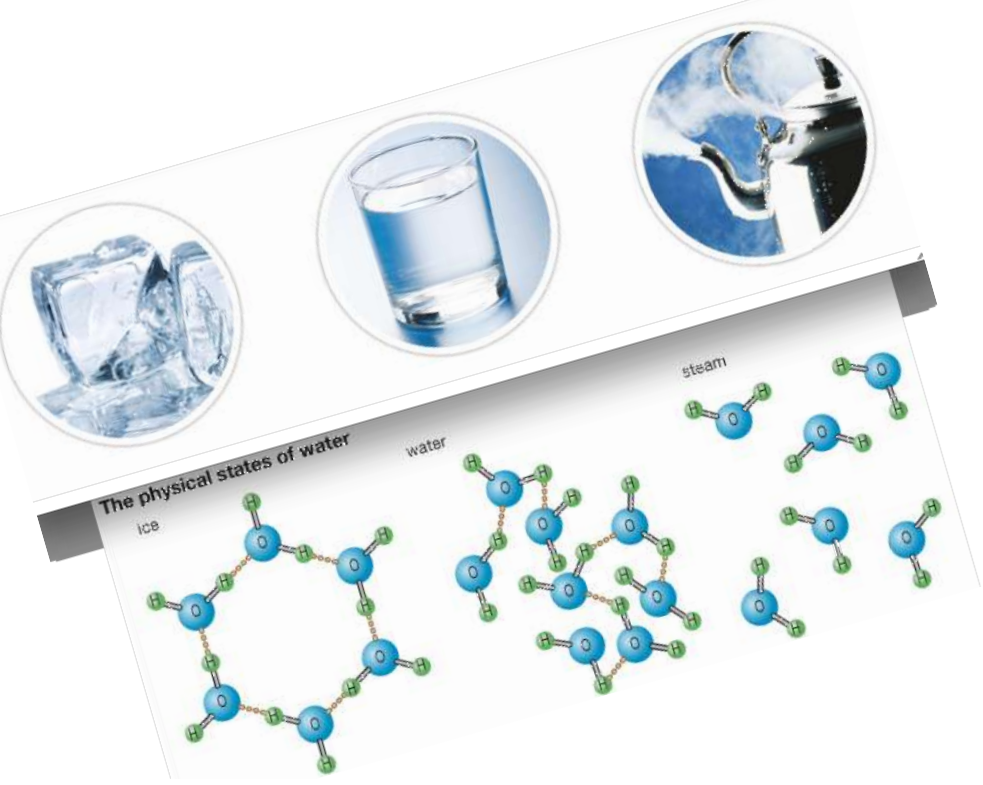
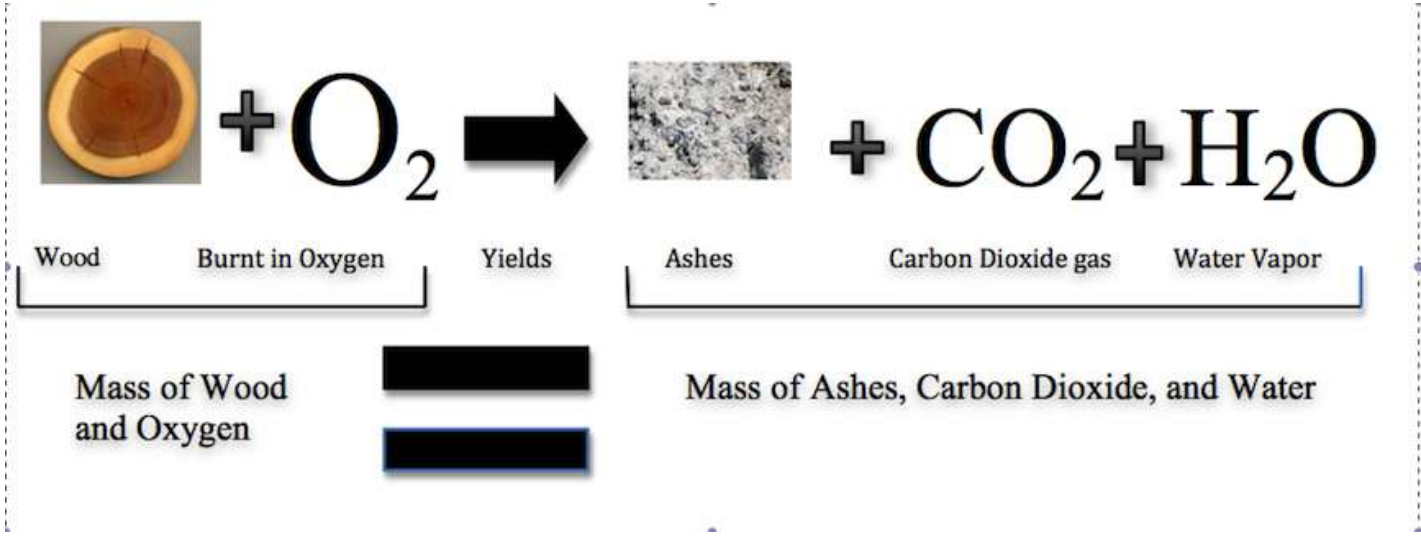




Physical vs Chemical Changes

Chemical

- not easily reversed
- new product(s) formed
- reactants used up
- often heat / light / sound / fizzing occurs
- electricity may be produced
- *a precipitate may form
- e.g. wood burning.

