doubtnut
India's Number 1 Education App

CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

STATES OF MATTER

Lecture Sheet Exercise I Intermolecular Forces Gas Laws Ideal Gas Equation Straight Objective Type Questions

1. Give the values of gas constant is different units.

A. 1,2

B. 2,3

C. 1,3

D. 4,3

Answer: C

Watch Video Solution

2. n moles of an ideal gas at temperature, T (in kelvin) occupy VL of volume, exerting a pressure of P atmospheres. What is the concentration (in mole $/ L$) ?

A. $\frac{RT}{R}$

B. $\frac{P}{RT}$

C. $\frac{RT}{P}$

D. $\frac{R}{RT}$

Answer: B

Watch Video Solution

3. Which of the following changes cannot increase the volume of a gas by 4 times

A. T is doubled, P is decreased to half

B. P is kept constant, T is increased by 4 times

C. t' is doubled, P is decreased to half

D. t' is kept constant, P is decreased to l/4th

Answer: C

Watch Video Solution

4. The temperature of a gas is increased by 1 aC. Then from the following statements pickout the correct one

1) The volume increases by 1/273 of its volume at 0°C at constant pressure

2) The pressure increases by 1/273 of its pressure at 0°C at constant

volume

3) The volume decreases by 1/273 of its volume at $0^{o}C$

4) The pressure is doubled to its pressure at $0^{o}C$

A. 1,3

B. 3,4

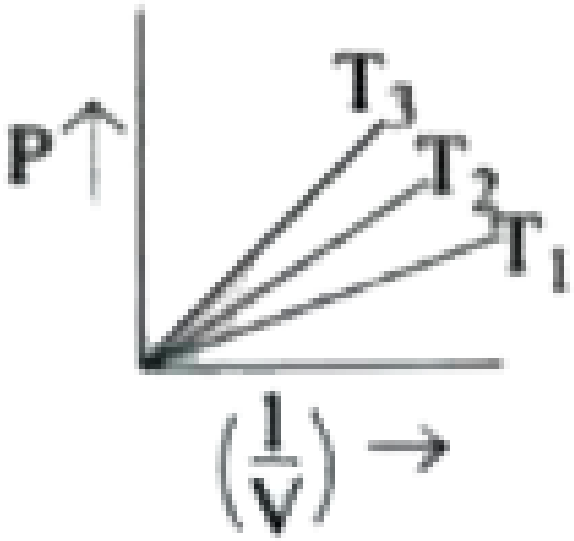
C. 1,2

D. 2,3

Answer: C

Watch Video Solution

5. From the graph the correct order of temperatures is:



A. $T_3 > T_2 > T_1$

B. $T_3 < T_2 < T_1$

C. $T_3 = T_2 = T_1$

D. $T_3 > T_2 < T_1$

Answer: A

Watch Video Solution

6. Which of the following indicates the isotherms?

A. 1,3

B. 1,2

C. 2,3

D. 2,4

Answer: B

Watch Video Solution

7. Which of the following indicates Charles' law mathematically (when n, P are constant)?

1) VT = constant

2) $V_1 = V_0\left(t + \frac{1}{273}\right)$

3) $V_0 = V_1\left(1 + \frac{1}{273}\right)$

4) V/T = constant (when n,P are constant)

A. 1,3

B. 1,2

C. 2,3

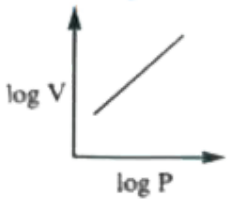
D. 2,4

Answer: D

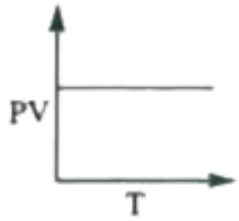
Watch Video Solution

8. Which among the following indicates change in the chemical composition due to dissociation

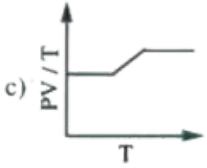
A.



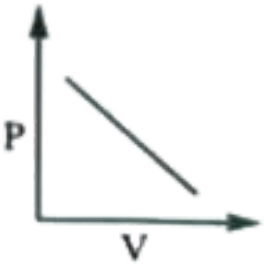
B.



C.



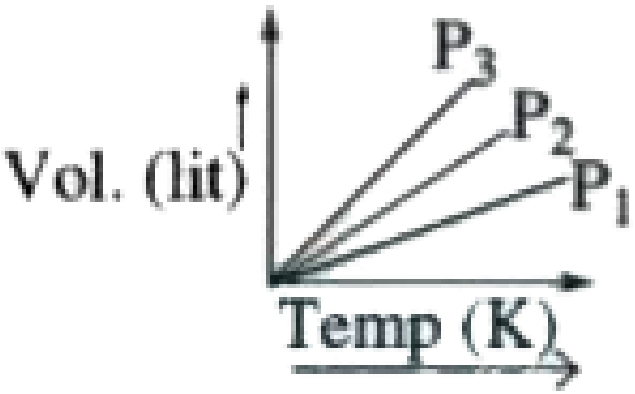
D.



Answer: C

Watch Video Solution

9. From the graph the order of pressure of a gas is



A. $P_1 > P_2 > P_3$

B. $P_1 < P_2 < P_3$

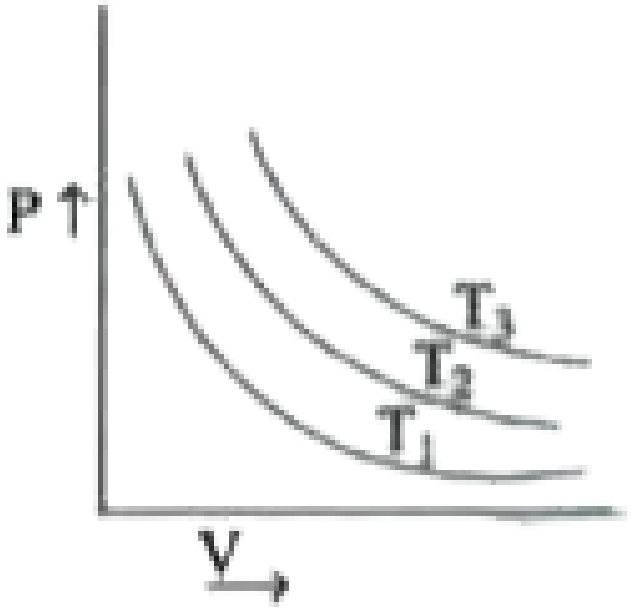
C. $P_1 = P_2 = P_3$

D. $P < P_2 > P_3$

Answer: A

Watch Video Solution

10. From the graph the correct order of temperature is:



A. $T_1 < T_2 < T_3$

B. $T_1 = T_2 = T_3$

C. $T_1 > T_2 > T_3$

D. $T_1 < T_2 > T_3$

Answer: A

Watch Video Solution

11. The approximate energy required to break A+B~ type ionic crystal into its ions is in the range of

A. 10 to 100 kJ/mole

B. 50 to 150 kJ/mole

C. 500 to 1000 kJ/mole

D. 2 to 50 kJ/mole

Answer: C

Watch Video Solution

12. In ion-dipole forces, the magnitude of the interaction energy (E)

A. $E = \frac{Z^2\mu}{r^2}$

B. $E = \frac{Z_r\mu}{r}$

C. $E = \frac{Z\mu^2}{r^2}$

D. $E = \frac{Z\mu}{r^2}$

Answer: D

Watch Video Solution

13. The energy order of dipole-dipole forces is'

A. 1 to 2 kJ/mole

B. 3 to 4 kJ/mole

C. 10 to 20 kJ/mole

D. 15 to 25 kJ/mole

Answer: B

Watch Video Solution

14. Regarding dipole - dipole attractions the incorrect statement is

A. Dipole - dipole attractions are more if the molecules have high dipole moment values

B. In liquid HBr, dipole - dipole attractions are present

C. Dipole - dipole interaction energy between stationary polar molecules $\propto r^{-3}$

D. Dipole - dipole interaction energy between rotating molecules $\propto r^{6}$

Answer: D

Watch Video Solution

15. The average energy of London forces is

A. 1 to 2 kJ/mole

B. 1 to 10 kJ/mole

C. 10 to 20 kJ/mole

D. 20 to 30 kJ/mole

Answer: B

Watch Video Solution

16. A graph is ploted between log V and log T for two moles of gas at constant pressure of 0.0821 atm. [V and T are in litres and kelvin]. Then which of the following is/are correct

A. The graph is a straight line with slope +1

B. The graph is a straight line with slope -1

C. The intercept on Y-axis is 0.301

D. The intercept on Y-axis is 2

Answer: A::C

Watch Video Solution

17. In the equation, PV = RT, the value of R will not depend on

A. the nature of the gas

B. the temperature of the gas

C. the pressure of the gas

D. units of measurement

Answer: A::B::C

Watch Video Solution

18. According to Charle's law, for a gas of constant mass

A. $\left(\frac{dV}{dT}\right)_P = K$

B. $\left(\frac{dV}{dt}\right)_P = -K$

C. $\left(\frac{dV}{dt}\right)_P = -\frac{K}{T}$

D. $V \propto T$(at constant P, const mass)

Answer: A::D

Watch Video Solution

19. Which of the following correctly represent the behaviour of an ideal gas

A. $PV_m \propto T$

B. $PM \propto dT$

C. $P \propto CT$

D. $PV_m \propto CT$

Answer: A::B::C

Watch Video Solution

20. For one mole of an ideal gas, if P = $\frac{P_0}{1+\left(\frac{V}{V_0}\right)^2}$, where P_0 and V_0 are constants. Which of the following are true?

