

States of Matter



Matter



- Anything that has mass and takes up space
- Matter is basically “stuff.” If it has substance, it is matter.

States of Matter

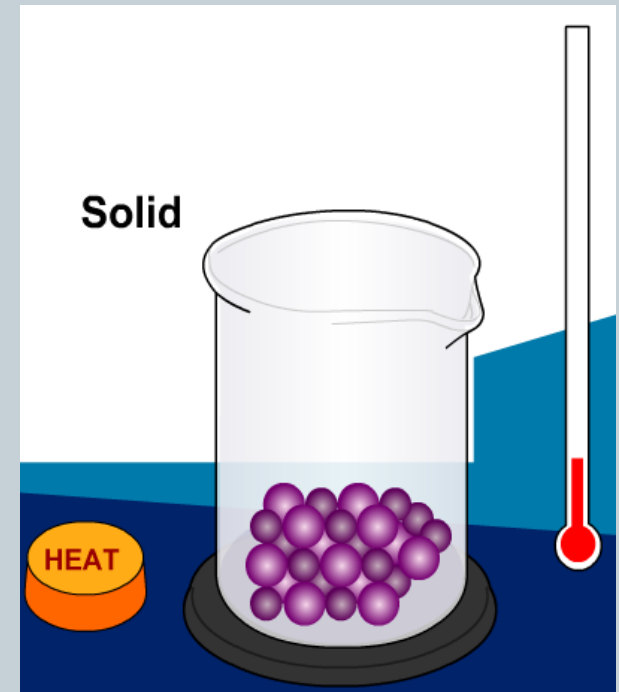
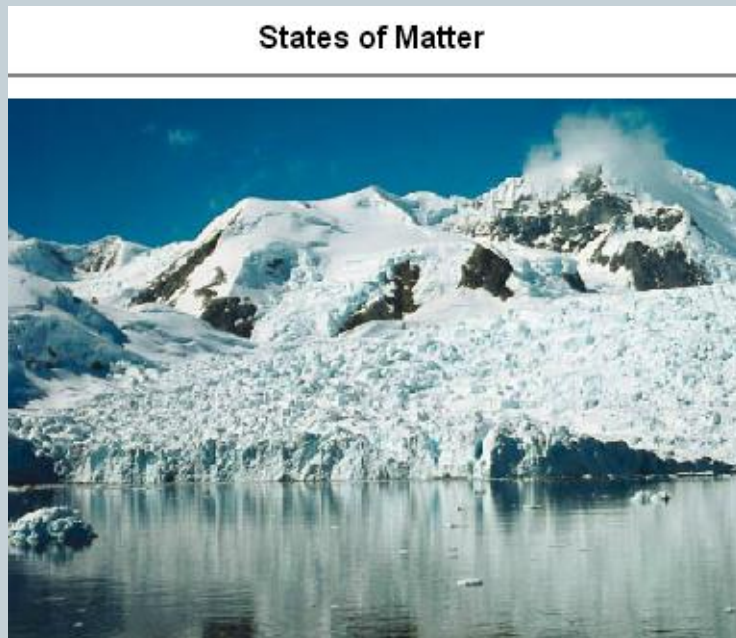


- 4 States of matter:
 - Solid
 - Liquid
 - Gas
 - Plasma
- Each is designated by the energy, movement, and behavior of the particles

States of Matter: Animations



- http://www.media.pearson.com.au/schools/cw/au_sch_whalley_sf1_1/int/matter.html



- http://www.media.pearson.com.au/schools/cw/au_sch_whalley_sf1_1/int/2_slg.html

States of Matter



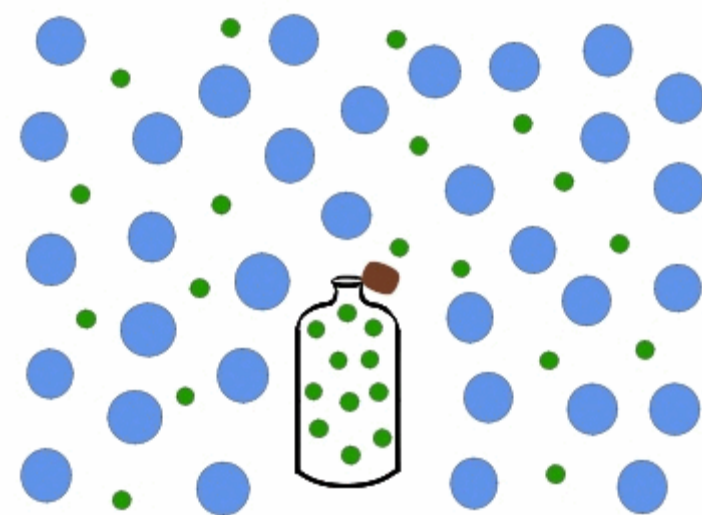
- Each state of matter has a different:
 - Energy level of the particles
 - Amount of movement
 - Spacing of the particles
 - Temperature
- ENERGY of a particle determines the kinetic energy (*and thus the temperature and state*) of a substance

