

Notes - Phases of Matter

Solids

- do not readily change shape.
- experience small changes in volume when heated or subjected to pressure.
- all particles are packed into a given volume in a highly organized and rigid manner which requires particles to be in direct contact with one another.

Liquids

- conforms to the shape of the container.
- experience only slight changes in volume when heated or subjected to pressure.
- particles are in close contact with each other but have enough room to slide past one another easily and prevent organized packing.

Gases

- conform to the shape of the container.
- experience drastic changes in volume when heated or subjected to pressure.
- particles are widely spread out and only contact each other during collisions.

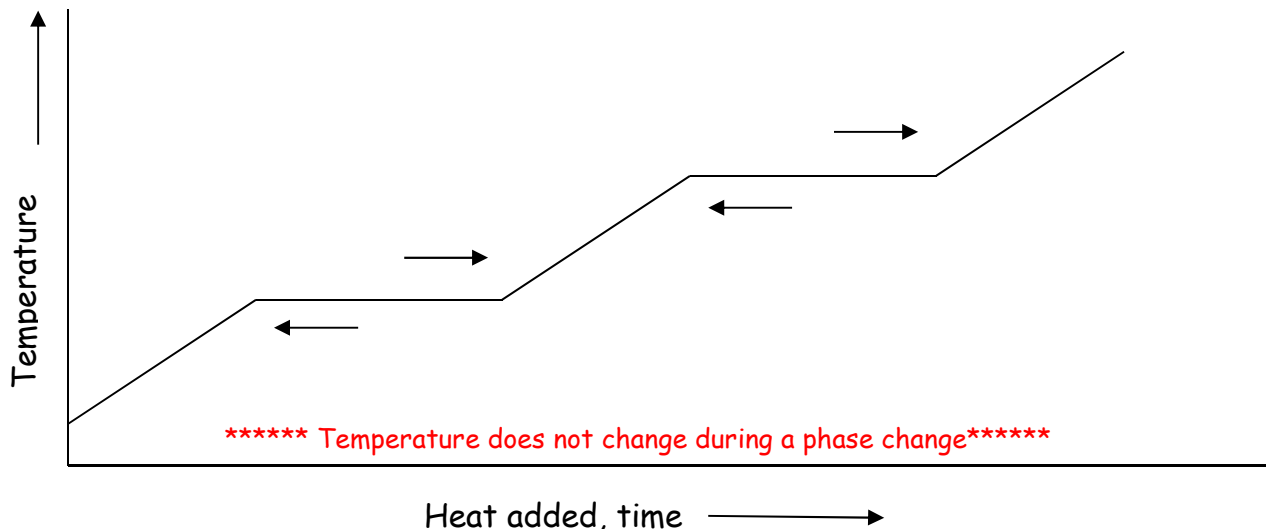
Matter may undergo 2 types of change;

- 1.) Chemical change - a new substance is produced.
- 2.) Physical change - change in phase or state such that no new substances are formed.

Phase Changes

- In general, heating a solid produces the following temperature behaviour:

Heating Curve



- Whenever there is a slope on the graph, all the heat is used to warm the substance so the temperature rises. Whenever there is a level region (slope = 0) on the graph, added heat (energy) is used to change the phase.

- Melting temperature - temperature at which solids change to a liquid.

- Freezing temperature - temperature at which liquids change to a solid.

*** The melting and freezing temperatures for a pure substance are the same temperature. At this temperature the solid and liquid co-exist.

- Boiling temperature - temperature at which the vapour pressure (pushing force) overcomes the air pressure allowing a liquid to change to a gas.

- Condensation temperature - temperature at which a gas changes to a liquid.

*** The boiling and condensation temperatures for a pure substance are the same temperature. At this temperature the liquid and gas co-exist.

*** Remember

evaporation = liquid → gas	condensation = gas → liquid
freeze (solidify) = liquid → solid	melt = solid → liquid
sublime or sublimation = solid → gas	deposition = gas → solid

Kinetic Energy in Physical Changes

- Molecules are constantly in motion. The energy they possess allowing them to be moving is called kinetic energy. **NOTE** - if molecules have zero kinetic energy they are at the lowest energy state possible called absolute zero (0 K or -273°C).

- Molecules express this kinetic energy through **3 forms**:

1.) Rotational energy (E_{rot}) - causes a molecule to rotate or spin.

2.) Vibrational energy (E_{vibe}) - causes a molecule to move rapidly in short displacement back and forth its individual bonds.

3.) Translational energy (E_{trans}) - causes a molecule to move in a straight line.