D. B. College (Jaynagar) Lect.- 22

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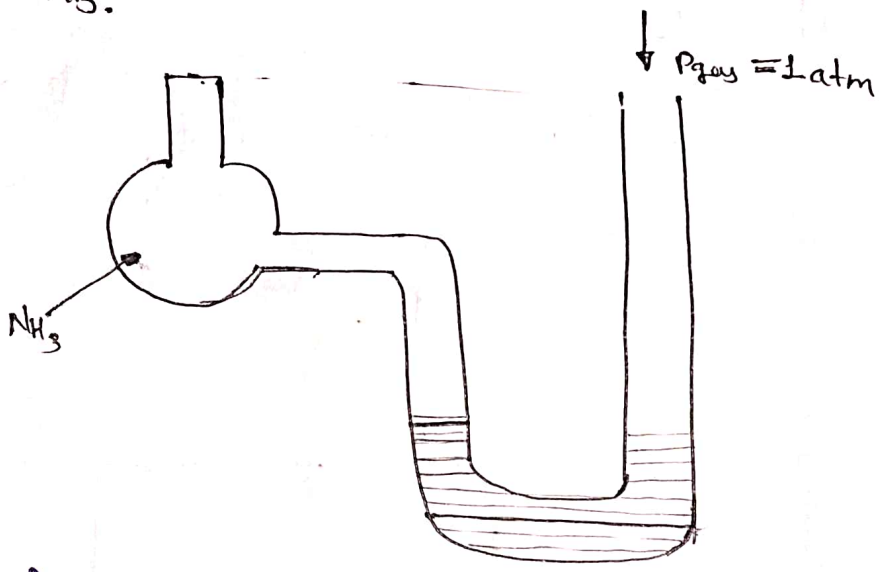
Part-I

GASEOUS STATE (Sub)

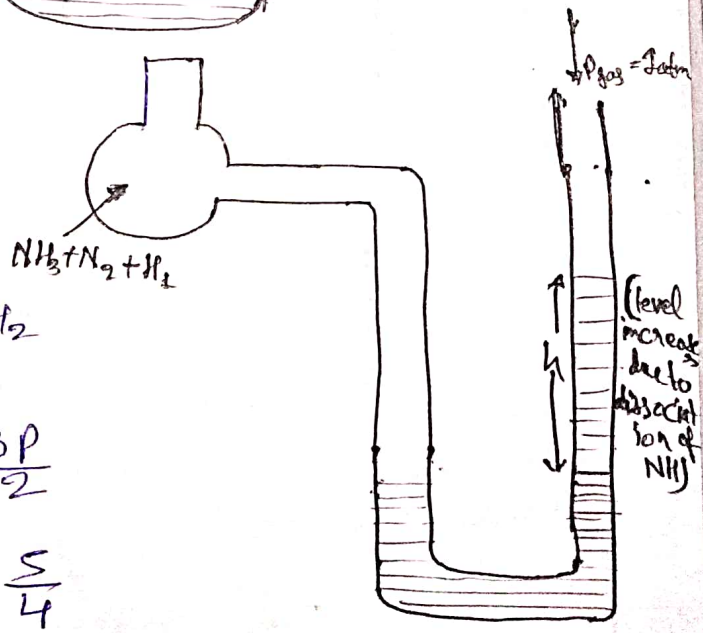
Illustration

1. A manometer attached to a flask contains NH_3 gas have no difference in Hg level initially as shown in diagram. After sparking into the flask there is difference of 19 cm in the mercury level in two column manometer. Calculate % dissociation of NH_3.



Sol^n. $P_{NH_3} = 1$ atm

$P_{NH_3} + P_{N_2} + P_{H_2} = 1 + \frac{19}{76} = \frac{5}{4}$ atm



$2NH_3 \rightarrow N_2 + 3H_2$

Before sparking 1 atm

After sparking $(1-P)$ $\frac{P}{2}$ $\frac{3P}{2}$

$P_{final} = 1 - P + \frac{P}{2} + \frac{3P}{2} = \frac{5}{4}$

or $P = \frac{1}{4}$

% dissociation $= \frac{1/4}{1} \times 100 = 25\%$.

