STATES OF MATTER

Kinetic Theory of Matter

- Matter is anything that has mass and takes up space.
- Mass is the amount of matter in an object.
- Matter is made up of particles which are in continual random motion.

Describing the states of matter…

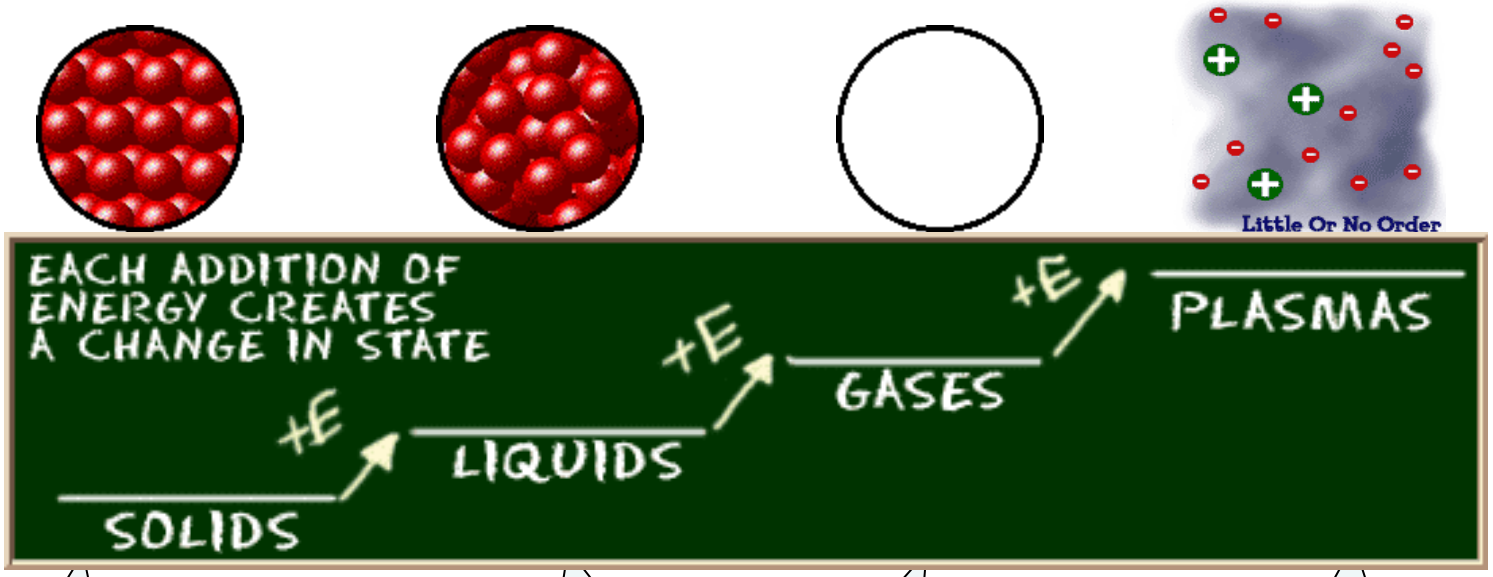
- Materials can be classified as solids, liquids, or gases based on whether their shapes and volumes are definite or variable.

- Examples of solids: rocks, wood
- Examples of liquids: water, olive oil
- Examples of gases: clouds, gasoline

STATES OF MATTER

- Based upon particle arrangement
- Based upon energy of particles
- Based upon distance between particles

STATES OF MATTER



SOLID

Tightly packed, in a regular pattern Vibrate, but do not move from place to place

LIQUID

Close together with no regular arrangement. Vibrate, move about, and slide past each other

GAS

Well separated with no regular arrangement. Vibrate and move freely at high speeds

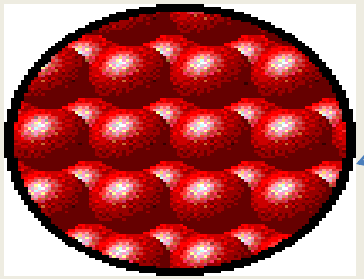
PLASMA

Has no definite volume or shape and is composed of electrical charged particles

SOLIDS

- A solid retains a fixed volume and shape, and is not easily compressible.

- Solids do not flow easily.
- Solids keep their shapes unless they are broken



This is an example of a solid under a microscope.

LIQUIDS…

-A liquid is a state of matter in which a material has a definite volume but not a definite shape.

