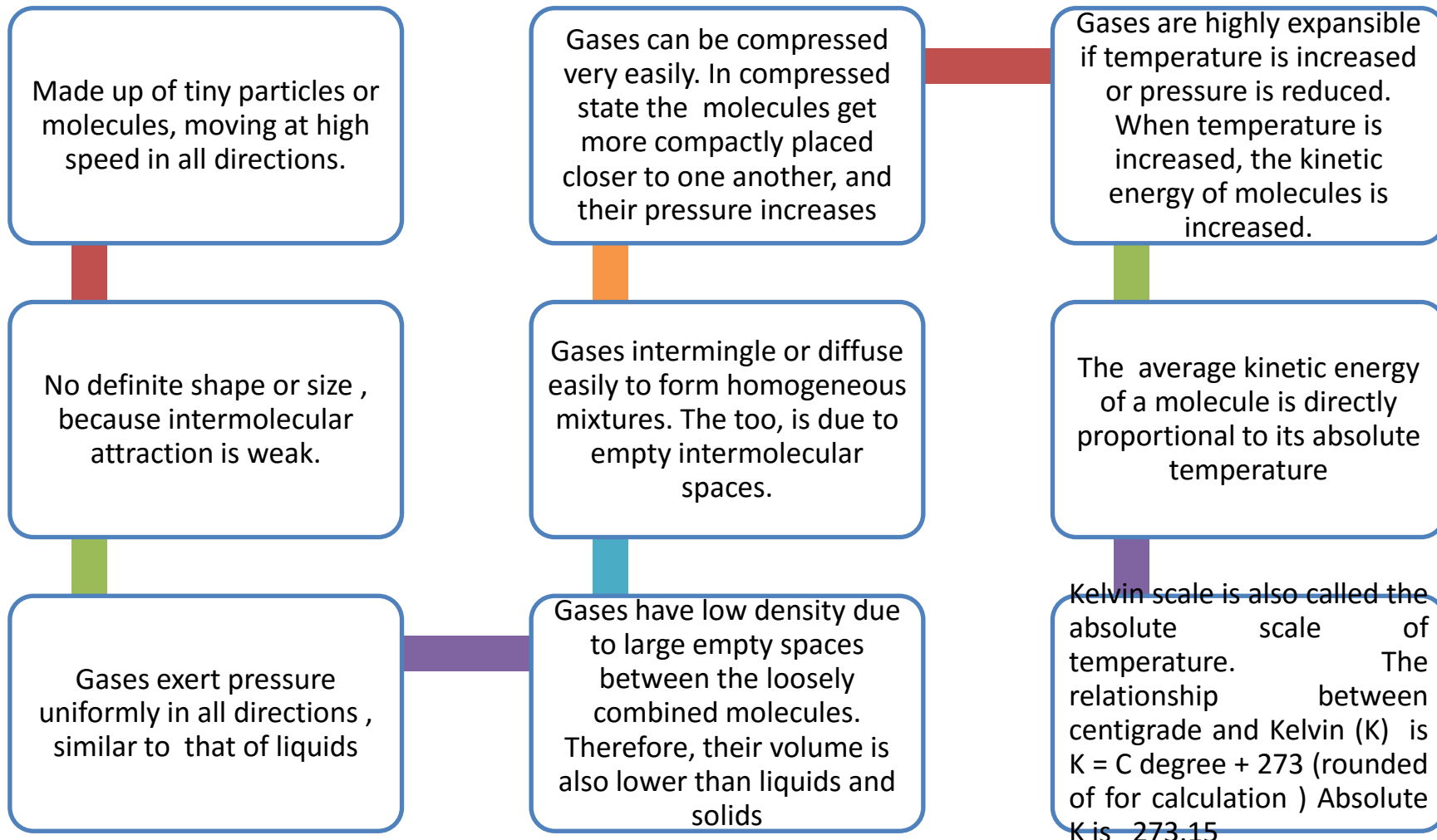


# Gas Laws

## Fundamentals of Chemistry

# Properties of Gases as per Kinetic molecular theory of matter



# Gas Laws

Volume of gas depends on temperature and pressure. Gas Law states that the volume (V) of a gas is the space occupied by that gas. It is equal to the volume of the container. Units of volume are litre (L), cubic decimetre ( dm<sup>3</sup>), cubic centimetre ( cm<sup>3</sup>), millilitre ( ml)

Pressure is the force per unit area exerted by the gas molecules on the walls of the container.

Units of pressure are (a) atmosphere ( atm); (b) height of mercury column in millimetre ( mm Hg), in centimetre ( cm Hg), in torr; (c) Pascal (Pa); and Bar. On standard atm = pressure exerted by exactly 76 cm Hg = 760 mm Hg = 760 torr. 1 atm = 101.325 kPa = 1 bar

- **Relationship** of Pressure and Volume: If pressure is doubled, volume gets halved. If pressure is halved, volume gets doubled.

Temperature is the intensity of heat or hotness of a gas. Heat flows from hot region to cold region until the temperature is equalised. Units of temperature are Degree celsius (C) and Kelvin (K). For graph of Boyle's law problems, volume is plotted on X axis, Pressure on Y axis, while temperature is constant.

- **Boyle's Law states** : (a) "At a constant temperature, the volume of a fixed mass of gas is inversely proportional to its pressure."
- If V is volume, P is pressure and K is temperature then for Boyle's law  $V = K / P$ .

# Charles's Gas Laws

Air expands on heating and contracts on cooling

The proportion by which the volume changes is not the same at change of temperature.

Charles' Law: " the volume of a given mass of a dry gas is directly proportional to its absolute temperature (K) if the pressure is kept constant"

Absolute Zero: the volume of a gas would be reduced to zero at minus 273 degree Celsius. The temperature of -273 degree C is called absolute zero.

In theory absolute zero is the lowest temperature that can be reached. At this point, all molecular motions cease . In practice , this temperature cannot be attained as all gases liquefy on cooling.

Zero K = -273 degree C;  
Boiling point of water = 100 degree C =  $100 + 273 = 373$  K;  
Melting point of water = 0 degree C + 273 = 273K All temperatures on Kelvin scale are positive.