A. (a)P=P_(0)//2$when$V= V_(0)`

B. (b)V= 2V_(0)$when$P = P_(0)`

C. (c)T = P_(0)V_(0)//2R$when$V = V_(0)`

D. (d)R = P/(TV_(0))$when$P =P_(0)`

Answer: A::C

Watch Video Solution

Lecture Sheet Exercise I Linked Comprehension Type Questions Passage I

1. Variation of volume with temperature was first studied by French chemist, Jacques Charles, in 1787 and then extended by another French chemist Joseph Gay-Lussac in 1802. For a fixed mass of a gas under

isobaric condition, variation of volume V with temperature t°C is given by V = $V_0[l + \alpha t]$ where V_0 is the volume at 0°C, at constant pressure. 1 or every 1° change in temperature, the volume of the gas changes by..... of the volume at 0° C

A. $\frac{1}{273}$ unit

B. 1 unit

C. 273 unit

D. 22.4 unit

Answer: A

Watch Video Solution

2. Variation of volume with temperature was first studied by French chemist, Jacques Charles, in 1787 and then extended by another French chemist Joseph Gay-Lussac in 1802. For a fixed mass of a gas under isobaric condition, variation of volume V with temperature t°C is given

by V = $V_0[l + \alpha t]$ where V_0 is the volume at 0°C, at constant pressure.

1 or every 1° change in temperature, the volume of the gas changes by..... of the volume at 0° C

A. α (given above) is called volume coefficient

B. Value of α is $3.66 \times 10^{-3\circ} C^{-1}$ for all gases

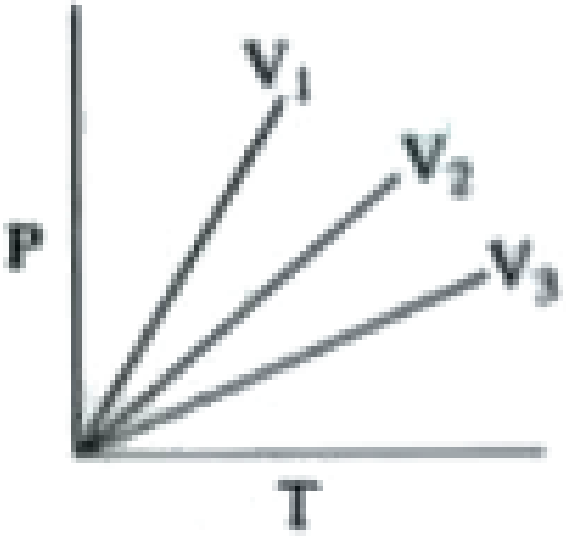
C. 273 K is the lowest possible temperature attained

D. Absolute zero is the temperature reached when all possible thermal energy has been removed from a substance

Answer: C

Watch Video Solution

3. Under isochoric condition, graphs between P and T are shown below.Then volumes of gases are related as



A. $V_1 = V_2 = V_3$

B. $V_1 > V_2 > V_3$

C. $V_1 < V_2 < V_3$

D. $V_2 < V_2 < V_3$

Answer: C

Watch Video Solution

4. Inside a spherical glass flask 'A' of radius 1 meter containg 300gm of H2, there was another rubber balloon B containing some N2. Inside the balloon B, another rubber balloon 'C containing some O_2 is present. At 27°C it was found that the balloon B had a radius of 60cm and balloon 'C had a radius of 30cm

Calculate the moles of nitrogen in the balloon B

A. 4.123atm

B. 3.123 atm

C. 2.123 atm

D. 1.123 atm

Answer: D

Watch Video Solution

5. Inside a spherical glass flask 'A' of radius 1 meter containg 300gm of H2, there was another rubber balloon B containing some N2. Inside the balloon B, another rubber balloon 'C containing some O_2 is present. At 27°C it was found that the balloon B had a radius of 60cm and balloon 'C had a radius of 30cm

Calculate the moles of nitrogen in the balloon B

A. 16,14

B. 1.614

C. 3.614

D. 36.14

Answer: D

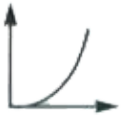
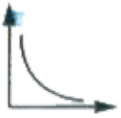
Watch Video Solution

Lecture Sheet Exercise I Matrix Matching Type Questions

List-I	List-II
A) Boyle's law	P) $P_{obs} = P_{atm} + P_{water\ vapour}$
B) Avogadro law	Q) $V_1 = n_1\left(\frac{V_2}{n_2}\right)$
C) Charles law	R) $V_t = V_0\left(1+\frac{t}{273}\right)$
D) Daltons law	S) $V_1 = P_2\left(\frac{V_2}{P_1}\right)$

1.

Watch Video Solution

List-I	List-II
A) $\frac{1}{V^2}$ vs P for ideal gas at constant T and n.	P) 
B) V vs $\frac{1}{T}$ for ideal gas at constant P and n	Q) 
C) PT vs T^2 for ideal gas at constant V and n	R) 
D) V vs $\frac{1}{P^2}$ for ideal gas at constant T and n	S) 

2.

Watch Video Solution

Lecture Sheet Exercise I Integer Type Questions

1. Two flasks of equal volumes have been joined by a narrow tube of negligible volume. Initially both the flasks are 300 K and totally 9 mole of gas is present. One of the flasks is then placed in a thermostat at 600K. How many moles of gas is present in hot bulb.

Watch Video Solution

2. A gas occupies a volume of 2.5L at $9 \times 10^5 Nm^{-2}$. The additional pressure required to decrease the volume of the gas to 1.5L keeping the temperature constant is ..... $\times 10^5 Nm^{-2}$?

Watch Video Solution

3. In how many solids only london dispersion forces exist ? Dry ice, Ice, Solid I_2, Solid 'Xe', Rocksalt, 'He' gas

Watch Video Solution

Lecture Sheet Exercise Ii Dalton S Law Diffusion Of Gasses Straight Objective Type Questions

1. The total pressure of a mixture of 8g of oxygen and 14g of nitrogen contained in a 11.2L vessel at $0^{o}C$ is.

A. 0.5 atm

B. 1 atm

C. 1.5 atm

D. 2 atm

Answer: C

Watch Video Solution

2. At 127°C and latm pressure, a mixture of a gas contains 0.3 mole of N_2, 0.2 mole of O_2 The volume of the mixture is

A. 15 lit

B. 22.4 lit

C. 18.2 lit

D. 16.4 lit

Answer: D

Watch Video Solution

3. A gaseous mixture containing 0.35g of N_2 and 5600 ml of O_2 at STP is kept in a 5 litres flask at 300K. The total pressure of the gaseous mixture is

A. 1.293atm

B. 1.2315atm

C. 12.315atm

D. 0.616atm

Answer: A

Watch Video Solution

4. When 2g of a gas A is introduced into an evacuated flask kept at 25°C, the pressure is found to be 1 atmosphere. If 3g of another gas is then added to the same flask, the total pressure becomes 1.5 atm. Assuming ideal behaviour, the ratio of their molecular weights $M_A : M_B$ is

Watch Video Solution

5. In a mixture of N_2 and CO_2 gases, the partial pressure of CO_2 is 1.25 atm. The total pressure of the mixture is 5 atm. The mole fraction of N_2 in the mixture is

A. 0.82

B. 0.75

C. 0.8

D. 0.65

Answer: B

Watch Video Solution

6. A and B are ideal gases. The molecular weights of A and B are in the ratio of 1 : 4. The pressure of a gas mixture containing equal weights of A and B is P atm. What is the partial pressure (in atm) of B in the mixture?

A. P/5

B. P/2

C. P/2.5

D. 3P/4

Answer: A

Watch Video Solution

7. The total pressure of a mixture of 6.4 grams of oxygen and 5.6 grams of nitrogen present in a 2 lit vessel is 1200mm. What is the partial pressure of nitrogen in mm?

