3.2 GAS PARTICLE INTERACTION

Gas is one of the four fundamental states of matter (the others being solid, liquid and plasma). A pure gas may be made up of individual atoms (e.g. a noble gas like neon), elemental molecules made from one type of atoms (e.g. Oxygen), or compound molecules made from a variety of atoms (e.g. carbon dioxide)

- A gas mixture, such as air, contains a variety of pure gases. What distinguishes a gas from liquids and solids is the vast separation of the individual gas particles.
- This separation usually makes a colorless gas invisible to the human observer.
- The interaction of gas particles in the presence of electric and gravitational fields are considered negligible, as indicated by the constant velocity vectors in the image.
- The gaseous state of matter is found between the liquid and plasma states, the latter of which provides the upper temperature boundary for gases.
- Bounding the lower end of the temperature scale lie degenerative quantum gases, which are gaining increasing attention.

Physical properties/ Macroscopic characteristics:

Most gases are difficult to observe directly, they are described through the use of four physical properties or macroscopic characteristics:

  - Pressure
  - Volume
  - Number of particles
  - Temperature

- Gas particles are widely separated from one another, and consequently, have weaker intermolecular bonds than liquids or solids.
- These intermolecular forces result from electrostatic interactions between gas particles.
- Like-charged areas of different gas particles repel, while oppositely charged regions of different gas particles attract one another; Gases that contain permanently charged ions are known as plasmas.

- Gaseous compounds with polar covalent bonds contain permanent charge imbalances and so experience relatively strong intermolecular forces, although the molecule while the compound's net charge remains neutral.
- Transient, randomly induced charges exist across non- polar covalent bonds of molecule and electrostatic interactions caused by them are referred to as Vandar Waals forces.
- The interaction of these intermolecular forces varies within a substance which determines many of the physical properties unique to each gas.
- A comparison of boiling points for compounds formed by ionic and covalent bonds leads as to this conclusion.
- The drifting smoke particles in the image provide some insight into low – pressure gas behavior.
- Compared to the other states of matter, gases have low density and viscosity. Pressure and temperature influence the particles within a certain volume.
- This variation in particle separation and speed is referred to as compressibility. This particle separation and size influences optical properties of gases as can be found in the following list of refractive indices.
- Finally, gas particles spread apart or diffuse in order to homogeneously distribute themselves throughout container.