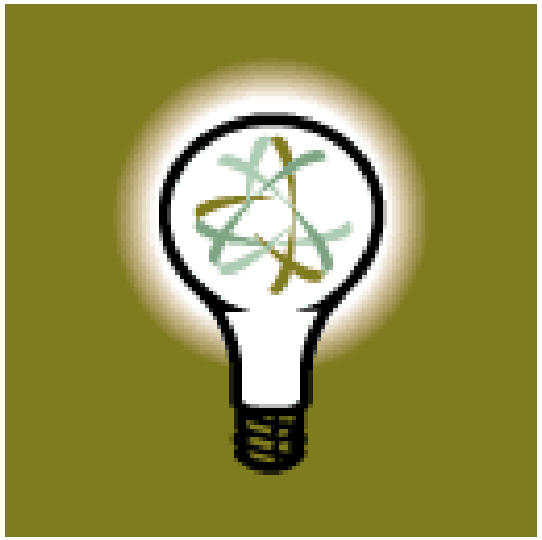
State Changes

How matter changes forms

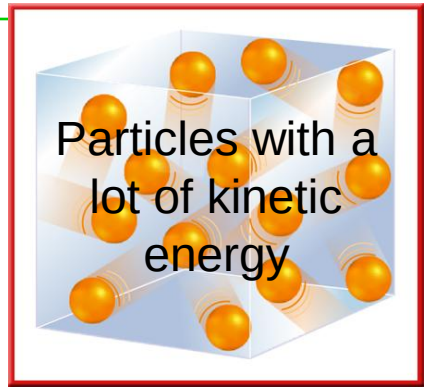
What is energy?

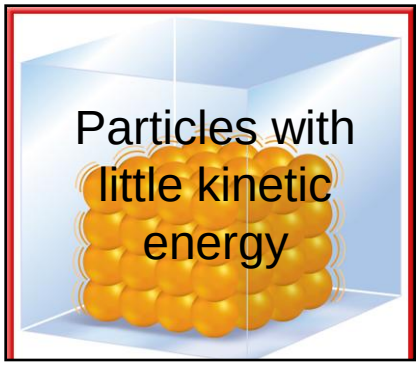
- Energy is the ability to do work or cause change.



Kinetic Energy

- Kinetic Energy is the energy of motion
  - Particles with a lot of kinetic energy move fast and far apart
  - Particles with little kinetic energy move slow & close together



