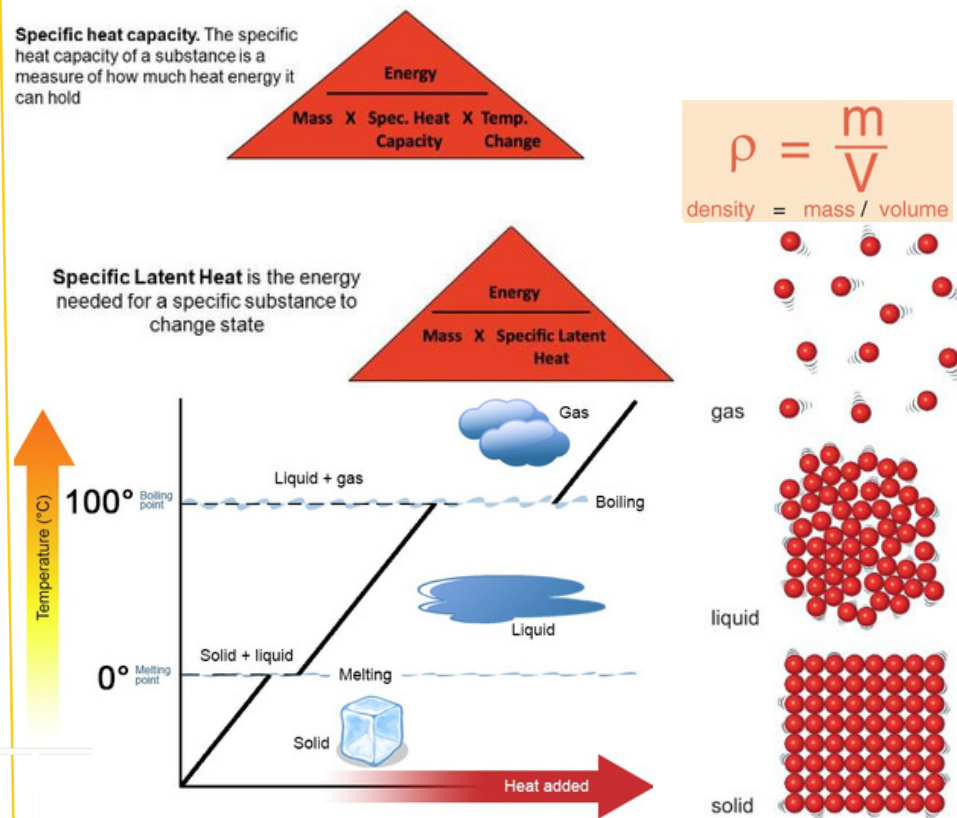


- 1 **The three states of matter are solid, liquid and gas.**
- 2 In **solid** the **forces of attraction** hold particles close together, the particles vibrate but cannot move freely. Solids have a fixed shape, do not flow and usually cannot be **compressed**.
- 3 In **liquid** the **forces of attraction** between particles is less than solids, the particles are free to move and can **flow**. Liquids take the shape of their container but usually cannot be **compressed**.
- 4 In gases the particles are far apart and moving very fast. The forces of attraction between particles is very small. Gases are **compressible** and expand to fill their container.
- 5 A **change of state** is where a substance changes the arrangement of particles e.g. solid to a liquid. Mass is **conserved**. This is **physical change** that can easily reversed.
- 6 Density (ρ) is the mass of substance (number of particles) in a given volume. Units are Kg/m^3 . Solids are usually denser than liquids.
- 7 Energy transferred to a substance is stored in the movement of the particles, called **thermal energy**.
- 8 **Temperature** is a measure of how fast particles move in a substance.
- 9 The amount of **thermal energy stored** in an object depends on its temperature, mass and the material it is made from. **Specific heat capacity (c)** is the amount of energy it takes to increase the Temperature of 1kg of the substance by 10°C .
- 10 **Heating curves** show temperature changes over time. Where the temperature stays constant the energy being given to the substance is being used to overcome the forces between particles.
- 11 Flat parts (**plateaux**) of a heating curve show a **change of state** occurring.



- 16 **Specific latent heat is the energy taken to make 1Kg of substance change state.**
- 17 **Specific latent heat of melting** is the energy taken to make 1kg of solid change into liquid.
- 18 **Specific latent heat of evaporation** is the energy taken to make 1kg of liquid change into a gas.
- 19 **Temperature** of a gas is a measure of the **average kinetic energy (KE)** of the particles of a gas

1

Pressure of a gas is due to the gas particles colliding (hitting) the sides of the container.

2

Heating a gas increases the KE of the gas particles, this increases the temperature of the gas.

3

For a fixed mass of gas in a fixed volume, pressure increases when the temperature increases. As the gas particles move faster, hitting the sides of the container more, with more force.

4

Pressure is force per unit area. Its units are **pascals (Pa)** $1\text{Pa} = 1\text{Nm}^2$

5

Gas pressure decreases as the temperature of a gas decreases. **Absolute zero** is the temperature at which a gas would not exert a pressure as the particles are no longer moving. **Absolute zero = -273°C or 0 K (kelvin)**

6

The **kelvin temperature scale** measures temperatures relative to absolute zero. Convert **Celsius ($^\circ\text{C}$)** to **Kelvin (K)** by subtracting 273. Convert from Kelvin to degrees Celsius add 273.

7

Average kinetic energy of particles is directly proportional to the kelvin temperature of a gas.

8

Decreasing the volume of a gas (fixed mass) at a fixed temperature will increase the pressure as there will be more collisions on the sides of the container.

9

Increasing the volume of a gas (fixed mass) at a fixed temperature will decrease the pressure.

11

To calculate the pressure or volume for gases of fixed mass at constant temperature we use: **$P_1 \times V_1 = P_2 \times V_2$** P = pressure V = Volume

12

When force is transferring energy to a gas e.g. using a bicycle pump, the energy is called **work done**. The energy transferred increases the energy of gas particles so increases the temperature of the gas. (the temperature of bicycle pump will go up as it is used).