A. 1200

B. 600

C. 900

D. 200

Answer: B

Watch Video Solution

8. 2gm of hydrogen is present in a closed vessel at S.T.P. If the same quantity of another gas 'X' when introduced into the vessel the pressure becomes 1.5 atm. The gas 'X' would be

A. CH_4

B. SO_2

C. He

D. O_2

Answer: C

Watch Video Solution

9. The rate of diffusion of methane at given temperature is twice that of gas 'X'. The Molecular weight of 'X' is

A. 32

B. 16

C. 8

D. 64

Answer: D

Watch Video Solution

10. 2 grams of Helium diffuses from a porous plate in 4min. How many grams of CH_4 would diffuse through the same plate in same time under similar conditions?

A. 4g

B. 16 g

C. 8 g

D. 2 g

Answer: A

Watch Video Solution

11. If the molecules of SO_2 effuse a distance of 150cm in a certain period of time, the distance travelled by the molecules of CH_4 effusing in the same time is

A. 300 cm

B. 600 cm

C. 37.5 cm

D. 75 cm

Answer: A

Watch Video Solution

12. The rate of diffusion of Hydrogen is about

A. 1/2 that of He

B. Twice that of He

C. 1.414 times that of He

D. Four times that of He

Answer: C

Watch Video Solution

13. Which of the pairs of gases diffuse at a slower rate than CO_2?

A. H_2 and He

B. SO_2 and SO_3

C. N_2 and CO

D. N_2O and C_3H_8

Answer: B

Watch Video Solution

14. Ammonia gas diffuses twice as fast as gas X. The gas 'X'is

A. SO_2

B. C_4H_{10}

C. C_5H_8

D. Cl_2

Answer: C

Watch Video Solution

15. The four tyres of a motor car are filled with CO_2, He, H_2 and O_2 respectively. The order in which they are to be reinflated is

A. CO_2, O_2, He, H_2

B. H_2, He, O_2, CO_2

C. H_2, He, CO_2, O_2

D. H_2, O_2, He, CO_2

Answer: C

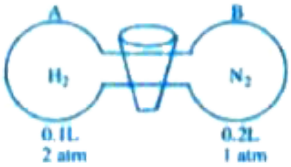
Watch Video Solution

Lecture Sheet Exercise Ii Dalton S Law Diffusion Of Gasses More Than One Correct Answer Type Questions

1. 10 Its of an air sample with relative humidity 0.6 is compressed to 5 litres at same temperature. What is the partial pressure of the water

vapour in the compressed air, if the pressure of saturated water vapour at that temperature is 2.4 K Pa

Watch Video Solution

2. 

After opening the stopcock _____

After opening the stopcock_____

A. The gases do not mix

B. Final pressure at equilibrium is 1.33 atm

C. H_2 occupies 'B' flask faster than 'N_2 ' occupying 'A

D. The final equilibrium pressure is 1.5 atm

Answer: B::C

Watch Video Solution

3. Among the following which gases are heavier then air

A. dry O_2

B. moist O_2

C. dry N_2

D. moist N_2

Answer: A::B::C

Watch Video Solution

4. To measure the pressure exerted by a trapped gas A, an open ended mercury manometer is used. After sparking the gas A, it dissociates as, A(g) $\rightarrow$ B(g) + 3C(g). If the pressure of A decreases to 0.9 atm, then (assume temperature to be constant, 300K)

A. total pressure increased to 1.3 atm

B. total pressure increased by 0.3 atm

C. difference in mercury level is 228 mm

D. Total pressure increased by 0.3 cm of Hg

Answer: A::B::C

Watch Video Solution

5. A balloon of diameter 21 meter weight 100 kg. Calculate its pay-load, if it is filled with He at 1.0 atm and 27°C. Density fair is 1.2 kgm^{-3} (Given : R = 0.0821 L atm $K^{-1}mol^{-1}$)

A. 4952.42 kg

B. 4932.42 kg

C. 493.242 kg

D. none of these

Answer: B

Watch Video Solution

Lecture Sheet Exercise Ii Dalton S Law Diffusion Of Gasses Linked Comprehension Type Questions Passage I

1. O_2 is partially atomised due to certain experimental conditions. The mixture of O_2 molecules and O atoms diffuses $\sqrt{5}$ times slower than Helium. What is the percentage atomisation of O_2 ?

A. $50\ \%$

B. $20\ \%$

C. $40\ \%$

D. $60\ \%$

Answer: D

Watch Video Solution

2. What is the mass of water vapour in $1m^3$ of air with 0.4 relative humidity at 300K? (Aqueous tension at 300 K=3.6 K Pa)

A. 22.12 gm

B. 10.53 gm

C. 4.68 gm

D. 2.86 gm

Answer: B

Watch Video Solution

Lecture Sheet Exercise Ii Dalton S Law Diffusion Of Gasses Linked Comprehension Type Questions Passage Ii

1. 1 g of methane diffused in 20 sec. under certain conditions. Under the same conditions $\sqrt{20}g$ of a hydrocarbon (A) diffused in 40 sec. A 10

mg of sample of (A) took up 8.40 ml of H_2 gas measured at 0°C and 760 mm pressure:

The number of n. bonds present in the compound A is/are

A. 2

B. 1

C. 3

D. 4

Answer: C

Watch Video Solution

2. If one of the open chain isomer of (A) on ozonolysis gives only formaldehyde & glyoxal, then its monocyclic isomer on ozonolysis gives

A. only glyoxal

B. only methyl glyoxal

C. formaldehyde & glyoxal

D. glyoxal & methyl glyoxal

Answer: B

Watch Video Solution

3. 1 g of methane diffused in 20 sec. under certain conditions. Under the same conditions $\sqrt{20}g$ of a hydrocarbon (A) diffused in 40 sec. A 10 mg of sample of (A) took up 8.40 ml of H_2 gas measured at 0°C and 760 mm pressure:

Identify the incorrect statement.

A. One of the isomers of (A) exhibits geometrical isomerism

B. One of the isomers of (A) gives white precipitate with Tollen's reagent

C. One of the isomers of (A) is asymmetric

D. One of the isomers on ozonolysis gives only acetone

Answer: D

Watch Video Solution

Lecture Sheet Exercise Ii Dalton S Law Diffusion Of Gasses Matrix Matching Type Questions

1.

List-I (characteristics of gas)	List-II (characteristics are directly proportional to)
A) Diffusion of gas	P) Temperature
B) Density	Q) Pressure
C) Critical Pressure	R) Attractive forces
D) Kinetic energy	S) Molecular mass

Watch Video Solution

Lecture Sheet Exercise Ii Dalton S Law Diffusion Of Gasses Integer Type Questions

1. A vessel contains equal weights of He and CH_4 gases at 20 bar pressure. Due to the leakage, the gases in the vessel started effusing out. What is the volume ratio of He and CH_4 gases coming out initally

Watch Video Solution

2. At 25°C vapour pressure of water is 23 mm of Hg. If partial pressure of water vapour in air at 25°C is 18.4 mm of Hg, the percentage relative humidity in air is how many multiple of ten?

Watch Video Solution

3. Two gram of hydrogen diffuse from a container in 10 minutes. How many grams of oxygen would diffuse through the same container in the same time under similar conditions?

Watch Video Solution

4. A vessel contains equal weights of He and CH_4 gases at 20 bar pressure. Due to the leakage, the gases in the vessel started effusing out. What is the volume ratio of He and CH_4 gases coming out initally

Watch Video Solution

Lecture Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency Straight Objective Type Questions

1. The kinetic energy of 'N' molecules of H_2 is 3J at -73°C. The kinetic energy of the same sample of H_2 at 127°C is

A. 12 J

B. 6 J

C. 9 J

D. 3 J

Answer: B

Watch Video Solution

2. SO_2 , molecule is twice as heavy as O_2 molecule. Hence at 25°C the ratio of the average kinetic energies of Sulphur dioxide and oxygen is

A. $1:1$

B. $2:1$

C. $1:2$

D. $4:1$

Answer: A

Watch Video Solution

3. The ratio of the kinetic energies of equal number of moles of H_2 and He at the same temperature is

A. $1:2$

B. $2:1$

C. $1:1$

D. $4:1$

Answer: C

Watch Video Solution

4. The temperature at which Methane molecules have the same average Kinetic energy as that of oxygen molecules at 27°C is

