

State Changes

How matter changes forms

I) Energy is the ability to do work or cause change.

a) *Kinetic Energy is the energy of motion*

- i) Particles with a lot of kinetic energy move fast and far apart
- ii) Particles with little kinetic energy move slow & close together

b) *Thermal Energy*

- i) The total kinetic energy of all the particles in a sample of matter is called thermal energy.

c) *Temperature*

- i) Temperature is the average kinetic energy of the individual particles in a substance
- ii) So... if it is hot more kinetic energy, if cold less kinetic energy.

d) *Heat*

- i) The movement of thermal energy from a substance at a higher temperature to one at a lower temperature is called heat.

II) *Changing states*

a) Matter can change from one state to another when thermal energy is released or absorbed.

- i) This is called a change of state.

b) *Melting*

- i) The change from the solid state to the liquid state is melting.
- ii) The temperature at which a substance changes from a solid to a liquid is called the melting point.
- iii) Melting is when matter absorbs thermal energy, and its temperature rises.

c) *Freezing*

- i) The change from the liquid state to the solid state is called **freezing**.
- ii) The temperature at which a substance changes from the liquid state to the solid state is called the freezing point.
- iii) Energy is released during freezing.
- iv) After all of the liquid has become a solid, the temperature begins to decrease again.

d) *Vaporization*

- i) The change from a liquid to a gas is known as vaporization.

- ii) The temperature of the substance does not change during vaporization.
- iii) However, the substance absorbs thermal energy.
- iv) Two forms of vaporization exist.
 - (1) Vaporization that takes place below the surface of a liquid is called boiling.
 - (a) The temperature at which a liquid boils is called the boiling point.
 - (2) Vaporization that takes place at the surface of a liquid is called evaporation.

e) Condensation

- i) As a gas cools, its particles slow down.
- ii) When particles move slowly enough for their attractions to bring them together, droplets of liquid form.
- iii) This process, which is the opposite of vaporization, is called **condensation**.

f) Sublimation

- i) Some substances can change from the solid state to the gas state without ever becoming a liquid.
- ii) During this process, known as sublimation, the surface particles of the solid gain enough energy to become a gas.