Kinetic Theory of Matter (AKA: Atomic Theory)

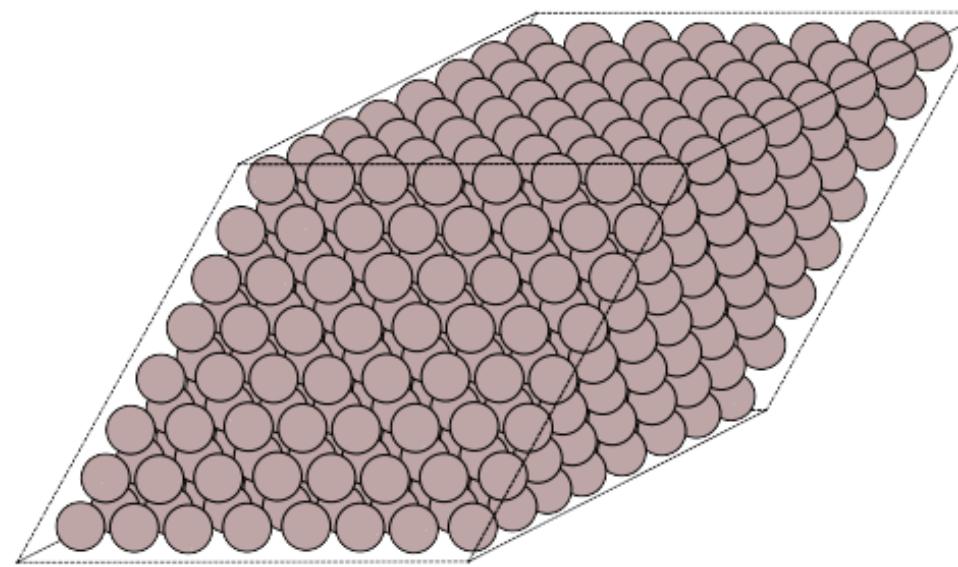


3 Parts of the Kinetic Theory

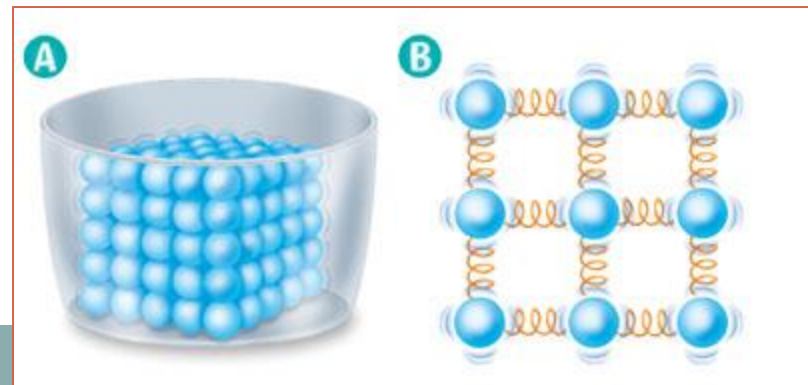
- 1) All matter is composed of small particles (atoms, molecules, ions)
- 2) Particles are in constant, random motion
- 3) Particles collide with each other and the sides of their container



Solids



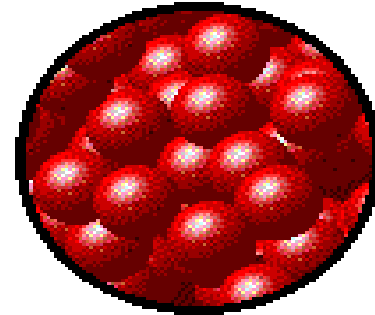
- **Energy:**
 - Very little energy
- **Movement:**
 - Vibrate against each other, don't move around much
- **Particle Spacing:**
 - Very little space between particles
- **Volume/Shape**
 - Definite volume and definite shape