Physical

- easily reversible
- no new products,
- often just a state change
- e.g. ice melting.

Notes At a Glance

LAB DEMO

Experiment	Vinegar	Water	Baking Soda	Alka Seltzer	Food Coloring
Physical Properties					
Chemical Properties					

LAB	Alka Seltzer and water	Baking soda and vinegar	Food coloring and water
Physical or Chemical Change			
WHY?			

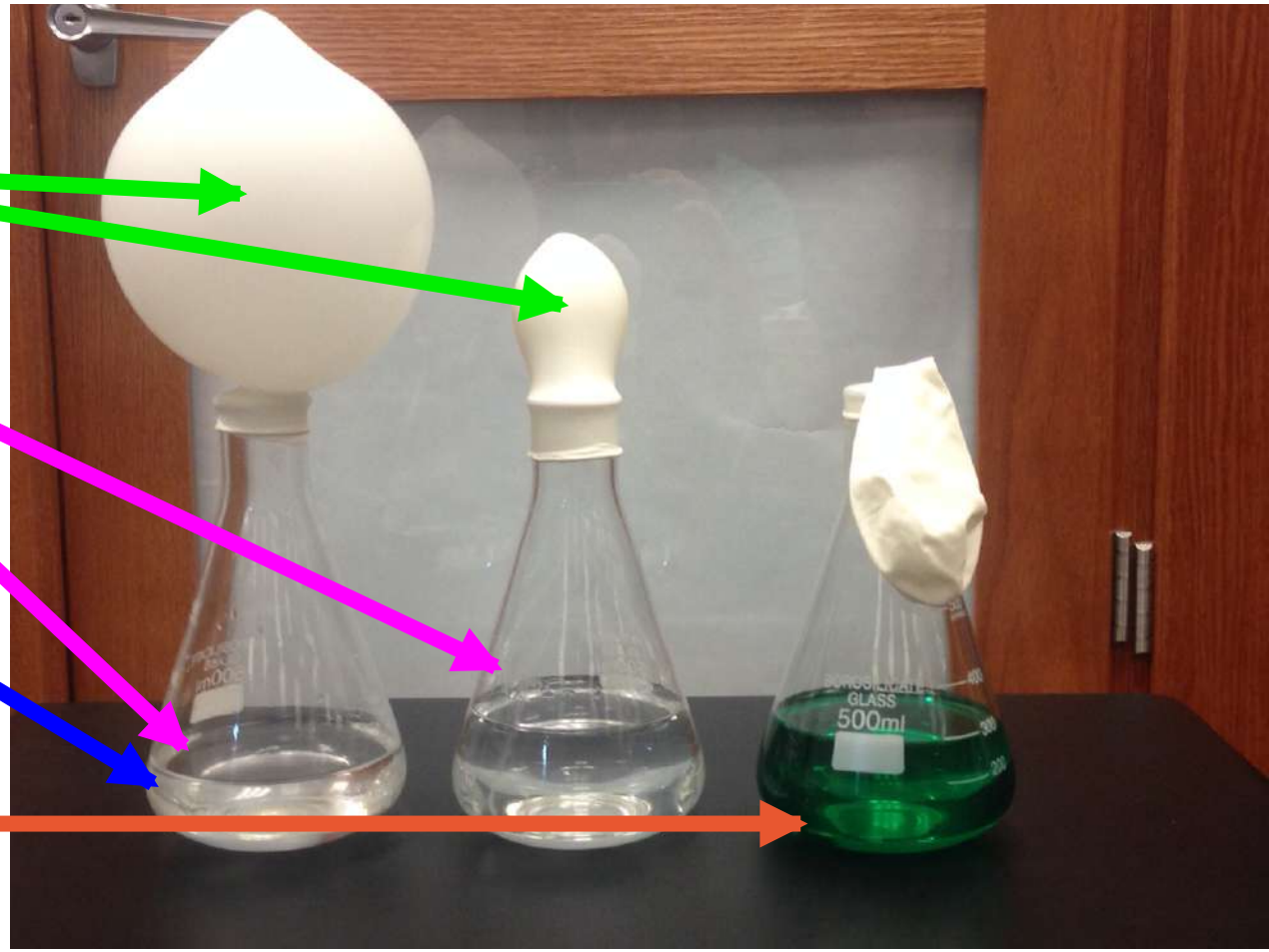
LAB DEMO

Experiment	Vinegar	Water	Baking Soda	Alka Seltzer	Food Coloring
Physical Properties	Clear, Liquid, Odor	Clear, Liquid	White, Soft, Powder, Solid	White, Smooth, Solid, Slight odor Circle, Hard	Green, opaque, Liquid
Chemical Properties			Reacts with vinegar	Reacts with water	

