposite, converting **mechanical** energy into **electrical** energy.