- Most liquids expand or spread out when heated and contract when cooled.

- When a liquid is cooled to its freezing point it becomes a solid.

GASES...

- Gas is the state of matter in which a material has neither a definite shape nor volume.

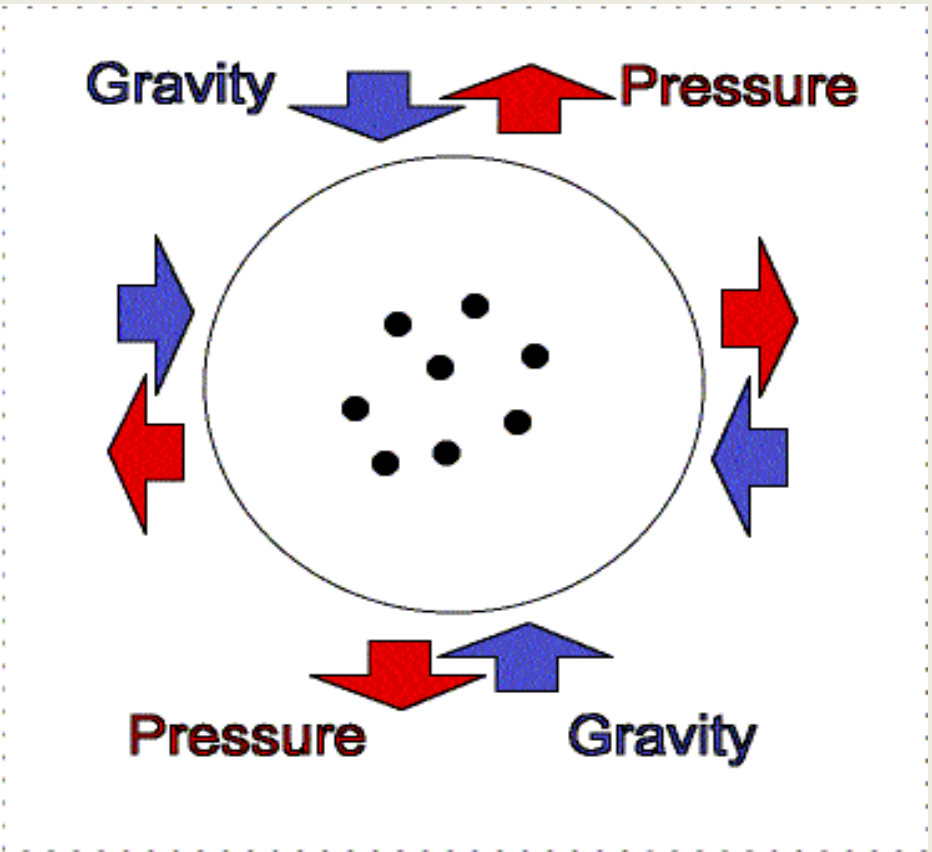
- Do not keep their shape, they completely fill up a container.

- gases can be compressed.

Factors That Affect Gas Pressure…

Gas pressure is affected by:

- temperature
- volume
- Number of particles



Temperature and phase changes

-- A phase change is a reversible physical change that occurs when a substance changes from one state of matter to another.

- The temperature of a substance does not change during a phase change.

• Six common phase changes are melting, freezing, vaporization, condensation, sublimation, and deposition.

PHASE CHANGES

Description of Phase Change	Term for Phase Change	Heat Movement During Phase Change
Solid to liquid	Melting	Heat goes into the solid as it melts.
Liquid to solid	Freezing	Heat leaves the liquid as it freezes.

PHASE CHANGES

Description of Phase Change	Term for Phase Change	Heat Movement During Phase Change
Liquid to gas	Vaporization, which includes boiling and evaporation	Heat goes into the liquid as it vaporizes.
Gas to liquid	Condensation	Heat leaves the gas as it condenses.
Solid to gas	Sublimation	Heat goes into the solid as it sublimates.

Melting and Freezing…

- The arrangement of molecules becomes less orderly as the material melts and more orderly as It freezes.

- At the freezing point, some molecules move slowly enough for attractions between molecules to have an effect.

- any energy gained after the phase change increases the average kinetic energy of the molecules, and the temperature rises.

Vaporization and Condensation

- The phase change in which a substance changes from a liquid into a gas is vaporization.
- The heat of vaporization varies from substance to substance.
- Evaporation takes place at the surface; of a liquid and occurs at temperatures below the boiling point.
- Evaporation is the process that changes a substance from a liquid to a gas at temperatures below the substance's boiling points.