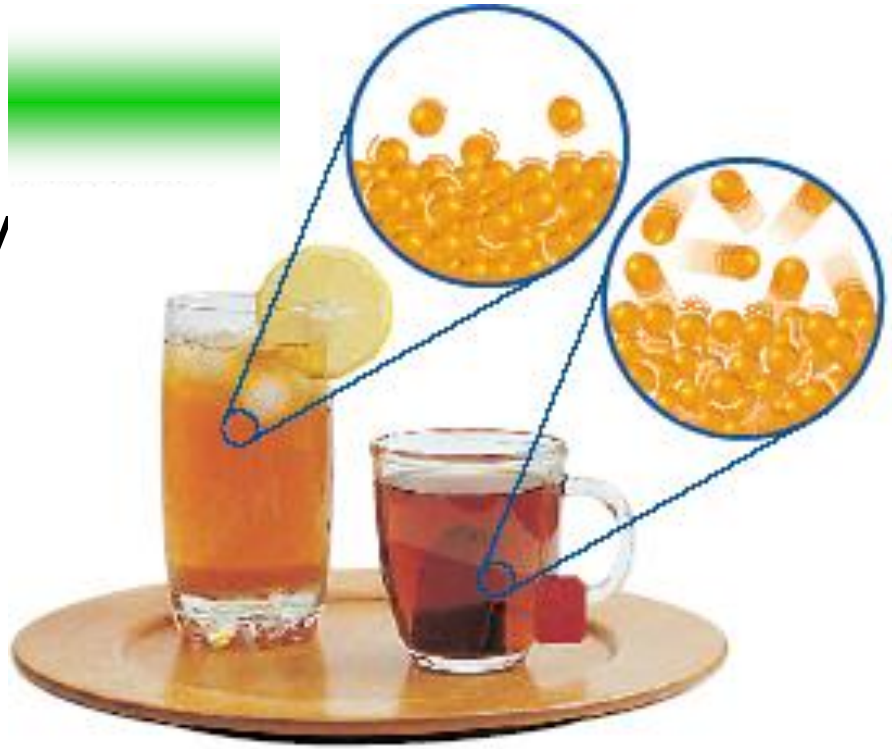


Thermal Energy

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

Temperature

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

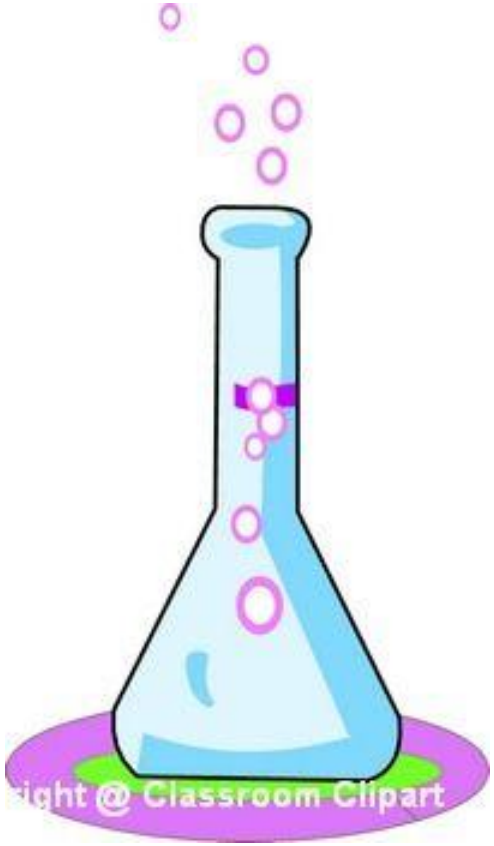


Heat

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

Changing states

- Matter can change from one state to another when thermal energy is released or absorbed.
- This is called a change of state.



State Change Pyramid

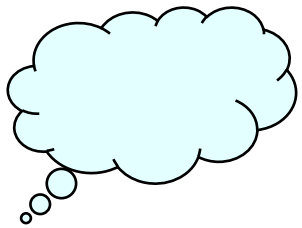
Absorbing

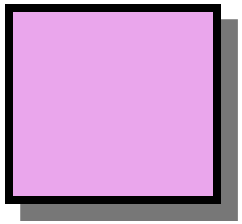
thermal energy

Releasing

thermal energy

Gas





Solid

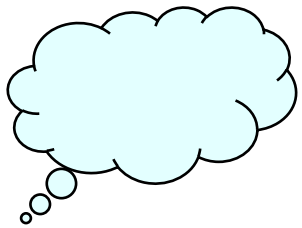
Liquid

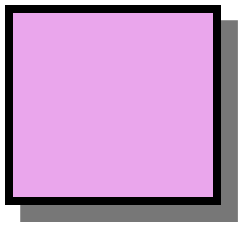
State Change Pyramid

Absorbing thermal energy

Releasing thermal energy

Gas





Solid

Melting

Liquid

Melting

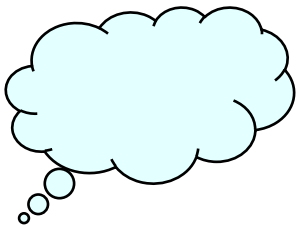
- The change from the solid state to the liquid state is melting.
- The temperature at which a substance changes from a solid to a liquid is called the melting point.
- Melting is when matter absorbs thermal energy, and its temperature rises.

