Chapter = 07

Properties of Matter

Q1. Discus the kinetic postulate of solid

KINETIC POSTULATE OF SOLID

1. The molecules are closely packed together and occupy minimum space.
2. The molecules usually arranged in a regular pattern called lattice.
3. There is a large number of particles per unit volume. That is why solids have the highest densities.
4. The forces of attraction between particles are very strong.
5. The particles are not able to change positions.
6. The particles vibrate about fixed positions thus are not entirely stationary.
7. This explains why solids have fixed shapes and volumes.

Q2. Discus the kinetic postulate of liquid

KINETIC POSTULATE OF LIQUID

1. The molecules are slightly further apart compared to that of solids.
2. The molecules occur in clusters
3. There is slightly less number of particles per unit volume compared to solids.
4. This why liquids have relatively high densities.
5. The forces of attraction between particles are strong.
6. The particles are free to move about within the liquid.
7. These features explain why liquids have fixed volumes, but take the shape of the container.

Q3. Discus the kinetic postulate of gas

KINETIC POSTULATE OF GAS

1. The molecules are very far apart.
2. The molecules are arranged randomly and are free to move with very high speeds.
3. There is small number of particles per unit volume.
4. The forces of attraction between particles are negligible. The particles are able to move freely in random directions at very high speeds.
5. The particles occupy any available.

Q4. What is Brownian motion

BROWNIAN MOTION

He observed the irregular motion of pollen grains suspended in water and deduced that the water molecules were in constant, random motion. This irregular motion caused by water molecules is called "Brownian motion" named after the scientist.

Q5. State Boyle's Law

BOYLE'S LAW

The volume of a fixed mass of a gas is inversely proportional to its pressure, provided its temperature remains constant.

Q6. In which state of matter the molecules are widely separated?

Ans. In gasses

Q7. In which state of matter the molecules are most closely packed?

Ans. In liquid state

Q8. In which state of matter molecules can move freely at high speed?

Ans. In solid

Chapter = 07

Numerical Problems

Numerical # 1

The pressure on $9cm^3$ of oxygen gas is doubled at a fixed temperature. What will its volume become?

Data

$V_1 = 9cm^3$

$P_1 = P$

P_2 = Double = 2P

V_2 = ?

Solution

$P_1V_1 = P_2V_2$

$P \times 9 = 2P \times V_2$

$\frac{9}{2} = V_2$

$V_2 = 4.5\ cm^3$

Numerical # 2

A container holds $30m^3$ of air at a pressure of 150000Pa. If the volume changed to $10m^3$ by decreasing load on the piston. What will the pressure of the gas become? Assume that its temperature remains constant.

Data

$V_1 = 30m^3$

P_1 = 150000 pa

$V_2 = 10m^3$

P_2 = ?

Solution

$P_1V_1 = P_2V_2$

$150000 \times 30 = P_2 \times 10$

$4500000 = 10P_2$

$P_2 = \frac{4500000}{10}$

P_2 = 450000 pa

Numerical # 3

Air at atmospheric pressure of 760 mm of Hg is trapped inside a container available with a moveable piston. When the piston is pulled out slowly so that the volume is increased from $100dm^3$ to $150dm^3$, the temperature remaining constant. What will be the pressure of the air becomes?

Data

P_1 = 760 mm of Hg

$V_1 = 100dm^3$

$V_2 = 150dm^3$

P_2 = ?

Solution

$P_1V_1 = P_2V_2$

$760 \times 100 = P_2 \times 150$

$P_2 = \frac{76000}{150}$

P_2 = 506.66 mm of Hg

Numerical # 4

A cylinder contains $60cm^3$ of air at a pressure of 140kPa. What will its volume be if the pressure on it is increased to 420 kPa?

Data

P_1 = 140 kPa

$V_1 = 60\ cm^3$

P_2 = 420 KPa

V_2 = ?

Solution

$P_1V_1 = P_2V_2$

$140 \times 600 = 420 \times V_2$

$V_2 = \frac{84000}{420}$

$V_2 = 200\ cm^3$

Numerical # 5

Air at a pressure of 1.0×10^5 Pa is contained in a cylinder fitted with a piston. The air is now compressed by pushing the piston, so that the same mass of air now occupies one-fifth the original volume without any change in temperature. Calculate the pressure of the air.

Data

$P_1 = 1.0 \times 10^5$ Pa

$V_1 = V$

$V_2 = \frac{1}{5} V = 0.2V$

$P_2 = ?$

$P_1V_1 = P_2V_2$

$1 \times 10^5 \times V = P_2 \times 0.2\ V$

$\frac{100000}{0.2} = P_2$

$P_2 = 500000$ Pa OR 5×10^5 Pa