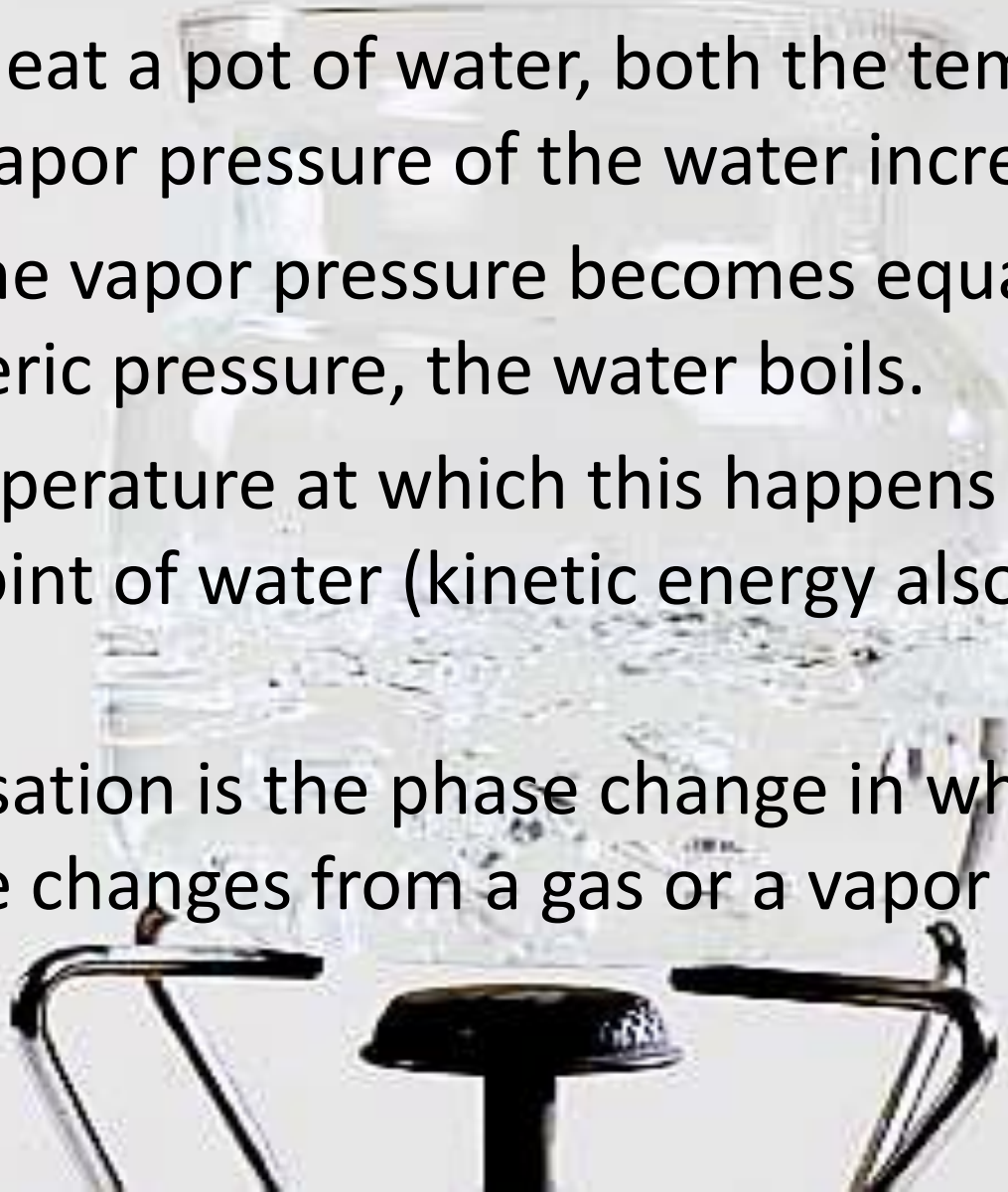
Boiling and Condensation…

- As you heat a pot of water, both the temperature and the vapor pressure of the water increase.

- When the vapor pressure becomes equal to the atmospheric pressure, the water boils.

- The temperature at which this happens is the boiling point of water (kinetic energy also explains this).

- Condensation is the phase change in which a substance changes from a gas or a vapor to a liquid.



