# PHASE CHANGES

## THE NATURE OF ENERGY

- Energy is the ability to do _____ or produce heat.
- Kinetic energy is energy of _____. Kinetic energy increases as the _____ of molecules goes up. Comparing any two samples, the one with the higher temperature has the _____ kinetic energy.
- Temperature is a measure of an object's average kinetic energy. The unit for temperature commonly used by scientists is degrees Celsius or _____.
- The potential energy of a substance depends upon its composition: the type of atoms in the substance, the number and type of chemical _____ joining the atoms, and the particular way the atoms are arranged. Chemical potential energy is stored in gasoline, wood, _____, etc.
- The law of conservation of energy states that in any chemical reaction or physical process, energy can be converted from one form to another, but it is neither _____ nor destroyed.
- Chemical systems contain both kinetic energy and potential energy. Energy (kinetic and potential) of the particles of a substance changes when _____, cooled, or changing phase. As you consider the phases - solid, liquid, gas – this is in order of increasing potential energy. Solids have the _____ potential energy. Liquids have a moderate amount of potential energy. _____ will have the most potential energy.

## HEAT

Heat, which is represented by the symbol ___, is energy that is in the process of flowing from a warmer object to a cooler object. The standard unit of heat and energy is the _____ (J). Heat involves a transfer of energy between 2 objects due to a _____ difference. Heat flows from "hot to cold." When the warmer object _____ heat, its temperature decreases and q is _____. When the cooler object absorbs heat, its temperature _____ and q is positive.

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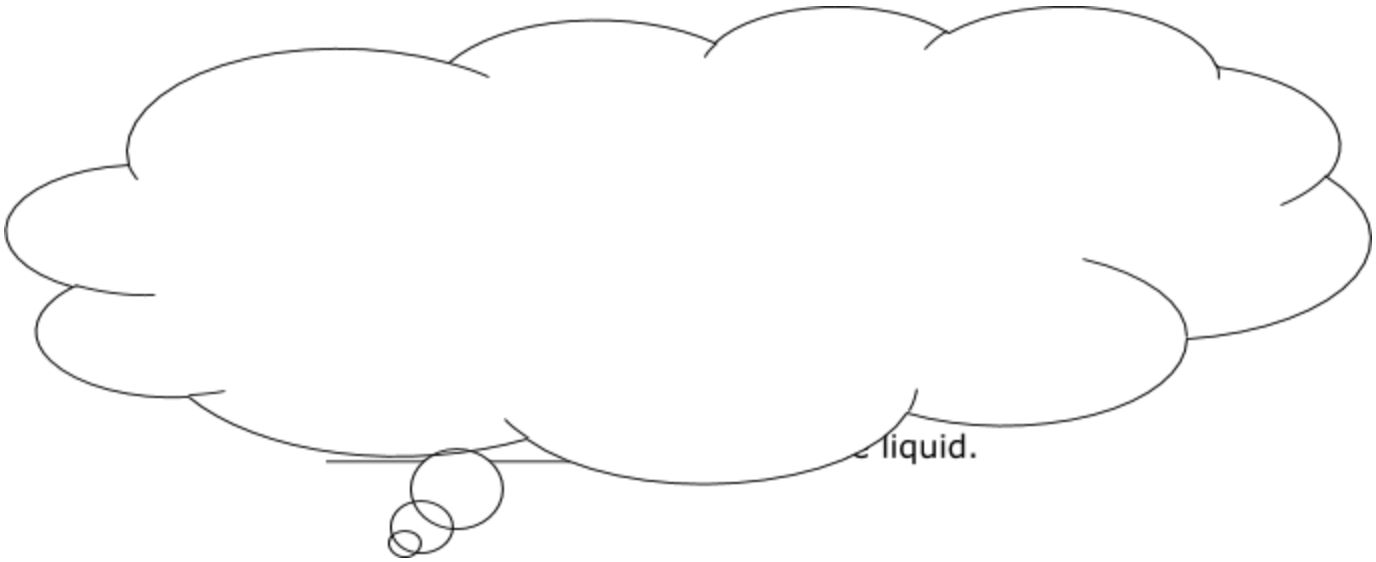
A material will change from one state or phase to another at specific combinations of temperature and surrounding _____. Typically, the pressure is atmospheric pressure, so temperature is the _____ factor to the change in state in those cases.