Liquids



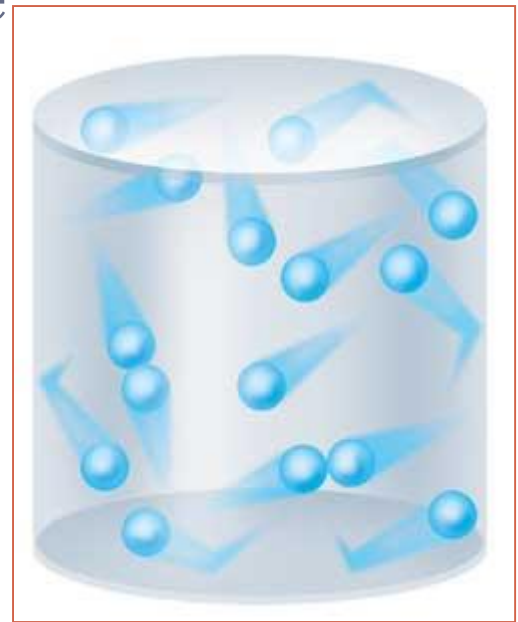
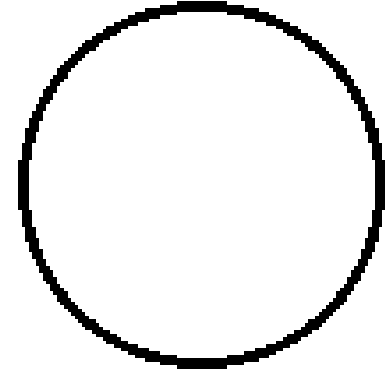
- **Energy:**
 - Increased energy from solid
- **Movement:**
 - Flow around each other
- **Particle Spacing:**
 - Particles have space between them
- **Volume/Shape**
 - Definite volume but no definite shape



Gas



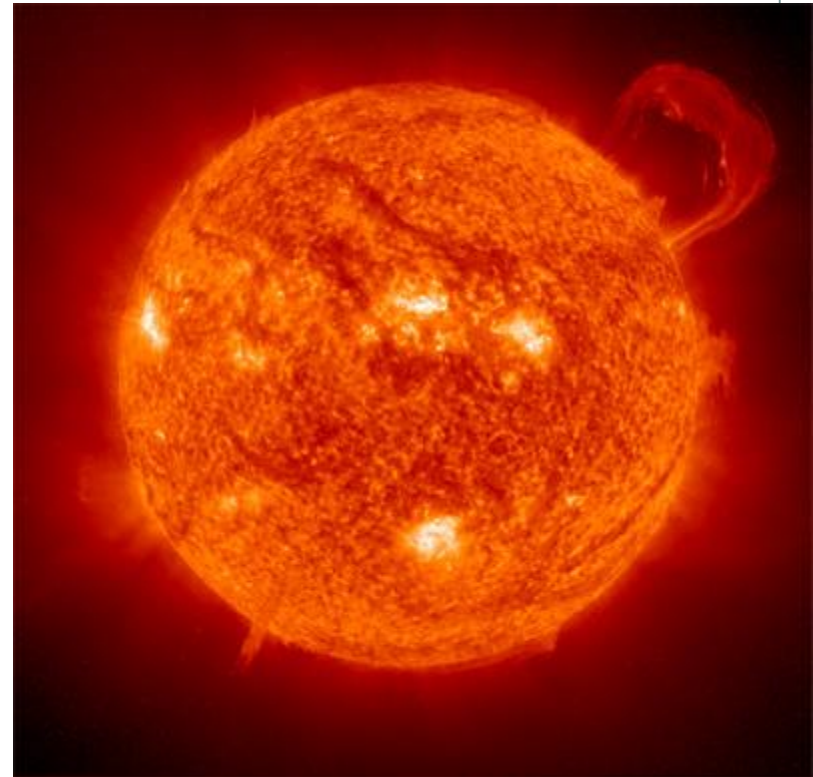
- **Energy:**
 - Tons of energy!
- **Movement:**
 - Flying past each other
 - Enough energy to escape the attractive forces of other particles
- **Particle Spacing:**
 - Far apart
- **Volume/Shape**
 - No definite volume and
 - No definite shape



