PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 23

**Total Marks : 28**

**Max. Time : 28 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.5,8,9 | (3 marks, 3 min.) | [21, 21] |
| Multiple choice objective ('–1' negative marking) Q.6 | (4 marks, 4 min.) | [4, 4] |
| Short Subjective Questions ('–1' negative marking) Q.7 | (3 marks, 3 min.) | [3, 3] |

**1.** If P, V, T represents the pressure, volume and temperature of gas respectively, then according to Boyle's law, which is correct for a fixed amount of ideal gas :

(A) $V \propto \frac{1}{T}$ (At constant P) (B) $V \propto P$ (At constant T)

(C) $V \propto \frac{1}{P}$ (At constant T) (D) $PV = nRT$

**2.** If an ideal gas at 1 atmosphperic pressure, is spreading from 20 $cm^3$ to 50 $cm^3$ at constant temperature, then find the final pressure :

(A) 0.4 atm (B) 2.5 atm (C) 5 atm (D) None of these.

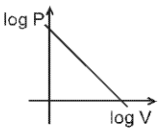
**3.** A vessel of 120 mL capacity contains a certain mass of an ideal gas at 20ºC and 750 mm pressure. The gas was transferred to another vessel, whose volume is 180 mL. Then the pressure of gas at 20ºC is :

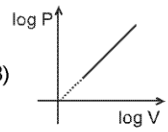
(A) 500 mm (B) 250 mm (C) 1000 mm (D) None of these

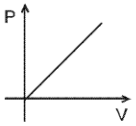
**4.** 5 L of a sample of a gas at 27°C and 1 bar pressure is compressed to a volume of 1000 mL keeping the temperature constant. The percentage increase in pressure is :

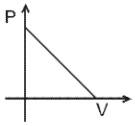
(A) 100 % (B) 400 % (C) 500% (D) 80%

**5.** For a fixed amount of ideal gas at constant temperature, which of the following plots is correct :

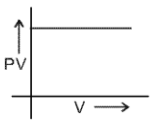
(A) 

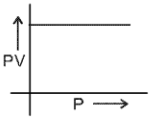

(B) 

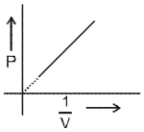

(C) 

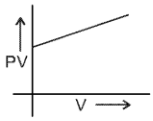

(D) 


**6.** For a fixed amount of ideal gas at constant temperature, which of the following plots is/are correct :

(A) 


(B) 


(C) 


(D) 


**7.** What should be the percentage increase in pressure for a 5% decrease in volume of an ideal gas at constant temperature ?

**8.** In which of the following cases is the pressure of air in air column maximum : (Assume same length of Hg column in each case) :

(A) 


(B) 

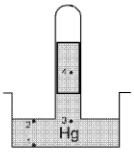

(C) 


(D) 


**9.** Compare the values of pressure at different points in the given diagram :

(A) $P_1 > P_2 > P_3 > P_4$ (B) $P_1 < P_2 < P_3 < P_4$

(C) $P_1 > P_2 = P_3 > P_4$ (D) $P_1 < P_2 = P_3 < P_4$



PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 25

**Total Marks : 32**

**Max. Time : 37 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.4 | (3 marks, 3 min.) | [12, 12] |
| Subjective Questions ('–1' negative marking) Q.5 to Q.9 | (4 marks, 5 min.) | [20, 25] |

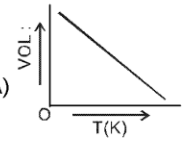
**1.** At constant pressure for a fixed amount of gas, which of the following represents Charles law :

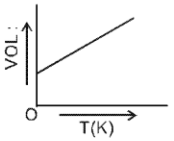
(A) $V \propto \frac{1}{T}$ (B) $V \propto T$ (C) $V \propto \frac{1}{T^2}$ (D) $V \propto d$

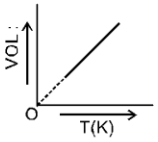
**2.** If $V_0$ is the volume of a given mass of gas at 273 K at constant pressure, then according to Charles law, the volume at 10ºC will be :

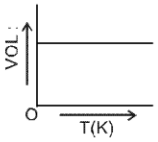
(A) $10\ V_0$ (B) $\frac{1}{273}(V_0 + 10)$ (C) $V_0 + \frac{10}{273}$ (D) $\frac{283}{273} V_0$

**3.** The correct representation of Charles law is given by :

(A) 


(B) 


(C) 


(D) 


**4.** Which of the following shows explicitly the relationship between Boyles law and Charles law :

(A) $\frac{P_1}{P_2} = \frac{T_1}{T_2}$ (B) $PV = K$ (C) $\frac{P_2}{P_1} = \frac{V_1}{V_2}$ (D) $\frac{V_2}{V_1} = \frac{P_1}{P_2} \times \frac{T_2}{T_1}$

**5.** 20 mL of hydrogen gas measured at 7ºC is heated to 77ºC. What is the new volume of gas at the same pressure?

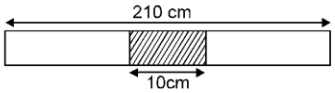
**6.** At what temperature in centrigrade, will the volume of a gas at 0ºC double itself, pressure remaining constant ?

**7.** A flask is of capacity one litre. What volume of air will escape from the open flask, if it is heated from 27°C to 37°C? Assume pressure to be constant.

**8.** A balloon blown up with 1 mole of gas has a volume of 480 mL at 14°C. At this stage, the balloon is filled to (7/8)th of its maximum capacity. Suggest :

(a) Will the balloon burst at 30°C ? (b) The minimum temperature at which it will burst.

**9.** A mercury column with a length 10 cm is in the middle of a horizontal tube with a length 210 cm closed at both ends . If the tube is placed vertically, the mercury column will shift through a distance 10 cm from its initial position .




At what distance will the centre of the column be from the middle of the tube,

(a) if one end of the tube placed horizontally is opened to atmosphere.

(b) if the upper end of the tube placed vertically is opened to atmosphere.

(c) if the lower end of the tube placed vertically opened to atmosphere.

[Take atmospheric pressure = 100 cm of Hg]

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 26

**Total Marks : 30**

**Max. Time : 35 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.2 | (3 marks, 3 min.) | [6, 6] |
| Multiple choice objective ('–1' negative marking) Q.3 | (4 marks, 4 min.) | [4, 4] |
| Subjective Questions ('–1' negative marking) Q.4 to Q.8 | (4 marks, 5 min.) | [20, 25] |

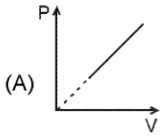
**1.** A bottle is heated with mouth open to have a final temperature as 125ºC from its original value of 25°C. The mole percentage of expelled air is about :

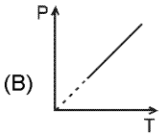
(A) 50% (B) 25% (C) 33% (D) 40%

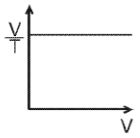
**2.** 1 litre of $N_2$ and 7/8 litre of $O_2$ are taken separately at the same temperature and pressure. What is the relation between the masses of the gases :

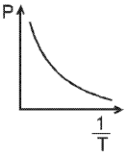
(A) $m_{N_2} = 3\,m_{O_2}$ (B) $m_{N_2} = 8\,m_{O_2}$ (C) $m_{N_2} = m_{O_2}$ (D) $m_{N_2} = 16\,m_{O_2}$

**3.** Which of the following graphs is /are possible for a fixed amount of gas :

(A) 


(B) 


(C) 


(D) 


**4.** A student forgot to add the reaction mixture to a round bottomed flask at 27°C but he put it on the flame. After a lapse of time, he realised his mistake. Using a pyrometer, he found that the temperature of the flask was 477°C. What fraction of moles of air would have expelled out ?