LAB	Alka Seltzer and water	Baking soda and vinegar	Food coloring and water
Physical or Chemical Change	Chemical Change	Chemical Change	Physical Change
WHY?	Fizzes, gas produced (new substance), irreversible,	Fizzes, gas produced (new substance), irreversible, endothermic reaction.	NO new substance created, only one physical change

LAB

Baking Soda & Vinegar | Alka Seltzer & Water | Food Coloring & Water



Things that we observed:

New Substances ~ Gas is released

Fizzes or Bubbles ~ Effervescent

Feels Cold ~ Endothermic

Color Change

**Remember more than one change can signify that a chemical change has happened.

Conservation of Mass/ Matter

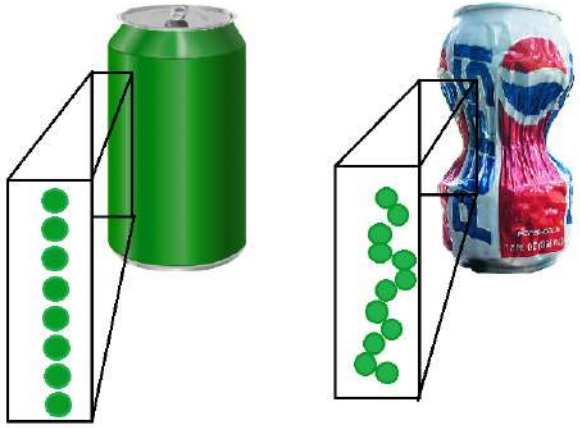
Definition: The law of conservation of Mass/Matter states that matter cannot be destroyed or created; molecules are just rearranged.

In an open system reaction matter can react and escape to the surroundings. (the lab without balloons)

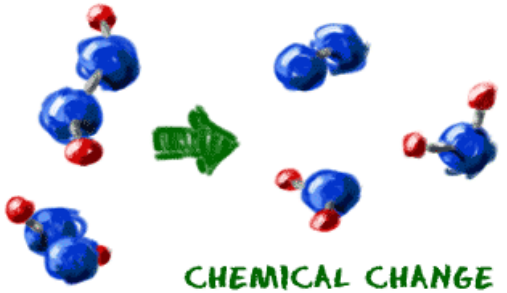
In a closed system matter is not allowed to enter and leave during a chemical reaction. (Putting a balloon on top of our beaker closed the system, trapping the gas in)

Law of Conservation of Matter (Mass)

- Matter cannot be created or destroyed. Either it is changed physically or chemically. Chemical changes allow for atoms to break and establish new bonds creating different substances with the same atoms.



PHYSICAL CHANGE
OF WATER INTO ICE



CHEMICAL CHANGE
OF HYDROGEN PEROXIDE
INTO WATER

Examples of LOCM

Example 1

In today's lab we began the experiment with

443g of vinegar
33g of baking soda

476g of materials

REACTION

470g of materials
Where did the 6g go?

They were released as gas into the atmosphere, because matter cannot be created or destroyed!!

Example 2

10 KG of wood

REACTION

9 KG of wood

Endothermic and Exothermic

- Endothermic Processes and Reactions are processes or reactions that need energy in the form of heat, to happen or proceed. You put heat INTO it. Because heat leaves the surroundings to go into the process or reaction it feels cold.
  **ENDO- INTO... Ice melting- heat transfers from my hand to an ice cube and melts, the process makes my hand feel cold.

- Exothermic Reactions give off heat as they happen. They are the opposite of an endothermic reaction. As heat is given off from the process or reaction it feels hot.
  **EXO- EXIT... Lighting a match heat radiates out of the reaction giving off heat.

Endothermic and Exothermic Processes and Reactions

Processes

Exothermic:

- freezing water
- solidifying solid salts
- condensing water vapor
- splitting of an atom

Endothermic:

- melting ice cubes
- melting solid salts
- evaporating liquid water
- forming a cation from an atom in the gas phase
- separating ion pairs
- cooking an egg
- baking bread

Reaction

Exothermic:

- Combustion of hydrogen
- Lighting a match
- Burning of propane
- Thermite
- Decomposition of hydrogen peroxide

Endothermic:

- Electrolysis
- Dissolving salt in water (think about making ice cream)
- Citric Acid solution with baking soda
- Mentos & Diet Soda
- Photosynthesis (chlorophyll is used to react carbon dioxide plus water plus energy to make glucose and oxygen)

What is Matter?