Plasma



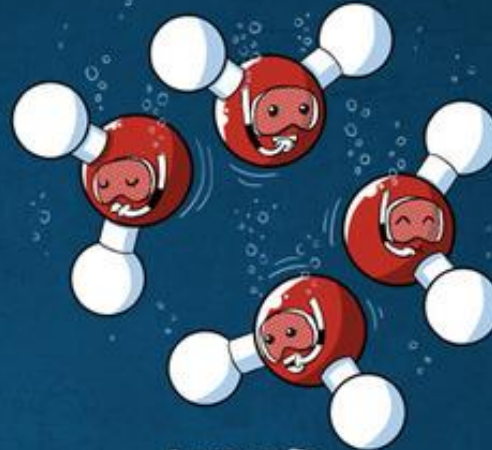
- Plasma is electrically charged gas
- Plasma is created at very very high temperatures (greater than 10,000 °F)
 - Seen in sun, stars, and lightning
- Most abundant state of matter in the **UNIVERSE**
 - Not the most abundant on Earth



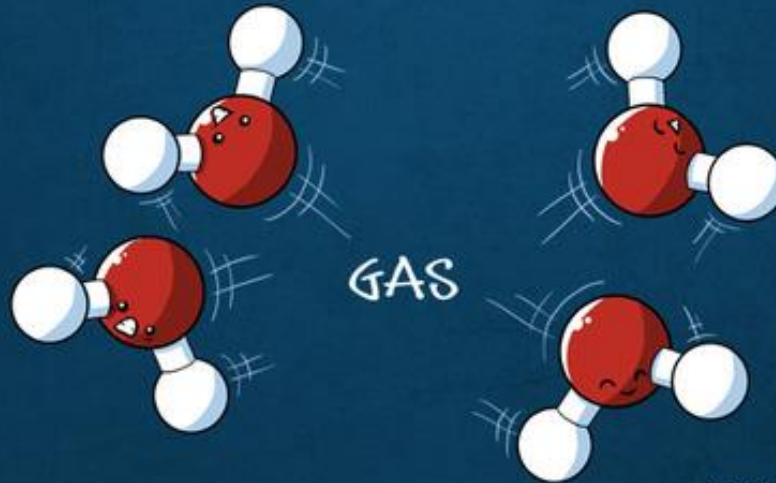
STATES OF ~~MATTER~~ W



SOLID



LIQUID

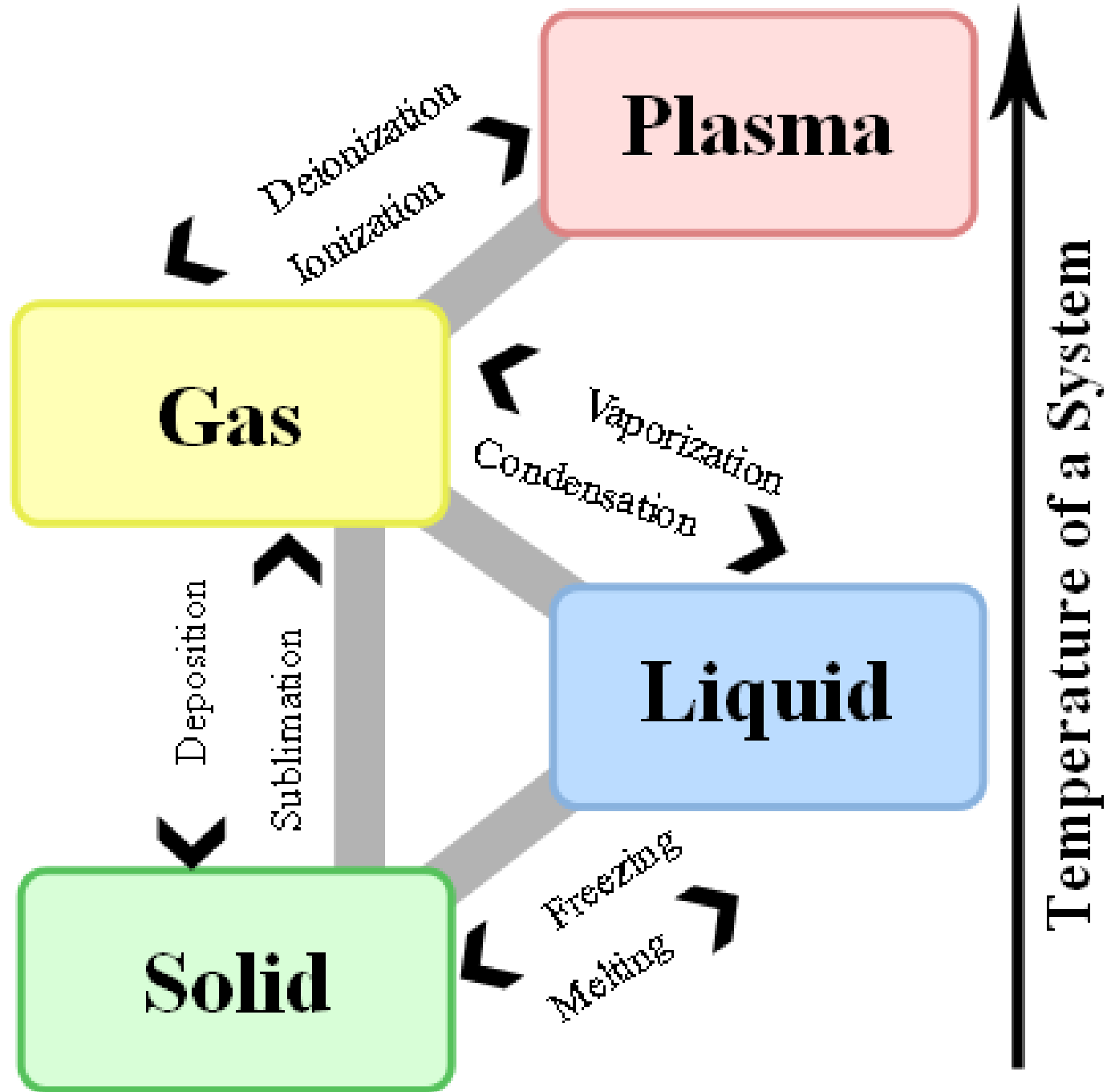


GAS

Changes in State



- **ENERGY** of the particles influences the state of matter
