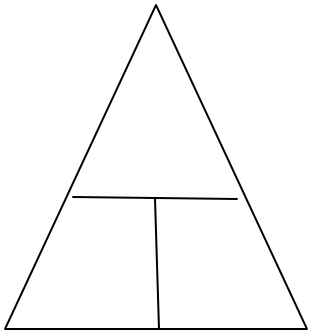
The Atom

a) Protons (p+)
   a. positive in charge
   b. located in nucleus
   c. gives identity to element
b) Neutrons (n^0)
   1. Neutral
   2. located in nucleus
   3. gives mass to element
   4. largest mass

c)Electrons (e^-)
   a. Negatively charged
   b. located in energy levels in electron cloud outside the nucleus
   c. Gives chemical properties to element
   d. smallest mass
   e. 1st =2 electrons, 2nd = 8 electrons, 3rd = 18 electrons, 4th = 32 electrons



1) Properties of Matter
   a) Substances
      i) Elements
      ii) Compounds
         (1) pure
   b) Mixtures
      i) Solutions
         (1) heterogeneous
            (a) different
         (2) homogeneous
            (a) same

2) Physical Properties
   a) Properties that you can observe using your senses
3) Physical Changes
   a) Changes that occur while the substance remains the same.
      (1) Ex:Ice →water →steam
4) Chemical Properties
   a) describes how a substance reacts with other substances or will act, chemically
5) Chemical change
   a) an actual chemical reaction takes place and a new substance is formed
      i) Ex: combustion

1. What is the equation to solve for density?
2. How is this equation rearranged to solve for mass?
3. How is this equation rearranged to solve for volume?
4. What is the density of a block that has a mass of 200 g and a volume of 50 mL?
5. What is the volume of a nail that has a density of 7 g/cm^3 and a mass of 2 equation to solve for density?

6) <u>Physical Properties/changes</u>
   a) density (D=m/V)
   b) color
   c) melting point
   d) boiling point
   e) hardness
   f) state of matter
   g) malleable
   h) ductile
      conductivity of electricity
   i) conductivity of heat
   j) luster
   k) solubility

<u>Chemical Properties/changes</u>
   l) flammability
   m) reactivity
   n) gas given off
   o) tarnishing
   p) corroding
   q) oxidation
   r) reacts with…
   s) endothermic
   t) exothermic
   u) forms a precipitate
   v) rusting

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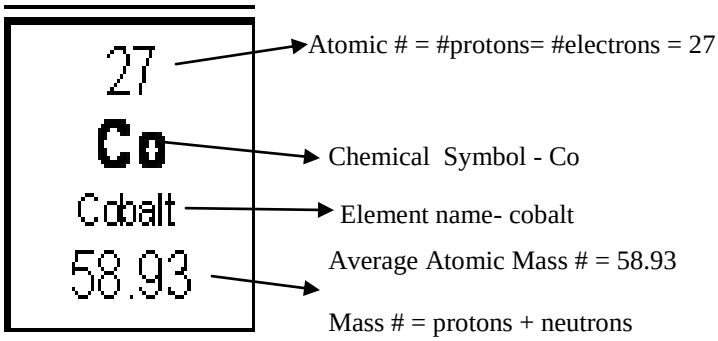
- The Periodic Table



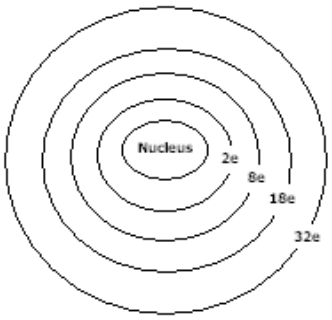
  - Each element has its own place on the periodic table.
  - Elements cannot be changed physically.
  - Elements can be changed chemically.
- Compounds
  - Chemical combination of two or more different elements
    - H_2O, NaCl, Li_2O
  - Have new physical and chemical properties from elements it is formed from.

ATOMIC STRUCTURE – COMPLETE THE FOLLOWING TABLE.

	Isotope Name	Atomic #	Mass #	#p^+	#n^0	#e^-
1.	hydrogen-2					
2.		1	1			
3.				6	6	
4.			7	3		
5.	chlorine-35					
6.		19			20	
7.			24	12		
8.		33	74			

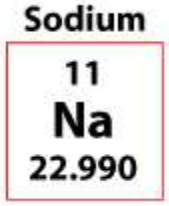
The Periodic Table

- 18 groups/families
  - Group # = valence electrons(e^-) 1,2, 13-18
    - He 2 valence e^-
    - no more than 8 valence e^-
    - Octet rule
      - except He has 2 valence
  - Oxidation #'s as known as ion charges come from valence e^-
- 7 periods
  - Period # = # e^- energy levels
  - Maximum # e^- in each level
    - 2-8-18-32



- What are the names of groups?
  - Group 1 _____
  - Group 2 _____
  - Groups 3-12 _____
  - Group 17 _____
  - Group 18_____

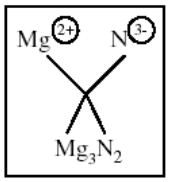
- Classify each of the following elements as an alkali metal, an alkaline earth metal, transition metal, metalloid, halogen, or noble gas based on its position in the periodic table.
  - boron _____
  - gold _____
  - krypton _____
  - calcium _____
  - neon _____
  - lithium _____
- Dot diagrams
  - Chemical symbol valence electrons represented by dots
  - Give the dot diagram for:
    - He _____
    - Xe _____
    - Cl _____
    - Na _____
    - B _____
    - O _____
    - N _____
    - H _____
    - Mg_____
  - Label the following on each diagram: element symbol, mass number, atomic number



  - How can the number of neutrons in an atom be calculated?

