

Matter and mass:

Matter: anything that takes up space and has mass

Density formula: Density = mass/volume

Law of conservation of mass: Mass cannot be created nor destroyed but it can be transformed from one form to another

Classification of matter:

Atoms: An atom is a particle of matter that uniquely defines a chemical element

Elements: The purest form of a substance

Compounds: 2 or more different chemically bonded elements

Mixtures: 2 or more different physically bonded elements

Pure & impure substances: pure substances are substances that are only made up of one type of atom,. Impure substances are substances that are made up of more than one type of atom

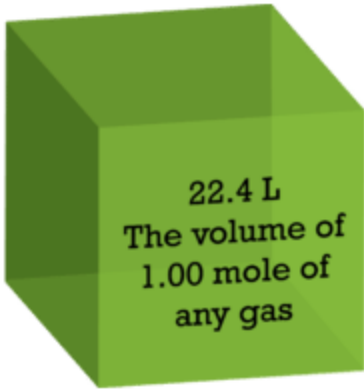
States of matter:

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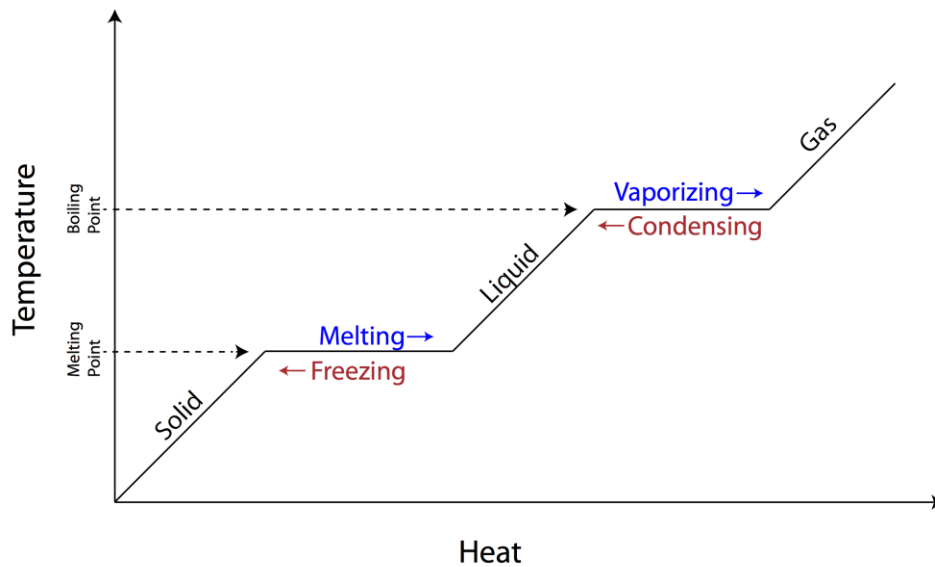
- **Solids** – relatively rigid, definite volume and shape. In a solid, the atoms and molecules are attached to each other. They vibrate in place but don't move around.
- **Liquids** – definite volume but able to change shape by flowing. In a liquid, the atoms and molecules are loosely bonded. They move around but stay close together.
- **Gases** – no definite volume or shape. The atoms and molecules move freely and spread apart from one another.

STP and gas volume:

Standard temperature and pressure (STP) is defined as 0oC (273.15K) and 1atm pressure. The molar volume of a gas is the volume of one mole of a gas at STP . **At STP, one mole (6.02×10²³ representative particles) of any gas occupies a volume of 22.4L** (figure below).



Changes of State From a Graph:



Kinetic Theory:

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There are 2 parts to kinetic theory:

1. the temperature of a substance increases with an increase in either the average kinetic energy of the particles or the average potential energy of separation (as in fusion) of the particles or in both when heat is added
2. the particles of a gas move in straight lines with high average velocity, continually encounter one another and thus change their individual velocities and directions, and cause pressure by their impact against the walls of a container

Kinetic Theory Interconversion:

During the interconversion of a solid into a liquid and liquid into gas on increasing temperature, the kinetic energy of the molecules increases and force of attraction among molecules decreases and vice-versa.

solid < liquid < gas

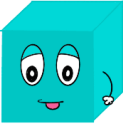
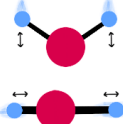


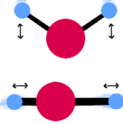

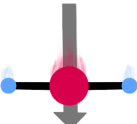

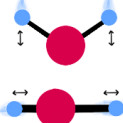

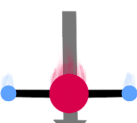
Kinetic Theory movement of particles:

An increase in average kinetic energy or average potential energy as well as an increase in temperature will occur if heat is added. This means that an increase in temperature and average energy both occur simultaneously, so they will be proportional to one another.

Particle Movement

Particle Movement

Permitted Movements in Different Phases

Phase of Matter	Permitted Movement		
 Solid	 Vibrational	 Rotational	
 Liquid	 Vibrational	 Rotational	 Translational
 Gas	 Vibrational	 Rotational	 Translational

Diffusion:

The movement of a fluid from an area of higher concentration to an area of lower concentration.

Factors that affect the movement of particles:

1. Temperature: An increase in temperature increases the rate of diffusion as it increases the energy of the particles, enabling them to move faster.
2. Concentration Difference: A higher concentration difference will result in a faster rate of diffusion, as a lot more diffusion needs to take place.
3. Diffusion Distance: The shorter distance the particles must move, the faster they will be able to diffuse.
4. Mass of the Molecule: The more mass a molecule has, the rate of diffusion will decrease, as greater mass means that more energy is required to move it.

Link between rate of diffusion & molecular mass

The more mass a molecule has, the more the rate of diffusion will decrease, as greater mass means that more energy is required to move it

Meniscus and parallax error:

Meniscus:

The effect when a liquid forms a small curve at the top in beaker where it's meant to be measured. Measure from the middle of the curve to get the right reading.

Parallax Error:

This happens when you measure with your eyes at a different perspective causing you to get the wrong reading.

Always ensure that the measuring cylinder is placed on a flat surface and crouch down to ensure that you are at eye level with the measurement.