**5.** If the volume of a gas contained in a vessel increases by 0.4 % when heated by 1ºC, then find the initial temperature of gas in ºC.

**6.** A gas occupies 300 mL at 27°C and 684 mm pressure. What would be its volume at STP ?

**7.** 2 g of a gas A is introduced into an evacuated flask kept at 27°C. The pressure is found to be 1 atm. If 3 g of another gas B is added to the same flask, the total pressure becomes 1.5 atm. Assuming constant temperature and ideal gas behaviour, calculate :

(a) the ratio of mol. weight of gases, $M_A$ and $M_B$. (b) the volume of the vessel, if gas A is He

**8.** Equal volumes of two gases, which do not react together, are enclosed in separate vessels. Their pressures are 100 mm and 400 mm respectively. If the two vessels are joined together, then what will be the pressure of the resulting mixture (temperature remaining constant) :

(A) 350 mm (B) 500 mm (C) 1000 mm (D) 250 mm

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 27

**Total Marks : 36**

**Max. Time : 36 min.**

**Topic : Gaseous State**

**Type of Questions** **M.M., Min.**
**Single choice Objective ('–1' negative marking) Q.1 to Q.12 (3 marks, 3 min.) [36, 36]**

**1.** At what pressure would a gas sample consisting of 2 mole $CO_2$ gas occupy a volume of 5.6 L at 273ºC :
(A) 32 atm (B) 24 atm (C) 16 atm (D) 8 atm

**2.** A sample of $N_2O$ gas occupies a volume of $0.1m^3$ at 684 mm of Hg pressure and 87ºC. The number of molecules present in the gas sample is : (Take R = $\frac{1}{12}$ L atm $K^{-1}$ $mol^{-1}$ )
(A) $1.8066 \times 10^{23}$ (B) $1.2044 \times 10^{24}$ (C) $6.022 \times 10^{23}$ (D) $1.8066 \times 10^{24}$

**3.** If the volume occupied by x mole of ethane ($C_2H_6$) gas at 2.46 atm pressure and 27ºC temperature is 0.5 L then the value of x is :
(A) 0.5 (B) 0.05 (C) 0.005 (D) 0.0005

**4.** A gas mixture consisting of 0.1 mole each of $O_2$ and $N_2$ gases occupies a volume of $1 \times 10^4$ mL at 38 cm of Hg pressure and a certain temperature. Find the value of T :
(A) 300°C (B) 600 K (C) 300 K (D) 600°C

**5.** 32 g of $SO_2$ is stored in a cylinder at 1 atm pressure and at 27ºC temperature. The volume of cylinder is : (Take R = 1/12 L atm $K^{-1}$ $mol^{-1}$ )
(A) 12.5 $m^3$ (B) 12.5 $dm^3$ (C) 12.5 cc (D) 12.5 mL

**6.** A cylinder can hold maximum 12.5 L of any liquid when it is fully filled. If ozone gas ($O_3$) is stored in cylinder at $10^5$ Pa pressure and – 73ºC temperature, then the weight of ozone gas in the cylinder is:
(A) 36 kg (B) 12 g (C) 36 g (D) 12 kg

**7.** A mixture consisting of 54 g $N_2O_5$ gas, $1.2044 \times 10^{23}$ molecules of NO gas, 0.2 gram-molecule of $N_2O$ gas and 0.1 mole of $N_2$ gas would occupy a volume of ..... $dm^3$ at 760 torr pressure and 27 ºC temprature :
(A) 22.4 (B) 24.6 (C) 0.0246 (D) 0.0224

**8.** If 66 g of an unknown gas X occupies a volume of about 125 $dm^3$ at 0.6 bar pressure and 600 K temprature, then the gas X could be :
(A) $N_2$ (B) $N_2O$ (C) CO (D) $CO_2$

**9.** Three different containers contain three different gases with the following parameters :
Container I of volume ($V_1$), containing 6 g of $H_2$ gas at 273 K, 1 atm.
Container II of volume ($V_2$), containing 2 mole of $CO_2$ gas at 273 ºC, 2 atm.
Container III volume ($V_3$), containing $24 \times 10^{23}$ molecules of $O_2$ gas at 0 ºC, 760 torr .
The correct order of volume of containers is :
(A) I > II > III (B) III > I > II (C) I > III > II (D) II > III > I

**10.** 3.06 L of $H_2O$ vapour is taken at a pressure of 1 atm and 373 K. It is now condensed to $H_2O$ ($\ell$) at 373 K. Calculate the approximate volume occupied by $H_2O$ ($\ell$) : (assume density of liquid water at 373 K = 1 g/mL)
(A) 3.06 L (B) 1.8 mL (C) 1.8 L (D) 3.06 mL

**11.** Which of the following relations is correct : (Where T represents temperature and d represents density) :
(A) 1 bar = 1 torr (B) T (in °C) = T (in K) + 273 (C) 1 $m^3 = 10^{-6}$ mL (D) $d_{g/mL} = \frac{d_{kg/m^3}}{1000}$

**12.** Two flasks A and B of equal volume contain $H_2$ gas under same pressure conditions. The temperature in flask A is greater than in flask B. Then :
(A) Flask A contains greater number of moles of $H_2$ gas than flask B.
(B) Flask B contains greater number of moles of $H_2$ gas than flask A.
(C) Flask A contains same number of moles of $H_2$ gas as flask B.
(D) Such a case is not possible.