 - Temperature is just something we can easily measure. Energy is more complicated to measure...
- **Increase energy**
 - Molecules move faster and spread out
 - Temperature increases
- **Decrease energy**
 - Molecules move slower and are closer together
 - Temperature decreases



Solid to Liquid and Back

- **Melting Point**
 - Point at which solids become liquid

- **Freezing Point**
 - Point at which liquid become solid

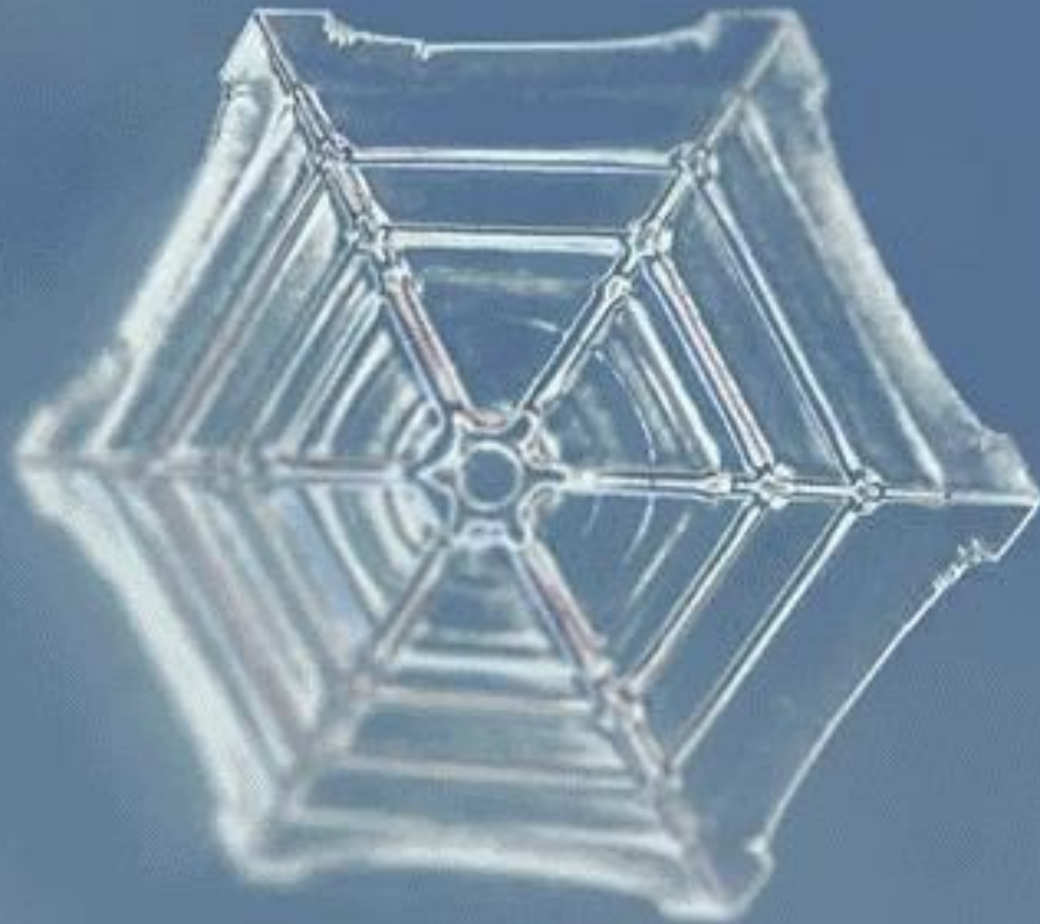
- Gallium is a metal with a very low melting point. Here, a gallium spoon melts in hot water...