Anything that has mass and takes up space (volume)

Examples:

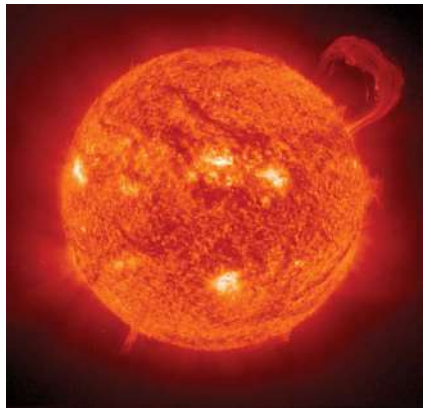
- A brick(a solid) has mass and takes up space
- A desk has mass and takes up space
- A pencil has mass and takes up space
- Air (a gas) has mass and takes up space
- Gasoline (a liquid) has mass and takes up space

All of the above examples are considered matter because they have mass and take up space. Can you think of anything that would not be considered matter?

WHY

Fire is NOT an example of matter

When a gas is heated by many thousands of degrees, the individual atoms collide with enough violence to knock electrons free, resulting in a collection of positively charged ions and free, negatively charged electrons. The gas is said to be ionized, and when a sizable number of the atoms become ionized, the gas is called a plasma.

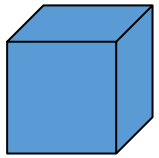


Photograph: The interaction of the Sun's magnetic field with the motions of the plasma in and around the Sun …
The interaction of the Sun's magnetic field with the motions of the plasma in and around the Sun … NASA

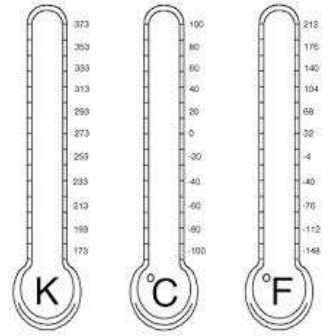
Fire, while hot, does heat up enough to ionize with enough particles under pressure to be considered a traditional plasma or for that matter… MATTER; it is considered by most scientists to be a chemical reaction.

Physical Properties of Matter

- Any property of matter that can be observed or measured without changing the identity of the matter
- **Examples**