A. 327° C

B. 27° C

C. 927° C

D. 627° C

Answer: B

Watch Video Solution

5. The kinetic energy of 1 mole of oxygen molecules in cal mol^{-1} at 27°C

A. 300

B. 600

C. 900

D. 800

Answer: C

Watch Video Solution

6. The RMS velocity of a gas at 0°C is 2m/s. The RMS velocity of the same gas at 819°C

A. 1 m/s

B. 4 m/s

C. 8m/s

D. 16 m/s

Answer: B

Watch Video Solution

7. At 27°C the ratio of the R.M.S. Velocities of ozone and oxygen molecules is

A. $\sqrt{\frac{3}{5}}$

B. $\sqrt{\frac{1}{4}}$

C. $\sqrt{\frac{4}{3}}$

D. $\sqrt{\frac{2}{3}}$

Answer: D

Watch Video Solution

8. At what temperature the most probable velocity of O_2 gas is equal to the RMS velocity of O_3 at 't'°C?

Watch Video Solution

9. The most probable velocity of the molecules of a gas is 1 km/sec. The R.M.S velocity of the molecules is

A. 1.128 km/sec

B. 1.224 km/sec

C. 1.5 km/sec

D. 1.086 km/sec

Answer: B

Watch Video Solution

10. At what temperature the velocity of O_2 molecules will have the same velocity as SO_2 at 47°C?

A. 113° C

B. 160° C

C. -113° C

D. -160° C

Answer: C

Watch Video Solution

11. Collision frequency (Z) of a gas at a particular pressure

A. decreases with the rise in temperature

B. increases with the rise in temperature

C. decreases intially and thereafter increases

D. unpredictable.

Answer: B

Watch Video Solution

12. The closest distance between the centres oi iwo molecules of a gas taking part in collision is called

A. molecular diameter

B. collision diameter

C. mole (a) and (b)

D. none of these

Answer: B

Watch Video Solution

13. If the mean free path is ' λ' at one atm pressure then its value at 5 atm pressure is

A. 5λ

B. $\frac{2}{5}\lambda$

C. $\frac{\lambda}{5}$

D. unpredictable.

Answer: C

Watch Video Solution

14. The number of collisions depends on

A) mean free path

B) pressure

C) temperature

A. A,C

B. A,B

C. B,C

D. A,B,C

Answer: D

Watch Video Solution

15. The mean free path of a gas molecule is the distance

A. between the two opposite walls of the container

B. which the molecule travel in one second

C. through which a molecule moves between two consecutive collisions

D. Which the molecule travel in one second

Answer: C

Watch Video Solution

Lecture Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency More Than One Correct Answer Type Questions

1. RMS velocity of a gas does not vary with_____at a given temperature.

A. pressure

B. volume

C. density

D. shape of the container

Answer: A::B::C::D

Watch Video Solution

2. Average kinetic energy of a gas does not depend on_____at a given temperature

A. pressure

B. volume

C. nature of gas

D. density

Answer: A::B::C::D

Watch Video Solution

3. Transitional kinetic energy of a gas molecule_____

A. is constant at constant temperature

B. depends on quantity of gas

C. does not change with volume at a given temperature

D. is same for all gases at a given temperature

Answer: A::C::D

Watch Video Solution

4. The correct statement regarding various types of molecular speeds are

A. increasing temperature increasing the fraction of molecules having U_{mps}

B. Increasing temperature increases U_{mps}

C. In a sample of gas at a given temperature, molecules with extremely low and high speeds are less

D. At the same temperature lighter gaseous having narrow distribution of molecular speeds than heavier gaseous

Answer: B::C

Watch Video Solution

5. Which of the following statement(s) is/are true?

A. The ratio of rms speed to average speed is independent of temperature

B. Average kinetic energy is independent of the change in temperature

C. The difference between rms and most probable speed increases on increase in temperature

D. The rms speed is higher for He than for H_2 at a given temperature

Answer: A::C

Watch Video Solution

Lecture Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency Linked Comprehension Type Questions Passage I

1. The root mean square speed of an ideal gas is given by : $u_{\text{rms}} = \sqrt{\frac{3RT}{M}}$ Thus we conclude that u_{rms} speed of the ideal gas molecules is proportional to square root of the temperature and inversely proportional to the square root of the molar mass. The translational kinetic energy per mole can also be given as $\frac{1}{2}Mu_{rms}^2$. The mean free path (λ) is the average of distances travelled by molecules in between two successive collisions whereas collision

frequency (C.F.) is expressed as number of collisions taking place in unit time. The two terms λ and C.F. are related by : $C.F = \left(\frac{u_{\text{rms}}}{\lambda}\right)$

A jar contains He and H, in the molar ratio 1 : 5. The ratio of mean translational kinetic energy at the same temperature is

A. $1:5$

B. $5:1$

C. $2:1$

D. $1:1$

Answer: D

Watch Video Solution

2. The root mean square speed of an ideal gas is given by : $u_{\text{rms}} = \sqrt{\frac{3RT}{M}}$ Thus we conclude that u_{rms} speed of the ideal gas molecules is proportional to square root of the temperature and inversely proportional to the square root of the molar mass. The

translational kinetic energy per mole can also be given as $\frac{1}{2}Mu_{rms}^2$. The mean free path (λ) is the average of distances travelled by molecules in between two successive collisions whereas collision frequency (C.F.) is expressed as number of collisions taking place in unit time. The two terms λ and C.F. are related by : $C.F. = \left(\frac{u_{\text{rms}}}{\lambda}\right)$ Which of the following relation is correct for an ideal gas regarding its pressure (P) and translational kinetic energy per unit volume (E) ?

A. $P = \frac{2}{3}E$

B. $P = \frac{3}{2}E$

C. $P = \frac{1}{2}E$

D. P = 2E

Answer: A

Watch Video Solution

3. The root mean square speed of an ideal gas is given by : $u_{\mathrm{rms}} = \sqrt{\frac{3RT}{M}}$ Thus we conclude that u_{rms} speed of the ideal gas molecules is proportional to square root of the temperature and inversely proportional to the square root of the molar mass. The translational kinetic energy per mole can also be given as $\frac{1}{2}Mu_{rms}^2$. The mean free path (λ) is the average of distances travelled by molecules in between two successive collisions whereas collision frequency (C.F.) is expressed as number of collisions taking place in unit time. The two terms λ and C.F. are related by : $C.\ F = \left(\frac{u_{\mathrm{rms}}}{\lambda}\right)$ If n represents number of moles, n0 is number of molecules per unit volume, k is Boltzmann constant, R is molar gas constant, T is absolute temperature and NA is Avogadro's number then which of the following relations is wrong ?

A. $P = n_0 kTN_A$

B. $P = n_0 RT$

C. $P = \frac{nKN_AT}{V}$

D. $n_0 = N_A \times \frac{n}{V}$

Answer: B

Watch Video Solution

Lecture Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency Matrix Matching Type Questions

1.

List-I	List-II
A) RMS velocity of gas molecules	P) Depends on T, P and number of moles of the gas
B) Average K.E. of gas	Q) Directly proportional to absolute temp
C) Volume of gas	R) Collisions of molecules on the walls
D) Pressure of the gas	S) Directly proportional to the square root of absolute temperature

Watch Video Solution

2.

List-I	List-II
A) If temperature of given gas is increased	P) Average speed of gas molecules will increase
B) If the pressure of the given gas increased at constant temperature	Q) Root mean square speed of gas molecule will increase
C) If the density of a given gas is lowered at constant temperature	R) Most probable speed of gas molecule will increase
D) If the volume of a given gas is increased at constant temperature	S) Speed of gas molecules will not change

Watch Video Solution

Lecture Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency Integer Type Questions

1. The K.E of N molecules of O_2 is x Joules at -123°C. Another sample of O_2 at 27°C has a KE of 2x Joules. The latter sample contains_____N molecules of O_2.

Watch Video Solution

2. Kinetic energy of 0.30 moles of He gas in a container of maximum capacity of 4 litres at 5 atmosphere, must be (R = 0.0821 atm litre $\text{mole}^{-1}K^{-1}$)_____ $\times 10^1$ atm.lit

Watch Video Solution

3. At 27°C, the average speed of N_2 molecules is xms4. At 927°, the speed will be_____ xms^{-1}

Watch Video Solution

4. Two flasks A and B have equal volumes. A is maintained at 300 K and B at 600 K. while A contains H_2 gas, B has an equal mass of CH_4 gas. Assuming ideal behaviour for the both gases find the ratio of $(u_{av})_A : (u_{av})_B$.