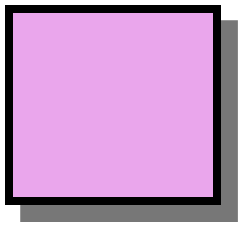
State Change Pyramid

Absorbing thermal energy

Releasing thermal energy

Gas





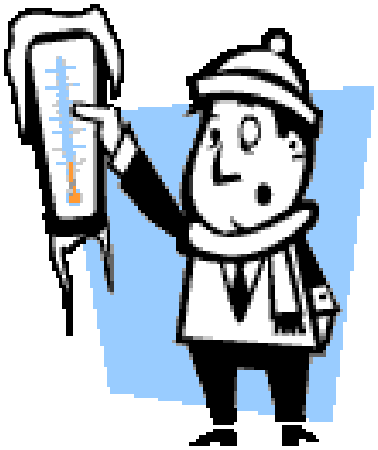
Solid

Melting

Freezing

Liquid

Freezing

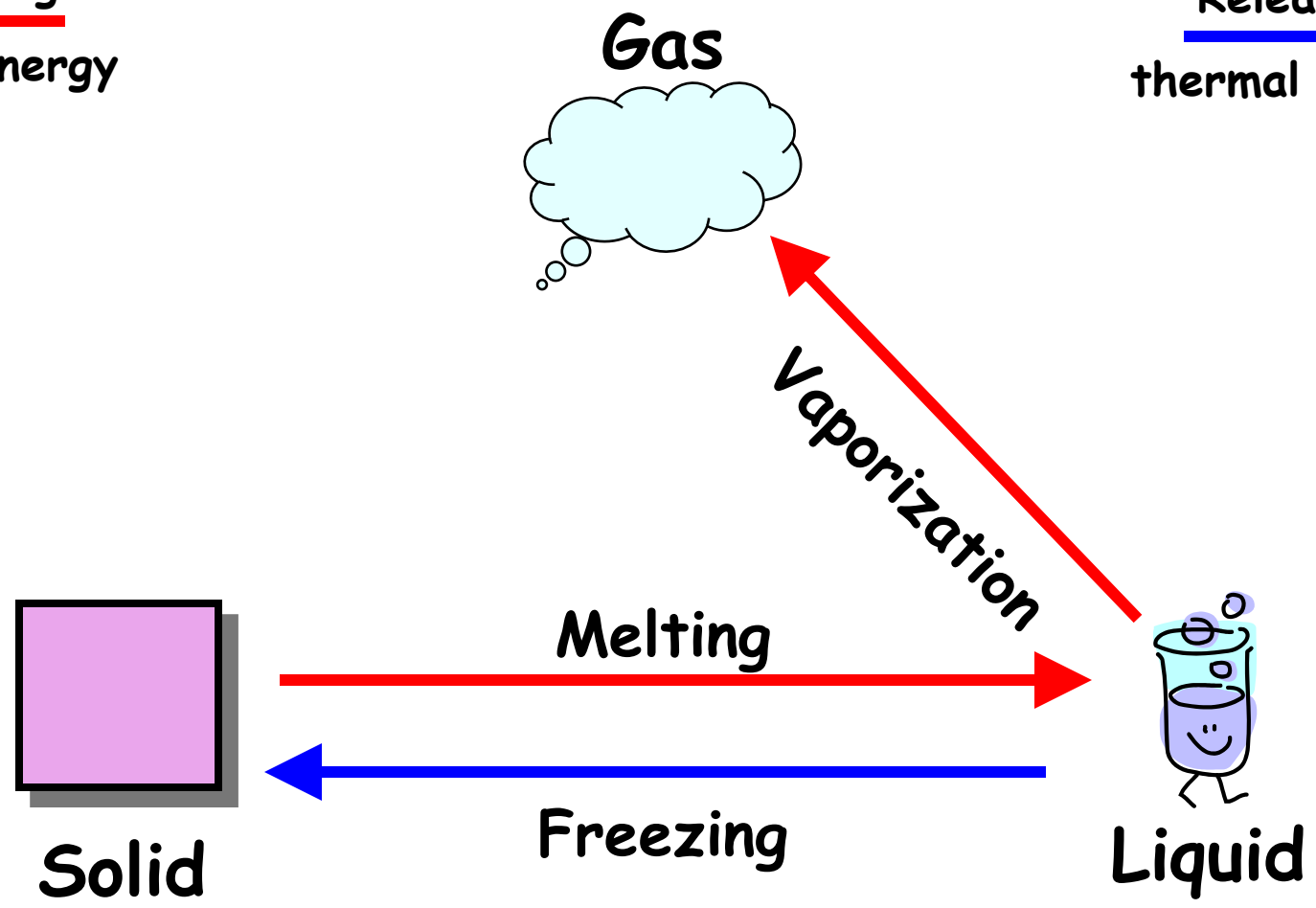


- The change from the liquid state to the solid state is called **freezing**.
- The temperature at which a substance changes from the liquid state to the solid state is called the freezing point.
- Energy is released during freezing.
- After all of the liquid has become a solid, the temperature begins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

State Change Pyramid

Absorbing thermal energy

Releasing thermal energy



Vaporization

- The change from a liquid to a gas is known as vaporization.
- The temperature of the substance does not change during vaporization.
- However, the substance absorbs thermal energy.