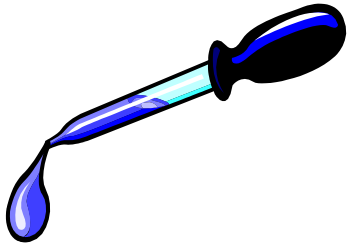
temperature



color

shape

taste



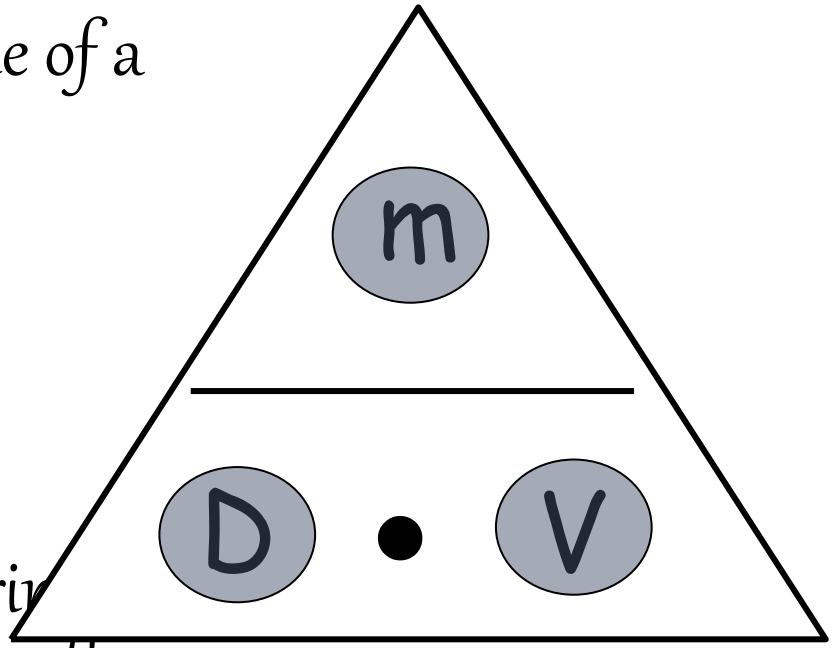
state/phase

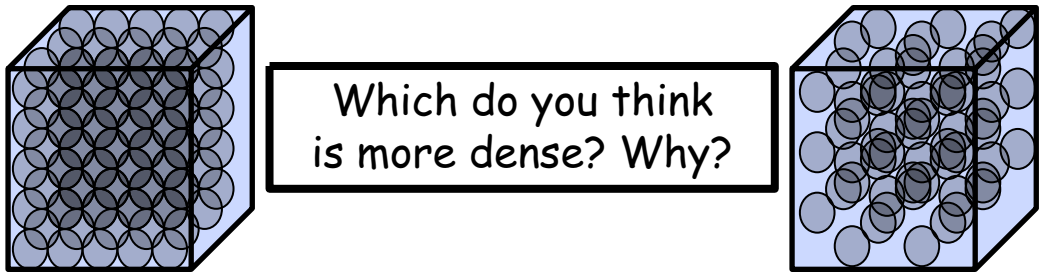
density

$$D = \frac{m}{V}$$

Density

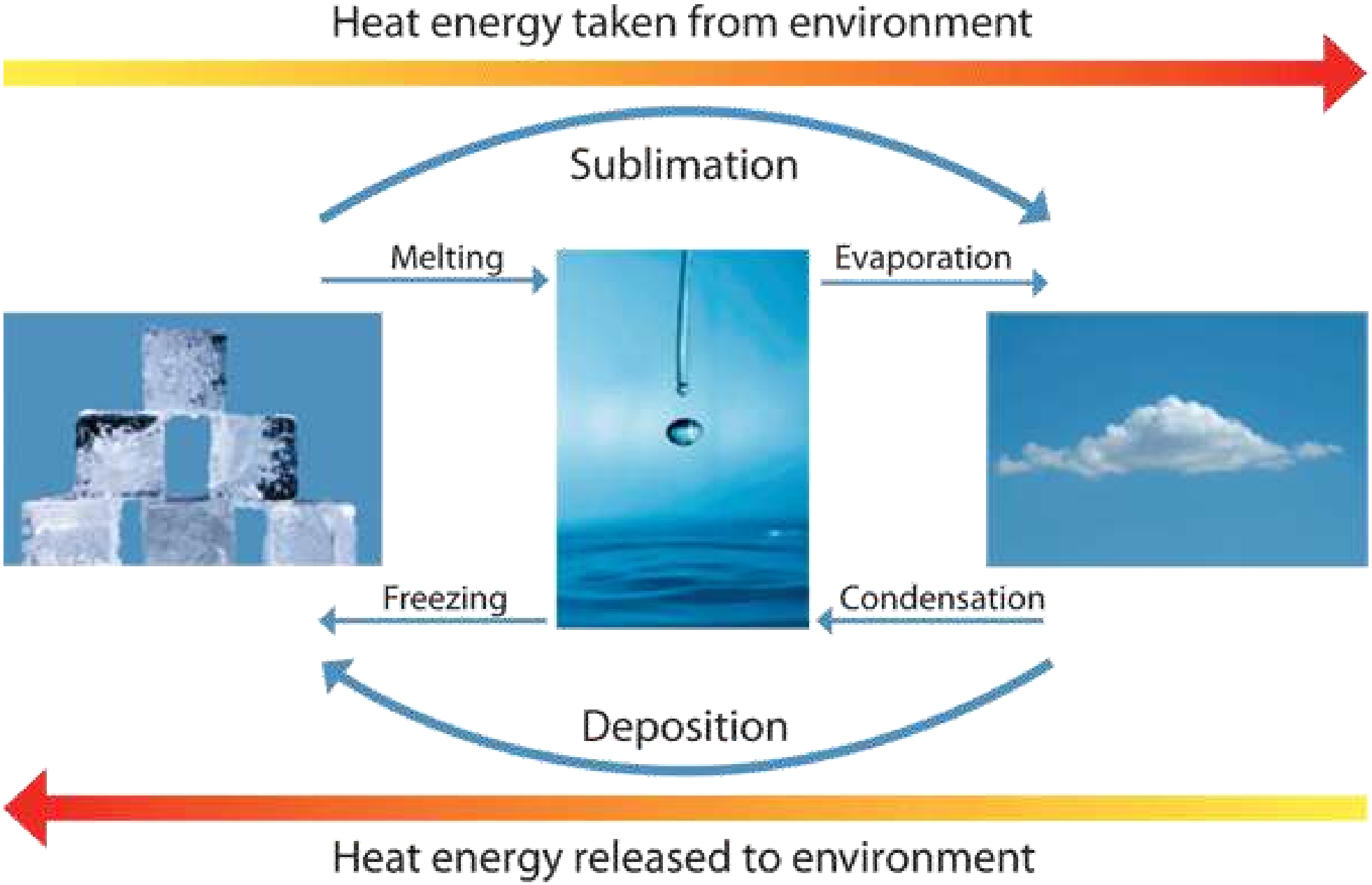
- a measure of the amount of matter present in a given volume of a substance
- typically expressed in the following units:
  - grams per cubic centimeter (g/cm^3) for solids
  - grams per milliliter (g/ml) for liquids
- can change as temperature and pressure change
- does not depend on how much of a substance you have (intrinsic property) – in other words, the density of a gold bar would be the same as the density of a gold flake