Density:

Density may be defined as mass per unit volume

$$d = \frac{m}{V}$$

Units:

CGS : g/cm^3

MKS : kg/m^3

Relation: $1\ kg/m^3 = 10^{-3}\ g/cm^3$

Note: 1. Mass, volume and no. of moles are extensive properties (that depend on mass) hence additive in nature.

2. Density, Pressure and Temperature are intensive properties (they does not depend on mass) hence non-additive in nature.

Illustration

1. In a barometeric tube Hg is replaced by H_2O then find the height of H_2O column. Assume that vapour pressure of H_2O in negligible.

Sol. $h_1 d_1 g = h_2 d_2 g$

$h_1 d_1 = h_2 d_2$

$76 \times 13.6 = h_2 \times 1$

$h_2 = 1033.6\ cm$

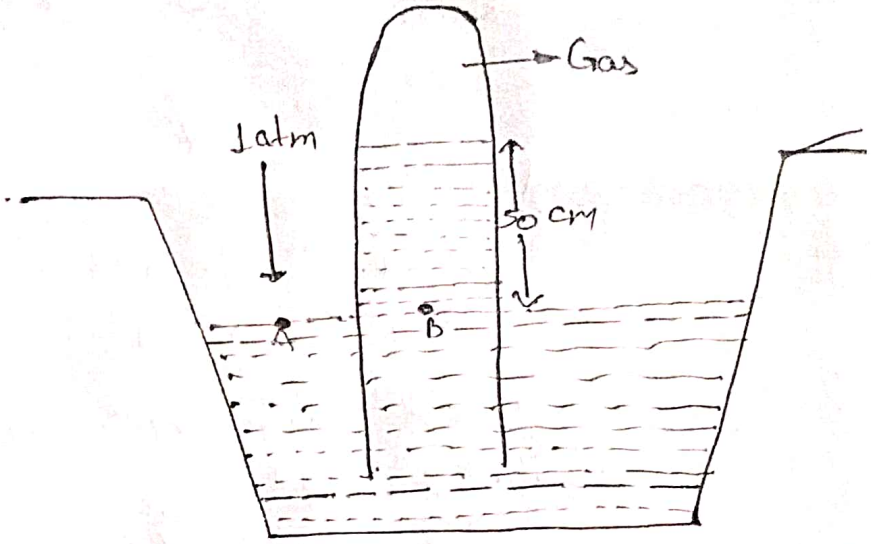
[$d_{Hg} = 13.6\ g\ ml^{-1}$]

[$d_{H_2O} = 1\ g\ ml^{-1}$]

$= 10.336\ m$

Note: Density of Hg is high so column of small height is required.

2. Calculate the pressure of the gas in following arrangement



$P_A = P_B$

At the equilibrium position

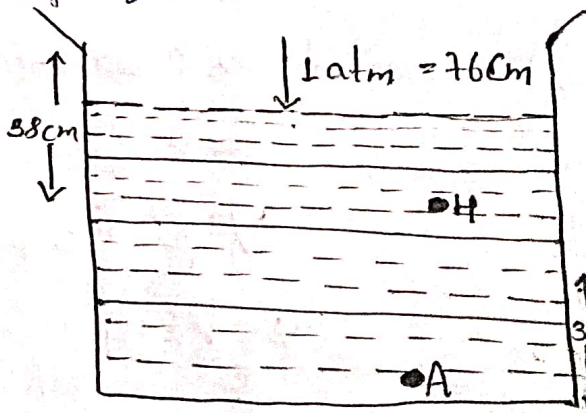
$P_{atm} = P_{gas} + P_{Hg}$

$76\,cm = = P_{gas} + 50 \qquad P_{gas} = 26\,cm$

An open tank is filled with Hg upto a height of 76cm. Find the pressure at the

(1) Bottom of the tank
(2) Mid of the tank

Atmospheric Pressure = 1atm



Ans 2 atm, 1.5 atm