Vaporization

- Two forms of vaporization exist.
- Vaporization that takes place below the surface of a liquid is called boiling.
- The temperature at which a liquid boils is called the boiling point.
- Vaporization that takes place at the surface of a liquid is called evaporation.

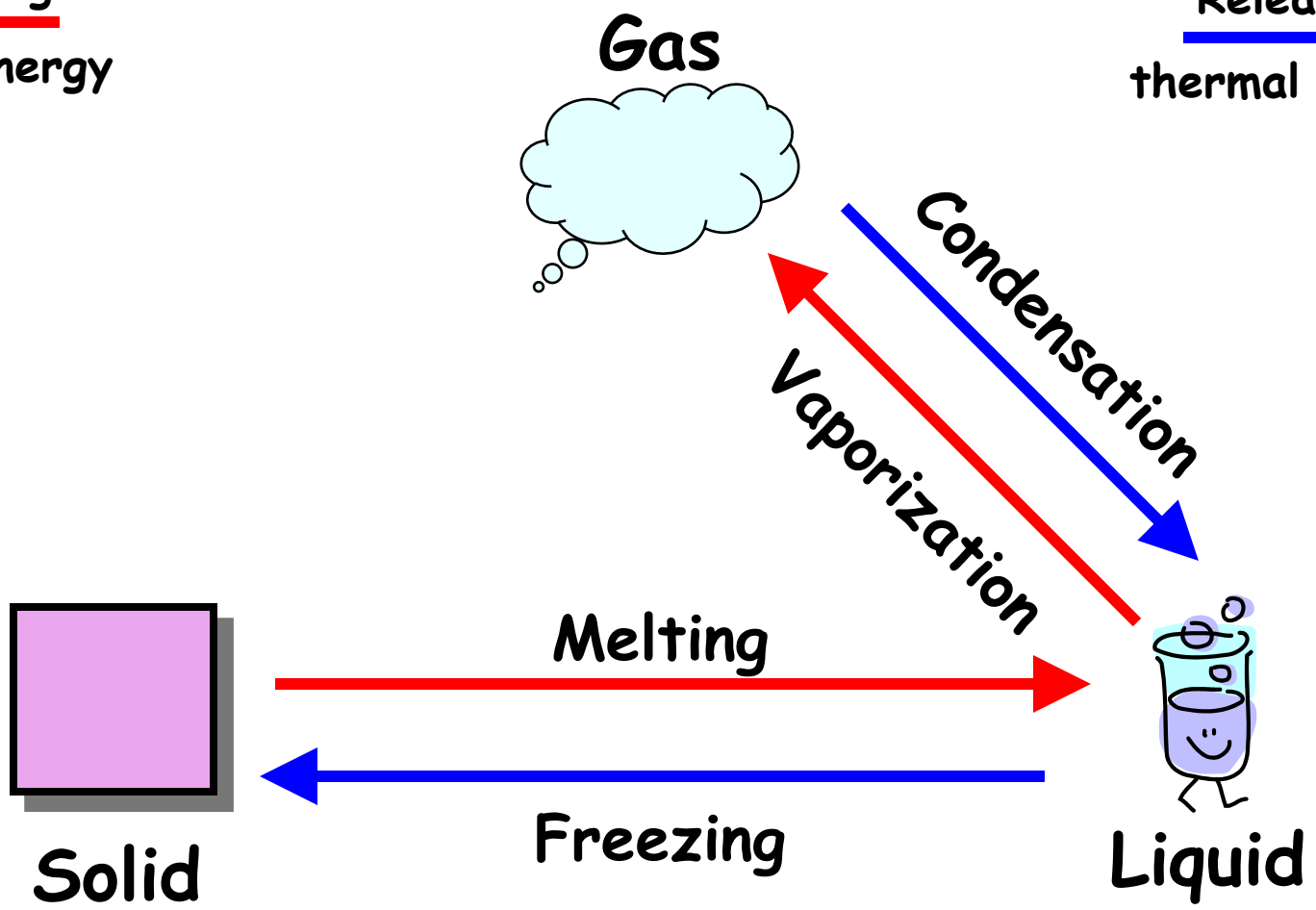
Evaporation

- Evaporation, which occurs at temperatures below the boiling point, explains how puddles dry up.
- It takes more than speed for water molecules to escape the liquid state.
- During evaporation, these faster molecules also must be near the surface, heading in the right direction, and they must avoid hitting other water molecules as they leave.