Hot iron ball placed onto brick of ice



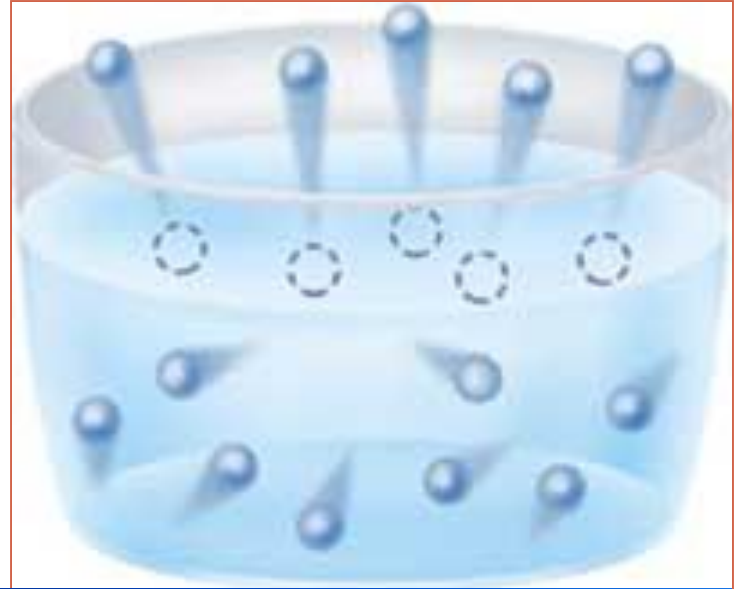
Water crystallizing into snow



Liquid to Gas and Back



- **Boiling Point** - Point at which liquid becomes gas
 - AKA: vaporization
 - Ex: water boiling on a stove
- **Condensation** – gas changes to liquid
 - Ex: Mirror fogging up, dew on grass, etc