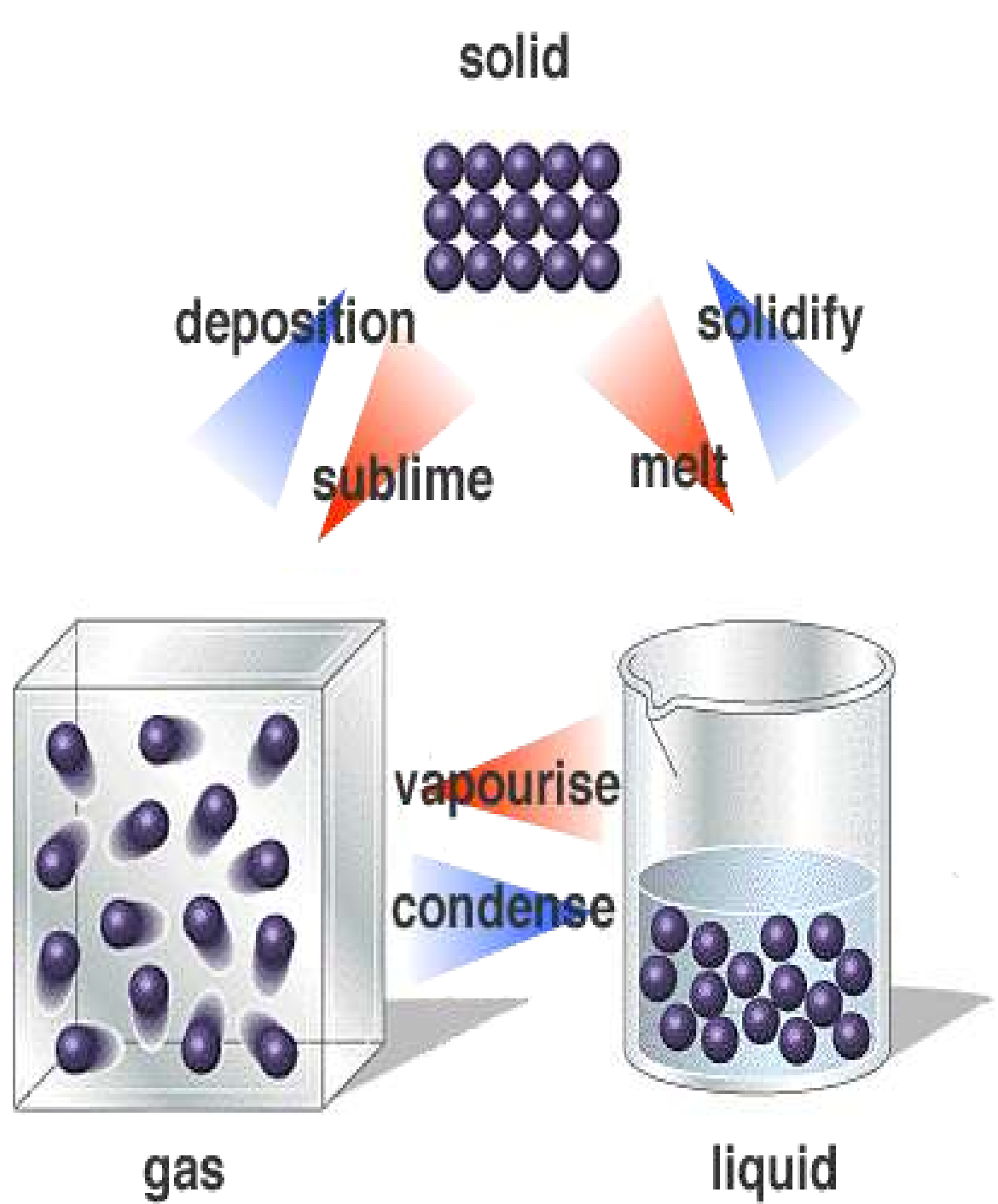


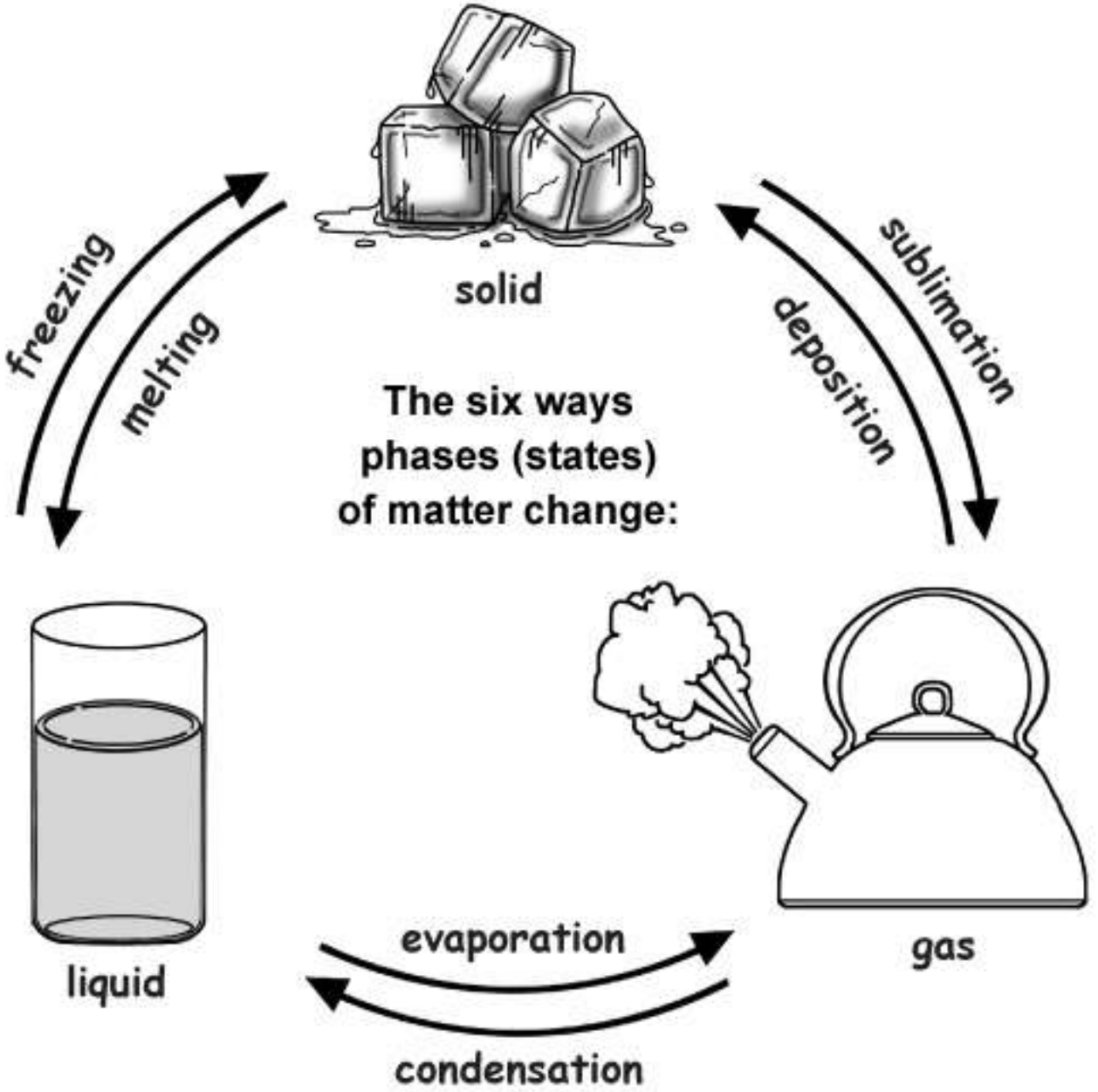


Look at the following slides to see different ways to process Phase Change

Figure 7

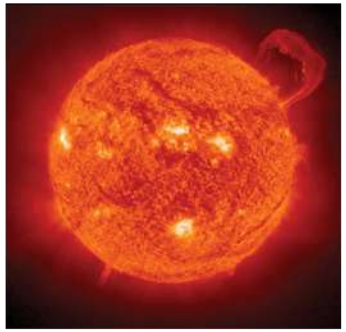



solid
deposition
solidify
sublime
melt
vapourise
condense
gas
liquid


solid
freezing
melting
sublimation
deposition
The six ways
phases (states)
of matter change:
liquid
gas
evaporation
condensation

Changes in States

Physical Changes



Plasma

Disposition

Ionization

Recombination

Vaporization

(Evaporation/Boiling)