+1 +2 +3 +4 -3 -2 -1 0 oxidation #'s (ion charges)

- What is an oxidation numbers?_____
- Where do they come from? _____
- How do we use them? _____
- Naming binary compounds
  - Use the oxidation # or ion charge
  - Use the absolute value



- Criss cross
- What is the name of this compound? _____ _____
- Name the following compounds:

a. Na_2O _____ b. Al_2O_3 _____

c. K_2O _____ d. $CaCl_2$ _____

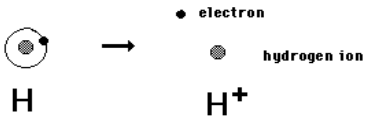
e. What is the formula of magnesium oxide? _____

f. What is the formula of lithium fluoride? _____

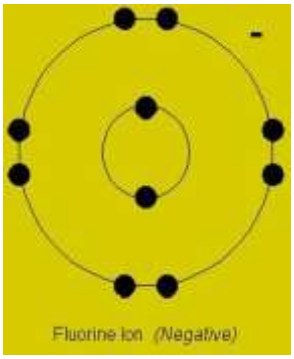
- Polyatomic Ions (USE YOUR REFERENCE TABLE!!)
  - a group of nonmetal that hang out together and react together
  - $Cu(NO_3)_2$_____
  - $BaCrO_4$_____
  - $BaSO_3$ _____
  - $AgNO_3$_____
  - $Na_2Cr_2O_7$ _____
  - $MgSO_4$ _____
- Ions and Isotopes
  - Ions : positively or negatively charged elements
  - A "charged" atom.
    - Atoms become charged by gaining or losing electrons.

    2 Types of Ions:

    - (+) ions
      - Atoms become (+) by losing electrons



    - (-) ions
      - Atoms become (-) by gaining electrons



- Metals _____ electrons and become_____ charged ions.
- Nonmetals _____electrons and become _____ charged ions.

- Each of these represents Hydrogen
- The number represents the mass #

$^{12}_{6}C$ $^{13}_{6}C$ $^{14}_{6}C$

- Each of these represents Carbon
- The top # represents the mass #
- The bottom # represents the Atomic #

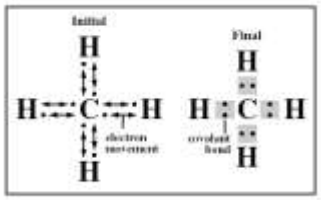
➢ Isotopes : different form of the same element
- Same # protons
- Same # electrons

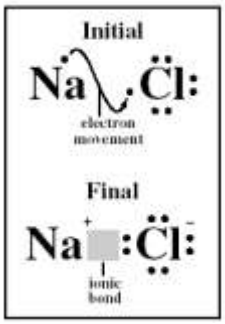
➢ Two ways to write isotopes
- H-1 H-2 H-3
- Which is an ion? Ca-20 or Ca^{+2}
- Which is an isotope? H-3 or H^{+1}?
- How many electrons does each have?

- N^{+5} _____
- He^{+} _____
- F^{-1} _____
- Al^{+2} _____
- P^{-3} _____
- Mg^{+2} _____

➢ Bonding comes from the combination of valence electrons.
- Metallic bonding occurs in metals.
- Covalent shares electrons between nonmetals

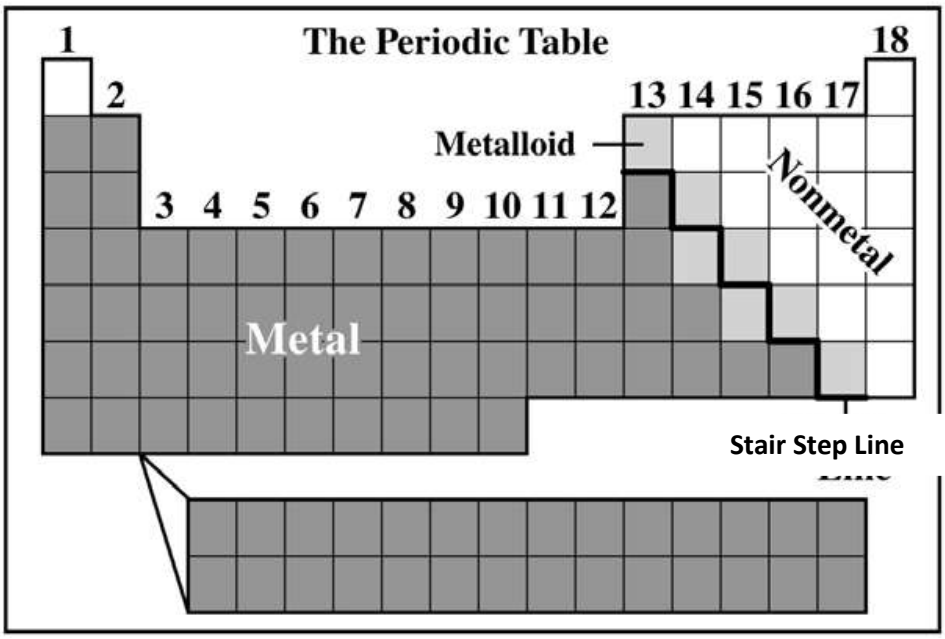
Ionic transfers electrons from metals to nonmetals.





Which is covalent? Which is ionic? Which is metallic?

a. NaCl _____ b. H_2SO_4 _____c. Cu _____



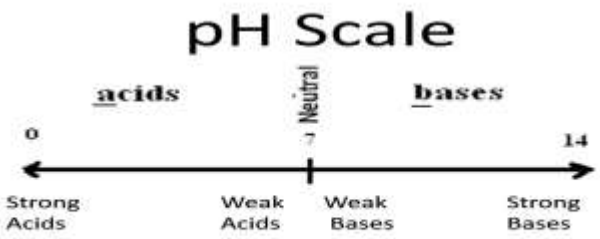
- Metal elements are located to the left of the Stair Step Line
  - solids at room temperature with the exception of mercury (Hg).
- Metals physical properties
  - Luster = _____
  - Malleable = _____
  - Ductile = _____
  - Conduct electricity and heat
- Nonmetal elements are located to the right of the Stair Step Line
  - H
  - Gases or solids at room temperature
  - Br liquid at room temperature
- Nonmetals physical properties
  - Brittle =_____
  - Dull =_____
  - Do not conduct heat or electricity
- Metalloids are located between the metals and nonmetals along the Stair Step Line
  - B, Si, Ge, As, Sb, Po, Te
    - have both metallic and nonmetallic properties
    - Metalloids are used as part of electronic circuits
- Physical and Chemical Changes
  - Physical change
    - New substance NOT formed
- Chemical Equations
  - Chemical reactions give chemical changes
  - New substance is made
    - New chemical and physical properties
    - Signs
      - Development of gas
        - Bubbling, fizzing
      - A solid is made from 2 or more liquids
      - Energy/Heat/ light (ENERGY) given off as product