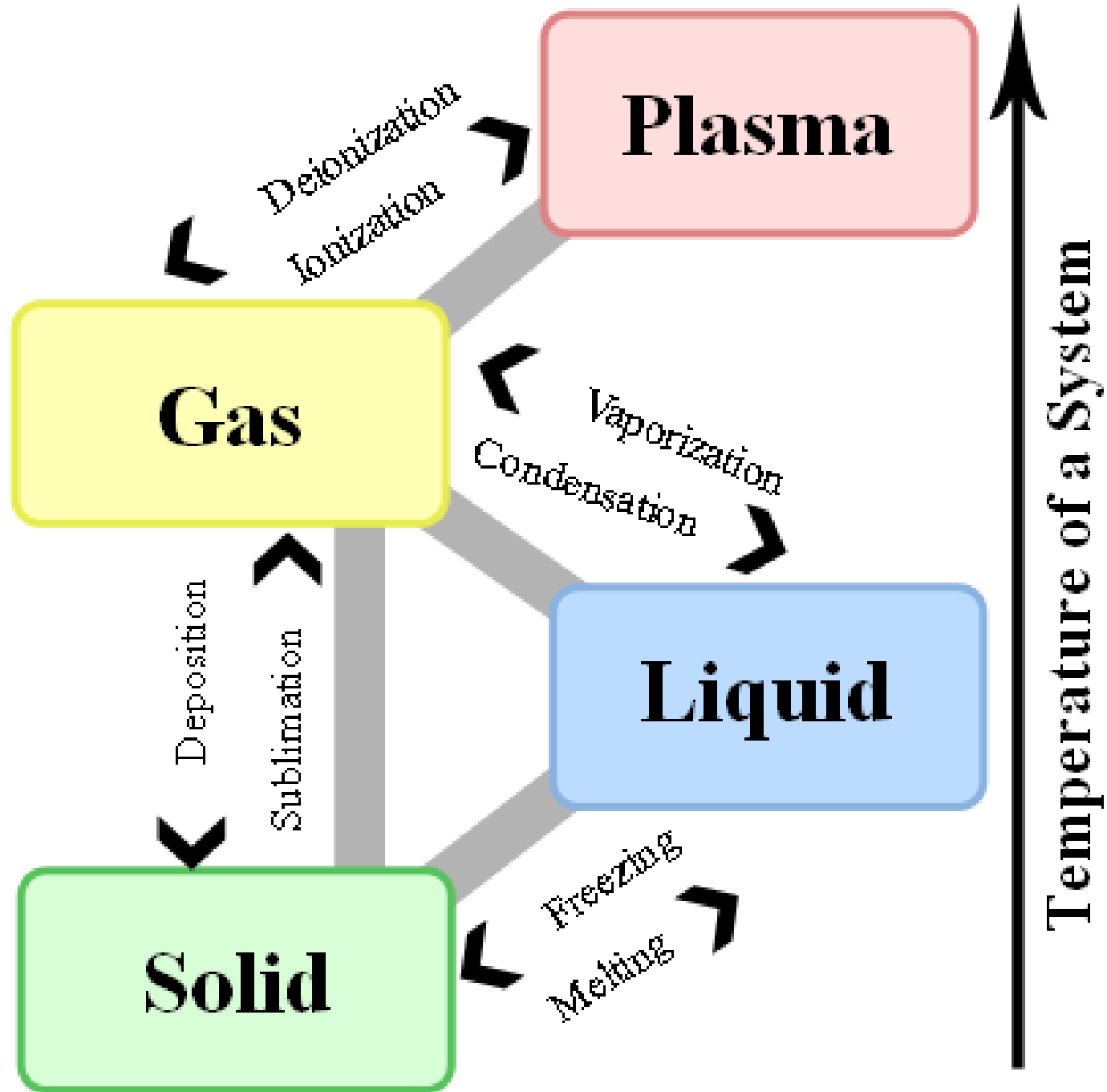
Solid to Gas and Back



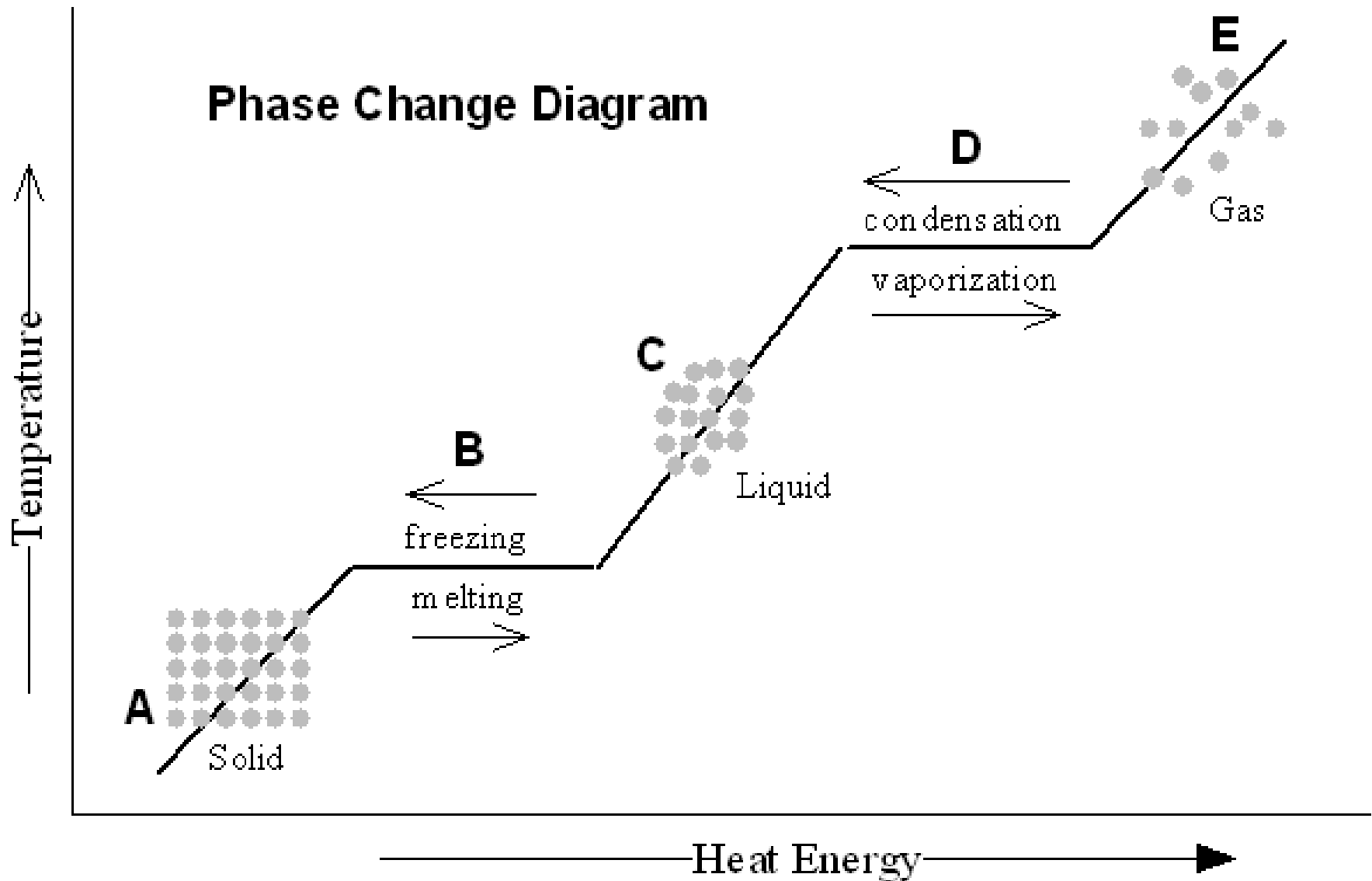
- **Sublimation**- change from solid directly to gas
 - Ex: Dry Ice