Gas

Condensation

Liquid

Melting

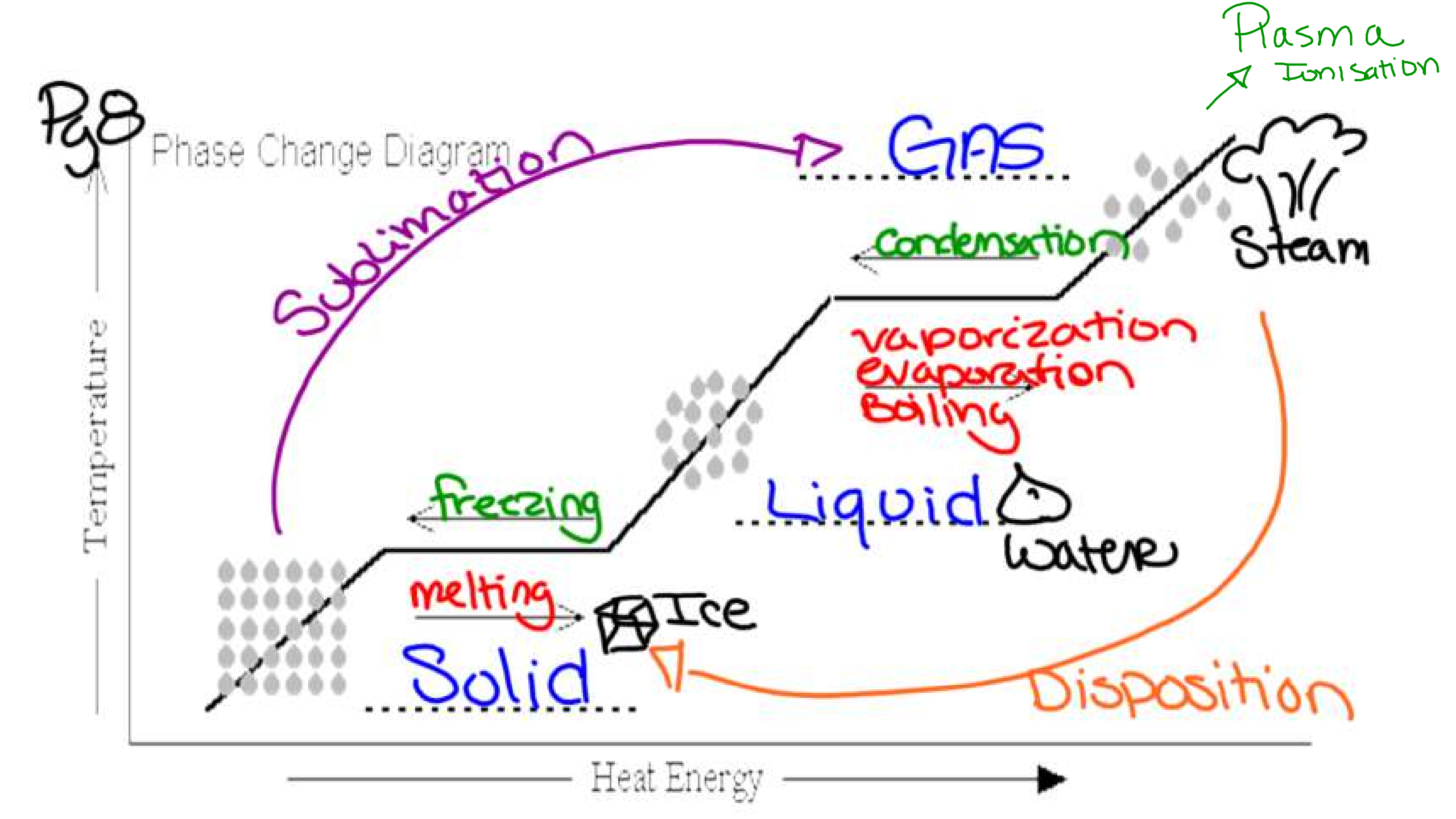
Freezing

Solid

Sublimation

Bose-Einstein

All changes in state require a change in energy


Pg8
Phase Change Diagram
Temperature
Heat Energy
Sublimation
GAS
Plasma
Ionisation
Condensation
Steam
vaporization
evaporation
Boiling
Liquid
water
freezing
melting
Ice
Solid
Disposition

Phases of Matter

Phase	Motion of Particles	Speed of Particles
Solid	Particles vibrate in place	Slow
Liquid	Particles are close, but can slide past one another	Medium
Gas	Particles are constantly expanding	Fast
Plasma	Unknown	Faster than we can see

Chemical Properties of Matter

- any property of matter that describes a substance based on its ability to change into a new substance
- **Examples**

flammability

reactivity with vinegar

reactivity with oxygen

Iron + Oxygen → Iron oxide (rust)

$2Fe + 3O_2 \rightarrow Fe_2O_3$

- **Chemical Changes**: changes that create NEW materials
- The original materials are changed into something different.
- Examples of chemical changes include: