CHS Physical Science EOCT Review

Presented

By

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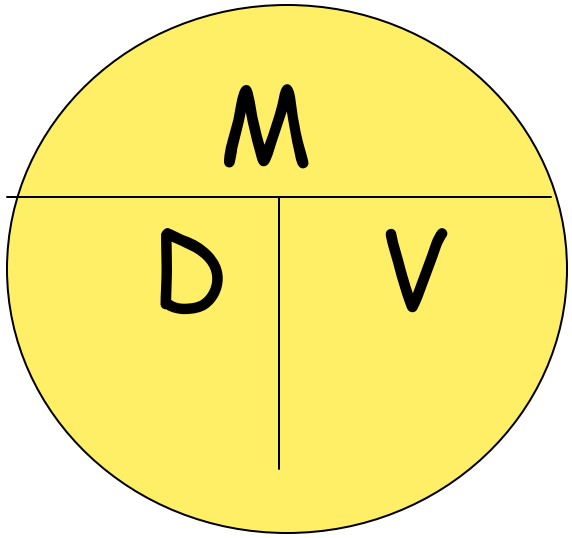
Unit 1: Science Skills and Properties of Matter

Density
D=m/v

5.0g object, dimensions are:



Length = 2 cm

Width = 1 cm

Height = 5 cm

L x W x H = ?

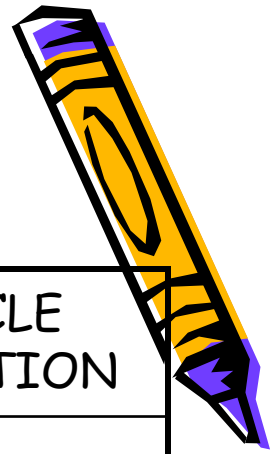
What is the density of the object?

Unit 2: States of Matter

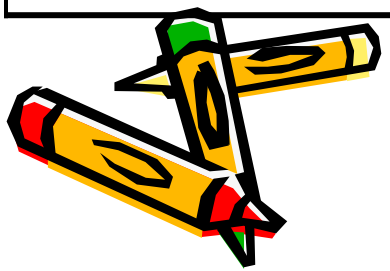
Comprehending the relationship between molecular motion and phases of matter:

- Characteristics of matter related to its state
- Interpreting Properties of matter at the atomic level
- Determining the relationship between the temperature, volume, and pressure of a gas
- Using a phase diagram to clarify the transfer of energy

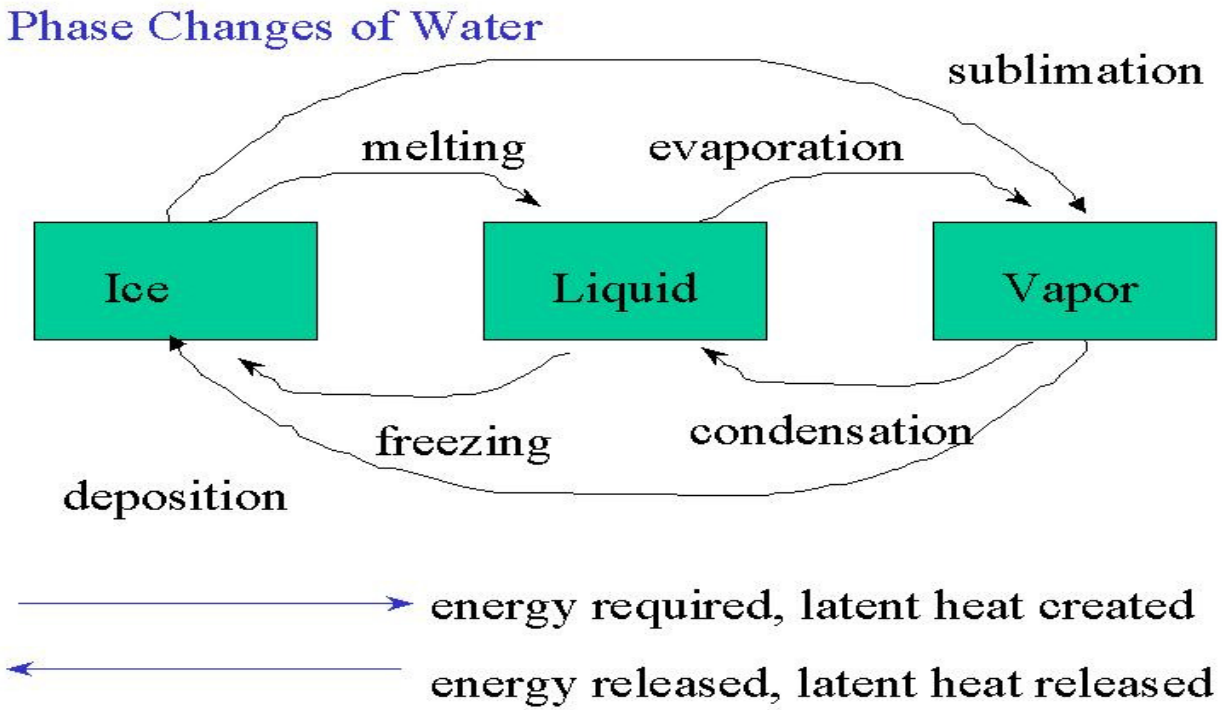
Phases of Matter



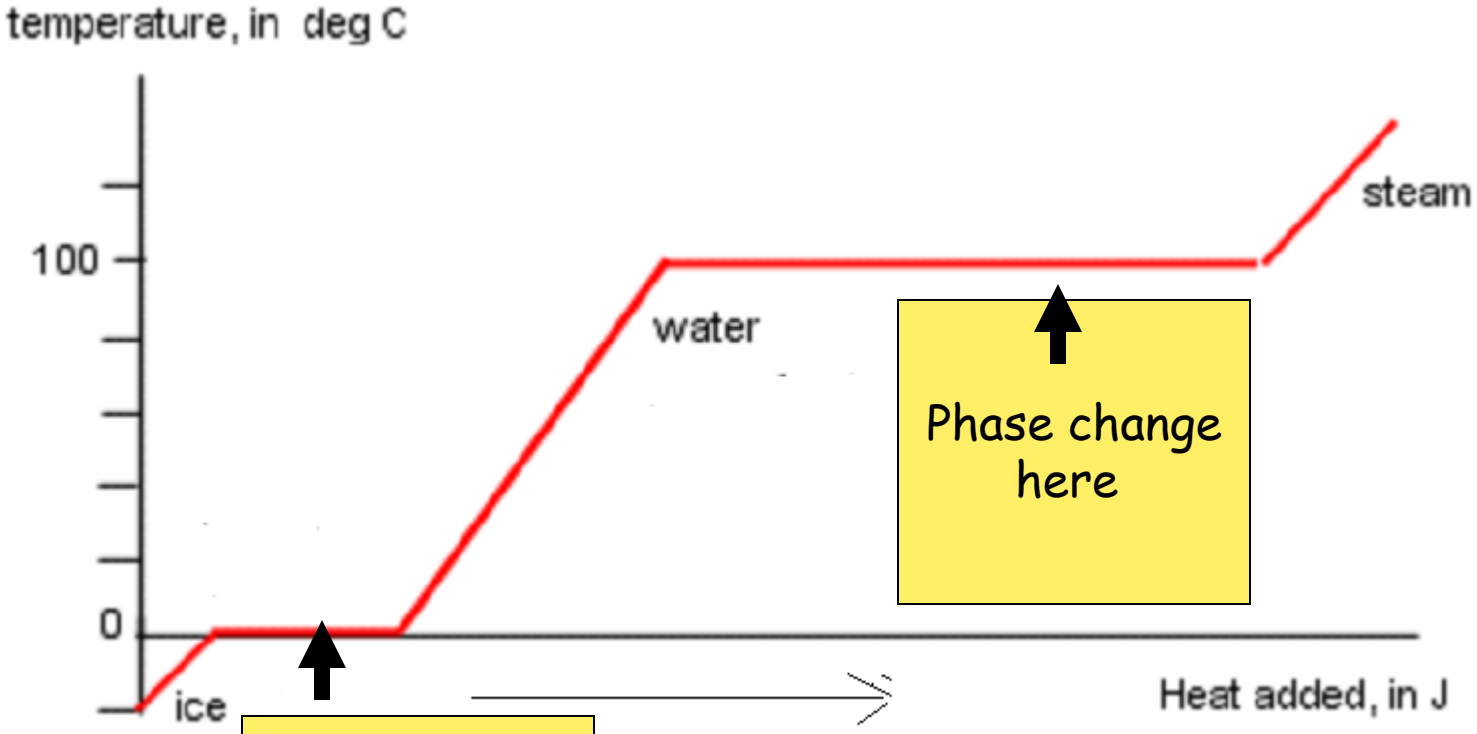
STATE OF MATTER	SHAPE	VOLUME	PARTICLE DESCRIPTION
SOLID	has definite shape	has definite volume	particles move slowly and cannot be compressed
LIQUID	has no definite shape (takes the shape of container)	has definite volume	particles move faster but cannot be compressed
GAS	has no definite shape	has no definite volume (fills volume of container)	particles move the fastest and can be compressed



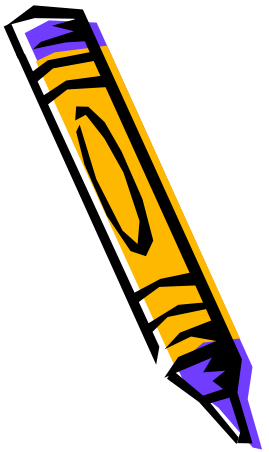
Phase Changes of Water



Phase Change Diagram of Water



Sample Question



As a gas is heated,

a. Particles making up the gas move slower.
b. Particles making up the gas grow larger.
c. Particles making up the gas move further apart.
d. The volume of the gas usually decreases.

Gas Laws

As P ↑, V ↓

As n ↑, V ↑

As T ↑, V ↑

As n ↑, T ↑

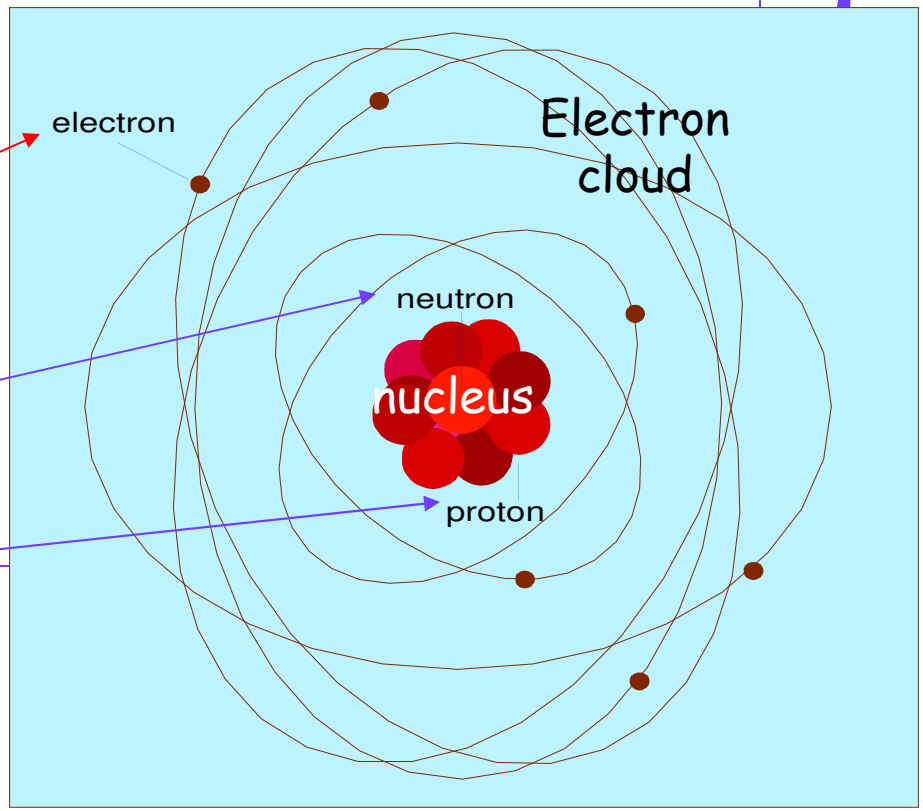
P = pressure

T = temperature

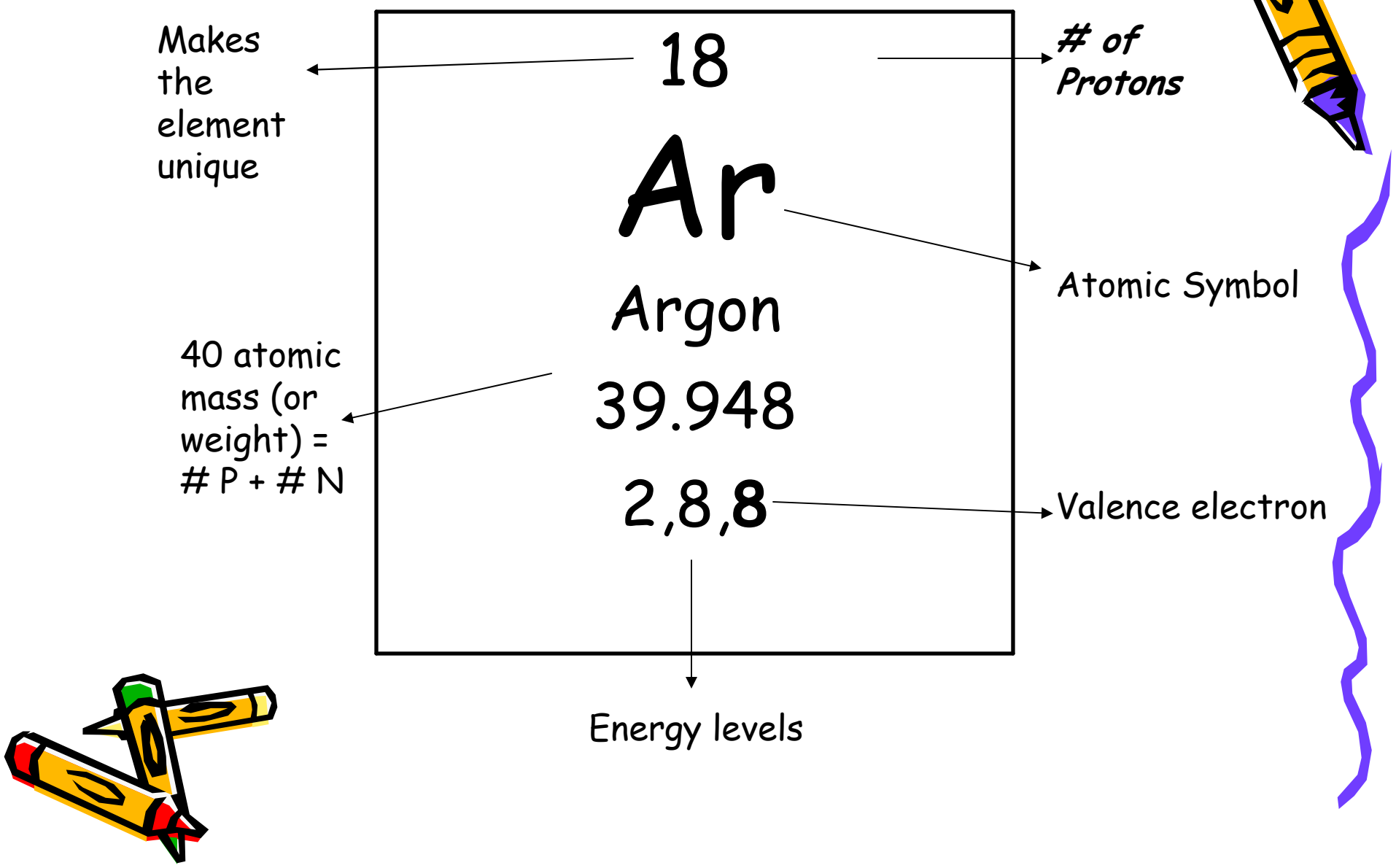
n = # of particles

Unit 3: Atomic Structure

Understanding the relative size, location, and charge of protons, neutrons, and electrons in an atom.



Periodic Table block



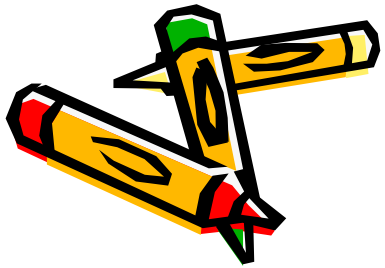
*Locating information in the periodic table to predict the structure of an atom/
*Finding the symbol, atomic number, or atomic mass given the name of an element

- How many of each does a Copper 64 atom have?

a) Protons 29

b) Electrons 29

c) Neutrons 36

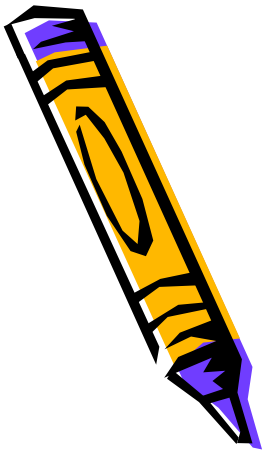


Recognizing isotopes of the same atom

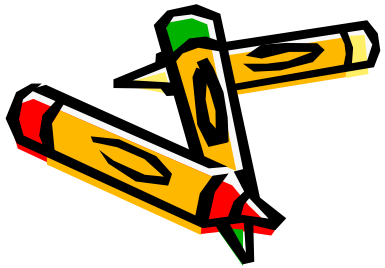
- **Same # of protons**
- **Different # of neutrons**

Element	Atomic Mass	Protons	Electrons	Neutrons
Carbon-12	12.01	6	6	6
Carbon-14	14.00	6	6	8
Sodium-22	22.00	11	11	11
Sodium-25	25.00	11	11	14

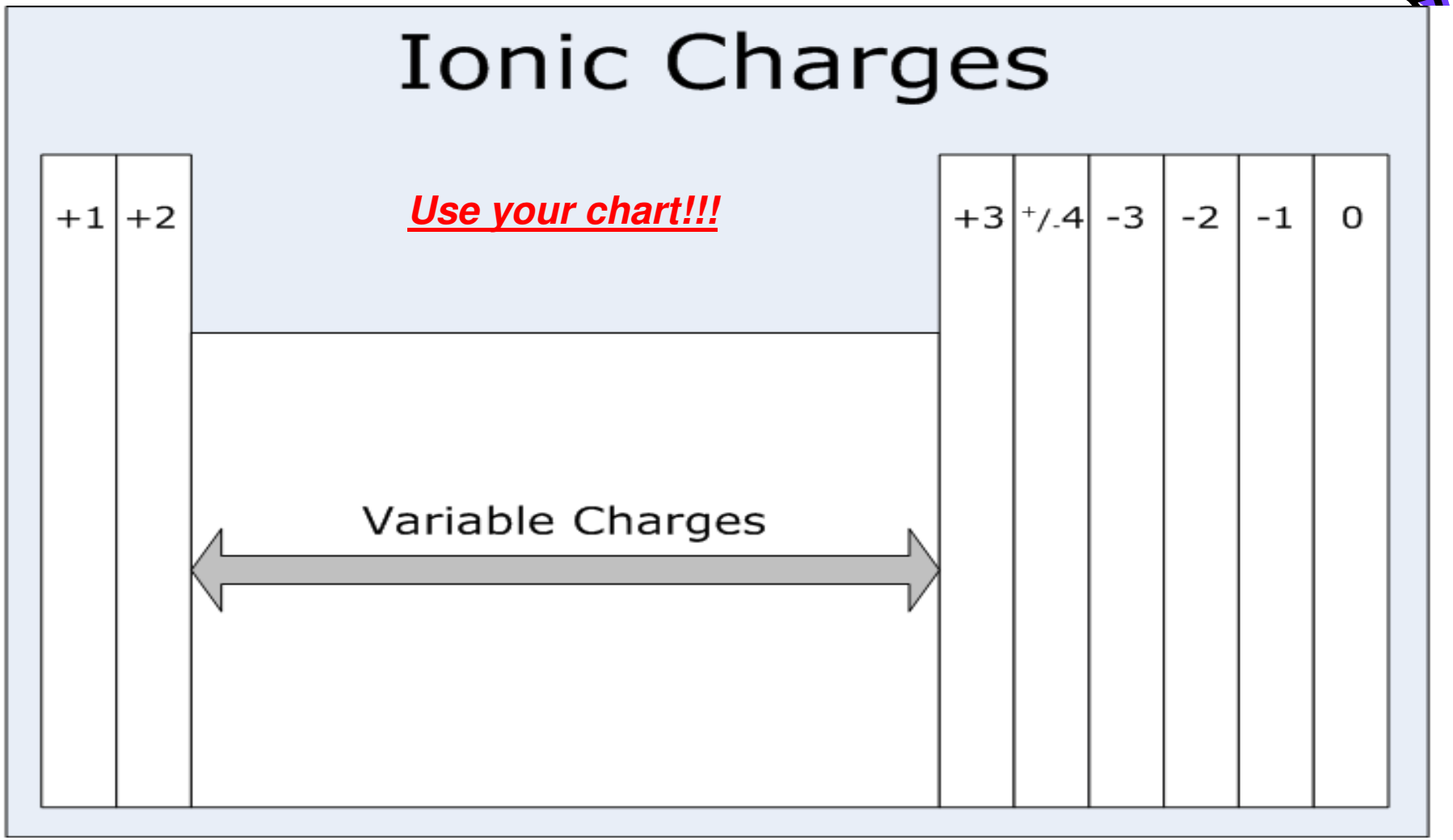
Distinguishing between atoms, molecules, and ions



- Atoms – made up of protons, neutrons, and electrons
- Molecules – made up of atoms covalently bonded
- Ions – charged atoms #p ≠#e



Calculating the charge on an atom or ion based on number of protons and electrons in an atom

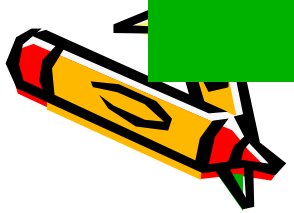


How are ions and atoms of the same element different?

- a) ions typically have more neutrons than atoms.
- b) Ions are always larger than atoms.
- c) Ions always either have more _____ or less _____ than atoms.
- d) Ions have a different number of protons than the atom

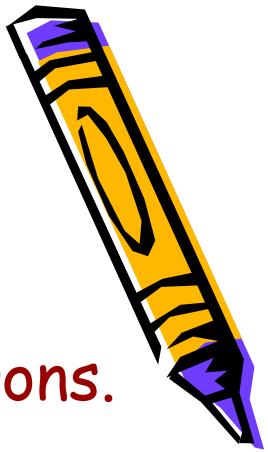
Unit 4: Periodic Chart

- Outer shell electrons
- Valence state(s)
- Outer shell electrons v.s. reactivity
- Neutral atom v.s. ion
- Metal/metalloid/nonmetal
- Reactivity relative to vertical location in a family



Sample Questions

- Almost all of the mass of an atom is located in its _____
- How many electrons will be find in an atom of selenium? _____
- How many neutrons will we find in an atom of Zr?