Watch Video Solution

5. The mass of molecule A is twice the mass of molecule B. The rms speed of A is twice the rms speed of B. If two samples of A and B contain same number of molecules, what will be the ratio of pressures of two samples in separate containers of equal volume._____

Watch Video Solution

Lecture Sheet Exercise Iv Vanderwaal S Egn Critical Constants Straight Objective Type Questions

1. The behaviour of temporary gases like CO_2 approaches that of permanent gases like N_2, O_2 etc. as we go

A. Below critical temperature

B. Above critical temperature

C. Above absolute zero

D. Below absolute zero

Answer: B

Watch Video Solution

2. The relationship between P_c, V_c and T_c is

Watch Video Solution

3. When a compressed gas is allowed to expand through a porous plug at temperature above its inversion temperature, there is

A. a fall in temperature

B. a rise in temperature

C. neither a fall nor a rise in temperature

D. a fall in temperature first, followed by a rise in temperature.

Answer: B

Watch Video Solution

4. The gas that is heated up during Joule Thomson effect at ordinary temperture is

A. O_2

B. CO_2

C. H_2 occupies 'B' flask faster than 'N_2 ' occupying 'A

D. SO_2

Answer: C

Watch Video Solution

5. The Joule Thomson coefficent is zero at

A. Inversion temperature

B. Critical temperture

C. Absolute temperature

D. Below 0^oC

Answer: A

Watch Video Solution

6. When an ideal gas undergoes unrestricted expansion

A. cooling occurs because the molecules lie above inversion temp.

B. no cooling occurs as no attractive interactions exist among molecules

C. cooling occurs as molecules collide with each other among molecules

D. cooling does not occur as these do work equal to loss in kinetic energy

Answer: B

Watch Video Solution

7. A gas X causes heating effect when allowed to expand. This is because

A. The gas is a noble gas

B. The inversion temperature of the gas is very low

C. The gas is ideal gas

D. The boiling point of the gas is very low

Answer: B

Watch Video Solution

8. The cooling caused by the expansion of a compressed gas below its inversion temperature without doing external work is called

A. Joule Thomson effect

B. Adiabatic demagnetisation

C. Tyndall effect

D. Compton effect

Answer: A

Watch Video Solution

9. A mixture of hydrogen and helium is prepared such that the number of collisions on the wall per unit time by molecules of each gas is same. Which gas has higher concentration?

A. helium

B. hydrogen

C. both have same concentration

D. can't be determined

Answer: A

Watch Video Solution

10. For a mixture of I mole He and 1 mole Ne, select the correct statements(s)

A. Molecules of the two gases strike the wall of the container with same frequency

B. Molecules of the helium strike the wall more frequently

C. $u_{av\,(He)} > u_{av\,(Ne)}$

D. both 1 and 3

Answer: D

Watch Video Solution

11. The compressibility factor of an ideal gas is

A. 1

B. 1.5

C. 2

D. Infinity

Answer: A

Watch Video Solution

12. A real gas deviates most from ideal behaviour at

A. High temperature and Low pressure

B. High pressure and Low temperature

C. High pressure and High temperature

D. Low pressure and Low temperature

Answer: B

Watch Video Solution

13. An ideal gas cannot be liquified because

A. collisions are elastic

B. f the absence of attractive forces

C. gravity has no effect on the molecules

D. the average K.E. is not proportional to the absolute temperature.

Answer: B

Watch Video Solution

14. The most ideal gas among real gases is

A. Hydrogen

B. Helium

C. Carbon dioxide

D. Nitrogen

Answer: B

Watch Video Solution

15. Vander Waal's equation for one mole of CO_2 gas at low pressure will be

A. $\left(P + \frac{a}{v^2}\right)V = RT$

B. $P(V - b) = RT - \frac{a}{V^2}$

C. $P = \frac{RT}{V - b}$

D. $P\left(\frac{RT}{V - b} - \frac{a}{V^2}\right)$

Answer: A

Watch Video Solution

1. Which of the following statements is/are correct with respect to behaviour of real gas.

A. a) For every vander Waal gas at critical condition, attractive force will be dominant

B. b) The liquid and gaseous state can be distinguished only if the temperature is below the gas's critical temperature.

C. c) At very high pressures, real gases occupy greater volume as compared to ideal gas having same moles at same temperature and exerting same pressure.

D. d) For a real gas the 'y' intercept of $\frac{PV_m}{T}$ vs curve where 'P' represents pressure (in atm), V_m represents molar volume and 'T' represents temperature in kelvin is equal to 0.0821 atm-litre/mol Kelvin

Answer: A::B::C::D

Watch Video Solution

2. Select the correct statement.

A. At high pressure real gases are less compressible in comparision to ideal gas

B. H_2 and He are more compressible than ideal gases at all pressures

C. Except H_2 and He, the compressibility factor $Z = \left(\frac{PV}{nRT}\right) < 1$ for all gases at low pressure.

D. The compressibility factor of real is independent of temperature

Answer: A::C

Watch Video Solution

3. Which of the following are the characteristics of a real gas

A. The molecules attract each other

B. It shows deviations from the ideal gas law

C. It obeys the gas law at low temperature and high pressure

D. The mass of molecules is negligible

Answer: A::B

Watch Video Solution

4. The correct statement amongst the following is:

A. a)For every gas there exists a characteristic temperature above which it cannot be liquefied no matter however high is the pressure applied called critical temperature of the gas.

B. b)For every gas there exists a characteristic temperature at which its compressibility factor is equal to unity for some range of pressure.

C. c)Amongst He, N_2, O_2 and CO_2, CO_2 has the lowest value of "a" and He has the lowest value "b" where a and b are vander walls constants of the gas.

D. d)The extent of departure of Z (compressibility factor) from unity is the measure of the extent of deviation from ideal behavior.

Answer: A::B::D

Watch Video Solution

5. The internal pressure loss of one mole of vander Waal gas over an ideal gas is not equal to

A. zero

B. b^2

C. $\frac{a}{V^2}$

D. $b - \frac{a}{RT}$

Answer: A::B::D

Watch Video Solution

Lecture Sheet Exercise Iv Vanderwaal S Egn Critical Constants Linked Comprehension Type Questions Passage I

1. Homogeneous mixing and compressibility both result from the fact that the molecules are far apart in gases. Mixing occurs because individual gaseous molecules have little interaction with their neighbours and, assuming that no reaction takes place, the chemical identities of those neighbours are irrelevant. Compressibility is possible in gases because only about 0.1% of the volume of a typical gas is taken up by the molecules themselves under normal

circumstances, the remaining 99.9% is empty space.

Compressibility factor of a gas is given by :

A. $\frac{PV}{R}$

B. $\frac{PV}{R^2}$

C. $\frac{R}{PV}$

D. $\frac{PV}{nRT}$

Answer: D

Watch Video Solution

2. Homogeneous mixing and compressibility both result from the fact that the molecules are far apart in gases. Mixing occurs because individual gaseous molecules have little interaction with their neighbours and, assuming that no reaction takes place, the chemical identities of those neighbours are irrelevant. Compressibility is possible in gases because only about 0.1% of the volume of a typical

gas is taken up by the molecules themselves under normal circumstances, the remaining 99.9% is empty space.

Assume molecules are spherical of radius 1A . Volume occupied by molecules in one mole of a gas at NTP is :

A. $2.52m^3$

B. $2.52 \times 10^{-4}m^3$

C. $2.52 \times 10^{-6}m^3$

D. $2.52 \times 10^{-2}m^3$

Answer: C

Watch Video Solution

3. Homogeneous mixing and compressibility both result from the fact that the molecules are far apart in gases. Mixing occurs because individual gaseous molecules have little interaction with their neighbours and, assuming that no reaction takes place, the chemical

identities of those neighbours are irrelevant. Compressibility is possible in gases because only about 0.1% of the volume of a typical gas is taken up by the molecules themselves under normal circumstances, the remaining 99.9% is empty space.

For H_2 and He, force of attraction is negligible, hence compressibility factor is :

A. $\frac{PV}{RT}$

B. $\left(1+\frac{Pb}{RT}\right)$

C. $\left(1-\frac{a}{RTV}\right)$

D. $\left(1+\frac{RT}{Pb}\right)$

Answer: B

Watch Video Solution

Lecture Sheet Exercise Iv Vanderwaal S Egn Critical Constants Linked Comprehension Type Questions Passage Ii

1. Critical constants are related with van der waals' constant as follows:

$V_c = 3b, P_c = \frac{a}{27b^2}, T_c = \frac{8a}{27Rb}$

The pressure required to liquefy a gas at the critical temperature is called :

A. reduced pressure

B. critical pressure

C. vapour pressure

D. atmospheric pressure

Answer: B

Watch Video Solution

2. The essential conditions for liquefaction of gases were discovered by Andrews in 1869 as a result of his study of pressure-volume-temperature relationship for CO_2 . It was found that above a certain temperature, it was impossible to liquefy a gas whatever the pressure

was applied. The temperature below which the gas can be liquefied by the application of pressure alone is called critical temperature (Tc). The pressure required to liquefy a gas at this temperature is called the critical pressure (Pc). The volume occupied by one mole of the substance at the critical temperature and pressure is called critical volume. Critical constants are related with van der waals' constant as follows:

$$V_c = 3b, P_c = \frac{a}{27b^2}, T_c = \frac{8a}{27Rb}$$

The values of critical volumes of four gases A, B, C and D are 0.025L, 0.312L, 0.245L and 0.432L respectively. The gas with larger molecular diameter will be :