- EXOTHERMIC
- Energy/Heat taken in
  - ENDOTHERMIC
- Reactants →Products
- Four types of Reactions
  - Synthesis
    - A+ B →AB
      - 1 P
  - Decomposition
    - AB→ A+B
      - 1 R
  - Single Replacement
    - AB + C → AC + B
    - 1 E + 1 C→ 1E + 1C
  - Double Replacement
    - AB + CD → AD + CB
    - 1 C + 1 C →1 C + 1 C

- What type of reaction is ?
  - $BaO + H_2O \rightarrow Ba(OH)_2$ _____
  - $Pb(NO_3)_2 + HF \rightarrow HNO_3 + PbF_2$ _____
  - $H_4SiO_4 \rightarrow SiCl_4 + H_2O$ _____
  - $Al + FeO \rightarrow Al_2O_3 + Fe$ _____
- Counting Atoms
  - Coefficient X Subscript
- How many atoms?
  - $3\ H_2O_2$ _____ $2\ Mg(OH)_2$ _____ $3C_5H_{10}$ ____ $4Fe_2O_3$ _____ $2\ Pb(NO_3)_2$ _____
- Balancing Equations
  - Law of Conservation of Matter/Mass
    - Same number of each atom on each side of →
    - Total number of atoms same on each side of →
  - Balance the following:
    - __Al +__ FeO → __Al_2O_3 + __Fe
    - ___P_2S_2 → __ P_4 + __ S_8
    - __ Au + __ O_2 →___ Au $_2$ O_3
    - __Si Cl_4 +__ H_2O →__ H_4SiO_4
    - ____ N_2 + ____ H_2 → ____ NH_3
    - ____ GaF_3 + ____ Cs → ____ CsF + ____ Ga
    - ____ NaF + ____ Br_2 → ____ NaBr + ____ F_2
    - ____ $AgNO_3$ + ____ Cu → ____ $Cu(NO_3)_2$ + ____ Ag

- Acids, Bases, and pH

ACIDS	BASES
--most start with H Ex. HCl	--most end with OH Ex. NaOH
--are corrosive(will eat metal)	--Some are corrosive
--taste sour	--taste bitter
	--are slippery(like soap)
--produce hydronium ions -- H_3O^+	--produce hydroxide ions OH^-
--Turn litmus paper pink	--Turn litmus paper blue
--Clear in phenolthalein	--Pink in phenolthalein
--conduct electricity(stronger the better)	--conduct electricity(stronger the better)



- Nuclear Chemistry

Sometimes very heavy elements have unstable nuclei. Atoms of these elements are radioactive. A radioactive element may decay and give off three types of radiation.

Alpha (α) radiation or particles.
- Made of helium (He) nucleus
- (+) charge
- Lowest energy
- Most mass
- A sheet of paper can stop them

Beta (β) radiation or particles.
- made of electrons (e^-)
- (-) charge
- Medium energy
- Least mass
- Aluminum or tin foil can stop them

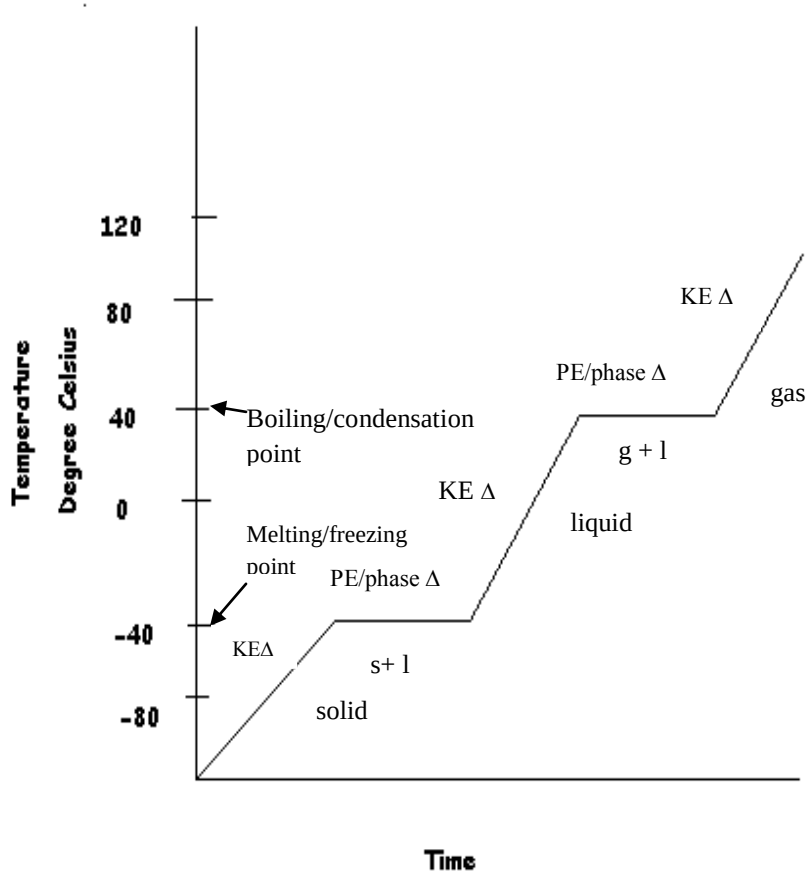
Gamma (γ) rays
- Made of waves
- No charge
- Most energy
- No mass
- Lead or concrete can stop

- Fission
  - The splitting of large nuclei into lighter nuclei
  - Found in nuclear weapons, power plants
  - Converts mass into energy
  - Nuclear waste from fission creates storage problems
  - Smaller to bigger
- Fusion
  - Occurs when two light nuclei, such as hydrogen, collide together and combine to form heavier nuclei.
  - Bigger to smaller
  - Fusion occurs in the sun and stars
    Converts mass into energy

  - What is nuclear radiation and what are the 3 types?
  - Which type of radiation is most penetrating?
  - Compare and contrast nuclear fission and fusion.