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 28

**Total Marks : 30**

**Max. Time : 33 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.6 | (3 marks, 3 min.) | [18, 18] |
| Subjective Questions ('–1' negative marking) Q.7 to Q.9 | (4 marks, 5 min.) | [12, 15] |

**1.** The density of Nitrogen gas is maximum at :

(A) STP (B) 273 K and 1 atm (C) 546 K and 2 atm (D) 546 K and 4 atm

**2.** A gas has a density of 1.25 g $L^{-1}$ at STP. Identify it :

(A) $NO_2$ (B) $O_2$ (C) $N_2$ (D) $SO_2$

**3.** A sample of impure air contains 80% $N_2$, 10% $O_2$, 5% $CO_2$ and 5% Ar by volume. The average molecular weight of the sample is : (At wt. of Ar = 40)

(A) 29.4 (B) 29.8 (C) 30.0 (D) 29.6

**4.** The density of gas A is twice that of a gas B at the same temperature. The molecular weight of gas B is thrice that of A.The ratio of the pressure exerted on A and B will be :

(A) 6 : 1 (B) 7 : 8 (C) 2 : 5 (D) 1 : 4

**5.** A mixture of two gases A and B in the mole ratio 2 : 3 is kept in a 2 litre vessel. A second 3 litre vessel has the same two gases in the mole ratio 3 : 5. Both gas mixtures have the same temperature and same pressure. They are allowed to intermix and the final temperature and pressure are the same as the initial values, the final volume being 5 litres. Given that the molar masses are $M_A$ and $M_B$, what is the mean molar mass of the final mixture :

(A) $\frac{77M_A+123M_B}{200}$ (B) $\frac{123M_A+77M_B}{200}$ (C) $\frac{77M_A+123M_B}{250}$ (D) $\frac{123M_A+77M_B}{250}$

**6.** Two flasks of equal volume connected by a narrow tube (of negligible volume) contains a certain amount of $N_2$ gas at 2 atm and 27°C. The $I^{st}$ flask is then immersed into a bath kept at 47°C while the $II^{nd}$ flask is immersed into a bath kept at 127°C. The ratio of the number of moles of $N_2$ in $I^{st}$ flask and II flask respectively after sometime will be :

(A) 5 : 4 (B) 2 : 3 (C) 3 : 2 (D) 4 : 5

**7.** Two glass bulbs of equal volume and filled with a gas at 500 K and pressure of 76 cm of Hg, are connected by a narrow tube. One of the bulb is then placed in a water bath maintained at 700 K and the other bulb is maintained at 500 K. What is the new value of the pressure inside the bulbs ? The volume of the connecting tube is negligible.

**8.** A certain amount of gas is enclosed in a sphere of volume 5L at pressure 7atm and temperature 327ºC. It is then connected to another sphere of volume 2.5 L by a narrow tube and stopcock. The second sphere is initially evacuated and the stopcock is closed. After opening the stopcock, the temperature of gas in the second sphere becomes 127ºC, while the first sphere is maintained at 327ºC. Find the final gas pressure within the two spheres.

**9.** The stop cock connecting the two bulbs of volume 8 litre and 10 litre containing an ideal gas at 6.25 atm and 4 atm respectively, is opened. What is the final pressure, if the temperature remains same ?

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 29

**Total Marks : 36**

**Max. Time : 40 min.**

## Topic : Gaseous State

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.3,7 | (3 marks, 3 min.) | [12, 12] |
| Multiple choice objective ('–1' negative marking) Q.1,4 | (4 marks, 4 min.) | [8, 8] |
| Subjective Questions ('–1' negative marking) Q.4,5,6,8 | (4 marks, 5 min.) | [16, 20] |

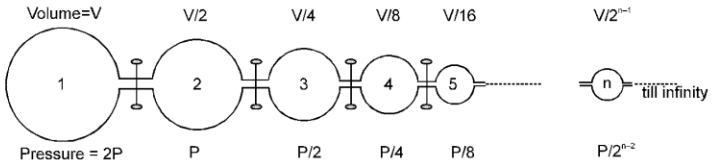
**1.** Equal masses of Sulphur dioxide and Oxygen gases are mixed in an empty container at 25°C. The fraction of the total pressure exerted by sulphur dioxide is :

(A) 1/3 (B) 1/2 (C) 2/3 (D) $\frac{1}{3} \times \frac{273}{298}$

**2.** A mixture of helium and methane gases at 1.4 bar pressure contains 20% by mole of helium. Partial pressure of helium will be :

(A) 0.7 bar (B) 0.28 bar (C) 0.56 bar (D) 0.8 bar

**3.**




Infinite number of flasks are connected to one another as shown above. The volumes and pressures in each flask vary as shown. The stopcocks are initially closed. The common pressure, when all the stopcocks are opened, is : (Assume constant temperature)

(A) P (B) $\frac{1}{2}$P (C) $\frac{P}{4}$ (D) $\frac{4}{3}$P

**4.** The density of a mixture of $O_2$ and $N_2$ gases at NTP is 1.3 g litre$^{-1}$. Calculate partial pressure of $O_2$.

**5.** Two gases A and B having molecular weights 60 and 40 respectively are enclosed in a vessel. The weight of A is 0.6 g and that of B is 0.2 g . The total pressure of the mixture is 750 mm. Calculate the partial pressure of the two gases.

**6.** A spherical balloon of mass 100 Kg and diameter 21 m is filled with He gas at 168° C and 5 atm pressure.If the density of air is $\frac{14}{11}$ g/L, find the value of payload of the balloon (in Kg). Take R = $\frac{1}{12}$ L atm $K^{-1}$ $mol^{-1}$

**7.** A mixture of He and $SO_2$ at one bar pressure contains 20% by weight of He. Partial pressure of He will be:

(A) 0.2 bar (B) 0.4 bar (C) 0.6 bar (D) 0.8 bar

**8.** A 11 litre flask contains 20g of Neon and an unknown weight of Hydrogen. The gas density is found to be 2g/litre at $0^0$C. Determine the average molecular weight of the gas mixture.

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 30

**Total Marks : 31**

**Max. Time : 33 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.2 to Q.3 | (3 marks, 3 min.) | [6, 6] |
| Multiple choice objective ('–1' negative marking) Q.1,4 | (4 marks, 4 min.) | [8, 8] |
| Subjective Questions ('–1' negative marking) Q.5,9 | (4 marks, 5 min.) | [8, 10] |
| Comprehension ('–1' negative marking) Q.6 to Q.8 | (3 marks, 3 min.) | [9, 9] |

**1.** A gaseous organic compound has a density of 2.5 kg/m$^3$ at 2 atm and at 273$^0$C. The molecular formula of the compound can be :

(A) $C_3H_4O$ (B) $C_4H_6O$ (C) $C_4H_8$ (D) $C_5H_{10}$

**2.** The ratio of rates of diffusion of $SO_2$, $O_2$ and $CH_4$ under identical conditions is :

(A) 1 : $\sqrt{2}$ : 2 (B) 1 : 2 : 4 (C) 2 : $\sqrt{2}$ : 1 (D) 1 : 2 : $\sqrt{2}$

**3.** If the number of molecules of $SO_2$ (molecular weight = 64) effusing through an orifice of unit area of cross-section in unit time at 0°C and 1 atm pressure is n, the number of He molecules (atomic weight = 4) effusing under similar conditions at 273°C and 0.25 atm is :

(A) $\frac{n}{\sqrt{2}}$ (B) $n\sqrt{2}$ (C) 2n (D) $\frac{n}{2}$

**4.** The time taken for effusion of 32 mL of oxygen gas will be the same as the time taken for effusion of which gas sample under identical conditions : (Take $\sqrt{2}$ = 1.4, $\sqrt{3}$ = 1.7)

(A) 64 mL of $H_2$ (B) 50 mL of $N_2$ (C) 44.8 mL of $CH_4$ (D) 22.4 mL of $SO_2$

**5.** 5 mL of He gas diffuses out in 1 second from a hole. Find the volume of $SO_2$ that will diffuse out from the same hole under identical conditions in 2 seconds.