A. A

B. D

C. B

D. C

Answer: B

Watch Video Solution

Lecture Sheet Exercise Iv Vanderwaal S Egn Critical Constants Matrix Matching Type Questions

1. Match the compression factor under different condition (in List-I) with its value (in List-II)

List-I	List-II
A) Compression factor (Z) for ideal gas	P) $\frac{3}{8}$
B) Z for real gas at low P	Q) $(1+Pb/RT)$
C) Z for real gas at high P	R) 1
D) Z for critical state	S) $(1-a/RTV)$

Watch Video Solution

Lecture Sheet Exercise Iv Vanderwaal S Egn Critical Constants Integer Type Questions

1. Excluded volume for free random motion of gas molecules is how many times the actual volume of gas molecules

Watch Video Solution

2. Inversion temperature of a gas is how many times the Boyle's temperature?

Watch Video Solution

3. What is the value of: $\frac{27RbT_c}{a}$?

Watch Video Solution

4. Real gases exert less pressure when compared with ideal gases due to the attraction between the gas molecules. Reduction in pressure of real gases $\propto (\text{Concentration of gas})^n$. What is the value of n ?

Watch Video Solution

Lecture Sheet Exercise V Vapour Pressure Viscosity Surface Tension Straight Objective Type Questions

1. A relation between vapour pressure and temperture is known as

A. Ideal gas equation

B. Boltzmam equation

C. Clausious equation

D. Clausius - Clapeyron equation

Answer: D

Watch Video Solution

2. A manifestation of surface tension is :

A. Rise of liquid in a capillary tube

B. Spherical shape of liquid drops

C. Upward movement of water in soils

D. All the above

Answer: D

Watch Video Solution

3. The unit of surface tension is

A. Dynes cm^{-2}

B. Ergs/cm

C. Joules m^{-1}

D. $N.\ m^{-1}$

Answer: D

Watch Video Solution

4. Generally liquid drops assume spherical shape because

A. A sphere has maximum surface area

B. A sphere has minimum surface area

C. Sphere is symmetrical in shape

D. Sphere is heavy

Answer: B

Watch Video Solution

5. The surface tension of water at 20°C is 72.75 dyne cm^{-1} . Its value in SI system is

A. $7.275Nm^{-1}$

B. $0.7275Nm^{-1}$

C. $0.07275Nm^{-1}$

D. None of these

Answer: C

Watch Video Solution

6. Example of surface active substance

A) Cholesterol , B) Alcohol , (C) Soap

A. A,B

B. B,C

C. A,C

D. A,B,C

Answer: D

Watch Video Solution

7. On heating a liquid, its surface tension

A. Increases

B. Decreases

C. Remains same

D. Is reduced to zero

Answer: B

Watch Video Solution

8. Water drops stick to a glass surface due to

A. Cohesion

B. Adhesion

C. Flocculation

D. Greesy nature

Answer: B

Watch Video Solution

9. Find incorrect match

A. Unit of surface energy = $J - m^{-2}$

B. Unit of surface tension = $N - m^{-1}$

C. Molecules on the surface of liquid = less energy

D. Minimum surface area of a liquid = Lowest energy state

Answer: C

Watch Video Solution

10. Sharp glass edges are heated for making them smooth (polishing of glass) which is due to its

A. Viscocity

B. Surface tension

C. Fluidity

D. Expansion nature of glass

Answer: B

Watch Video Solution

Lecture Sheet Exercise V Vapour Pressure Viscosity Surface Tension More Than One Correct Answer Type Questions

1. Viscosity of ethanol is 12.0 millipoise. Viscosity of ethanol in S.I system is equal to

A. 1,2

B. 1.2×10^{-3}

C. 1.2×10^{-2}

D. 1.2×10^{-2}

Answer: A::C::D

Watch Video Solution

2. Which are not suitable units for surface tension in S.I. system

A. $Kg.\ m^{-1}S^{-1}$

B. $Kg.\ S^{-1}$

C. $N.\ m^{-1}$

D. $J.\ m^{-1}$

Answer: A::B::D

Watch Video Solution

Practice Sheet Exercise I Intermolecular Forces Gas Laws Ideal Gas Equation Level I

1. At 273°C and 380 torr pressure, the density of a gas is $1.25 kg/^3$. So its density at STP in g// is

A. 5 g/l

B. 2.5 g/l

C. 10 g/l

D. 0.5 g/l

Answer: A

Watch Video Solution

2. If 10 gm of a gas at atmospheric pressure is cooled from 273°C to 0°C keeping the volume constant, its pressure would become

A. 2 atm

B. 273 atm

C. 1/273 atm

D. 1/2 atm

Answer: D

Watch Video Solution

3. The molecular weights of two ideal gases A and B are respectively 100 and 200. One gram of A occupies V litres of volume at STP. What is the volume (in litres) occupied by one gram of B at STP ?

A. V/2

B. V

C. 4V

D. 2V

Answer: A

Watch Video Solution

4. One litre of a gas weighs 4g at 300 K and 1 atm. If the pressure is reduced to 0.75 atm, the temperature at which one litre of the same gas weights 2g is

A. 600 K

B. 900 K

C. 450 K

D. 800 K

Answer: C

Watch Video Solution

5. Two identical vessels are filled with 44g of Hydrogen and 44g of carbon dioxide at the same temperature. If the pressure of CO_2 is 2 atm, the pressure of Hydrogen is

A. $1atm$

B. 44 atm

C. 2 atm

D. 22 atm

Answer: B

Watch Video Solution

6. N_2 gas is present in one litre flask at a pressure of 7.6×10^{-10} mm of Hg. The number of N_2 gas molecules in the flask at 0°C are

Watch Video Solution

7. 112ml. of oxygen at STP is subjected to liquefication. The mass of liquid oxygen obtained is

A. 0.64 g

B. 0.16 g

C. 0.32 g

D. 0.96 g

Answer: B

Watch Video Solution

8. The density of a gas at 27°C and 1 atm is d. Pressure remaining constant at what temperature its density becomes 0.75 d

A. 36° C

B. 127° C

C. 30° C

D. 54° C

Answer: B

Watch Video Solution

Watch Video Solution

9. If one mole of a gas A (mol.wt-40) occupies a volume of 201itres, under the same conditions of temperature and pressure the volume occupied by 2 moles of gas B (mol.wt=80) is

A. 80 L

B. 60 L

C. 50 L

D. 40 L

Answer: D

Watch Video Solution

10. The value of the universal gas constant R depends upon the

A. Nature of the gas

B. Mass of the gas

C. Temperature of the gas

D. The units of measurement

Answer: D

Watch Video Solution

11. Value of Rin SI units is

A. $8.315 \times 10^7 ergK^{-1}\text{mole}^{-1}$

B. $8.315 JK^{-1}\text{mole}^{-1}$

C. 0.0823 lit.Atm.$K^{-1}\text{mole}^{-1}$

D. $2calK^{-1}\text{mole}^{-1}$

Answer: B

Watch Video Solution

12. The gas constant R represents work done

A. per molecule

B. per degree absolute

C. per degree per mole

D. per mole

Answer: C

Watch Video Solution

13. A gas of volume 2000ml is kept in a vessel at a pressure of 10^3 pascals at a temperature of $27^\circ C$. If the pressure is increased to 10^5 pascals at the same temperature, the volume of the gas becomes

A. 1000ml

B. 20ml

C. 2ml

D. 200ml

Answer: B

Watch Video Solution

14. At a constant temperature a gas is initially at 2 atm pressure. To compress it to 1/8th of its initial volume, pressure to be applied is

A. 4atm

B. 8atm

C. 12atm

D. 16atm

Answer: D

Watch Video Solution

15. The volume of a given mass of a gas is 100ml at 100°C. If pressure is kept constant at what temperature will the sample have the volume of 200ml?

A. 50° C

B. 473° C

C. 200° C

D. 400° C

Answer: B

Watch Video Solution

Practice Sheet Exercise I Level Ii Straight Objective Questions

1. How much should the pressure be increased in order to decrease the volume of a gas by 5% at constant temperature

A. 0.25

B. 0.1

C. 0.0426

D. 0.0526

Answer: D

Watch Video Solution

2. The weight of one litre of a gas at latm pressure and 300K is 4g. At what temperature the weight of the gas is 4g when the pressure is made 0.5 atm and volume is 1 litre?

