SSLC -Chemistry -Class -15

Unit 2 : Gas Laws and Mole Concept

Avagadro's Law

> At constant temperature and pressure, the volume of a gas is directly proportional to the number of molecules.

Relationship between volume of a gas and moles

In the case of gases, at a given pressure and temperature, the volume of a gas depends upon the number of molecules, and not on the type and size of the molecules.

So, whatever gas may it be at the same conditions of pressure and temperature, if the number of molecules are the same, their volume also is the same.
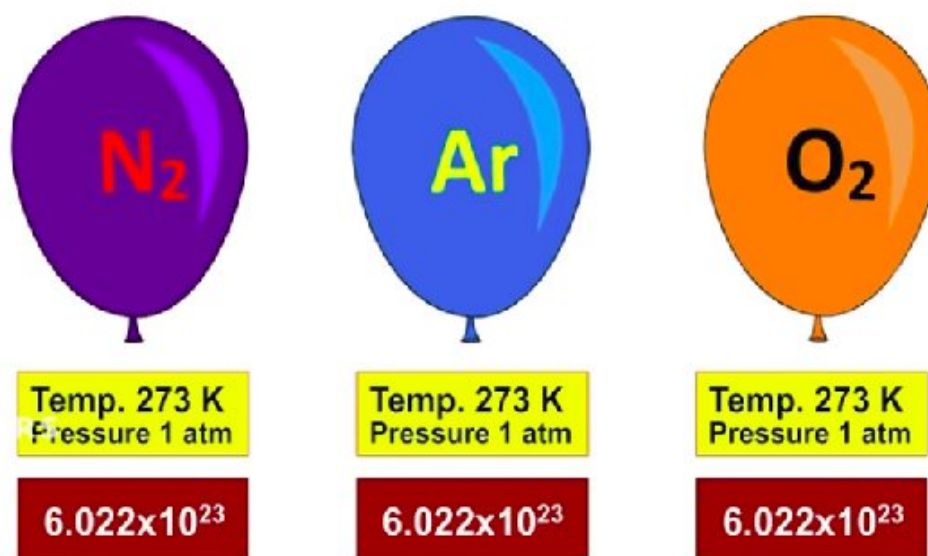
> One mole of any gas under the same conditions of temperature and pressure will contain the same number of molecules and hence their volume will also be the same. This is called **molar volume** of the gas.

Scientists experimentally proved that the volume of 6.022×10^{23} molecules (1 mol) of any gas at 273K and 1 atm pressure occupies 22.4 litres.

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273 K temperature and 1 atm pressure are known as standard temperature and pressure or STP.

That is, at STP one mole of any gas will occupy a volume of 22.4 L. This is called molar volume at STP.

Let us consider 3 balloons containing one mole each of gases Nitrogen, Argon, and Oxygen taken at constant temperature and pressure.(STP)

Temp. 273 K Pressure 1 atm	Temp. 273 K Pressure 1 atm	Temp. 273 K Pressure 1 atm
6.022×10^{23}	6.022×10^{23}	6.022×10^{23}

Each balloon contains same number of molecules.
So according to Avagadro's law the volume will be the same. This will be 22.4L (Molar volume)

Equal volume contains equal number of molecules.

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Questions

1) . Calculate the number of moles in 22.4L of CO_2 gas at STP.

2) . Calculate the volume of 85g of Ammonia at STP ? (Molecular mass -17)

3). 2 moles of Nitrogen gas (N_2) is taken in a container at STP.

 a) Calculate the number of molecules present in the sample ?

 b) Find out the volume of the gas .

 c) Calculate the mass in grams .

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