- **Deposition** – change from gas directly to solid
 - Ex: Snow and Hail



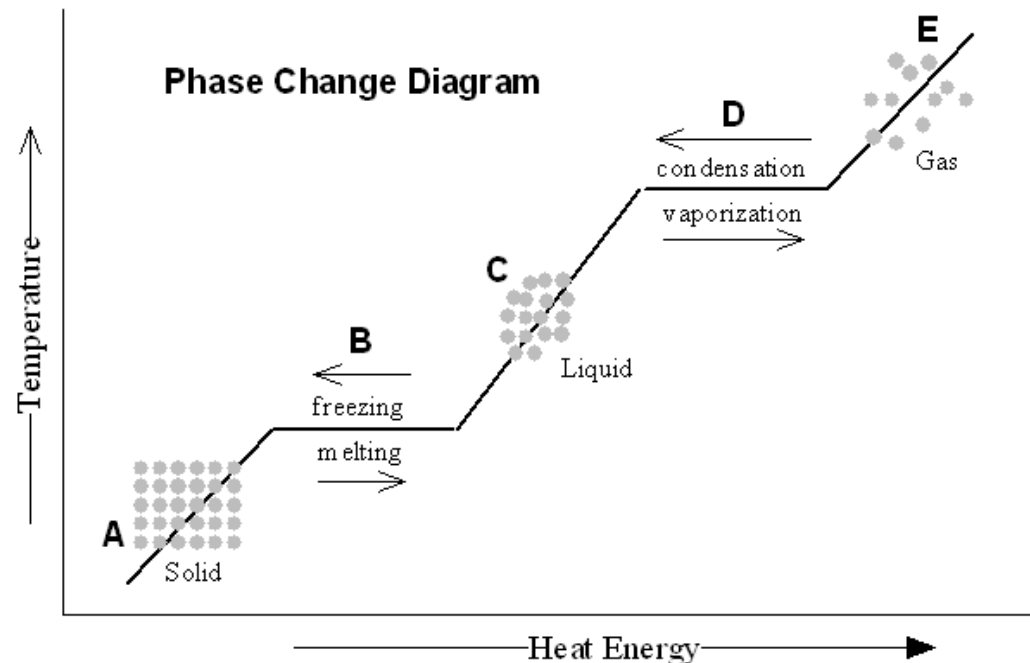
Honors: Phase Change Diagram



Honors: Phase Change Diagram

- **A** – the substance is entirely a solid
- **B** – the substance is both solid and liquid
- **C** – the substance is entirely a liquid
- **D** – the substance is both a liquid and a gas
- **E** – the substance is entirely a gas

- When changing from solid to liquid, the substance isn't entirely liquid until the graph has a positive slope



Honors: Phase Change Diagram