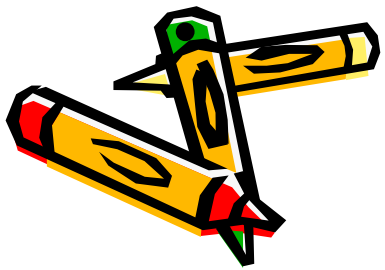


Iodine-127 has 53 protons and 74 neutrons. Iodine-131 has 53 Protons and 78 neutrons. We would consider Iodine 127 and Iodine 131 as being

a) Ions
b) Isotopes
c) Different elements
d) Exactly the same

Unit 5: Chemical Bonds

- Formula and name for compounds formed when two elements react
- Formula for ionic binary compounds and diatomic molecules
- Ionic v.s covalent bonds
- Formulas



*Naming compounds

Ionic

- A combination of a metal and a nonmetal

NaCl

LiF

CaO

KI

Covalent

- Two nonmetals combined together

NO_2

CO_2

BCL_3

O_2

Rules for naming and writing the formula

- 1. Metal name comes first
- Change the ending of the second element to "ide"
- If you have two nonmetals, use the prefixes:

Mono – 1	Penta - 5
Di - 2	Hexa - 6
Tri - 3	Hepta - 7
Tetra – 4	Octa - 8

- Which of the following is the correct name for the compound formed when sodium reacts with iodine?

a) Sodium chloride
b) Sodium iodide
c) Sodium iodine
d) Iodine soda

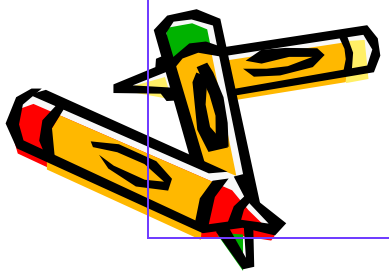
Chemical Reactions

- **Synthesis** $H_2 + O_2 \rightarrow H_2O$

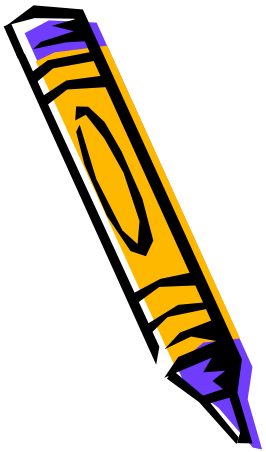
  $2H_2 + O_2 \rightarrow 2H_2O$

- **Decomposition** $H_2O \rightarrow H_2 + O_2$

  $2H_2O \rightarrow 2H_2 + O_2$



Chemical Reactions



- Single Displacement

$ZN + CuSO_4 \rightarrow Cu + ZnSO_4$

(balanced)

- Double Displacement

$Pb(NO_3)_2 + KI \rightarrow PbI_2 + KNO_3$

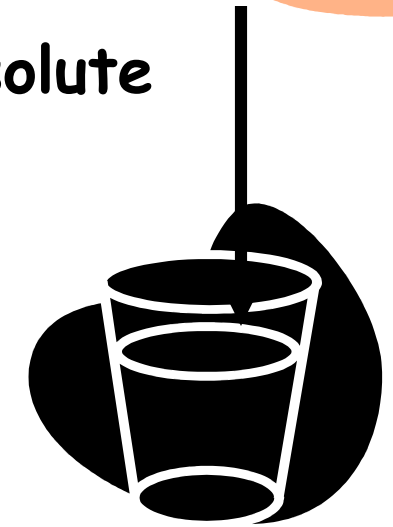
$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$

Solute vs. Solvent in Solutions

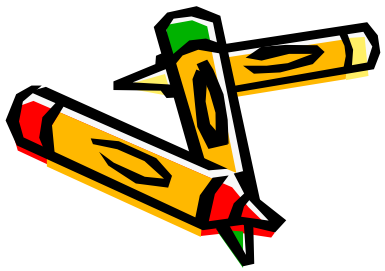
- Sol**U**te –part that gets dissolved
- Solv**EN**t-does the dissolving
- Ex. Salt water or sodium chloride dissolved in water

Ex. salt

solute



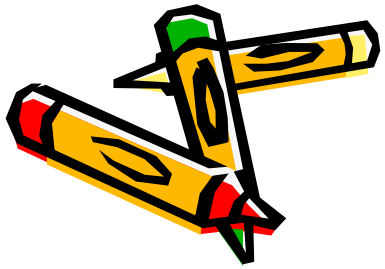
H2O is the universal **solvent**



Quick Reminder

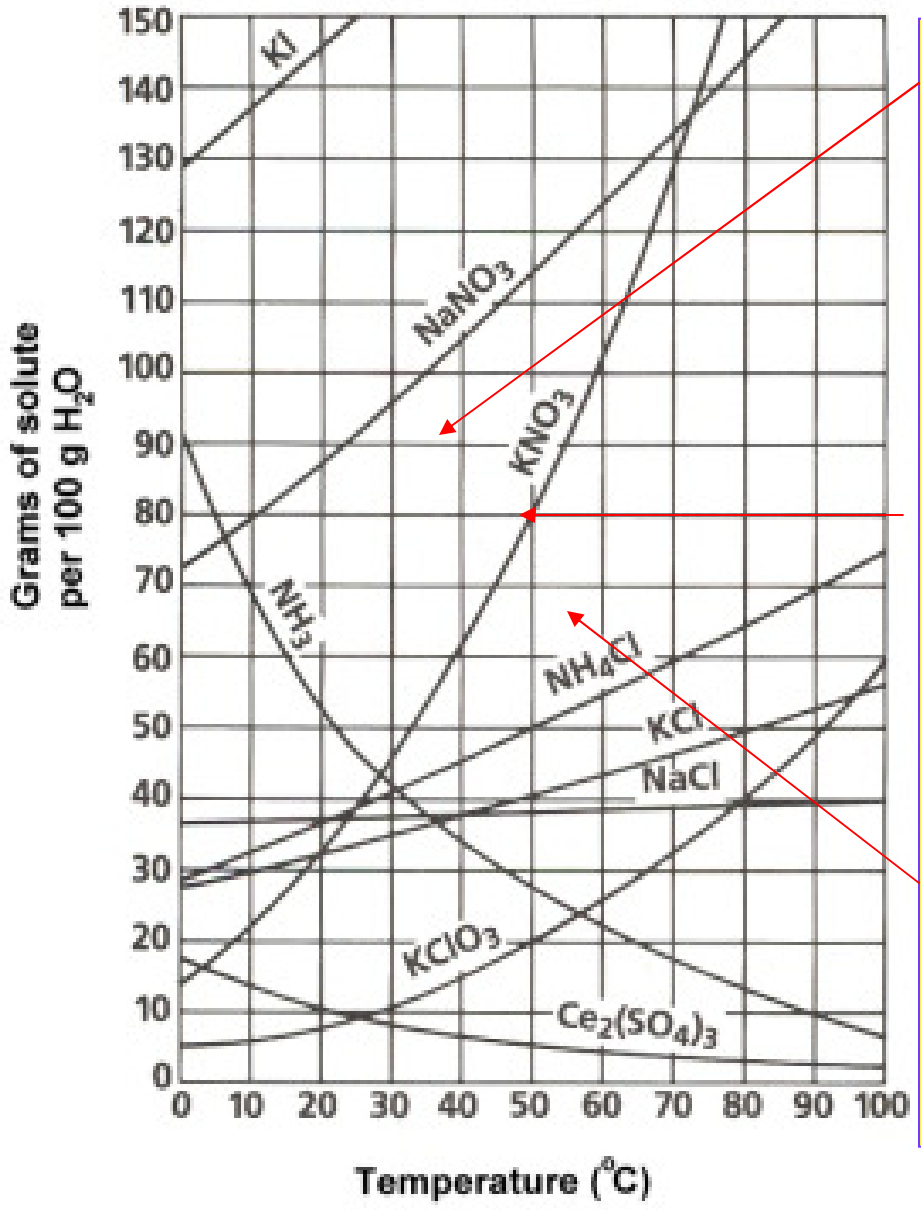
"U" put the Solute into the Solvent!

Like dissolves like
Polar molecules dissolve polar molecules
Non-polar molecules dissolve non-polar molecules



Factors that control solution rates

- Collisions
- Temperature
- Mixing
- Similarity of the solvent and solute
- Catalyst/emusifiers (ex. Eggs in cakes)
- Inhibitors
- Surface area
- Concentration * saturated/supersaturated/unsaturated



Supersaturated

More than what the solutions can hold. (Crystals form)
Above the line

Saturated

No more solute can dissolve.

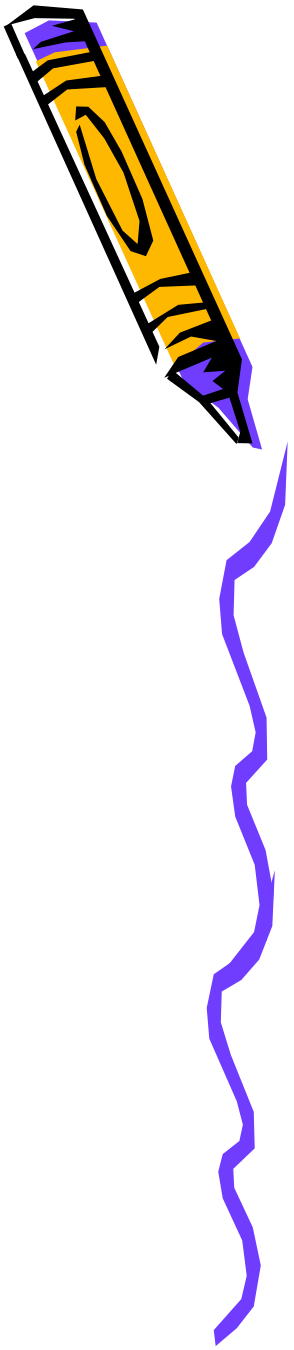
(on the line)

Unsaturated

More solute can dissolve.

(below the line)

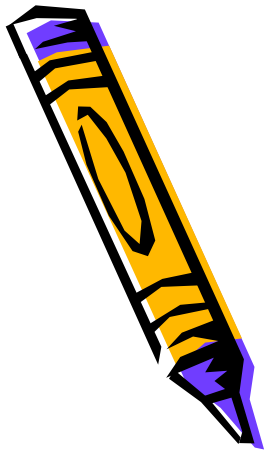
Sample Question



Which of the following is not characteristic of an acid?

- A. Tastes sour
- B. Reacts with metals
- C. Turns litmus paper red
- D. Slippery to the touch

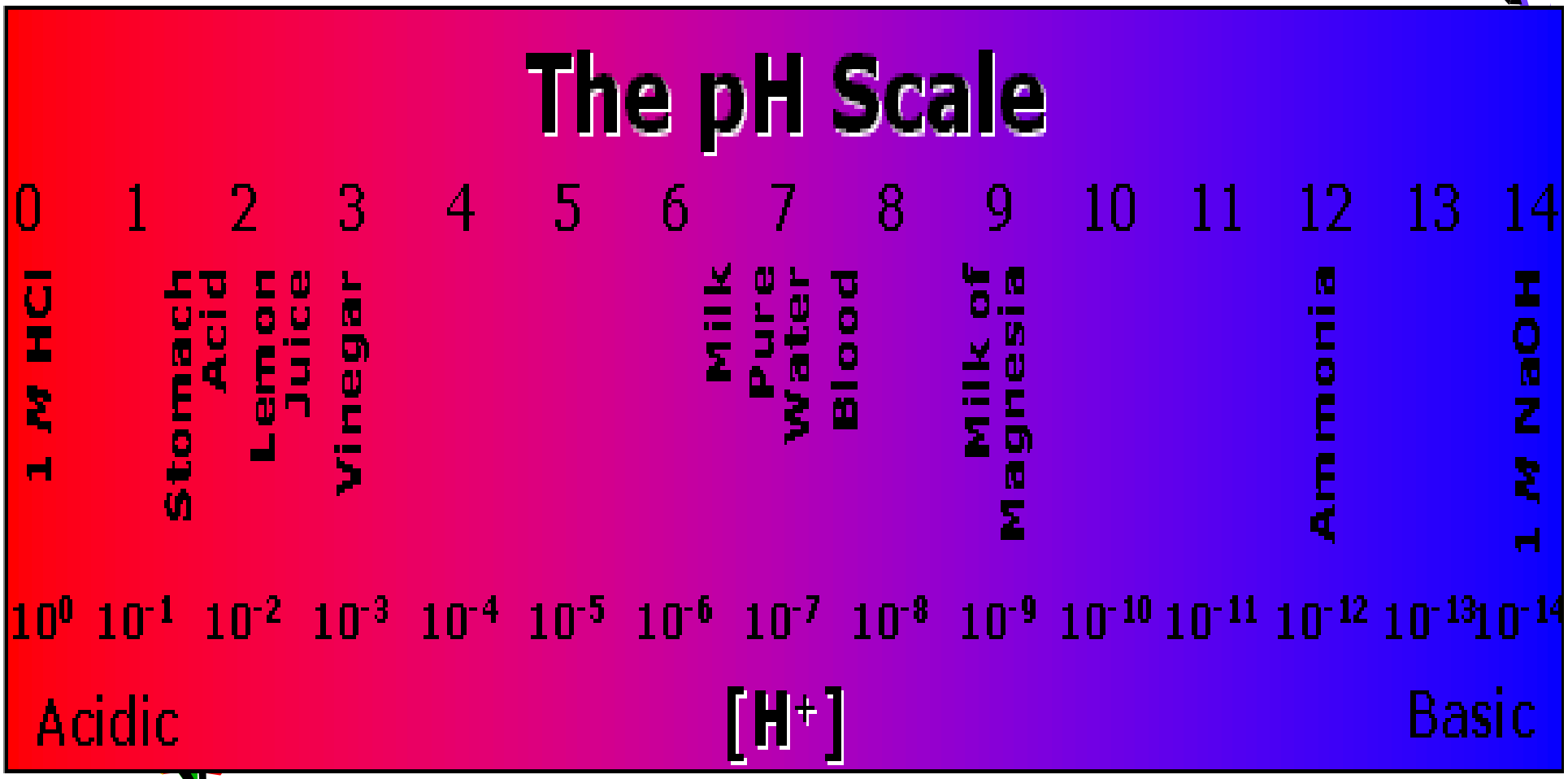
Sample Question



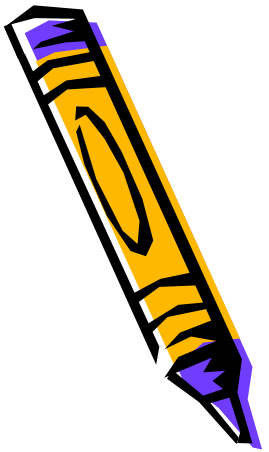
Why does oil not dissolve in water?

- A. Water is polar and oil is nonpolar
- B. Water and oil are both polar
- C. Water acts like an emulsifier when it is around oil
- D. Water is less dense than oil

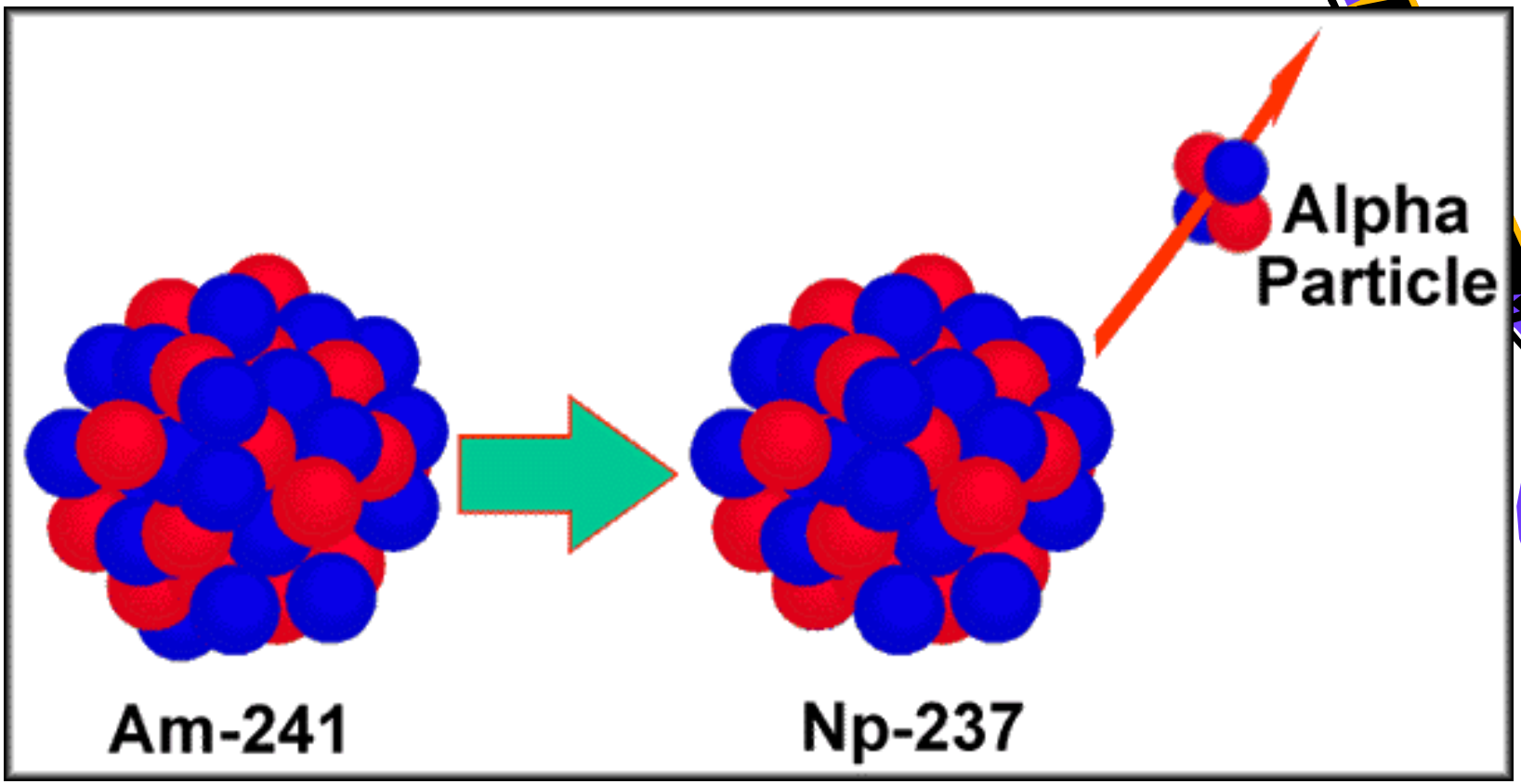
Acids V.S. Bases



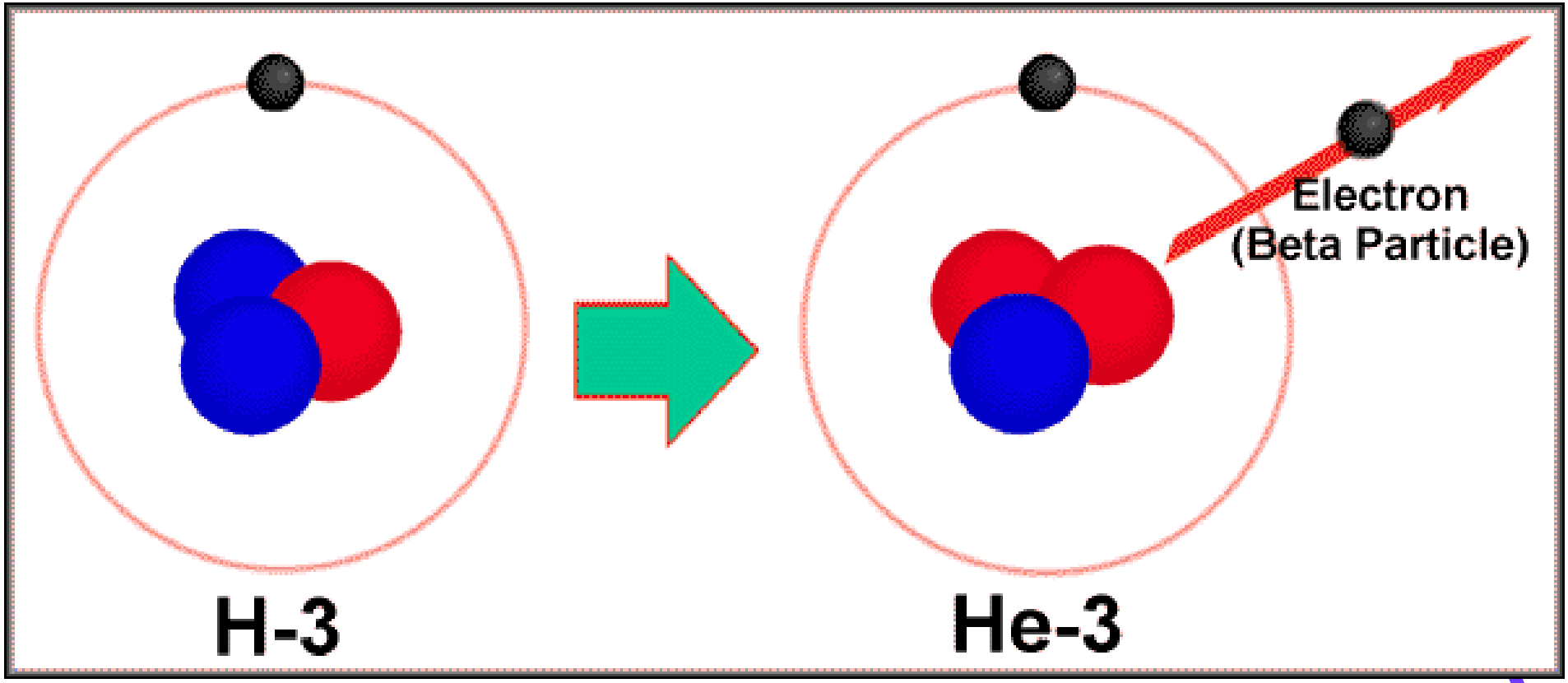
Unit 8: Nuclear Chemistry



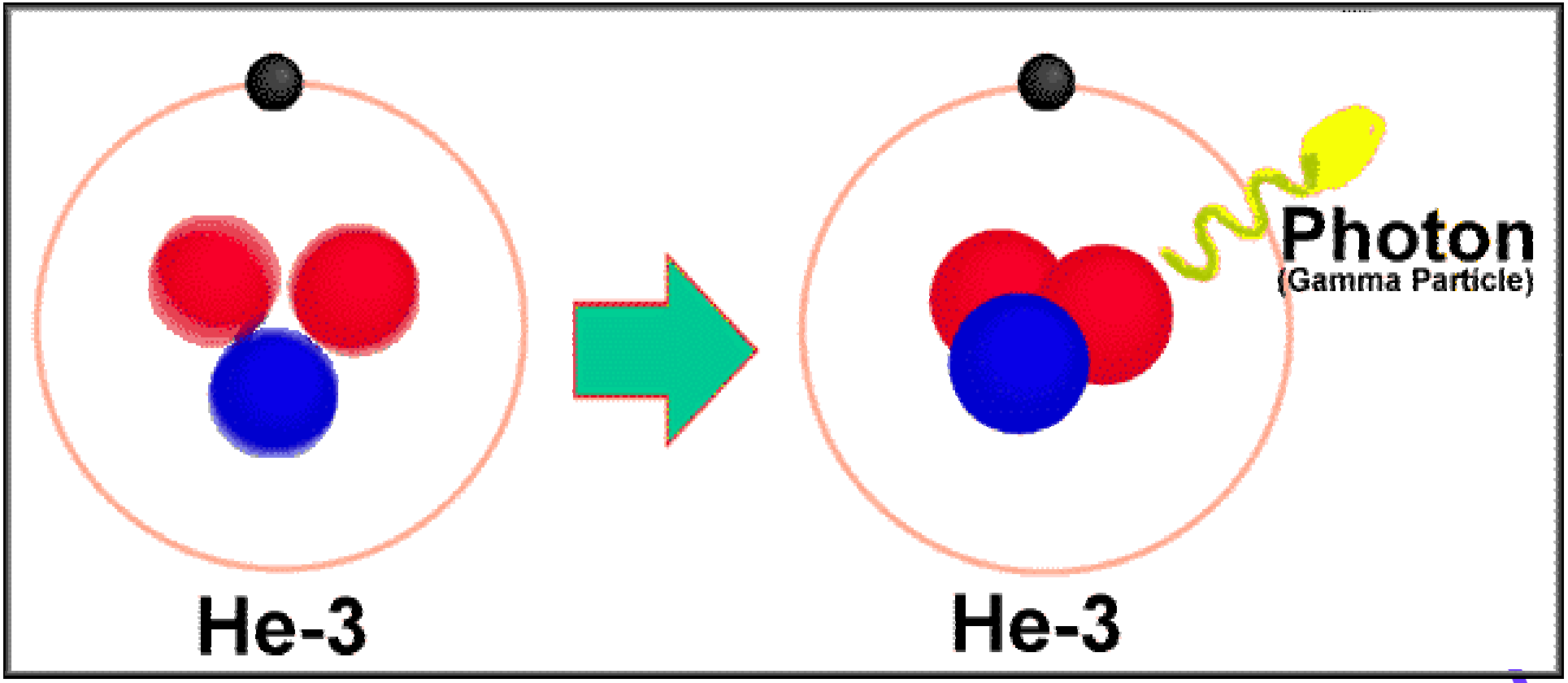
- Alpha, beta, and gamma decay
- Fission and fusion
- Half life
- Nuclear energy



Forms an atom with two fewer protons and two fewer neutrons

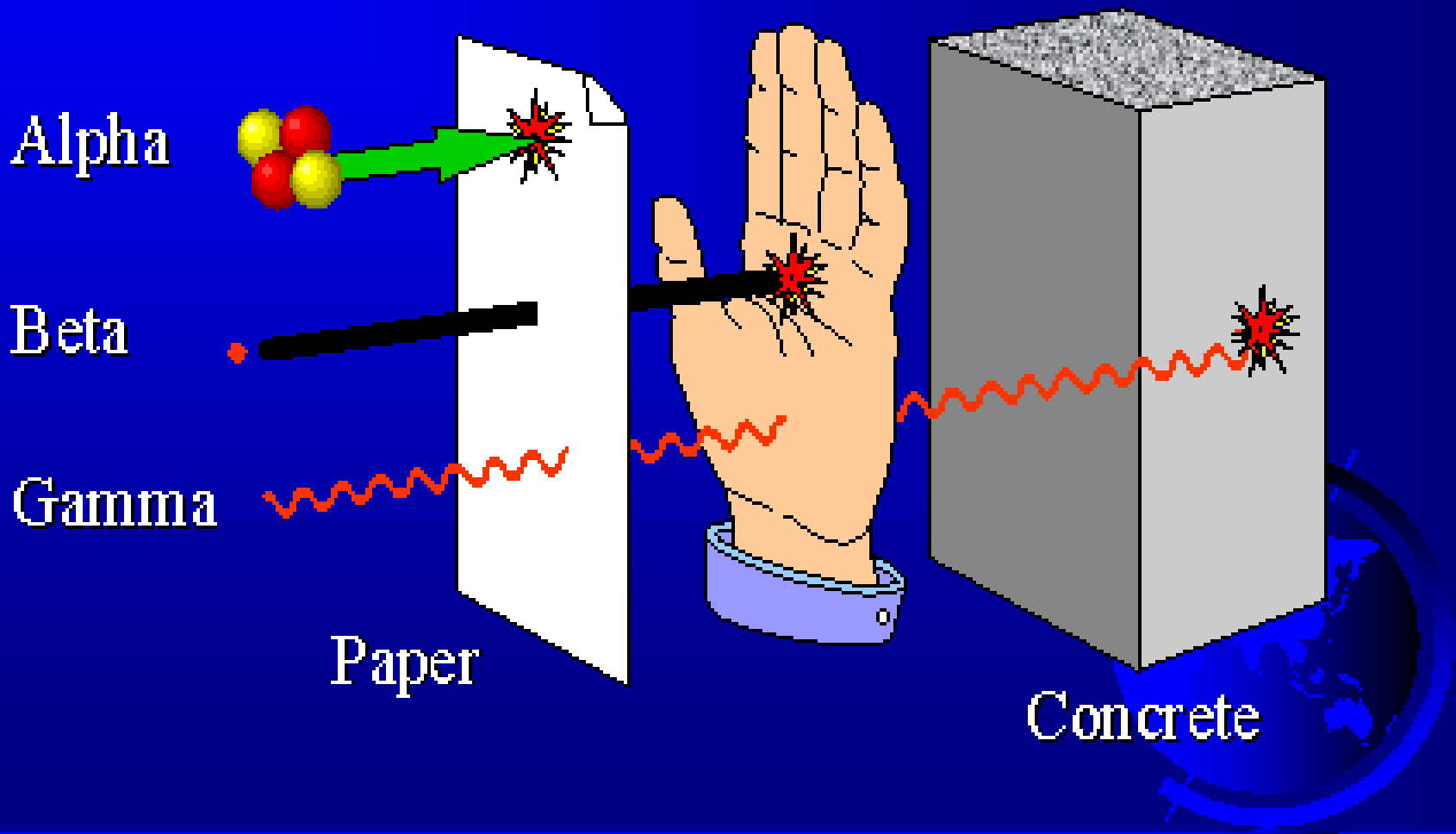


Causes a neutron to change to a proton and an electron

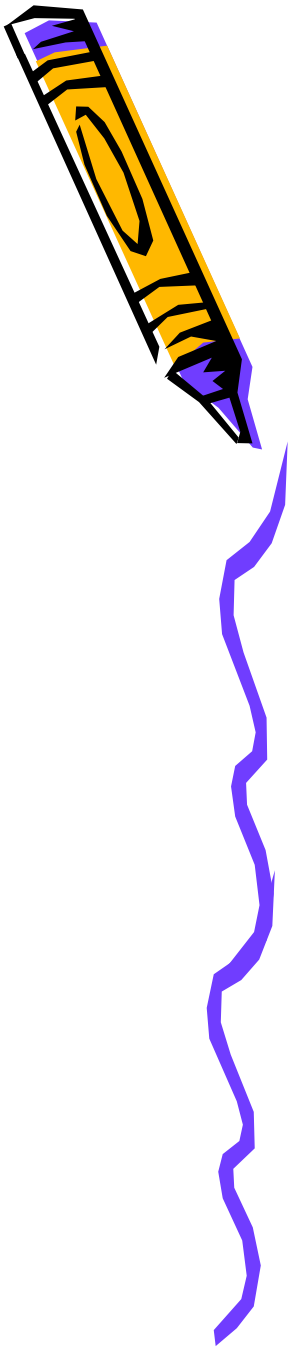


Only releases energy

Relative Penetrating Power



Sample Question

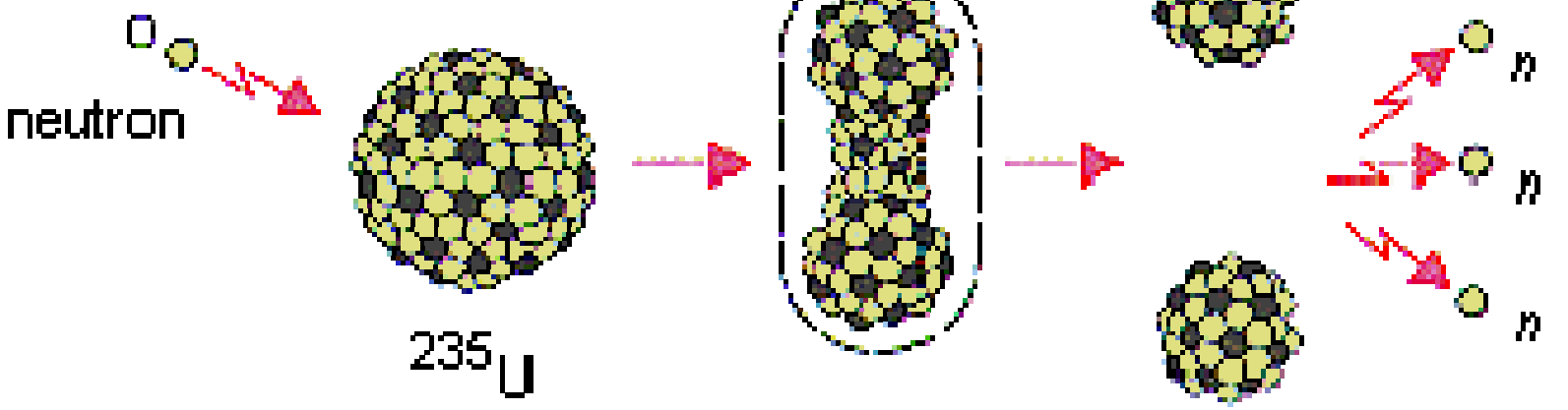


3 Which type of radiation, from an external source, will penetrate deepest into the human body?

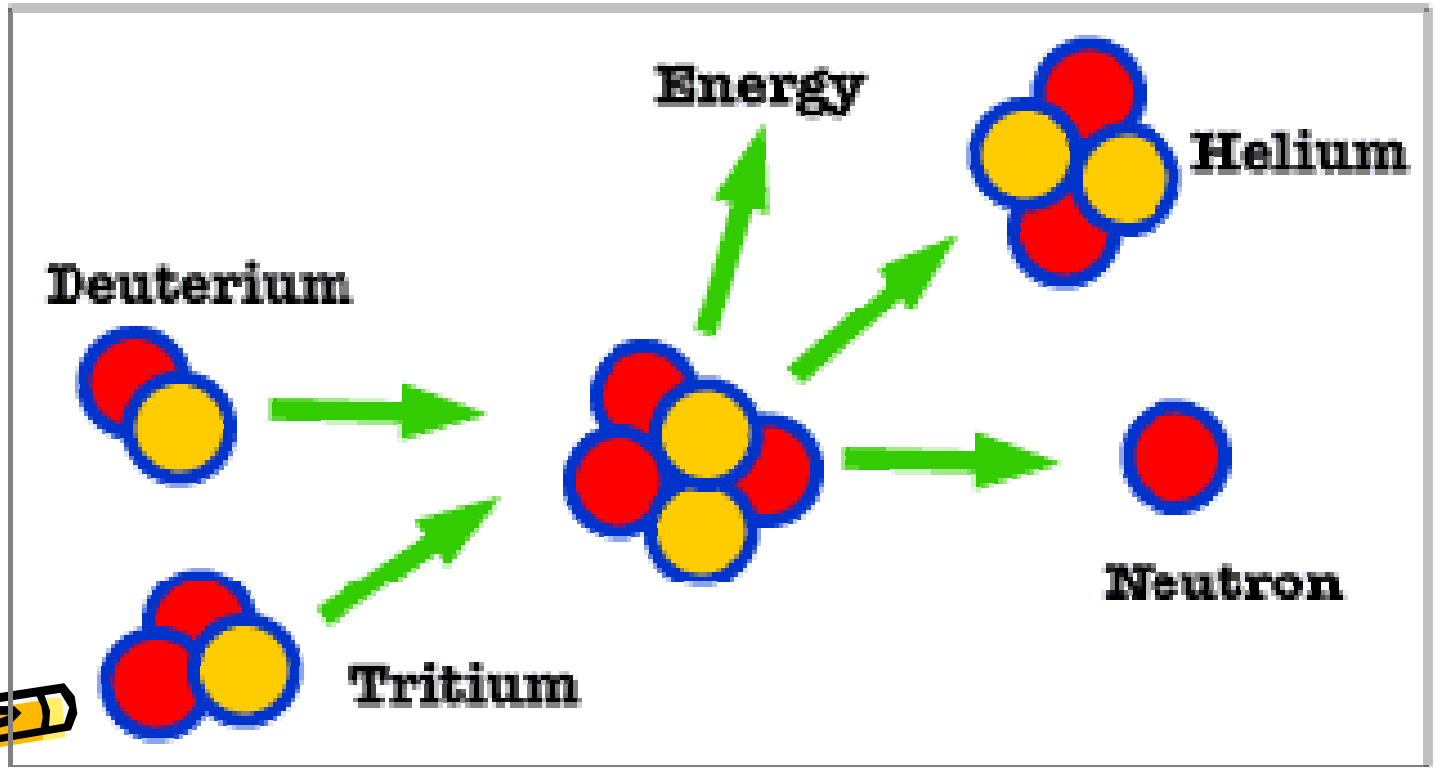
A alpha
B gamma
C ultraviolet
D x-ray

Answer "B" is correct
Because gamma radiation
Is the most energetic radiation
So it penetrates deepest into body tissue

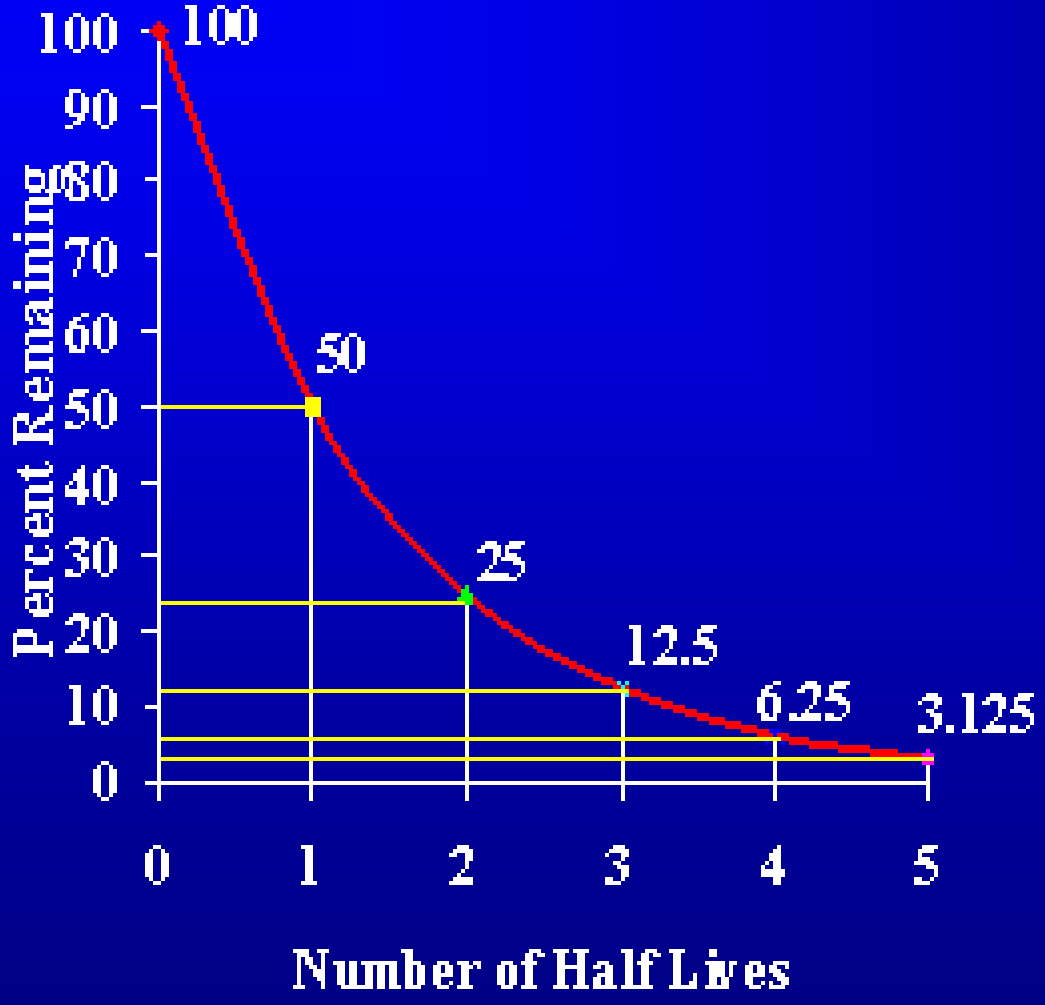
Fission
Breaking apart



Fusion
Joining together



The Meaning of Half Life



- Half Life is the time required for half of the atoms to decay.
- It is not the time for all of the atoms to decay.