Sublimation and Deposition

Sublimation is the phase change in which a substance changes from a solid to a gas or vapor without changing to liquid first.

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Deposition is when gas or vapor changes directly into a solid without first changing to a liquid.

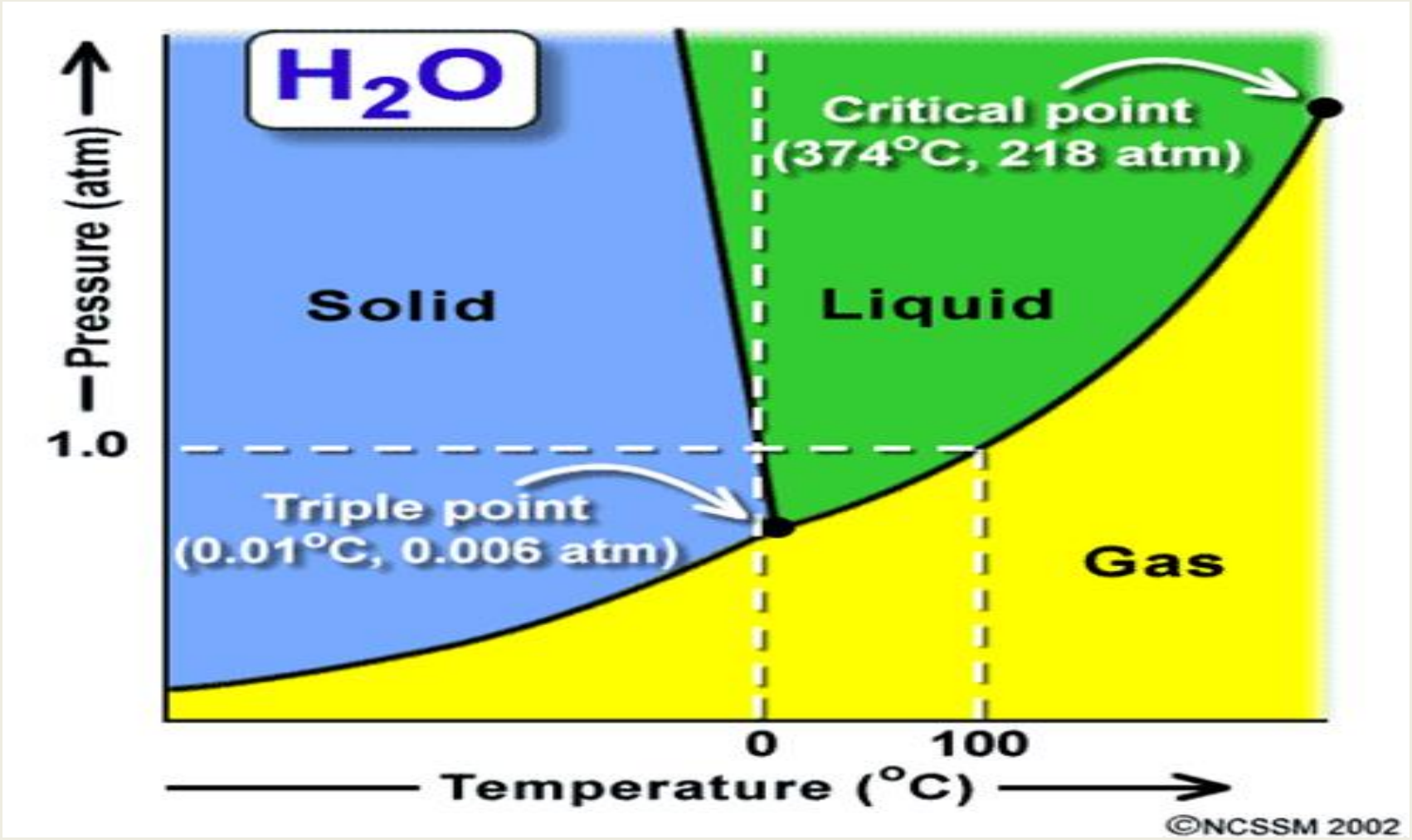
Phase Change Diagrams

- Phase diagrams summarize the effects of temperature and pressure on a substance inside a closed container."

- Every point in the diagram represents a combination of temperature and pressure for the system.

- The diagram is organized into three areas: solid, liquid, and gas.