### VAPORIZATION AND CONDENSATION

- Vaporization is the process by which a liquid changes into a _____ or vapor. Vaporization is an endothermic process – the liquid _____ heat.
- When vaporization occurs only at the surface of an uncontained liquid (no lid on the container), the process is called _____.
- Endothermic : Absorbs heat; Would feel _____ if you were to touch it; Pulls in heat from its surroundings – such as your hand, and converts it to chemical _____ energy
- Condensation is the process by which a gas or vapor becomes a liquid. It is the _____ of vaporization. Condensation is _____ – heat is released.
- Exothermic : Releases heat; Would feel _____ if you were to touch it; Release chemical potential energy and you would perceive it as heat
- Vaporization results in an increase in potential energy. Condensation results in a _____ in potential energy. Kinetic energy remains _____ during vaporization and condensation.

### DYNAMIC EQUILIBRIUM

In a closed system, the rate of vaporization can _____ the rate of condensation. When the rates are equal the system is said to be in dynamic equilibrium. Molecules are constantly changing _____ - "Dynamic" The total amount of liquid and vapor remains _____ - "Equilibrium"




**MELTING AND FREEZING**

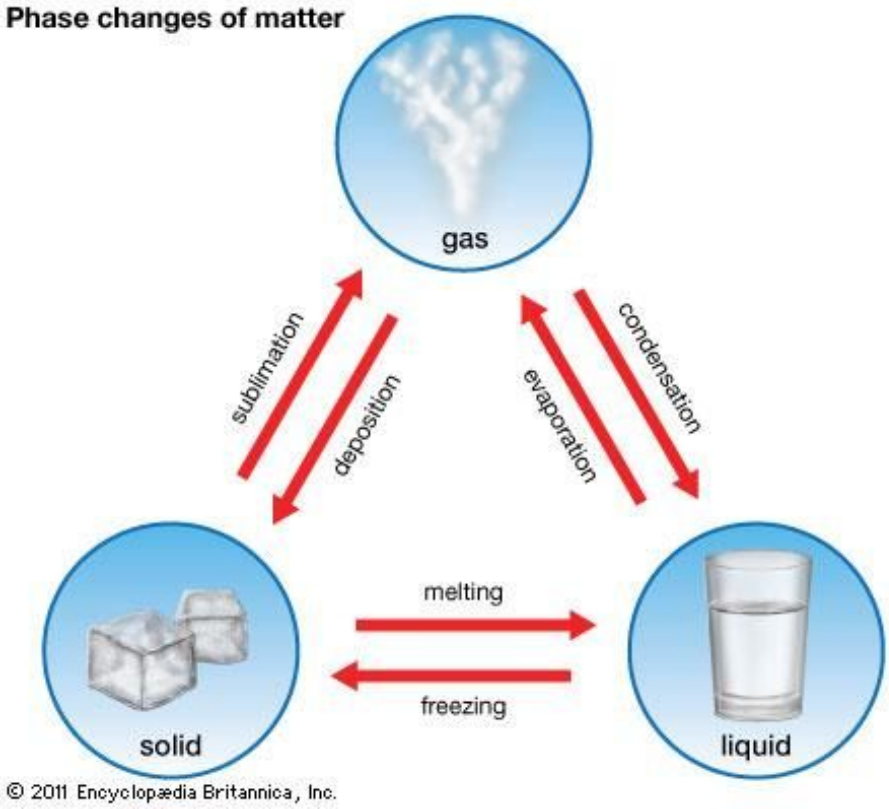
- The melting of a solid occurs when the forces holding the particles together are _____ and the solid becomes a liquid. Melting is an endothermic process – the solid _____ heat.
- Freezing occurs when a liquid becomes a crystalline solid. Freezing is an exothermic process – the liquid _____ heat. The freezing point is the _____ as the melting point.
- Melting results in an _____ in potential energy. Freezing results in a decrease in potential energy. Kinetic energy remains _____ during melting and freezing.

Phase

## SUBLIMATION AND DEPOSITION

- The process by which a _____ changes directly into a gas without first becoming a liquid is called sublimation. Solid air fresheners and _____ ice are examples of solids that sublime. Sublimation is _____.
- When a substance changes from a gas or _____ directly into a solid without first becoming a liquid, the process is called deposition. Deposition is the _____ of sublimation. _____ is an example of water deposition. Deposition is _____.
- Sublimation results in an increase in _____ energy.

Deposition results in a decrease in potential energy. Kinetic energy remains _____ during sublimation and deposition.




Classify the following phase changes.

1. dry ice (solid carbon dioxide) to carbon dioxide gas

2. ice to liquid water

3. liquid water to ice

4. water vapor to liquid water