Half-Life

Every radioactive element has a distinctive rate of decay.

The formula : $t_{1/2}$

That is half the time it takes half of the atoms to undergo decay

Sample problem:

How much of a 100.0g sample of ^{198}Au is left after 8.10 days if it's half-life is 2.70 days?

Answer: **12.5 g**

Strategy: Make a chart

Time(hr)	Amount ^{198}Au remaining (g)
0	100.0 g
2.7	50.0 g
5.4	25.0 g
8.1	**12.5 g**

Types of Energy

- potential energy = stored energy due to position or chemical composition
- kinetic energy = energy due to motion

Types of Energy

Mechanical

Heat

Nuclear

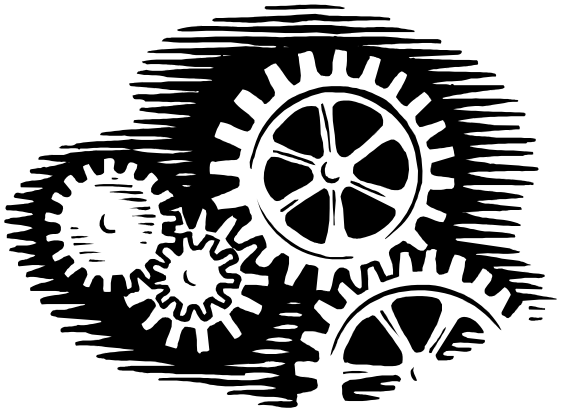
Electrical

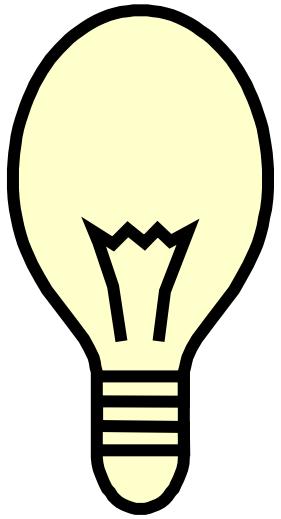
Light

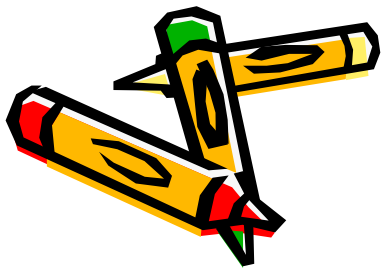
Sound

Chemical

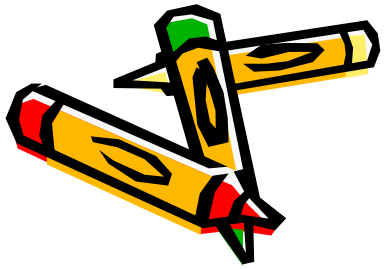
Electromagnetic

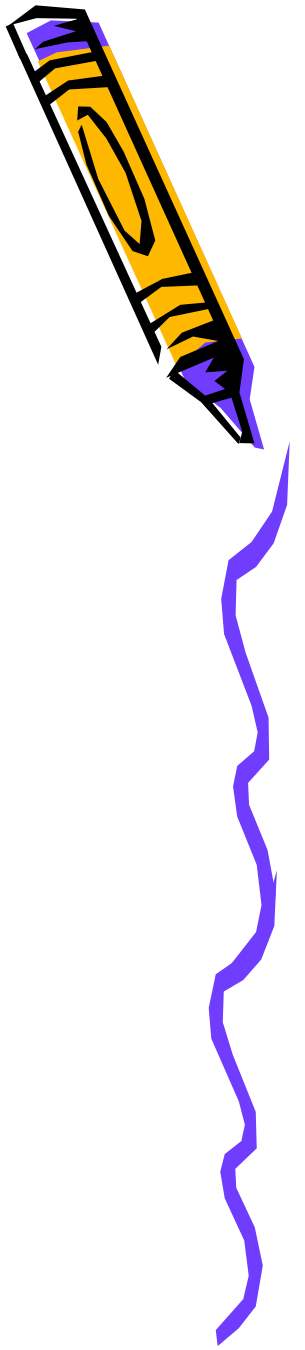




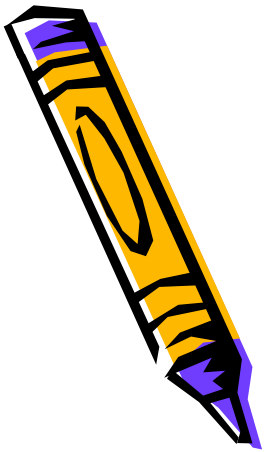


Energy Transformations





Heat Energy



- Heat can be transferred through:
  - Conduction = when objects have Direct Touch
  - Convection = when matter moves (like in an OVEN)
  - Radiation = in the form of waves (does not require matter) like RAYS of the sun\
- Conductors = easily transmit energy
  - Example: metals
- Insulators = do not easily transmit energy
  - Example: gases such as air

Forces, Waves and Electricity
16%

Speed and Velocity

- **Speed** = distance divided by time

$$s = d/t$$

- Units of speed = m/s
- **Velocity** = speed in a given **direction**
- Example:
  - 55 mph = speed
  - 55 mph north = velocity

Acceleration

- **<u>Acceleration</u>** = rate at which velocity changes
- Involves a **change in speed OR direction**

$$a = (v_f - v_i)/ t$$

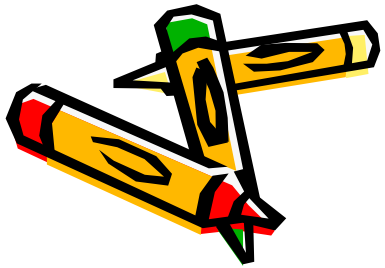
- Units of acceleration = m/s^2
- Example: 0 to 60 mph in 5 seconds
- For acceleration to occur a net (unbalanced) force must be applied

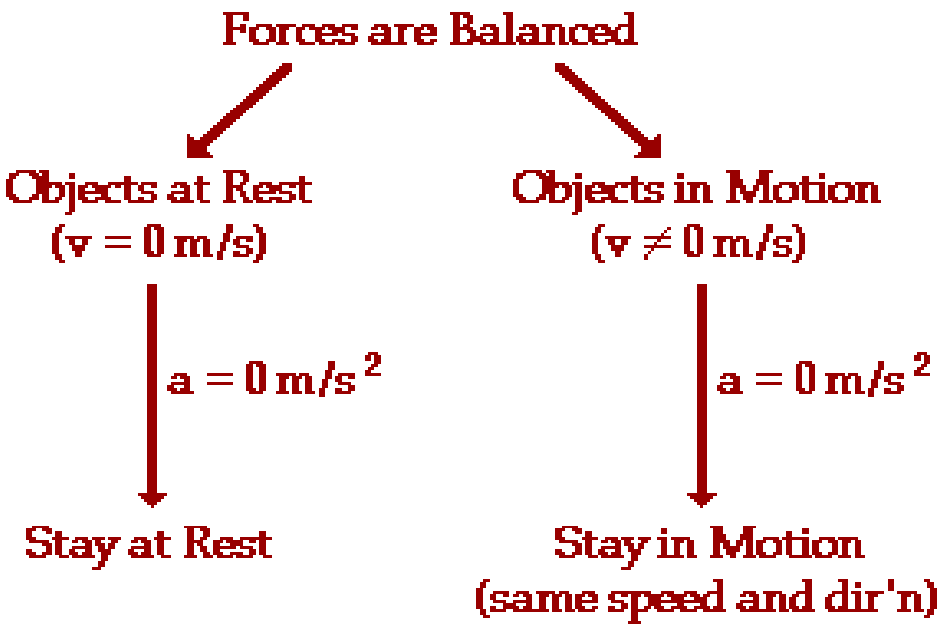
Sample Question #1

- Use the equations for velocity and acceleration to solve the following examples:
  - A ball rolls in a straight line very slowly across the floor traveling 1.0 meter in 2.0 seconds. Calculate the velocity of the ball.
    - Answer: v = 0.50 m/s
  - If the ball from the above question rolls to a stop in 2.0 seconds, calculate the acceleration (deceleration) of the ball.
    - Answer: a = -0.25 m/s^2

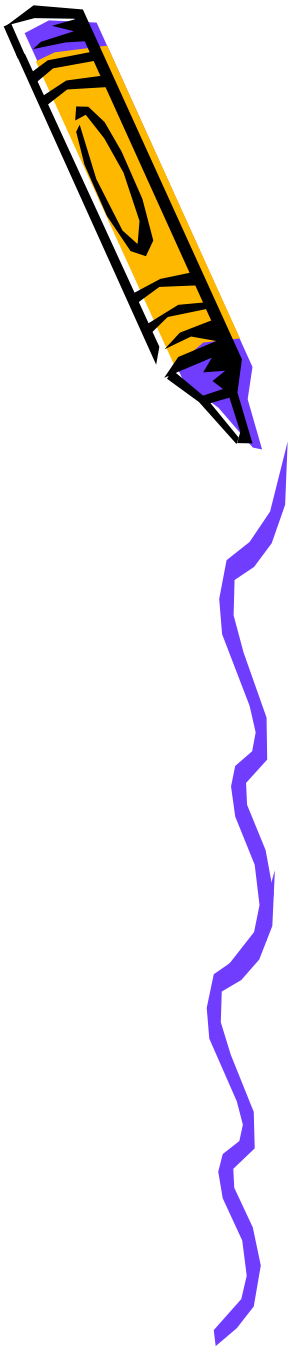
Newton's 1st Law of Motion

- An object at rest will remain at rest and an object in constant motion wi remain in constant motion unless acte on by an unbalance force.
- Reason for seatbelts





Newton's 2nd Law of Motion



- Force = mass x acceleration

$$F = ma$$

Forces are Unbalanced

↓

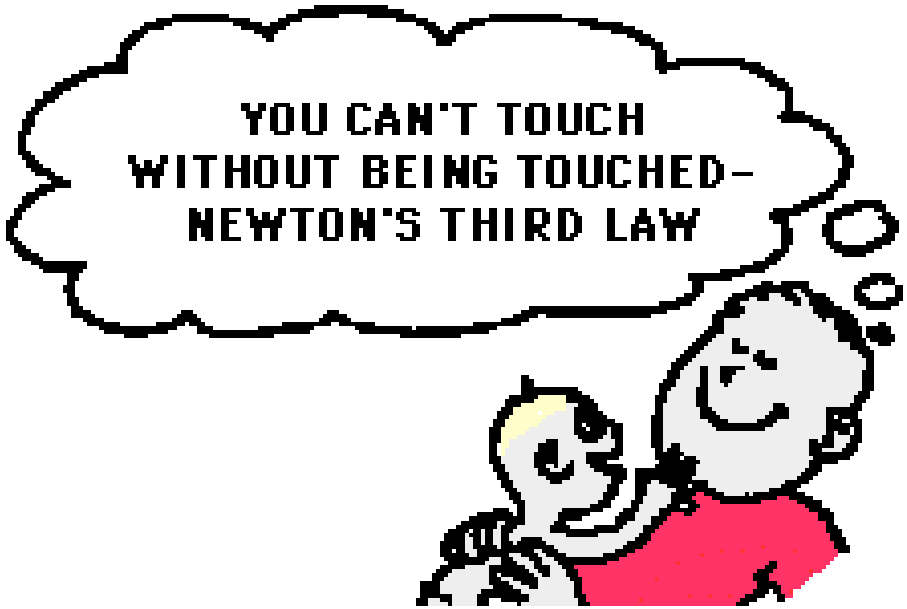
There is an acceleration

↙ ↘

The acceleration depends directly upon the "net force"

The acceleration depends inversely upon the object's mass.