- States of Matter
  - solids
    - have definite shape AND a definite volume
    - particles VIBRATE in place
  - liquids
    - have NO definite shape, have definite volume
    - particles SLIDE freely
  - gases
    - have NO definite shape AND NO definite volume
    - particles fill the volume of the container
  - plasma

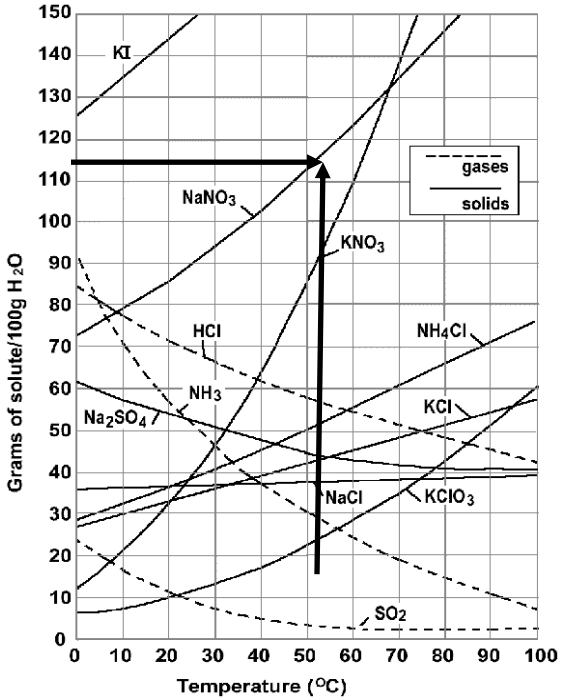
        - most abundant in Universe
        - positively and negatively charged gases
        - found in stars
- Changes in states of matter
    - Phase changes
    - melting the process of changing from a solid to a liquid (energy is being put into the substance)
        - melting point
        - the temperature at which melting occurs
        - physical property
        - the melting point of water is 0°C
    - freezing
        - the process of changing from a liquid to a solid
        - (energy is being pulled out of the substance)
    - freezing point
        - same temperature as melting point
    - vaporization
        - the process of changing from a liquid to a gas
        - (energy in being put into the substance)
    - evaporation /vaporization/boiling
        - the process of changing from a liquid to a gas
    - boiling point
        - the temperature at which boiling occurs
        - boiling point of water is l00ºC
    - condensation
        - the process of changing from a gas to a liquid
    - sublimation
        - the process of changing from a solid to a gas
        - ex: dry ice ($C0_2$)
- ALL CHANGES IN STATE ARE PHYSICAL CHANGES!!!!!!!!



- Thermal Energy
  - Heat flows form high to low temperatures.
  - A difference in temperatures causes heat flow.
  - Good conductors, such as metals, conduct heat rapidly.
  - Insulators, such as wood or plastic, conduct heat very slowly
- Three methods of heat flow
  - Conduction
    - heat transfer by direct contact
    - particles vibrate in place but do not move
    - solids, liquids and gases
  - Convection
    - Heat transfer by current
    - warm rises, cool drops (change in density)
    - particles flow form one region to another
    - liquids and gases
  - Radiation
    - Transfer by electromagnetic waves from the Sun
    - Solids, liquids and gases
- Kinetic Theory of Matter
  - Particles always moving
    - Increased movement
    - Increased KE
    - Increased temperature
    - Decreased movement
    - Decreased KE
    - Decreased temperature
  - Describe heat and how it flows.
  - What is temperature and how does it reflect kinetic energy?

- What 3 things does thermal energy depend on?
- Compare and contrast conduction, convection, and radiation.

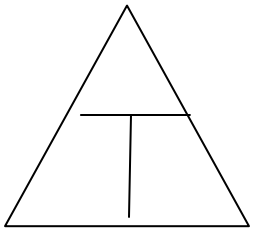
- Solutions/Solubility

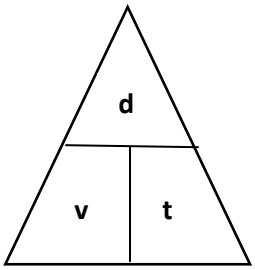


- Polarity compounds that have (+) and (-) region
- Water is polar
  - Anything that is polar will dissolve in H_2O
  - Oils are nonpolar so they do not dissolve in H_2O
- Solvent = does the dissolving
- Solute = is dissolved
- "Like dissolves like"
- Unsaturated = below the line
- Saturated = on the line
- Supersaturated = above the line
- Which compound is least affected by temperature?
- Which compound's solubility decreases as temperature increases?
- How many grams of KNO_3 will dissolve in 100 g of water at 60^o C?
- What is its solubility at this temperature?

Using a triangle→

- Triangles always yield 3 formulas
- You can divide the number on the top
  - by either number underneath
    or
  - multiple the two bottom numbers



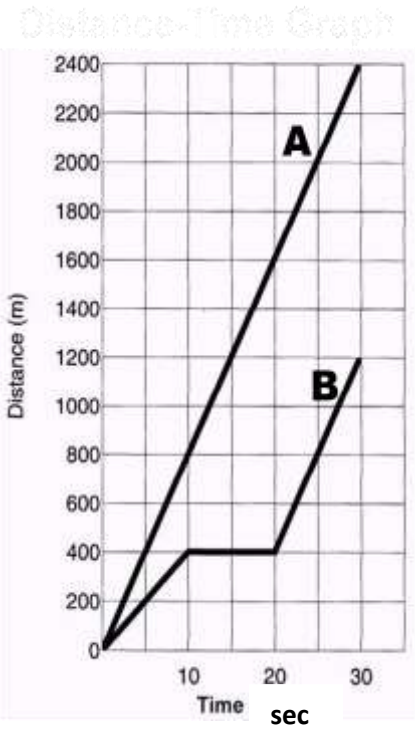


- distance
  - far you travel
  - no direction

$$\mathbf{v = \Delta d / \Delta t}$$

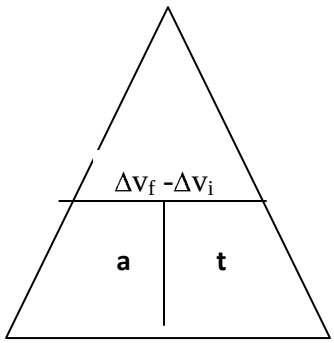
- displacement
  - how far you are from where you started
  - direction
- Speed
  - how fast you are going
  - no direction
- velocity
  - how fast and in what direction
- Velocity/speed is the change in the distance traveled divided by the time
  - Units
    - meters/seconds
    - m/s

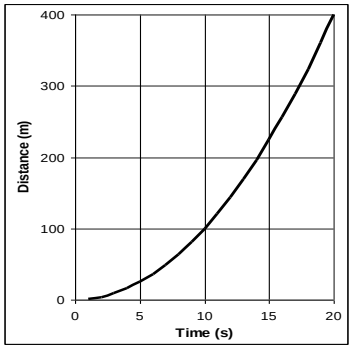
        - time
            - seconds
    - can be kilometers/hour
        - km/hr
    - An object rolls east at a steady speed of 15 m/s for 5 seconds. What distance did it travel?
    - What is the time it takes a dog to run 5 meters at a velocity of 2 meters/second?
    - What is the average speed of a cat that walks 2 kilometers in 0.5 hours?
- Make sure to change time to seconds if distance in meters
    - what is the average speed of a rock that drops 3 meters in 1 minute?
- Graphs



