STD 10– FIRST BELL – CHEMISTRY – CLASS-15

Chapter 2

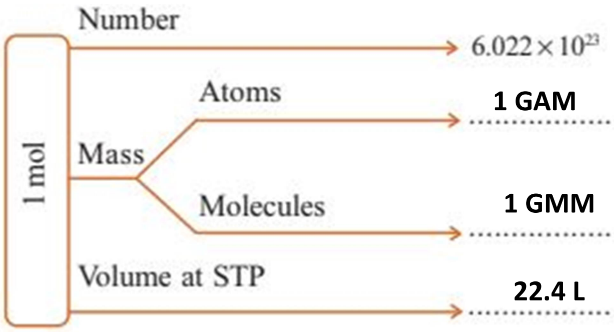
GAS LAW AND MOLE CONCEPT

Relation between volume of a gas and moles.

- In gases molecules are very distant apart. Compared to the size of the molecules the distance between them is much greater.
  - In 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.
  - 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.
- In gas law, if there are changes in pressure and temperature, the volume is also changed.
  - Scientists experimentally proved that the volume of 6.022×10^{23} molecules (1 mol) of any gas at 273K and 1atm pressure occupies 22.4 litres.
  - 273K temperature and 1 atm pressure are known as standard temperature and pressure or STP.
  - At STP one mole of any gas will occupy a volume of 22.4L. This is called molar volume at STP.

Gas	Volume
One mole of Hydrogen at STP	22.4L
One mole of Nitrogen at STP	22.4L
One mole CO_2 at STP	22.4L
One mole H_2O at STP	22.4L
One mole NH_3 at STP	22.4L

- Number of moles of gas at STP= $\frac{\text{Volume in litres at STP}}{22.4L}$



Questions and Answers

1. Calculate the no of molecules in 44.8L of oxygen at STP.
   - Number of moles= $\frac{\text{volume in liters}}{22.4}$

     $= \frac{44.8}{22.4}$

     = 2 mole

   Number of molecules in 1 mole oxygen=6.022×10^{23}

   Number of molecules in 2 mole oxygen=$2 \times 6.022 \times 10^{23}$

2. a) Calculate the mass of 112L CO_2 gas kept at STP (molecular mass=44).
   b) How many molecules of CO_2 are present in it?
   - a) No of moles in 112L CO_2= $\frac{112}{22.4}$

     = 5 mole.

     Mass of the gas = No of moles × GMM

     = 5×44= 220g

   - b) No of molecules = $5 \times 6.022 \times 10^{23}$

3. 112L CO_2 and 85g NH_3 at STP Is given. (Atomic mass C =12, O=16, N=14&H=1)
   a) Calculate number of molecules in sample
   b) Calculate the volume of NH_3
   - a) No of moles in 112L CO_2 = $\frac{\text{volume at STP}}{22.4}$

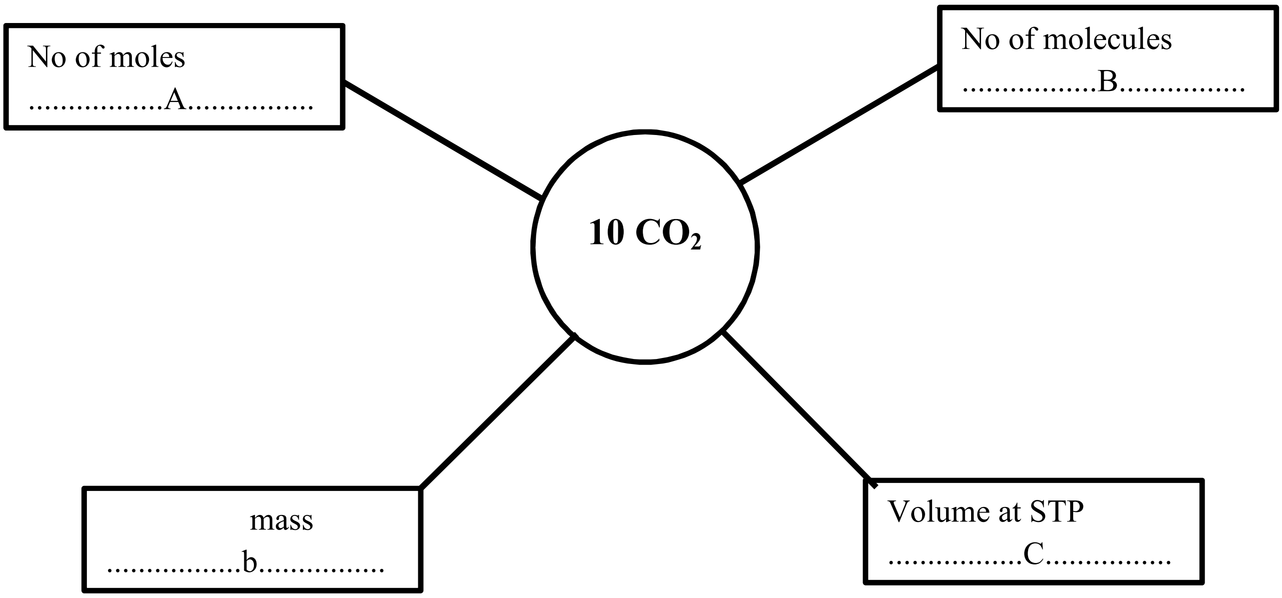
     $= \frac{112}{22.4} = 5$ mole.

     No of moles in NH_3 = $\frac{85}{17}$ =5 mole.

- b) Volume at STP = No of moles ×22.4
  = 5×22.4= 112L

HOME WORK

1. Complete the word diagram



2. Arrange the following in the decreasing order of number of molecules.
   a) 160g Oxygen gas.
   b) 67.2 L NH_3 at STP.
   c) 4 G MM Nitrogen.

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