Newton's 3rd Law of Motion

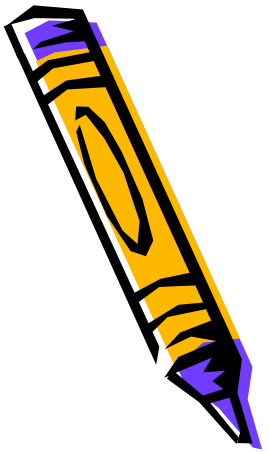


- For every action, there is an equal but opposite reaction
- Examples:
  - Punch a wall, it punches back
  - Rocket propulsion

Gravity

- **Gravity** = attractive force between two objects that have mass
- Makes falling objects accelerate (g = 9.8 m/s^2)
- Depends on mass and distance
- MASS Doesn't change on different planets

Mass versus Weight



MASS

- measure of the amount of matter in an object
- measured in kilograms
- does not depend on location
  - an object's mass on Earth is the same as its mass on the Moon

WEIGHT

- measure of the force of gravity on an object
- measured in Newtons
- does depend on location
  - an object's weight on Earth is more than its weight on the Moon

Energy and Work

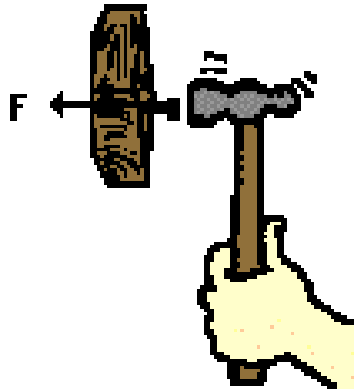
- **Energy** = The ability to do work
- **Work** = **transfer of energy** by applying a **force** to **move** an object

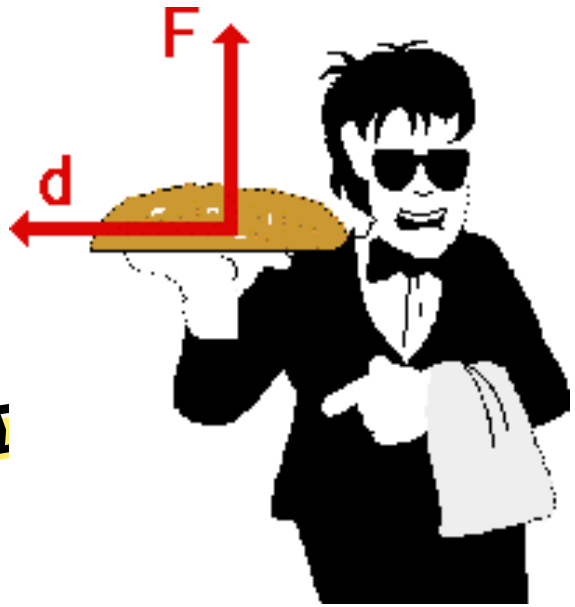
$$W = Fd$$

where force and distance are in same direction

- Both work and energy are measured in Joules

Examples of Work and No Work

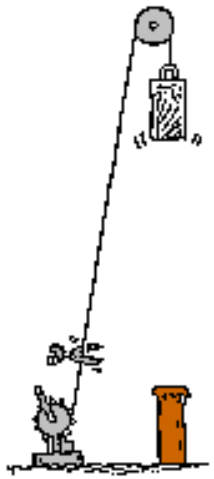


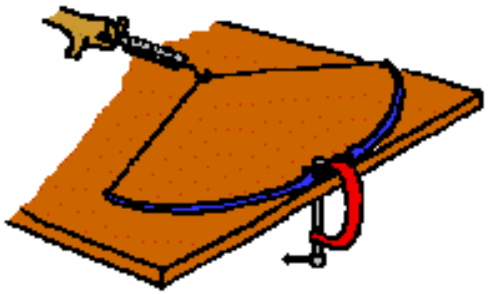


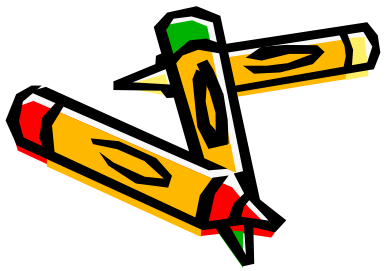
- Hammer applies a force to move the nail in the same direction = **WORK**
- Waiter applies a force upward while the tray moves forward = **NO WORK**

Types of Mechanical Energy

- Kinetic = energy of motion
- Potential = stored energy due to positi



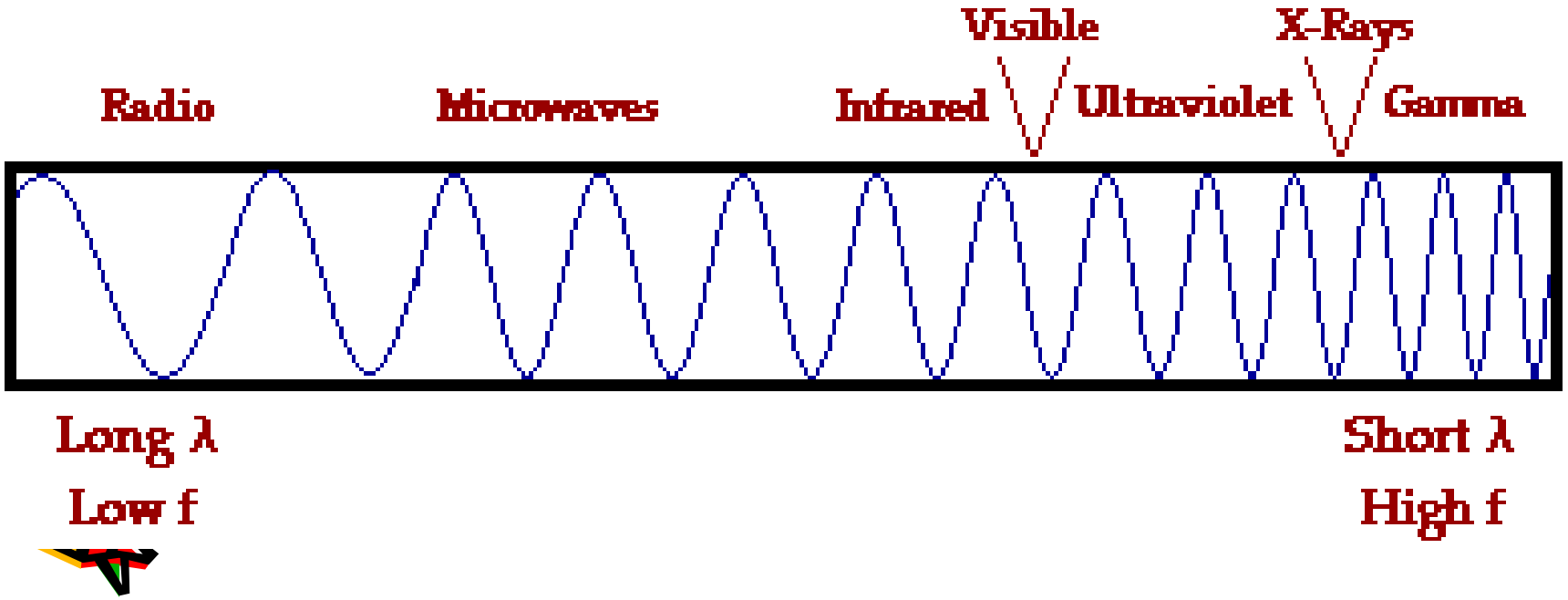




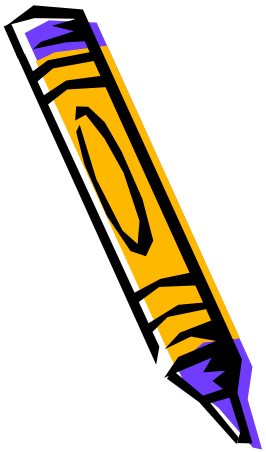
The heavy ram of a pile driver and the stretched bow possess stored energy of position – potential energy.

Light

- Light is a form of electromagnetic radiation (EM)
- EM spectrum shows the forms of radiation in order of increasing frequency (and

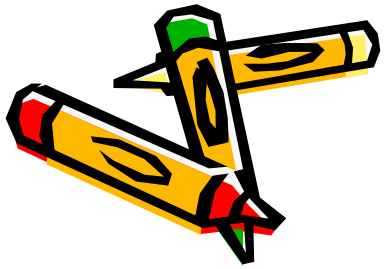


Electromagnetic Wave (EM) versus Mechanical Wave



EM WAVE

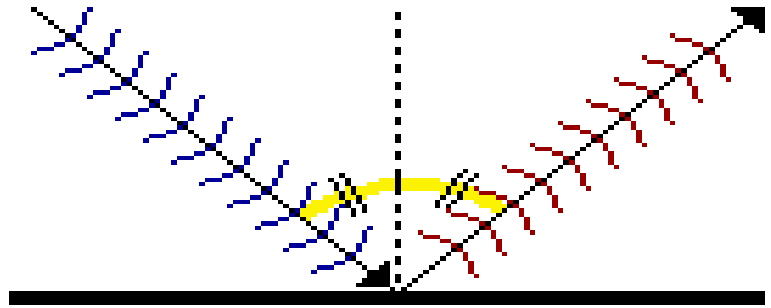
- does not require matter to transfer energy
- CAN travel through a vacuum
- example: light



MECHANICAL WAVE

- does require matter to transfer energy
- CANNOT travel through a vacuum
- example: sound

Reflection of Light

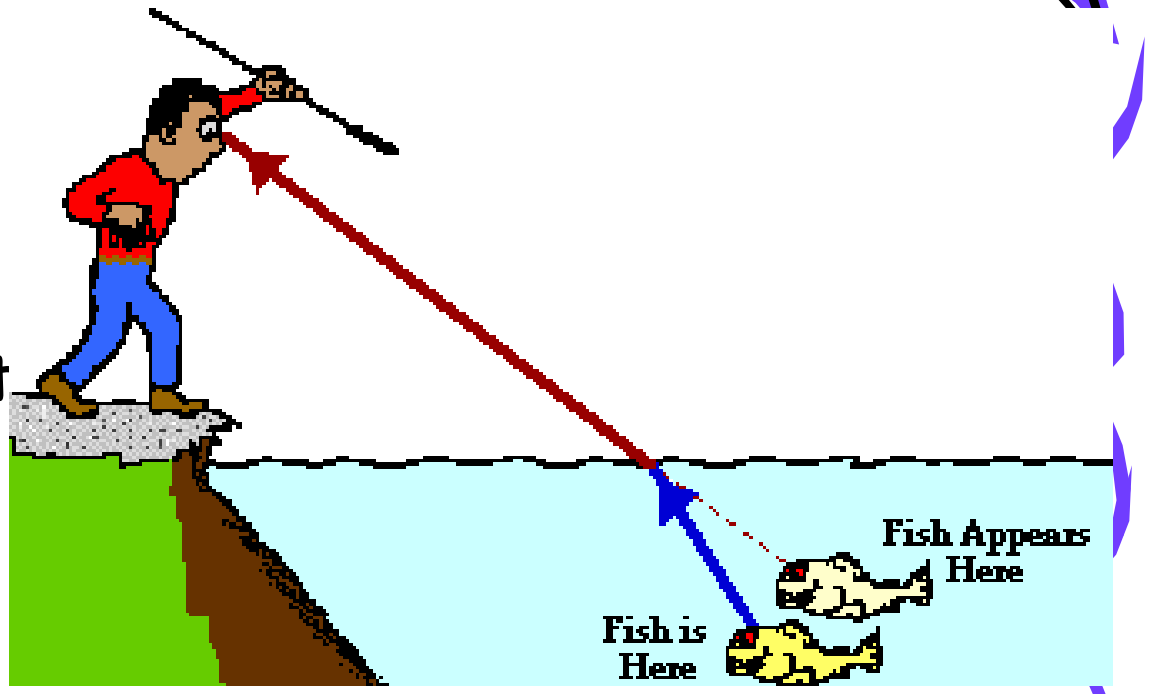


Light waves follow the "law of wave reflection."