## Comprehension # (Q.6 to Q.8)

### Graham's Law :

"Under similar conditions of pressure (partial pressure), the rate of diffusion of different gases is inversely proportional to square root of the density of different gases."

rate of diffusion $r \propto \frac{1}{\sqrt{d}}$ (d = density of gas)

r = volume flow rate $= \frac{dV_{out}}{dt}$

r = moles flow rate $= \frac{dn_{out}}{dt}$

r = distance travelled by gaseous molecules per unit time $= \frac{dx}{dt}$

The general form of the Grahams law of diffusion shows the variation of rate of diffusion of a gas with pressure of gas, temperature of gas, area of cross-section of orifice and molecular mass of the gas.
Now answer the following questions :

**6.** A bottle of dry $NH_3$ & a bottle of dry HCl connected through a long tube are opened simultaneously under identical conditions at both ends. The white ammonium chloride ring first formed will be:

(A) at the centre of the tube (B) near the HCl bottle

(C) near the $NH_3$ bottle (D) throughout the length of tube

**7.** At room temperature, $A_2$ gas (vapour density = 40) at 1 atm pressure and $B_2$ gas (vapour density = 10) at p atm pressure are allowed to diffuse through identical pinholes from opposite ends of a glass tube of 1m length and of uniform cross-section. The two gases first meet at a distance of 60 cm from the $A_2$ end. The value of p is :

(A) $\frac{4}{3}$atm (B) $\frac{1}{3}$atm (C) $\frac{3}{4}$atm (D) $\frac{1}{6}$atm

**8.** A mixture containing 2 moles of He and 1 mole of $CH_4$ is taken in a closed container and made to effuse through a small orifice of container. Then, which is the correct effused volume percentage of He and $CH_4$ initially, respectively :

(A) 40%, 60% (B) 20% , 80% (C) 80% , 20% (D) 60% , 40%

**9.** Pressure in a bulb dropped from 2000 to 1500 mm in 50 minute, when the contained oxygen leaked through a small hole. The bulb was then completely evacuated. A mixture of oxygen and another gas of molecular weight 72 in molar ratio 1 : 1 at a total pressure of 6000 mm was introduced. Find the molar ratio of two gases remaining in the bulb after a period of 70 minute.

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 31

Total Marks : 30

Max. Time : 30 min.

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Comprehension ('–1' negative marking) Q.1 to Q.6 | (3 marks, 3 min.) | [18, 18] |
| Single choice Objective ('–1' negative marking) Q.7 to Q.10 | (3 marks, 3 min.) | [12, 12] |

**Comperhension # (Q.1 to Q.3)**

Gas 'A' (Molar Mass = z128 g $mol^{-1}$) is taken in a closed container at the initial total pressure of 1000 mm of Hg. Pressure of the gas decreases to 900 torr in 5 seconds due to the diffussion though a square cross-section. Another similar sized container is taken in which gaseous mixture of A and B (Molar Mass = 72g $mol^{-1}$) is taken. Initial molar mass of the mixture is $\frac{472}{5}$ (calculated from density data) at the total pressure of 5000 torr. A rectangular cross-section is made in this container and gases are allowed to diffuse. Width of this cross-section is same as the side of the previous square cross section and length of the rectangular cross-section is 50% more than that of its width. Assume that the gases A and B are non-reacting and rate of diffusion of the gases are only dependent upon the initial total pressure and it is independent of the change in the pressure due to diffusion. Assume all other conditions to be identical.

Now answer the following questions :

**1.** Gas mixture diffused out initially from 2nd container has composition :

(A) $X_A = \frac{3}{7}$ (B) $X_B = \frac{3}{5}$ (C) $X_A = \frac{1}{3}$ (D) $X_B = \frac{1}{4}$

**2.** Ratio of the number of moles of A and B left in the container after 10 seconds from the start of diffusion, is :

(A) $\frac{7}{9}$ (B) $\frac{2}{3}$ (C) $\frac{8}{11}$ (D) None of the above

**3.** What is the time after which container will have same number of moles of A and B :

(A) 15 sec. (B) 50 sec. (C) 25 sec. (D) $\frac{50}{3}$ sec.

**Comperhension # (Q.4 to Q.6)**

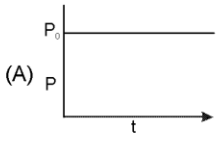
Graham's law tells as about rate of effusion or diffusion of gases. In modern form, it simply states that the rate of effusion or diffusion of any ideal gas is inversely proportional to square root of its molar mass.

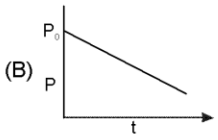
$$\frac{r_1}{r_2} = \frac{P_1}{P_2}\sqrt{\frac{M_2}{M_1}}$$

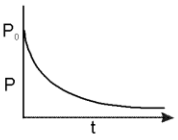
Also, rate of effusion of a gas mixture is simply the sum of rates of effusion of individual gases, since ideal gases do not affect each other.

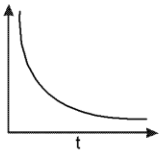
Now answer the following questions :

**4.** 10 moles of $N_2$ gas are placed in a vessel of constant volume and temperature. A hole is punctured in the vessel and left in vacuum. The pressure of $N_2$ in the vessel will vary with time as :

(A) 


(B) 


(C) 


(D) 


**5.** If a mixture of (80 mol %) He and (20 mol%) $SO_2$ is taken in an isothermal isochoric vessel, as the gases leak through a small hole in the vessel, when placed in vacuum :

(A) Average molar mass of gas mixture left in vessel increases with time.

(B) Average molar mass of gas mixture left in vessel remains same with time.

(C) Average molar mass of gas mixture left in vessel decreases with time.

(D) Variation of $M_{avg}$ with time depends on temperature as well as area of hole, so it cannot be commented upon, in general.

**6.** In the previous question, what will be the rate of effusion of the initial gas mixture relative to $D_2$ under same conditions of total pressure and temperature :

(A) 1/2 (B) 0.29 (C) 2 (D) 0.85

**7.** A helium atom is two times heavier than a hydrogen molecule. At 298 K, the average translational kinetic energy of helium is :

(A) two times that of hydrogen molecule (B) same as that of hydrogen molecule

(C) four time that of hydrogen molecule (D) half that of hydrogen molecule

**8.** At what temperature, will hydrogen molecules have the same average translational kinetic energy as nitrogen molecules have, at 35°C?

(A) $\left(\frac{28\times35}{2}\right)$°C (B) $\left(\frac{2\times35}{28}\right)$°C (C) $\left(\frac{2\times28}{35}\right)$°C (D) 35 °C

**9.** Average translational K.E. of one mole of helium gas at 273 K in calories is :

(A) 819 Cal (B) 81.9 Cal (C) 8.19 Cal (D) None of these

**10.** Average translational kinetic energy of 14 grams of nitrogen gas at 127°C is nearly : (mol. mass of nitrogen = 28 and gas constant = 8.3 J/mol/K)

(A) 4980 J (B) 1660 J (C) 2490 J (D) 9960 J

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 32

**Total Marks : 35**

**Max. Time : 36 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.3,5,6,7 | (3 marks, 3 min.) | [18, 18] |
| Multiple choice objective ('–1' negative marking) Q.4 | (4 marks, 4 min.) | [4, 4] |
| Subjective Questions ('–1' negative marking) Q.8 | (4 marks, 5 min.) | [4, 5] |
| Comprehension ('–1' negative marking) Q.9 to Q.11 | (3 marks, 3 min.) | [9, 9] |

**1.** Calculate the temperature at which the R.M.S. velocity of sulphur dioxide molecules is the same as that of oxygen gas molecules at 300 K :

(A) 600°C (B) 600 K (C) 300 K (D) 300°C

**2.** Suppose that we change the rms speed, $v_{rms}$, of the gas molecules in closed container of fixed volume from $5 \times 10^4$ cm $sec^{-1}$ to $10 \times 10^4$ cm $sec^{-1}$. Which one of the following statements might correctly explain how this change was accomplished :

(A) By heating the gas, we double the temperature.

(B) By pumping out 75% of the gas at constant temperature, we decreased the pressure to one quarter of its original value.

(C) By heating the gas, we quadrupled the pressure.

(D) By pumping in more gas at constant temperature, we quadrupled the pressure.

(E) None of the above.

**3.** Express the average kinetic energy per mole of a monoatomic gas of molar mass M, at temperature T K in terms of the mean speed of the molecules ($\bar{c}$) :

(A) $\frac{8M}{3\pi}(\bar{c})^2$ (B) $\frac{3M}{16}(\bar{c})^2$ (C) $\left(\frac{2M}{\pi}\right)(\bar{c})^2$ (D) $\left(\frac{3\pi M}{16}\right)(\bar{c})^2$

**4.** At same temperature and pressure, which of the following gases will have same average translational kinetic energy per mole as $N_2O$ :

(A) He (B) $H_2S$ (C) $CO_2$ (D) $NO_2$

**5.** Which of the following statements is not true :

(A) The ratio of the mean speed to the rms speed is independent of temperature of gas.

(B) The square of the mean speed of the molecules is equal to the mean squared speed at a certain temperature.

(C) Mean translational kinetic energy of the gas molecules at any given temperature is independent of the molecular mass of gas.

(D) The difference between rms speed and mean speed at any temperature for different gases diminishes as larger and yet larger molar masses are considered.

**6.** A flask of 4.48 L capacity contains a mixture of $N_2$ and $H_2$ at 0ºC and 1 atm pressure. If the mixture is made to react to form $NH_3$ gas at the same temperature, the pressure in the flask reduces to 0.75 atm. The partial pressure of $NH_3$ gas in the final mixture is :

(A) 0.33 atm (B) 0.50 atm (C) 0.66 atm (D) 0.25 atm

**7.** If the density of a gas sample is 4 g/L at pressure $1.2 \times 10^5$ Pa, the value of $v_{RMS}$ will be :

(A) 600 m/s (B) 300 m/s (C) 150 m/s (D) 450 m/s

**8.** The value of $v_{rms}$ for a gas X at 546° C was found to be equal to the value of $v_{mp}$ for another gas Y at 273° C. Assuming ideal behaviour, find the molecular mass of gas Y (in amu) if the molecular mass of gas X is 9 amu.

**Comprehension # (Q.9 to Q.11)**

The speed of a molecule of a gas changes continuously as a result of collisions with other molecules and with the walls of the container. The speeds of individual molecules therefore change, but it is expected that the distribution of molecular speeds does not change with time.

A direct consequence of the distribution of speeds is that the average kinetic energy is constant for a given temperature.

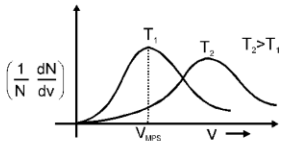
The average K.E, is defined as

$$\overline{KE} = \frac{1}{N}\left(\frac{1}{2}mv_1^2 + \frac{1}{2}mv_2^2 + .... + \frac{1}{2}mv_N^2\right) = \frac{1}{2N}\, m(v_1^2 + v_2^2 + ..... + v_N^2) = \frac{1}{2}\, m\,\overline{V^2}$$

Alternatively it may be defined as $\overline{KE} = \frac{1}{N}\left(\frac{1}{2}m\sum_i dN_i v_1^2\right) = \frac{1}{2}m\left(\sum_i \frac{dN_i}{N}\cdot v_1^2\right)$

where $\frac{dN_i}{N}$ is the fraction of molecules having speeds between $v_i$ and $v_i + dv$ and as proposed by Maxwell $\frac{dN}{N} = 4\pi\left(\frac{m}{2\pi KT}\right)^{3/2} \exp(-mv^2/2kT).v^2.dv$

The plot of $\left(\frac{1}{N}\frac{dN}{dv}\right)$ is plotted for a particular gas at two different temperatures against 'v' as shown.



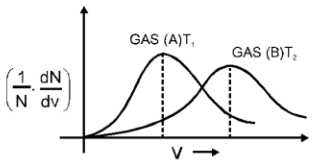

The majority of molecules have speeds which cluster around $v_{MPS}$ in the middle of the range of v. There area under the curve between any two speeds $v_1$ and $v_2$ is the fraction of molecules having speeds between $v_1$ and $v_2$.

The speed distribution also depends on the mass of the molecule. As the area under the curve is the same (equal to unity) for all gas samples, samples which have the same $v_{MPS}$ will have identical Maxwellian plots. On the basis of the above passage answer the questions that follow.

**9.** If a gas sample contains a total of 'N' molecules, the area under any given maxwellian plot is equal to:

(A) infinite (B) N (C) 1 (D) $\int_0^N \left(\frac{dN}{dv}\right)\cdot dv$

**10.** For the above graph drawn for two different samples of gases at two different temperatures $T_1$ and $T_2$, which of the following statements is necessarily true :




(A) If $T_2 > T_1$, $M_A$ is necessarily greater than $M_B$

(B) If $T_1 > T_2$, $M_B$ is necessarily greater than $M_A$

(C) $\frac{T_2}{M_B} > \frac{T_1}{M_A}$

(D) Nothing can be predicted

**11.** If two gases 'A' and 'B' and at temperature $T_A$ and $T_B$ respectively have identical Maxwellian plots, then which of the following statements are true :

(A) $T_B = T_A$

(B) $M_B = M_A$

(C) $\frac{T_A}{M_A} = \frac{T_B}{M_B}$

(D) Gases A and B may be $O_2$ and $SO_2$ at 27ºC and 327ºC respectively.

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 33

**Total Marks : 26**

**Max. Time : 28 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.6 | (3 marks, 3 min.) | [18, 18] |
| Subjective Questions ('–1' negative marking) Q.7 to Q.8 | (4 marks, 5 min.) | [8, 10] |

**1.** The vapour pressure of water depends upon :

(A) Surface area of water in container (B) Volume of container

(C) Temperature (D) All of these

**2.** Among the following substances, the maximum vapour pressure is exerted by :

(A) Water (b.pt. = 100ºC) (B) Acetone (b.pt. = 56ºC)

(C) Ethanol (b.pt. = 78ºC) (D) Chloroform (b.pt. = 61ºC)

**3.** A sample of air is saturated with benzene (vapour pressure = 100 mm Hg at 298 K) at 298K, 750 mm Hg pressure. If it is isothermally compressed to one third of its initial volume, the final pressure of the system is:

(A) 2250 torr (B) 2150 torr (C) 2050 torr (D) 1950 torr

**4.** A vessel has nitrogen gas and water vapours in equilibrium with liquid water at a total pressure of 1 atm. The partial pressure of water vapours is 0.3 atm. The volume of this vessel is reduced to one third of the original volume, at the same temperature, then total pressure of the system is :(Neglect volume occupied by liquid water)

(A) 3.0 atm (B) 1 atm (C) 3.33 atm (D) 2.4 atm

**5.** 60 mL of pure dry $O_2$ is subjected to silent electric discharge. If only 20% of it is converted to $O_3$, volume of the mixture of gases ($O_2$ and $O_3$) after the reaction is $V_1$ mL and after passing through turpentine oil is $V_2$ mL. $V_1$ and $V_2$ are :

(A) 56 mL and 52 mLrespectively (B) 48 mL and 40 mL respectively

(C) 48 mL and 44 mL respectively (D) 56 mL and 48 mL respectively

**6.** 15 mL of a gaseous hydrocarbon was exploded with 72 mL of oxygen. The volume of gases on cooling was found to be 57 mL, 30 mL of which was absorbed by KOH and the rest was absorbed in a solution of alkalline pyrogallol. Then the formula of hydrocarbon is :

(A) $C_3H_4$ (B) $C_2H_4$ (C) $C_2H_6$ (D) $C_3H_6$

**7.** 1 litre of a mixture of CO and $CO_2$ is taken. This mixture is passed through a tube containing red hot charcoal, where the following reaction takes place :

$$CO_2 + C \longrightarrow 2CO$$

The volume now becomes 1.6 litres. Find the volume of gas sample obtained by passing 1 litre of initial gas mixture through KOH solution.

**8.** 1120 mL of ozonised oxygen ($O_2 + O_3$) at STP weighs 1.76 g. Calculate the reduction in volume on passing this through alkalline pyrogallol solution

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 34

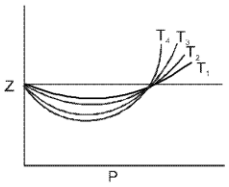
**Total Marks : 29**

**Max. Time : 31 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.3 | (3 marks, 3 min.) | [9, 9] |
| Multiple choice objective ('–1' negative marking) Q.4 to Q.6 | (4 marks, 4 min.) | [12, 12] |
| Subjective Questions ('–1' negative marking) Q.7 to Q.8 | (4 marks, 5 min.) | [8, 10] |

**1.** Which of the following is correct order of temperature shown in the above graph Z Vs P for the same gas :




(A) $T_4 < T_3 < T_2 < T_1$ (B) $T_1 < T_2 < T_3 < T_4$

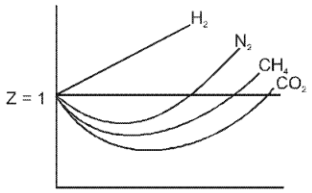
(C) $T_1 < T_2 < T_4 < T_3$ (D) $T_3 < T_4 < T_2 < T_1$

**2.** A real gas most closely approaches the behaviour of an ideal gas at :

(A) low pressure & low temperature (B) high pressure & high temperature

(C) low pressure & high temperature (D) high pressure & low temperature

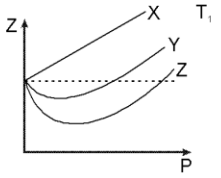
**3.** What is the correct increasing order of liquifiability of the gases shown as in above graph :



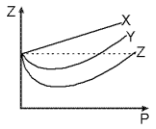

(A) $H_2 < N_2 < CH_4 < CO_2$ (B) $CO_2 < CH_4 < N_2 < H_2$

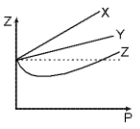
(C) $H_2 < CH_4 < N_2 < CO_2$ (D) $CH_4 < H_2 < N_2 < CO_2$

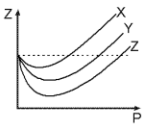
**4.*** Z vs P graph is plotted for 1 mole of three different gases X, Y and Z at temperature $T_1$.

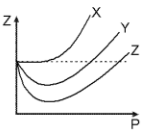



Then, which of the following may be correct if the above plot is made for 1 mole of each gas at $T_2$ temperature ($T_2 < T_1$) :

(A) 

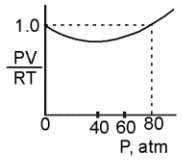
(B) 

(C) 

(D) 

**5.*** Which of the following statements regarding compressibility factor (Z) is/are correct :
(A) In the lower pressure region, value of Z initially decreases on increasing pressure and then increases, however $H_2$ and He gases are exception to this.
(B) Z for an ideal gas is greater than one.
(C) Z for a non-ideal gas can be greater than or less than unity depending on temperature and pressure.
(D) When Z < 1, intermolecular attraction dominates over intermolecular repulsion.

**6.*** The Vander waal's equation of state for a non-ideal gas can be rearranged to give $\frac{PV}{RT} = \frac{V}{V-b} - \frac{a}{VRT}$ for 1 mole of gas. The constants a & b are positive numbers . When applied to $H_2$ at 80K, the equation gives the curve as shown in the figure. Which one of the following statements is(are) correct :




(A) At 40 atm, the two terms V/(V – b) & a/VRT are equal.
(B) At 80 atm, the two terms V/(V – b) & a/VRT are equal.
(C) At a pressure greater than 80 atm, the term V/(V – b) is greater than a/VRT.
(D) At 60 atm, the term V/(V – b) is smaller than $1+\frac{a}{VRT}$.

**7.** Compressibility factor (Z) for $N_2$ at – 23°C and 820 atm pressure is 1.9. Find the number of moles of $N_2$ gas required to fill a gas cylinder of 95 L capacity under the given conditions.

**8.** Find the temperature at which the translational kinetic energy of hydrogen atom is equal to the transition energy of electron between $n_1 = 1$ and $n_2 = 2$ levels. (Take : Boltzmann constant $K = 1.36 \times 10^{-23}$ J/K.)

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 35

**Total Marks : 26**

**Max. Time : 27 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.5,8 | (3 marks, 3 min.) | [18, 18] |
| Multiple choice objective ('–1' negative marking) Q.6 | (4 marks, 4 min.) | [4, 4] |
| Subjective Questions ('–1' negative marking) Q.7 | (4 marks, 5 min.) | [4, 5] |

**1.** Vander waal's equation for 1 mole of a real gas under given conditions :

(a) high pressure — (i) $PV = RT + Pb$

(b) low pressure — (ii) $PV = RT - a/V$

(c) force of attraction between gas molecules is negligible — (iii) $PV = RT + a/V$

(c) volume of gas molecules is negligible — (iv) $[P - (a/V^2)](V - b) = RT$.

(A) (a)-(i), (b)-(ii), (c)-(i), (d)-(ii) (B) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

(C) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i) (D) (a)-(iv), (b)-(ii), (c)-(iii). (d)-(i).

**2.** Four different identical vessels at same temperature contains one mole each of $C_2H_6$, $CO_2$, $Cl_2$ and $H_2S$ at pressures $P_1$, $P_2$, $P_3$ and $P_4$ respectively. The value of Vander waal's constant 'a' for $C_2H_6$, $CO_2$, $Cl_2$ and $H_2S$ is 5.562, 3.640, 6.579 and 4.490 $atm.L^2.mol^{-2}$ respectively. If value of Vander waal's constant 'b' is taken to be same for all gases, then :

(A) $P_3 < P_1 < P_4 < P_2$ (B) $P_1 < P_3 < P_2 < P_4$ (C) $P_2 < P_4 < P_1 < P_3$ (D) $P_1 = P_2 = P_3 = P_4$

**3.** Consider the following statements :

1. $(a)_{NH_3} > (a)_{H_2O}$ [(a) is Vander waal's constant]

2. Pressure of the real gas is always more than the ideal gas for same temperature and volume of the container.

3. Compresssibilty factor for $H_2$ (g) is never less than unity at any temperature.

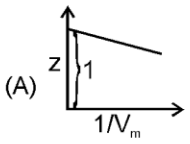
The above statements 1, 2, 3 respectively are : (T = True, F = False)

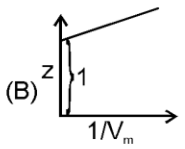
(A) T F F (B) F F F (C) F T F (D) T T F

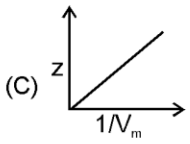
**4.** For a real gas with very large value of molar volume, which of the following equation can most suitably be applied:

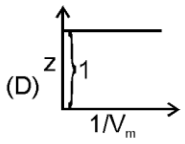
(A) $Z = 1 - \frac{a}{V_m RT}$ (B) $PV_m = RT$ (C) $Z = 1 + \frac{Pb}{RT}$ (D) $PV_m - RT = \frac{a}{V_m}$

**5.** For a real gas under low pressure conditions, which of the following graph is correct :

(A) 


(B) 


(C) 


(D) 


**6.*** Which of the following statements is/are correct about Boyle temperature ($T_B$) :

(A) Temperature at which 1st virial cofficient becomes Zero

(B) Temperature at which 2nd virial cofficient becomes Zero

(C) According to Vander waal's equation, value of $T_B$ = a\Rb

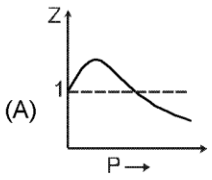
(D) $T_B$ of a gas depends upon the nature of gas

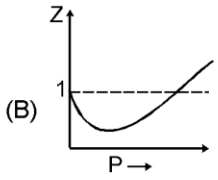
**7.** A hypothetical real gas A, having molar mass 16 g, has a density of 0.8 kg/$m^3$ at 2 atm pressure a temperature of 127ºC. Determine : [Take R = 1/12 L atm $K^{-1}$ $mol^{-1}$]

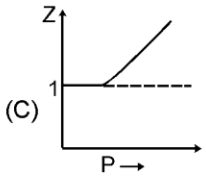
(i) the value of compressibility factor Z for gas A.

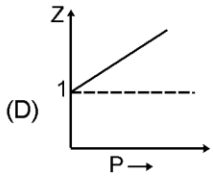
(ii) which forces are dominating among gas molecules, attractive or repulsive ?

**8.** Plot at Boyle's temperature for a real gas will be :

(A) 


(B) 


(C) 


(D) 

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 36

**Total Marks : 30**

**Max. Time : 32 min.**

**Topic : Gaseous State**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 to Q.6 | (3 marks, 3 min.) | [18, 18] |
| Multiple choice objective ('–1' negative marking) Q.7 | (4 marks, 4 min.) | [4, 4] |
| Match the Following (no negative marking) (2 × 4) Q.8 | (8 marks, 10 min.) | [8, 10] |

**1.** At the critical point for $H_2$ gas, value of Z = 3/8. Then, the value of Z under the similar conditions for $CO_2$, $O_2$, $SO_2$ at their respective critical points will be :

(A) greater than 3/8 (B) smaller than 3/8 (C) equal to 3/8 (D) nothing can be said

**2.** Critical temperature of a gas is _____ Boyle temperature :

(A) higher than (B) equal to (C) lower than (D) no relation between them

**3.** For the four gases A, B, E and D, the value of the excluded volume per mole is same. If the order of the critical temperature is $T_B > T_D > T_A > T_E$, then the order of their liquefaction pressure at a temperature T ($T < T_E$) will be :

(A) $P_A < P_B < P_E < P_D$ (B) $P_B < P_D < P_A < P_E$ (C) $P_E < P_A < P_D < P_B$ (D) $P_D < P_E < P_A < P_B$

**4.** The critical pressure $P_C$ and critical temperature $T_C$ for a gas obeying Vander Waal's equation are 80 atm and 87°C. Molar mass of the gas is 130 g/mole. The compressibility factor for the above gas will be smaller than unity under the following conditions :

(A) 1 atm and 800 °C (B) 1 atm and 1200 °C (C) 1 atm and 1000 °C (D) 1 atm and 1100 °C

**5.** Given that the critical temperature of oxygen is 154K and its critical pressure is 50 atm. Which of the following statements is/are true :

I. In a closed container at 154K and 50 atm, the solid, liquid, and gaseous phase of oxygen are in equilibrium.

II. Oxygen gas can be liquefied at room temperature.

III. It can be reasoned that ammonia has a critical temperature above 154 K.

(A) I is true (B) II and III are true (C) III is true (D) I and III are true

**6.** The virial equation for 1 mole of a real gas is written as : $PV = RT\left[1+\frac{A}{V}+\frac{B}{V^2}+\frac{C}{V^3}+.....\text{to higher power of n}\right]$

Where A,B and C are known as virial cofficients. If Vander waal's equation is written in virial form, then what will be the value of B :

(A) $a - \frac{b}{RT}$ (B) $b^3$ (C) $b - \frac{a}{RT}$ (D) $b^2$

**7.*** Critical temperature for a particular gas is – 177°C. Then for which of the following case, value of compressibility factor of the gas may be more than unity :

(A) at 0°C and 0.01 atm (B) at 0°C and 2000 atm (C) at 60°C and 0.01 atm (D) at 60°C and 10 atm

**8.** **Match the following :**

| **Column I** | **Column II** |
|---|---|
| (A) For a gas, repulsive tendency dominates | (p) Effects of 'a' and 'b' compensate each other. |
| (B) At $T_B$ = – 3 °C for a gas in high pressure region | (q) There is no difference between physical properties in liquid and gas state. |
| (C) At $T_C$ | (r) Z > 1 |
| (D) For He gas at 0°C in all pressure region | (s) $T_C$ = 80 K |

## DPP No. # 23

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1.** | (C) | **2.** | (A) | **3.** | (A) | **4.** | (B) | **5.** | (A) |
| **6.** | (ABC) | **7.** | 5.26 | **8.** | (A) | **9.** | (C) | | |

## DPP No. # 24

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **1.** | (B) | **2.** | 31 cm of Hg. | **3.** | x = 6 cm | **4.** | ≈ 101.3 cm. |
| **5.** | x = 26.84 cm | **6.** | 18 cm | **7.** | 550 cm | **8.** | 19 cm. |

## DPP No. # 25

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **1.** | (B) | **2.** | (D) | **3.** | (C) | **4.** | (D) |
| **5.** | 25 mL. | **6.** | 273ºC. | **7.** | 33.3 mL. | **8.** | (a) No, (b) 55 ºC. |
| **9.** | **(a)** 50.5 cm | **(b)** | 55 cm | **(c)** | 45 cm. | | |

## DPP No. # 26

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1.** | (B) | **2.** | (C) | **3.** | (A,B,C,D) | **4.** | 0.6 | | |
| **5.** | – 23ºC | **6.** | 245.7 mL | **7.** | (a) 1 : 3(b) 12.3 litre | | | **8.** | (D) |

## DPP No. # 27

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1.** | (C) | **2.** | (D) | **3.** | (B) | **4.** | (C) | **5.** | (B) |
| **6.** | (C) | **7.** | (B) | **8.** | (B,D) | **9.** | (B) | **10.** | (B) |
| **11.** | (D) | **12.** | (B) | | | | | | |

## DPP No. # 28

**1.** (D) **2.** (C) **3.** (B) **4.** (A) **5.** (A)

**6.** (A) **7.** 88.67 cm of Hg **8.** 4 atm **9.** 5 atm

## DPP No. # 29

**1.** (A) **2.** (B) **3.** (D) **4.** 0.28 atm

**5.** $p_A$ = 500 mm, $p_B$ = 250 mm. **6.** 3434Kg **7.** (D) **8.** 11 amu.

## DPP No. # 30

**1.** (A) **2.** (A) **3.** (A) **4.** (CD)

**5.** **2.5 ml.** **6.** (B) **7.** (B) **8.** (C) **9.** 9/46

## DPP No. # 31

**1.** (C) **2.** (A) **3.** (D) **4.** (C) **5.** (A)

**6.** (D) **7.** (B) **8.** (D) **9.** (A) **10.** (C)

## DPP No. # 32

**1.** (B) **2.** (C) **3.** (D) **4.** (A,B,C,D) **5.** (B)

**6.** (D) **7.** (B) **8.** 4 **9.** (C) **10.** (C)

**11.** (C,D)

## DPP No. # 33

**1.** (C) **2.** (B) **3.** (C) **4.** (D) **5.** (D)

**6.** (B) **7.** CO= 0.4L **8.** 896 mL.

## DPP No. # 34

**1.** (A) **2.** (C) **3.** (A) **4.*** (ACD)

**5.*** (ACD) **6.*** (CD) **7.** 2000 **8.** 80000 K

## DPP No. # 35

**1.** (A) **2.** (A) **3.** (B) **4.** (B) **5.** (A)

**6.*** (B,C,D) **7.** (i) Z = 1.2 (ii) repulsive forces

## DPP No. # 36

**1.** (C) **2.** (C) **3.** (B) **4.** (A) **5.** (C)

**6.** (D) **7.*** (B,C,D) **8.** [A – r] ; [B – r,s] ; [C – q] ; [D – r].

PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 24

**Total Marks : 31**

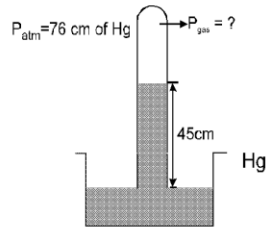
**Max. Time : 38 min.**

**Topic : Gaseous State**

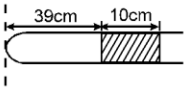
| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1' negative marking) Q.1 | (3 marks, 3 min.) | [3, 3] |
| Subjective Questions ('–1' negative marking) Q.2 to Q.8 | (4 marks, 5 min.) | [28, 35] |

**1.** If some gas is trapped above the mercury column in a Barometer during measurement of atmospheric pressure, the height of Hg column is observed to be h. Then :
(A) h > 76 cm (B) h < 76 cm (C) h = 76 cm (D) cannot be predicted.

**2.** In the following arrangement, find the pressure of the confined gas (in cm of Hg).

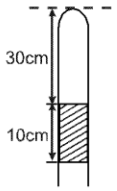



**3.** Given a one meter long glass tube closed at one end having a uniform cross-section containing a mercury column of 10 cm length, at a distance of 39 cm from the closed end. By what distance would this column move down, if the tube is held vertical with the open end downwards ? [Take atmo
spheric pressure to be 75 cm of Hg]



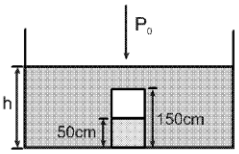

**4.** If another liquid L ($\rho$ = 10.2 g/cm$^3$) is used in place of mercury, then what should be the minimum length of Barometer tube to measure normal atmospheric pressure ?
(Take normal atmoshperic pressure to be 76 cm of Hg).

**5.** Given a long glass tube closed at one end having a uniform cross-section containing a mercury column of 10 cm length, at a distance of 30 cm from the closed end when held vertically as shown. The air trapped above the Hg column has pressure 85 cm of Hg. What will be the length of air column
if the glass tube is held horizontally ?




**6.** A glass tube with a sealed end is completely submerged in a vessel with mercury vertically. The air column is 15 cm long. To what height must the upper end be raised above the level of Hg, so that the level of Hg inside the tube is at the level of Hg in the vessel ? [Atmospheric pressure = 75 cm of Hg column]

**7.** A cylindrical diving bell (initially in open air), whose length is 150 cm, is lowered to the bottom of a tank. The water is found to rise 50 cm in the bell. Find the depth of the tank. Assume the atmospheric pressure at the surface as equivalent to 1000 cm height of water and the temperature as constant




**8.** An open glass tube is immersed in mercury in such a way that a length of 8 cm extends above the mercury level. The open end of the tube is then closed and raised further by 55 cm. What will be the length of air column above mercury in the tube ?
[ Atmospheric pressure = 76 cm of Hg ]