State Change Pyramid

Absorbing thermal energy

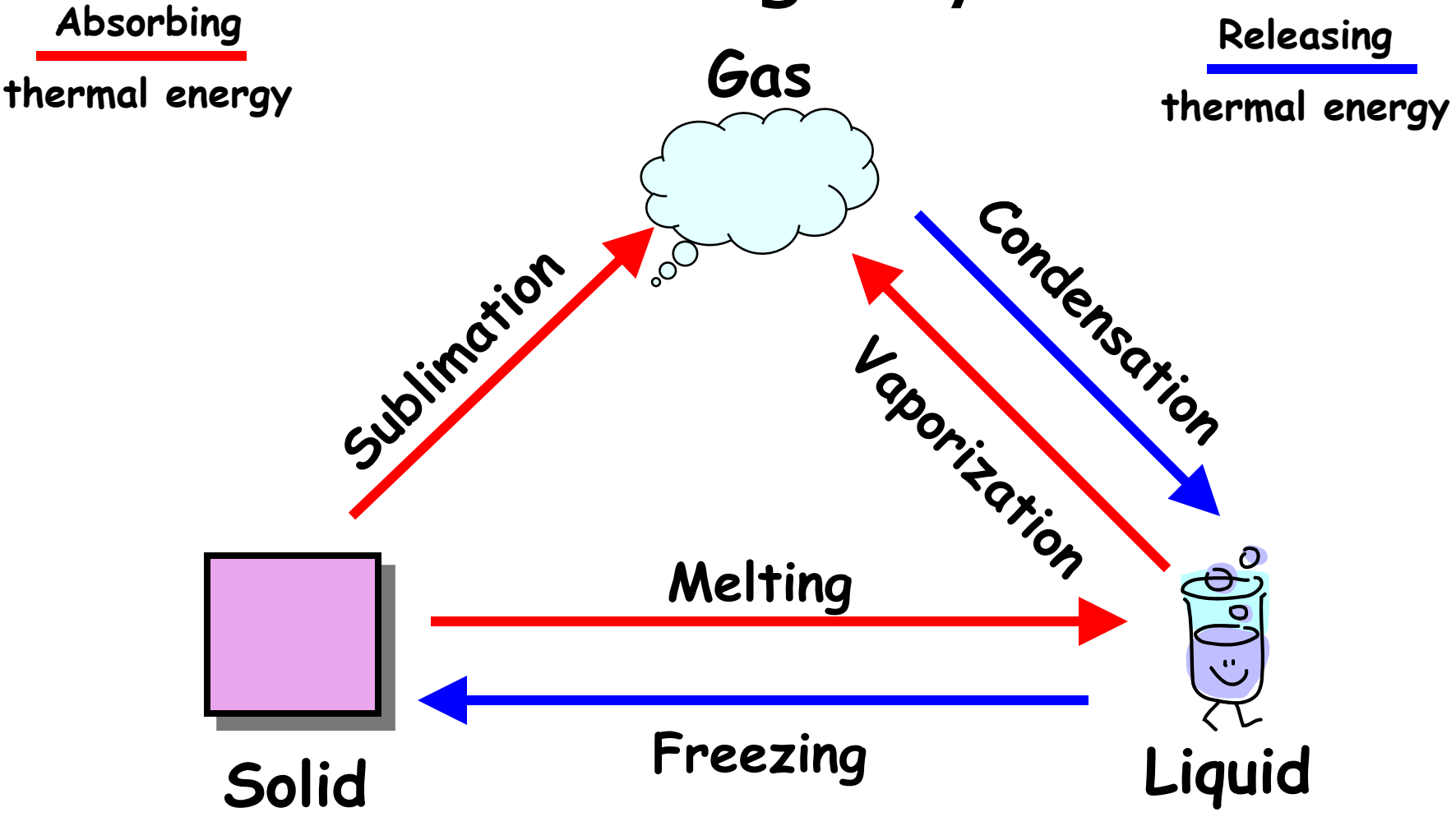
Releasing thermal energy



Condensation

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

State Change Pyramid



Sublimation

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

Picture from http://www.ehow.com/how_2098268_fogsmoke-dry-ice-halloween.html