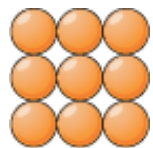


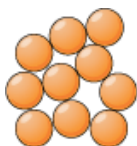
### 3. Particle model.



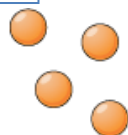
Solid

Particles can only **vibrate** around a **fixed position**. Particles are closely packed in a regular arrangement. They are the most dense.

Liquid



Particles are **closely packed** in an **irregular arrangement**. Particles are able to move relative to each other.

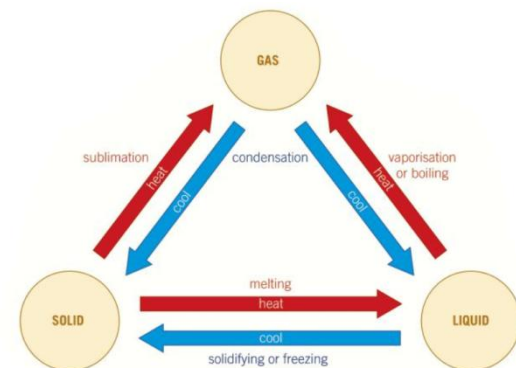


Gas

Particles are widely spread in a **irregular arrangement**. They move in **random directions** with a **range of speeds**. They are the least dense.

### Equations

$$\text{Density (kg/m}^3\text{)} = \text{Mass (kg)} / \text{Volume (m}^3\text{)}$$



### Definitions

**Density** is the mass per unit volume of an object.  
**Physical change** - Doesn't produce any new substances.

**Chemical change** - Produces new substances.

**Internal energy** - the total kinetic and potential energy of all the particles which make up a system.

**Potential energy** - the energy of an object due to its position. When the particles move further apart the bonds have to be broken and this energy goes into the potential store.

**Temperature** - a measure of the kinetic energy of particles.

**Specific heat capacity** - the amount of energy needed to raise the temperature of 1 kg of a substance by 1 degree Celsius.

**Specific latent heat** - the energy needed for a substance to change the state of one kilogram of the substance with no change in temperature.

**Specific latent heat of fusion** - energy needed to change 1kg of substance between solid and liquid.

**Specific latent heat of vaporisation** - energy needed to change 1kg of matter between liquid and gas.

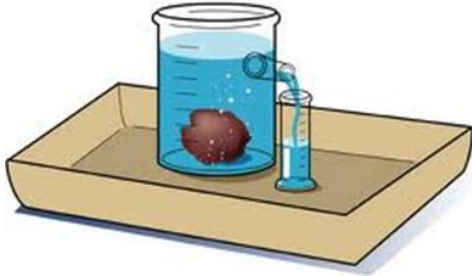
### Pressure in gases

- The temperature of a gas is related to the average kinetic energy of the molecules.
- When molecules collide with the wall of their container they exert a force.
- The total force from all the molecules inside the container on a unit area is the pressure.
- Changing the temperature of a gas at a constant volume changes the pressure.
- Transferring energy by applying a force does work on a gas and increases the internal energy. This can increase the temperature.

### Triple only:

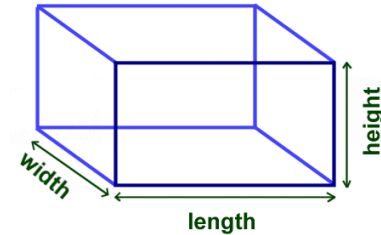
- Pressure produces a net force at right angles to the wall of the container.
- Increasing the volume at a constant temperature decreases the pressure.

## Irregular shape solid



- Measure the mass using a balance.
- Fill the displacement can with water above the spout and wait for it to stop dripping.
- Place a measuring cylinder under the spout.
- Place the object into the water.
- Measure the volume of water, this is the same as the volume of the object.
- Divide mass by volume to calculate density.

## Regular shape solid



- Measure the mass using a balance.
- Measure the length, width and height using a ruler.
- Multiply them together to get the volume.
- Divide mass volume to calculate density.