A. 200K

B. 150K

C. 600K

D. 1200K

Answer: B

Watch Video Solution

3. V moles of N_2 gas at S.T.P. conditions occupy a volume of 10 litres, then the volume of '2x' moles of CH_4 at 273°Cand 1.5 atm is

A. 20 lit

B. 26.6 lit

C. 5 lit

D. 16.6 lit

Answer: B

Watch Video Solution

4. Balloons of 4L capacity are to be filled with Hydrogen at a pressure of 1 atm and 27°C from an 8L cylinder containing Hydrogen at 10 atm at the same temperature. The number of balloons that can be fdled is

A. 20

B. 18

C. 40

D. 38

Answer: B

Watch Video Solution

5. A steel cylinder of 8 litres capacity contain hydrogen gas at 12atm pressure. At the same temperature how many cycle tubes of 4 litres capacity at 2 atm can be filled up with this gas.

(A) 12, B) 48, (c) 5, (D) 10

A. A,C

B. B,C

C. A,B

D. A,B,C

Answer: D

Watch Video Solution

6. The interactions that are results of temporary dipoles induced in the ordinarily non polar molecules are

A. Dispersion forces

B. Dipole-dipole

C. Dipole induced dipole

D. Hydrogen bonding

Answer: A

Watch Video Solution

7. Non polar compounds can also solidify because of

A. Van der waals forces

B. Dipole - dipole interaction

C. Ionic bonds

D. Hydrogen bonds

Answer: A

Watch Video Solution

Practice Sheet Exercise I Level Ii More Than One Correct Answer Type Questions

1. Boyle's law for a gas of constant mass, may be expressed as

A. $\left(\frac{dP}{dV}\right)_T = \frac{K}{V}$

B. $\left(\frac{dP}{dV}\right)_T = -\frac{K}{V^2}$

C. $\left(\frac{dP}{dV}\right)_T = -\frac{K}{V}$

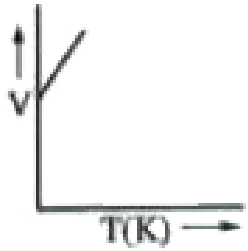
D. $V\alpha\frac{1}{P}$ at constant T

Answer: B::D

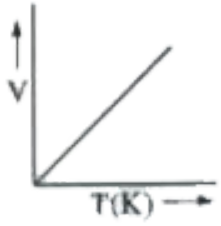
Watch Video Solution

2. Which of the following shows correct relation between volume and temperature at constant pressure for a given amount of gas

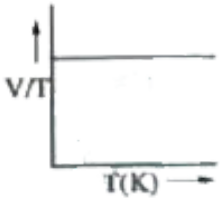
A.



B.



C.



D.

Answer: B::C::D

Watch Video Solution

3. Select the correct statements among the following

A. Greater the humidity, lesser will be the rate of evaporation

B. Greater is the humidity, lesser will be the density of air

C. If room temperature = dew point, relative humidity = 100%

D. Dew point is the temp at which the gas at given atmospheric condition becomes saturated with water vapour

Answer: A::B::C::D

Watch Video Solution

4. Which are heavier than dry air?

A. most air

B. SO_2

C. Cl_2

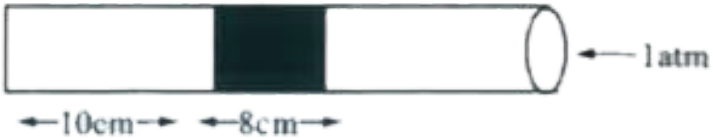
D. O_2

Answer: B::C::D

Watch Video Solution

Practice Sheet Exercise I Level Ii Linked Comprehension Type Questions Passage Ii

1. A 10 cm column of air is trapped by a column of mercury, 8 cm long, in a capillary tube horizantally fixed as shown below, at 1 atm pressure. When the tube is held at certain angle θ° , with open end up, the weight of Hg is borne partially by the gas. Vertical Height of Hg is a measure of additional pressure on gas:



The length of air coloumn.when the tube is fixed vertically at the same temperature wth open end up is

A. $\frac{76 \times 84}{10} cm$

B. $\frac{76 \times 10}{84}$ cm

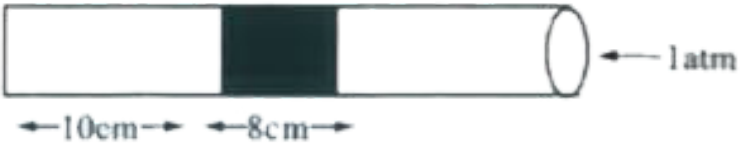
C. $\frac{84 \times 10}{76}$ cm

D. $\frac{76 \times 10}{68}$ cm

Answer: B

Watch Video Solution

2. A 10 cm column of air is trapped by a column of mercury, 8 cm long, in a capillary tube horizantally fixed as shown below, at 1 atm pressure. When the tube is held at certain angle θ° , with open end up, the weight of Hg is borne partially by the gas. Vertical Height of Hg is a measure of additional pressure on gas:



The length of air coloumn.when the tube is fixed vertically with opend end down at same temperature is

A. $\frac{76 \times 68}{10}$

B. 0 cm

C. $\frac{76 \times 10}{68}$

D. $\frac{76 \times 10}{84}$

Answer: C

Watch Video Solution

Practice Sheet Exercise I Level Ii Matrix Matching Type Questions

1. Match the following columns

List-I (solubility of)	List-II (Interaction)
A) SO_2 in water	P) Ion-dipole
B) Xe in water	Q) Hydrogen bonding
C) NH_4Cl in water	R) dipole - induced dipole
D) Glucoe in water	S) dipole - dipole

Watch Video Solution

2.

List-I (Pair of molecules)	List-II (Main type of intermolecular force)
A) Two molecules of HCl	P) Hydrogen bonding
B) Two propane molecules	Q) Dipole induced dipole interaction
C) One CH_4 and one HCl molecule	R) Dipole - dipole interaction
D) Two molecules of NH_3	S) London dispersion force

Watch Video Solution

Practice Sheet Exercise I Level Ii Integer Type Questions

1. The density of air 380 K and 722 mm of Hg is 1 g/cm^3 . If air is cooled to 100 K and 1 atm the final density is :

Watch Video Solution

Practice Sheet Exercise Ii Dalton S Law Diffusion Of Gases Level 1 Straight Objective Type Questions

1. In a gaseous mixture at 4 atm pressure, 25% of molecules are Nitrogen, 40% of molecules are carbon dioxide and the rest are oxygen. The partial pressure of oxygen in the mixture is

A. 1.40 atm

B. 1.6 atm

C. 1 atm

D. 0.9 atm

Answer: A

Watch Video Solution

2. A sample of water gas contains 42% by volume of carbon monoxide. If the total pressure is 760 mm. the partial pressure of carbon monoxide is

A. 380 mm

B. 319.2 mm

C. 38 mm

D. 360 mm

Answer: B

Watch Video Solution

3. 3g of H_2 and 24g of O_2 are present in a gaseous mixture at constant temperature and pressure. The partial pressure of hydrogen is

A. 1/3 of total pressure

B. 2/3 of total presure

C. 3/2 of total pressure

D. 1/2 of total pressure

Answer: B

Watch Video Solution

Watch Video Solution

4. At 27° C, a closed vessel contains a mixture of equal weights of helium (mol. wt. = 4), methane (mol. wt. =16) and sulphur dioxide (mol. wt = 64). The pressure exerted by the mixture is 210 mm. If the partial pressures of helium, methane and sulphur dioxide are P_1, P_2 and P_3 respectively, which one of the following is correct ?