- When light strikes a boundary, it reflects.
- The angle at which the wave approaches a flat reflecting surface is equal to the angle at which the wave leaves the surface (like a bounce pass of a basketball).
- Reflection results in image formation.

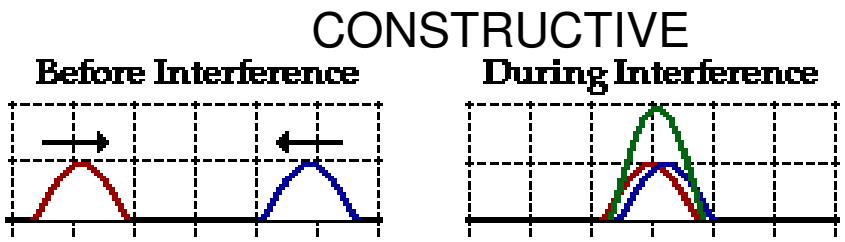
Refraction of Light

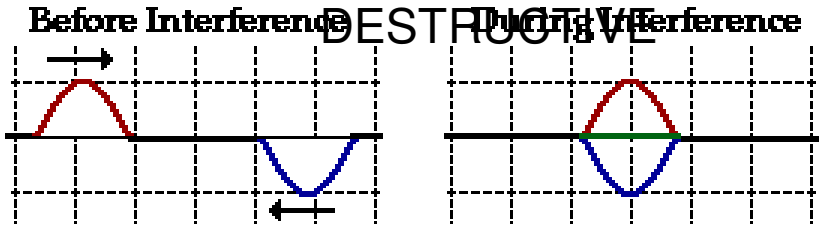
- Light waves travel faster in air than in water and slower in glass than water.
- **More dense = slower light**
- When light enters a different medium, speed changes and it bends.
- Bending of light due to change in speed = **REFRACTION**



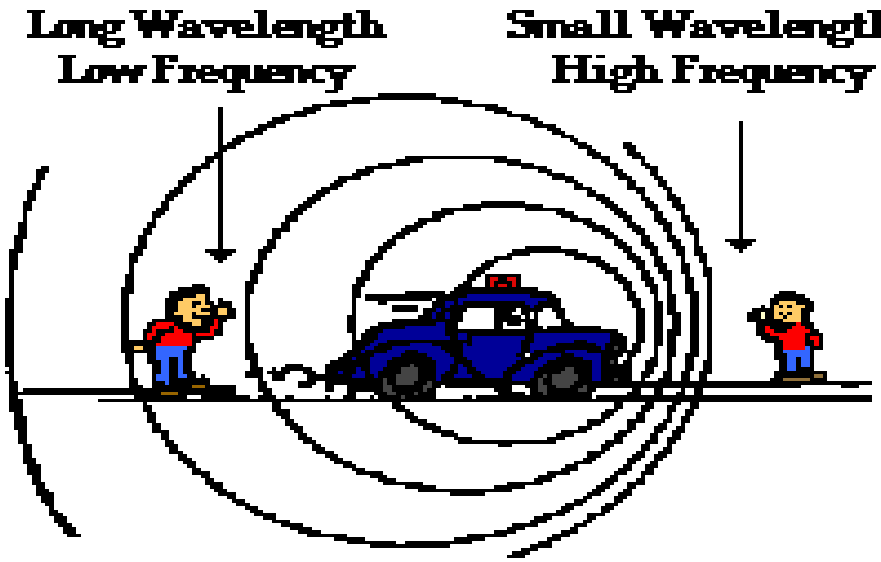
Wave Interference

- the phenomenon which occurs when two waves meet while traveling along the same medium
- **constructive** = waves add to produce a larger wave
- **destructive** = waves cancel to produce a smaller wave





The Doppler Effect



The Doppler Effect for a moving sound source

- observed whenever
  he source of waves is
  ıoving with respect
  ɔ an observer
  n apparent change in
  requency occurs
  ɔward = higher
  requency
  way = lower
  frequency

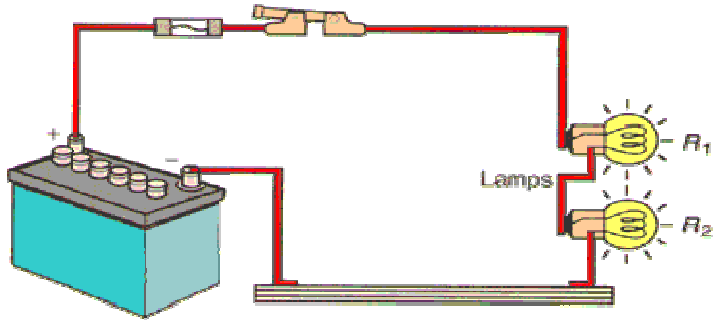
Electricity

- Electrons carry a negative charge.
- Lost electrons = positive charge
- Gained electrons = negative charge
- REMEMBER:
  - Like charges repel
  - Opposites attract

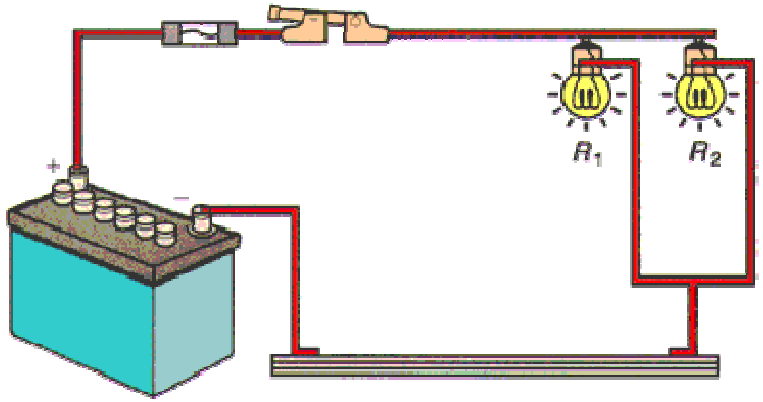
Electrical Circuits

- Current flows in a **closed** circuit
- Ohm's Law
  - V = IR
- Two types of circuits:
  - **Series** (single path)
  - **Parallel** (poly paths)

SERIES

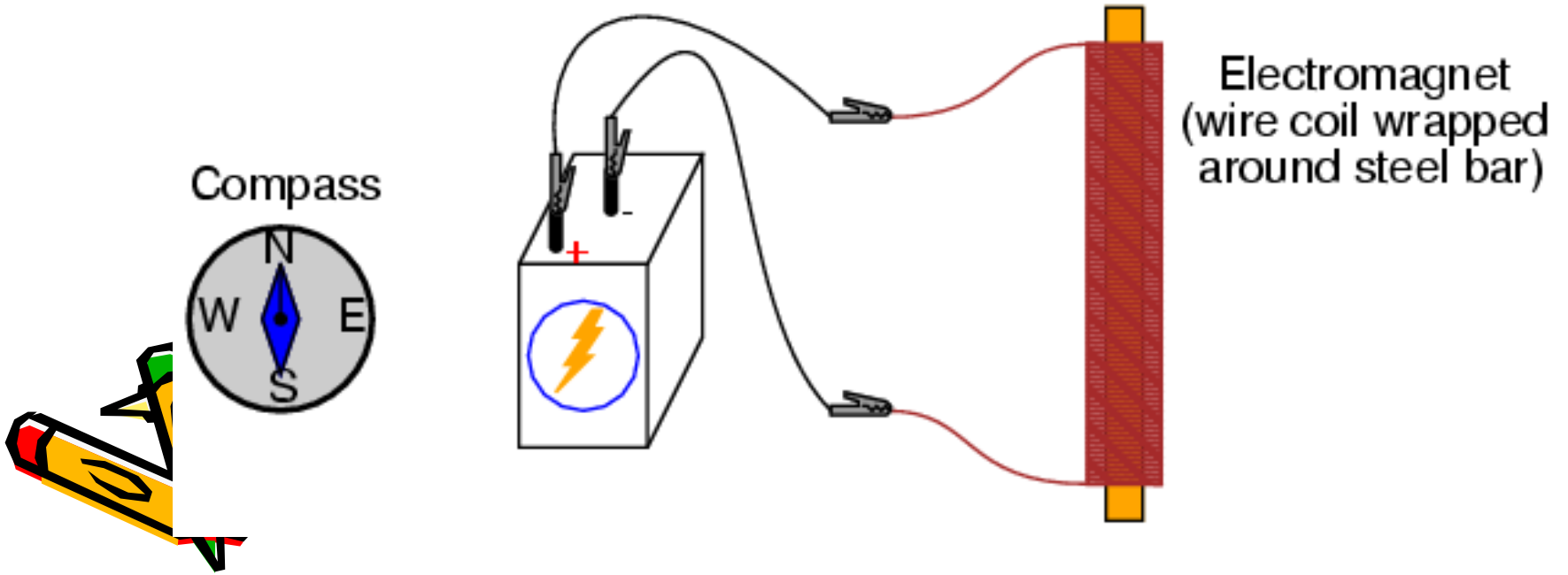


PARALLEL

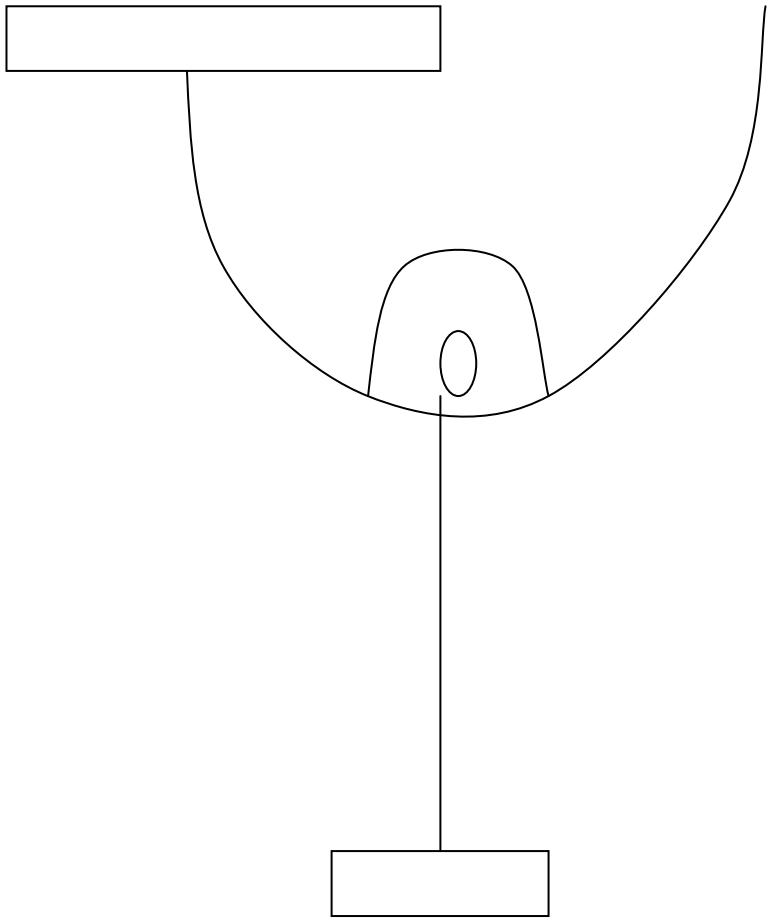


Electromagnet

- One can make an electromagnet with a nail, battery, and wire
- When current flows through the coiled wire, the nail becomes magnetized.



- Waves –
  - Hertz - frequency
- Electricity
  - Coulomb- charge C
  - Volts- Potential Difference Voltage V
  - Amps- Current A
  - Ohms- Resistance Ω



- What is the mechanical advantage of this simple machine?
- A. 0
- B. 1
- C. 2
- D. 3

34. The mechanical advantage of a simple machine is 4. If the output distance is 3m, What must be the input distance?

- A. 0.75 m
- B. 1 m
- C. 7 m
- D. 12 m

Success takes place when preparation meets opportunity.