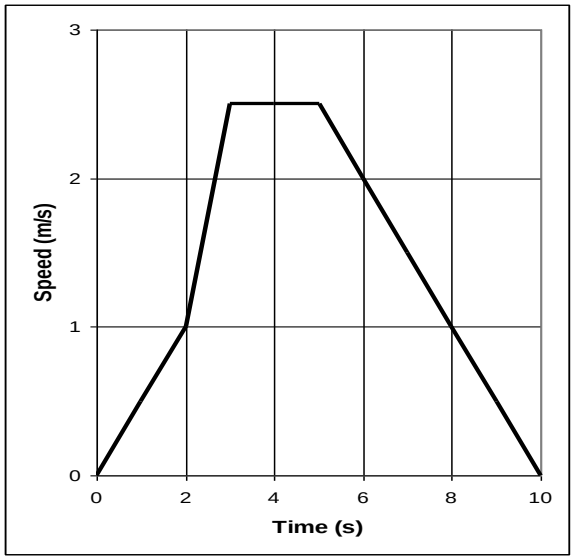
- Slope = speed/velocity
- Steeper slope = faster speed/velocity
- 0 slope= no motion
- Flatter slope = slower speed/velocity
- Line A is uniform speed/velocity
    - Means same slope at each point
- Which line is uniform?
- Which line has a faster speed/velocity?
- At what time is the object not moving?
- What is the speed/velocity of line A?
- What is the speed/velocity of line B from 0 to 10 seconds?
- What is the speed/velocity of line B from 10 to 20 seconds?
- What is the speed/velocity of line B from 10 to 20 seconds?

- Acceleration
    - Change in velocity/time
    - Δv=velocity $_{final}$-velocity $_{initial}$
    - a= $\Delta v_f - \Delta v_i$ / t
    - Positive
    - Negative
    - Speeding up
    - Slowing down
    - Changing direction
    - What is the acceleration of a car that speeds up from 0 m/s to 100 m/s in 25 s?
    - What is the acceleration of a car that slows down from 500m/s to 200 m/s in 20 seconds?
    - How long did it take a cat to accelerate at 2m/s/s when his velocity changed from 0 m/s to 10 m/s?
    - Shown by a curved line on a distance –time graph





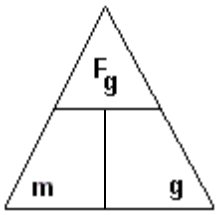
- Acceleration graph



  - Slope = acceleration
  - Steeper slope = faster acceleration
  - + slope = + acceleration
  - – slope = - acceleration
  - 0 slope= no acceleration
  - Flatter slope = slower acceleration
  - No slope = 0 acceleration
  - What is the acceleration from 0 to 2 seconds?
  - At what time is the object not moving?
  - What is the acceleration from 2 to 3 seconds?
  - What is the acceleration from 5 to 10 seconds?

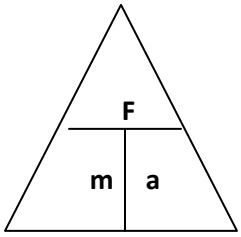
- Gravity
  - "g"
  - 9.8m/s^2 on Earth
  - Acceleration of a falling object
  - All objects would fall at the same rate regardless of mass if there were no air resistance
  - Like on the moon
  - In a vacuum
    - Place with no air resistance
  - Size and shape (not weight or mass) effect how fast it falls because of air resistance
  - Terminal velocity
    - Force of Weight = force of air resistance
    - a falling object stops accelerating because the upward force of air resistance equals the downward force of gravity
  - The value of g decreases the farther away from the center of Earth an object gets.
  - Weight of an object would decrease if it was placed on top of a mountain or put into space
  - Value of g increases the closer you get to the center of Earth
- Weight
  - Gravitational force is a force between any two objects.
  - The strength of the force is related to the mass of the objects and the distance between them.
  - The more mass an object has, the greater the gravitational force it exerts.
  - Really how gravity effects your weight
  - weight is a force

- $F_g = mg$
- $g = 9.8$ m/s/s, $9.8 m/s^2$



- What is the force that causes a 10kg mass to accelerate at 20 m/s^2?
- What is the mass that that a 200 Newton force accelerates at 1 m/s/s?
- What is the acceleration of a 100kg object that has a net force of 2000 Newton net force?
- How much force is present when a 10 kg rock changes its velocity from 0 m/s to 10 m/s in 2 seconds?
- What is the weight of a 10 kilogram rock?
- What is the mass of a 980 Newton boulder?
- What is the weight of a 1kg cat?
- How much mass does a 450 Newton object?
- On the surface of a distant planet a 5 kg mass weighs 20 N. What is the acceleration due to gravity there ?

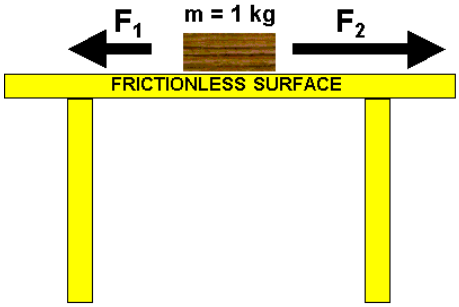
- Mass
  - How much matter an object has
  - Never changes based on location
  - Physical property of matter
  - An object has mass whether or not gravity or any other force is acting upon it
- Newton's Laws of Motion
  - 1st Law of Motion
  - Aka Law of Inertia
    - Things keep on doing what they are doing
    - The tendency of an object to resist any change in its motion
    - The more mass, the more inertia
    - The less mass, the less inertia
    - Large forces are required to change the motion of objects with large masses
    - Small forces can change the motion of objects with low masses