Water phase diagram



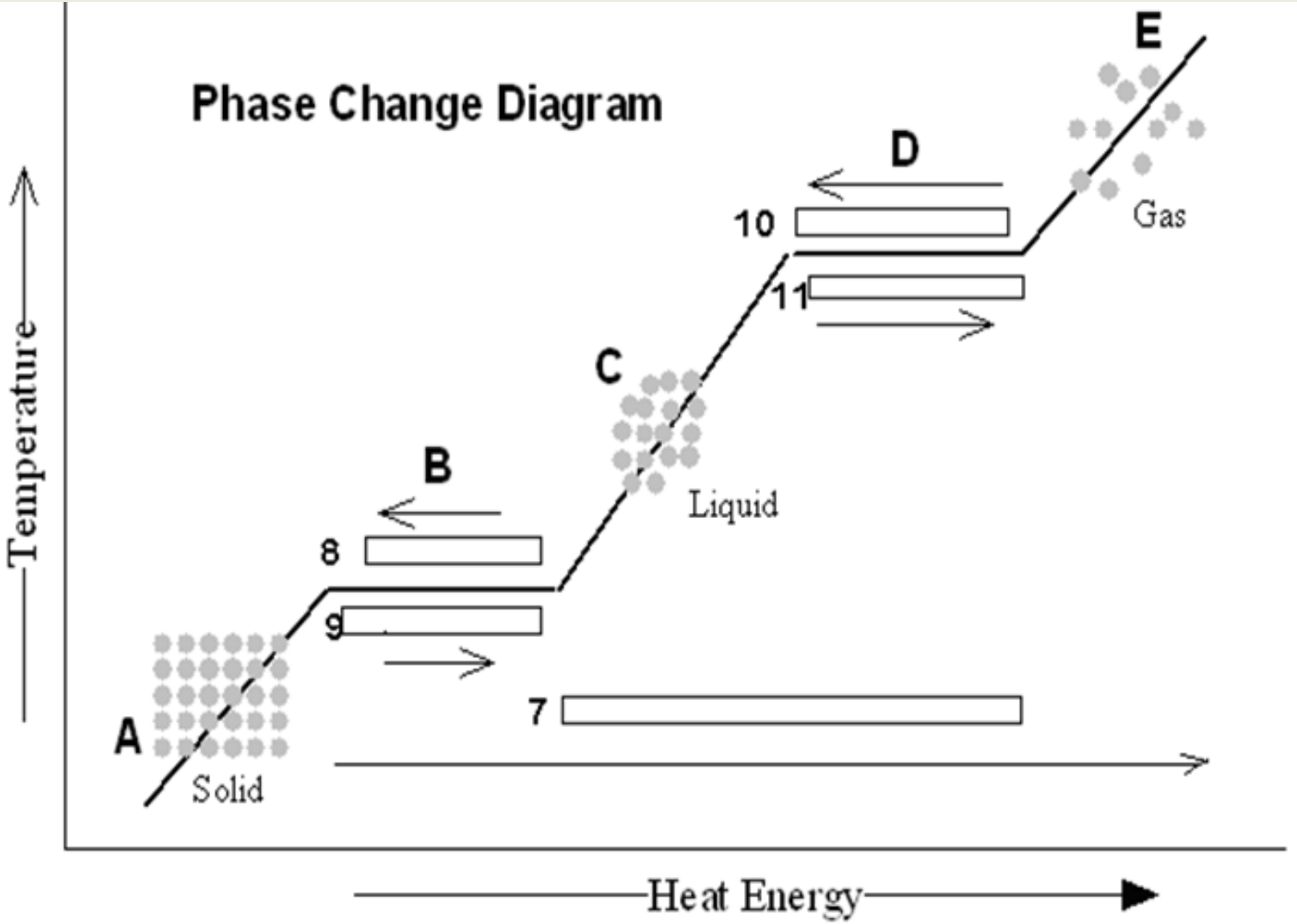
Definitions

- Triple Point: Indicates the temperature and pressure conditions at which the solid, liquid, and vapor of the substance exist at equilibrium.

- Critical Point: The Critical point indicates the critical temperature and the critical pressure.

- Critical Temperature: The temperature above which the substance cannot exist in a liquid state.

- Critical pressure: The lowest pressure at which the substance can exist as a liquid at the critical temperature.


Phase Change Diagram
E
D
10
Gas
11
C
B
Liquid
8
9
7
A
Solid
Temperature
Heat Energy