  - 2nd Law of Motion
    - Aka F = m a
    - States that the acceleration, *a*, of an object is directly related to the net force, *F*, applied to the object and inversely related to the mass, *m*, of the object.
    - Used to find the net force
    - Force = mass x acceleration
    - The greater the net force acting on an object, the greater the acceleration of the object.
    - The greater the mass of the object, the lower the acceleration of the object.
    - Forces can be
      - balanced
      - → + ←
      - unbalanced
      - → + ←
      - Cause accelerations
  - 3rd Law of Motion
    - Aka action-reaction
    - States that forces occur as equal and opposite pairs.
    - For every action force there is an equal and opposite reaction force.
    - For example, when a book is sitting on a table, the weight of the book produces a downward action force on the table. The tabletop in turn pushes on the book with an upward reaction force. These forces are equal in magnitude but opposite in direction.
    - Highly misunderstood.
      - Correct: force of bug on windshield equal in size but opposite in direction to force of windshield on bug

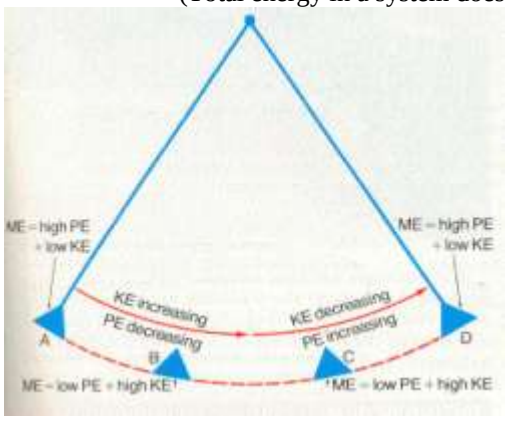
- Correct: Person exerts 10 N→ ←Wall exerts 10N
- Incorrect: gases out of balloon to the right cause it to move to the left

- List and define (IN YOUR OWN WORDS) **Newton's 3 Laws of Motion**. Include any applicable equations
- Compare and contrast **mass and weight**. How can weight be calculated?

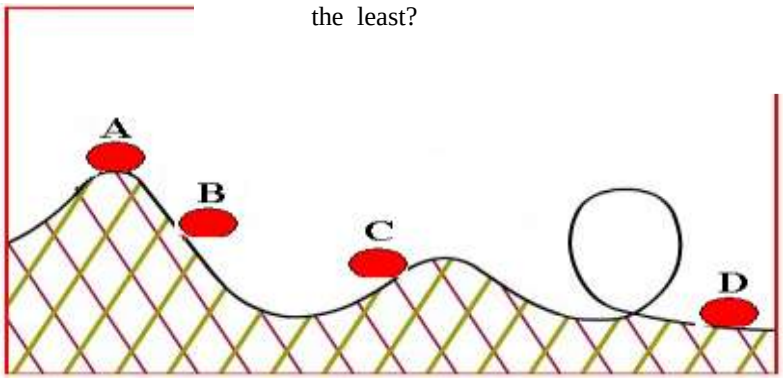


- The diagram shows a wooden block on a frictionless surface with two opposing forces acting on it.
- What is the weight of the wooden block?
- If F_1 = 2 N and F_2 = 5 N, what is the the net force acting on the block?
- In what direction and under what conditions is the block moving?
  A at rest B moving to the right at a constant velocity
  C accelerating to the left D accelerating to the right
- What is the acceleration of the block?
- A boy jumps off a boat into the water; the boat moves backward at the same time. If the boy exerted 50N of force onto the boat, how much force did the boat exert on him?

- Assorted Force Stuff
  - Friction
    - Always acts opposite to the direction of the object
    - Present whenever two objects are touching
    - It always takes more force to get an object moving than it takes to keep it moving.
- Energy
  - The ability to do work
  - measured in joules (J)
  - Kinetic Energy
  - Energy due to motion
  - KE = ½mv^2
  - Potential Energy
  - Energy due do position or condition
  - PE = mgh
    - Use 9.8 m/s/s = g
- Law of Conservation of Energy
  - Energy is neither created or destroyed
    it can only be transformed or change forms
    - Total Energy = KE + PE
    - (Total energy in a system does not change)



- At what position is PEg greatest?
- At which position is KE greatest?
- If total energy is 60 J at the beginning, what is total energy at the end?
- At what point does the object weigh the most?
- At what position does the object weigh the least?



- What is the potential energy of a rock an object with a mass of 8kg when it is raised 10 meters?
- A 5kg wagon on a frictionless surface travels 10m/s. What is the kinetic energy?

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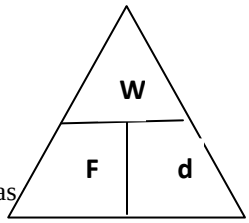
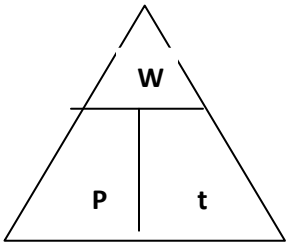
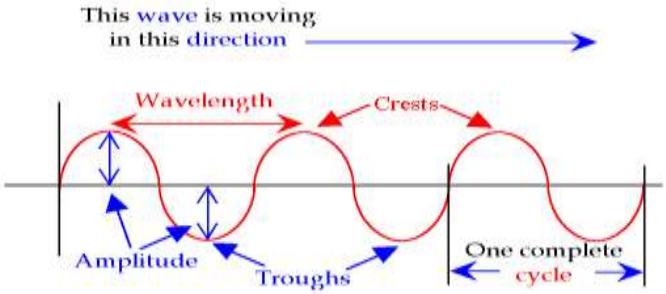
- What is the potential energy of a 10 Newton rock that is 10 meters above the ground?

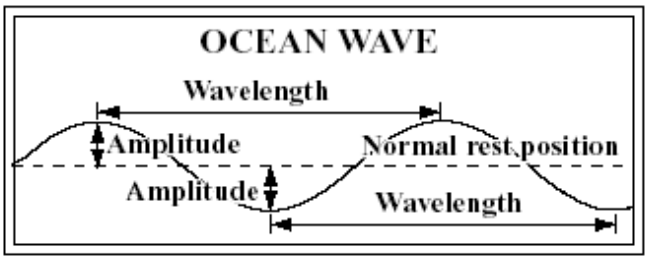
- Work and Power
  - Work = Force x distance
  - W = F · d
  - no movement= no work
  - Joule (J)
  - A total of 1000J of work was done when a 250N force was exerted on a shelf. How far was
  - How much work is done when a rock is moved 100 meters by a 10 Newton force?
  - How much work is done when a 2000 Newton force cannot move a rock?
  - Power
  - Rate of doing work
  - Power = Work/time
  - P = W / T
  - Time must be in seconds
  - Watts (W)
  - A student exerts a force of 500N to move a box 10 meters in 5 seconds. What is the student's power?
  - How much power is generated if a 120 Newton force moves 1 meter in 2 seconds?
  - How much work is done if a car has 100 Watts of power in 5 seconds?
  - What is work and what is required for work to be taking place?
  - How can work be calculated?
  - Define power and give the equation for calculating it.
  - Explain the relationship between energy and work.
  - Compare and contrast potential and kinetic energy, giving the equations for calculating both.



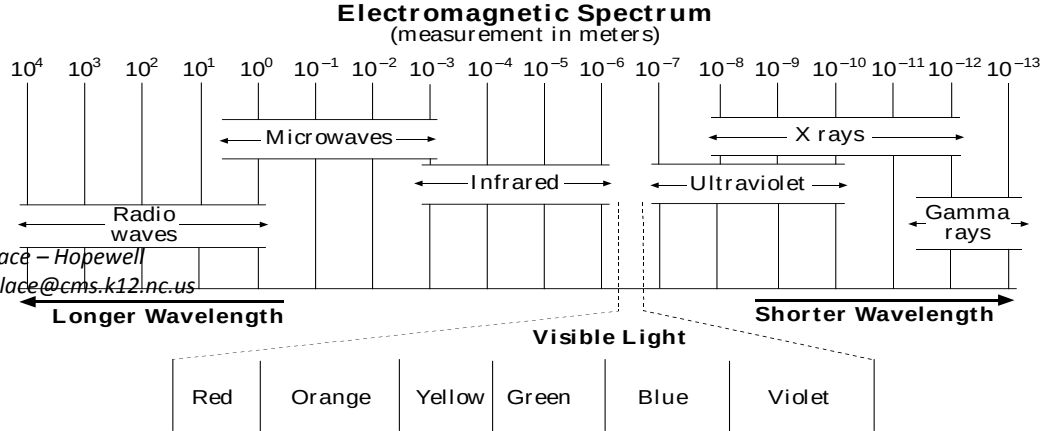


- Waves
  - Disturbances that repeat the same cycle of motion
  - Transfer energy through matter or empty space.





  - Properties of all waves
    - longer wavelengths/lower frequency/lower energy
    - shorter wavelength/higher frequency/higher energy
  - Transverse
    - electromagnetic waves
    - light waves
    - media moves at right angles to the direction of travel
    - Can travel without a medium
      - State of matter



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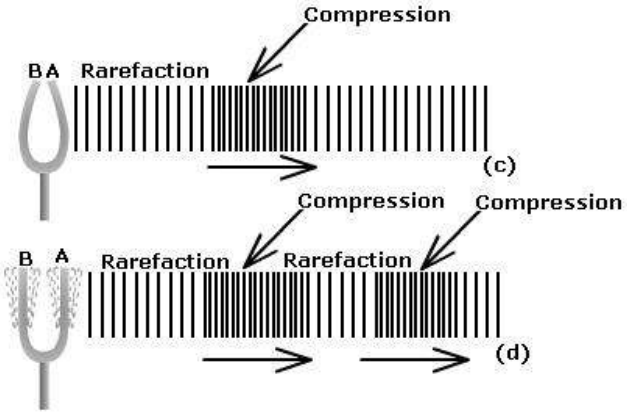
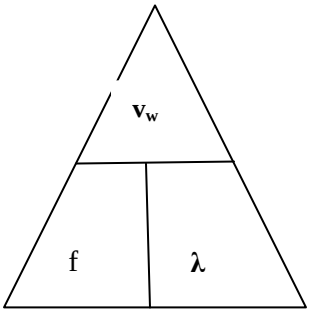
- Longitudinal



  - Sound waves
  - media moves parallel to the direction of travel
  - Cannot travel without a medium
  - Cannot hear sound without a state of matter to travel through
  - Sound travels fastest through solids, then liquids, then gases

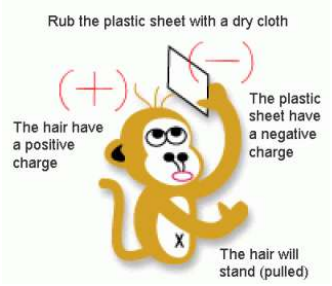
- Basic properties
  - Frequency is # waves per time
    - Herttz
    - Hz
  - Frequency is related to pitch
  - Amplitude is related to amount of energy
  - Taller waves carry more energy
  - Smaller waves carry less energy
  - Velocity = frequency x wavelength
  - $v_w = f \lambda$
  - What is the velocity of a wave that has a frequency of 2 Hertz and a wavelength of 2 meters?
  - What is the frequency of a 5 meter wave that has a velocity of 1 m/s?

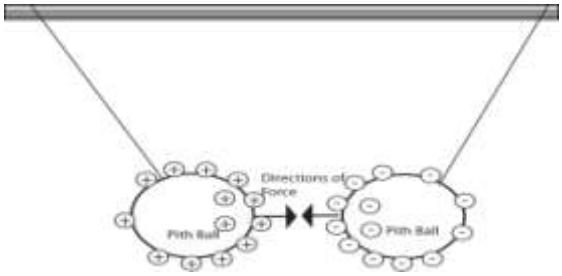


- Doppler Effect
- Apparent change in the pitch/frequency of a moving object
  - A siren gets louder the closer it gets to you, then the sound suddenly drops when you are at the source of the sound
- Which has the greater frequency, radio waves or gamma waves?
- Which has the highest energy, radio waves or gamma waves?
- What waves carry the most energy?
- What waves carry the least energy?
- Illustrate a **transverse wave** and label the following parts:
  - Crest
  - Trough
  - Wavelength

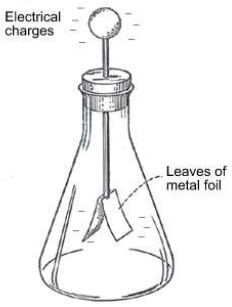
- Amplitude
- Explain the relationships between **frequency, period, and wavelength**. How can these properties be used to calculate wave speed?
- How are wave energy and **amplitude** related?
- Describe the properties of sound waves.
- What types of waves are sound waves?

➢ Electricity
- Static Electricity
  - Static Electricity
    - electricity that is not moving.
    - Lightning is static electricity
    - When your clothes "cling" in the dryer
  - Basic Law of Electrostatics
    - Like charges repel, opposite charges attract
  - How do objects become "charged"?



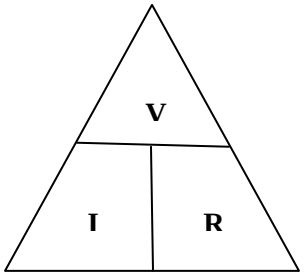


  - Objects become charged by gaining or losing electrons
  - Negative means something *gained* electrons
  - Positive means something *lost* electrons
  -

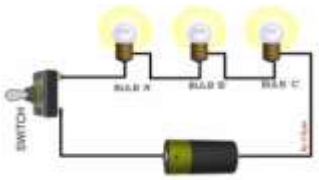


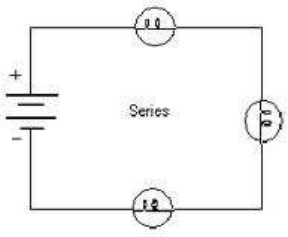
  - Detect charge on an electroscope
  - Protons will not move
  - Charging happens 3 ways
    - Friction
      - Rubbing
    - Conduction
      - Direct contact
      - No contact, no conduction
    - Induction
      - Rearrangement of charge of a neutral object caused by a nearby charged object
- Current electricity
  - Voltage will determine whether electricity will or will not flow
    - Voltage
    - Volts
      - V

- Potential difference
- Resistance determines how much current flows
  - Resistance
  - Ohms
    - Ω
  - Low resistance, high current
  - High resistance, low current
  - Current
    - How many electrons flow
    - Amperes
    - Amps
      - A

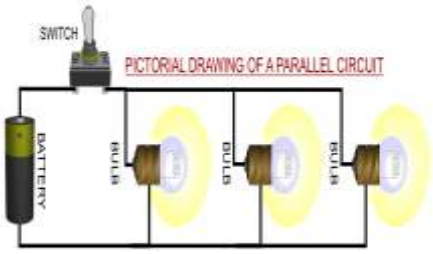


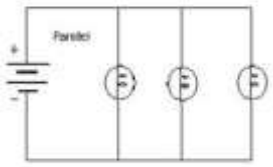
- Ohm's Law
  - Voltage = Current x Resistance
  - V = I x R
- What is the voltage of a 10 Amp current with a resistance of 10 Ohms?
- What is the current of 100 Volts and a resistance of 10 Ohms?
- What is the resistance of a 10 Volt device that has a current of 100 Amps?
- 2 Types of Electric Circuits
  - Circuits must be closed for electricity to flow
  - Electricity is the flow of electrons
  - Series
    - Current has only one path to take.
    - All of the current will travel through each device.
    - If one device does not work, nothing will work
  - Parallel
    - Current has more than one path to take.
    - All of the current will not travel through each device
    - One device does not work, everything else will work





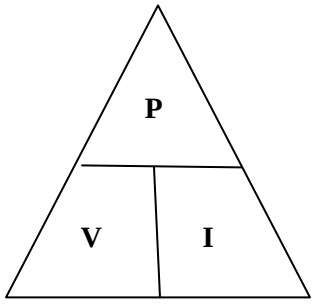
Series circuits





Parallel circuits

- Power
  - Electrical power is the rate at which electricity is used.
    - Power = voltage x current
    - P = V x I
    - Watts = Voltage x Amps
  - Unit is Watts
    - W
- How is a net electric charge produced?



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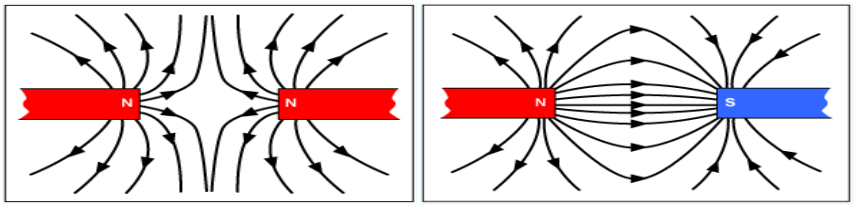
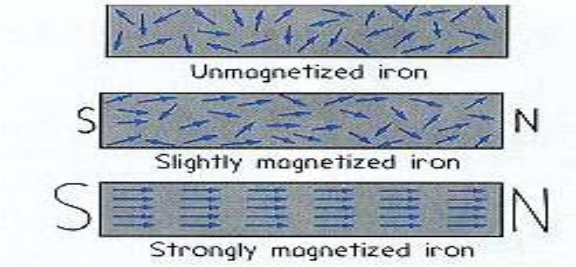
- What are the 2 types of electric current and what is the difference between the two?
- Describe an electrical insulator and a conductor and give examples of each.
- What is resistance and what 3 things affect it?
- Describe voltage.
- What is Ohm's Law? (Give the equation also)
- Compare and contrast a series and parallel circuit. Illustrate and example of each.
- Explain how electric power is calculated and give the equation
- What is the power of a 10 Amp current that has a voltage of 220 Volts?

➢ Magnetism
- Two types of magnets
  - Permanent
    - Made of two poles and domains
      - North Pole and South Pole
      - Magnets have fields that are strongest at the poles
      - Iron, cobalt and nickel
      - opposite poles attract; like poles repel
      - magnetic field lines always go from the north pole to the south pole of a magnet
      - when lines are closer together the field is stronger (like closer to the poles)
      - electric current has a magnetic field and will turn the needle of a compass
      - If broken, permanent magnets become new magnets, each with a north and south pole.



Lines of repulsion **Lines of attraction**

- In a permanent magnet, the "Domains" are aligned.
- In a normal piece of metal, the domains are not aligned.



  - Temporary Magnets
    - Can be made by direct contact to align the domains in the metals
    - Electromagnets
      - Metal core, coils, voltage source
      - Will quit working when the current is turned off.
    - Increase the strength
      - increasing the coils
      - increasing voltage
      - use of pure iron core

- Describe how an electromagnet works.
- How can you make a magnet?
- What can you do to increase the strength of an electromagnet?
- Where is a magnet strongest?
- What elements are permanent magnets made of?
- How are electricity and magnetism related?

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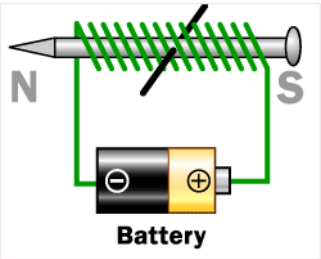

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