A. $P_3 > P_2 > P_1$

B. $P_1 > P_2 > P_3$

C. $P_1 > P_3 > P_2$

D. $P_2 > P_3 > P_1$

Answer: B

Watch Video Solution

5. 0.157g of a certain gas collected over water occupies a volume of 135ml at 27°C and 750mm of Hg. Assuming ideal behaviour, the molecular weight of the gas is (aqueous tension at 27°C is 26.7 mm of Hg)

A. 30

B. 32

C. 28

D. 16

Answer: A

Watch Video Solution

6. A sample of air contains Nitrogen, Oxygen and saturated with water vapour under a total pressure of 640 mm. If the vapour pressure of

water at that temperature is 40 mm and the molecular ratio of $N_2 : O_2$ is 3:1, the partial pressure of Nitrogen in the sample is

A. 480 mm

B. 600 mm

C. 450 mm

D. 160 mm.

Answer: C

Watch Video Solution

7. In a ten litre vessel, the total pressure of a gaseous mixture containing H_2, N_2 and CO_2 is 9.8atm. The partial pressures of H_2 and N_2 are 3.7 and 4.2 atm respectively. Then the partial pressure of CO_2 is

A. 1.9 atm

B. 0.19 atm

C. 2.4 atm

D. 0.019 atm

Answer: A

Watch Video Solution

8. A certain quantity of a gas occupies 100ml when collected over water at 15°C and 750mm pressure. If it occupies 91.9ml in dry state at STP, the vapour pressure of water at 15°C is

A. 12.8 mm

B. 14.8 mm

C. 13.2 mm

D. 13.7 mm

Answer: C

Watch Video Solution

9. Dalton's law of partial pressures is applicable to

A. $NO + O_2$

B. $H_2 + Cl_2$

C. $NH_3 + HCl$

D. $CO_2 + O_2$

Answer: D

Watch Video Solution

10. A balloon filled with acetylene is kept in a vessel of hydrogen at the same temperature and pressure. If the balloon is punctured with a pin, it

A. collapses

B. bursts

C. nothing happens

D. becomes red

Answer: B

Watch Video Solution

11. Among the following gaseous elements with atomic numbers, which will have greater rate of diffusion?

A. Z=7

B. Z=8

C. Z=10

D. Z=17

Answer: C

Watch Video Solution

Watch Video Solution

12. Assertion (A) : Poisonous gases can be diluted by the process of diffusion

Reason (R) : Ansil's alarm works on the principle of Graham's law

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: B

Watch Video Solution

13. Pick out the pair of gases with the same rate of diffusion

A. CO, NO

B. N_2O, CO

C. N_2O, CO_2

D. CO_2, NO_2

Answer: C

Watch Video Solution

14. For the diffusion of a gas at pressure P, the rate of diffusion is expressed by

A. $r\alpha\frac{P}{\sqrt{M}}$

B. $r = \frac{P}{M}$

C. $r\alpha\frac{M}{\sqrt{P}}$

D. $r = \frac{P}{\sqrt{M}}$

Answer: A

Watch Video Solution

15. A gas diffuses four times as quickly as oxygen. The molecular weight of the gas is

A. 2

B. 4

C. 8

D. 16

Answer: A

Watch Video Solution

1. At what temperature will the rate of diffusion of N_2 be 1.6 times the rate of diffusion of SO_2 at 27°C?

A. 336°C

B. 27°C

C. 50°C

D. 63°C

Answer: D

Watch Video Solution

2. 50 ml of oxygen diffuses under certain conditions through a porous membrane. The volume of Hydrogen that diffuses in the same time under the same conditions is

A. 12.5 ml

B. 25ml

C. 100ml

D. 200ml

Answer: D

Watch Video Solution

3. Two samples of gases 'a' and 'b' are at the same temperature. The molecules of 'a' are travelling 4 times faster than molecules of 'b'. The ratio of M_a / M_b will be

A. $1/4$

B. $16/1$

C. $4/1$

D. $1/16$

Answer: D

Watch Video Solution

4. The reaction between gaseous NH_3 and HBr produces a white solid NH_4Br. Suppose that NH_3 and HBr are introduced simultaneously into the opposite ends of an open tube of 1 metre length. Where would you expect the white solid to form?s

A. At a distance of 34.45 cm from NH_3 end

B. At a distance of 68.5 cm from NH_3 end

C. At a distance of 44.45 cm from HBr end

D. At a distance of 45.45 cm from HBr end

Answer: B

Watch Video Solution

5. O_2 and He are taken in equal weights in a vessel. The pressure exerted by Helium in the mixture is

A. 1/8 th of total pressure

B. l/9th of total pressure

C. 2/9 th of total pressure

D. 8/9th of total pressure

Answer: D

Watch Video Solution

6. Equal volumes of two jars contain HCl, NH_3 gases respectively at constant temperature and pressure P. When one of the jars is inverted over another jar so that they mix up, the pressure in either of the jars is

A. 1 atm

B. Equal to P

C. Becomes Zero

D. P + P = 2P

Answer: C

Watch Video Solution

7. Combination that do not obeys Dalton's law:

A = CO

$B = Cl_2$

$C = F_2$

D =Xe

A. A,B

B. B,C

C. B,D

D. A,C

Answer: C

Watch Video Solution

Practice Sheet Exercise Ii Dalton S Law Diffusion Of Gases Level Ii More Than One Correct Answer Type Questions

1. Two vessels are connected by a valve of negligible volume. One container, A has 2.8 g N_2 at $T_1 K$. The other container, B is completely evacuated. The container A is heated to $T_2 K$, while container B is maintained at $\frac{T_2}{3} K$. Volume of A is half that of B. If the valve is opened, then

A. 6/70 moles of N_2 will be present in B

B. The weight ratio of N_2 in A and B vessels is 1:6

C. N_2 gas does not enter into B vessel

D. number of moles of N_2 released into B vessel is less than that in A vessel

Answer: A::B

Watch Video Solution

2. Which pairs can not explain Dalton's law ?

A. H_2, O_2

B. H_2, F_2

C. NH_3, HCl

D. NO, O_2

Answer: B::C::D

Watch Video Solution

3. Which of the following gases have same rate of diffusion at constant P and T ?

A. C_2H_6

B. C_2H_4

C. N_2

D. CO

Answer: B::C::D

Watch Video Solution

Practice Sheet Exercise Ii Dalton S Law Diffusion Of Gases Level Ii Linked Comprehension Type Questions Passage Ii

1. A 10 cm column of air is trapped by a column of mercury, 8 cm long, in a capillary tube horizantally fixed as shown below, at 1 atm pressure. When the tube is held at certain angle θ° with open end up, the

weight of Hg is borne partially by the gas. Vertical Height of Hg is a measure of additional pressure on gas.

The length of air coloumn,when the tube is fixed vertically at the same temperature wth open end up is

A. $\frac{76 \times 84}{10}$ cm

B. $\frac{76 \times 10}{84}$ cm

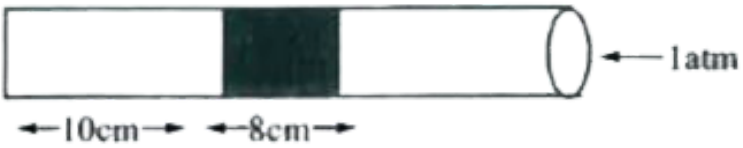
C. $\frac{84 \times 10}{76}$ cm

D. $\frac{76 \times 10}{68}$ cm

Answer: B

Watch Video Solution

2. A 10 cm column of air is trapped by a column of mercury, 8 cm long, in a capillary tube horizantally fixed as shown below, at 1 atm pressure. When the tube is held at certain angle θ° with open end up, the weight of Hg is borne partially by the gas. Vertical Height of Hg is a measure of additional pressure on gas.



The length of air coloumn,when the tube is fixed vertically with opend end down at same temperature is

A. $\frac{76 \times 68}{10}$

B. 0 cm

C. $\frac{76 \times 10}{68}$

D. $\frac{76 \times 10}{84}$

Answer: C

Watch Video Solution

Practice Sheet Exercise Ii Dalton S Law Diffusion Of Gases Level Ii Matrix Matching Type Questions

1.

List-I (solubility of)	List-II (Interaction)
A) SO_2 in water	P) Ion-dipole
B) Xe in water	Q) Hydrogen bonding
C) NH_4Cl in water	R) dipole - induced dipole
D) Glucoe in water	S) dipole - dipole

Watch Video Solution

2.

List-I (Pair of molecules)	List-II (Main type of intermolecular force)
A) Two molecules of HCl	P) Hydrogen bonding
B) Two propane molecules	Q) Dipole induced dipole interaction
C) One CH_4 and one HCl molecule	R) Dipole - dipole interaction
D) Two molecules of NH_3	S) London dispersion force

Watch Video Solution

Practice Sheet Exercise Ii Dalton S Law Diffusion Of Gases Level Ii Integer Type Questions

1. The density of air 380K and 722 mm of Hg is lg/cm^3. If air is cooled to 100K and 1 atm the final density is :

Watch Video Solution

Practice Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency Level I Straight Objective Questions

1. RMS velocity of a gas at a given temperature is how much factor higher than its most probable velocity

A. $\frac{3}{2}$

B. $\frac{\sqrt{3}}{2}$

C. $\sqrt{\frac{3}{2}}$

D. $2/3$

Answer: B

Watch Video Solution

2. What is the RMS speed of a moist particle of mass 10^{-12} g at 27°C according to kinetic molecular theory?

A. 0.35 cm/sec

B. 0.45 cm/sec

C. 0.6 cm/sec

D. 0.7 cm/sec

Answer: C

Watch Video Solution

3. The Ne atom has 10 times the mass of H_2. Which of the following statements is true?

I) At $25^\circ C$ the both have the same kinetic energy

II) Ten moles of H_2 would have the same volume as 1 mole of Ne at

same temperature and pressure

III) One mole of Ne exerts the same pressure as one mole of H_2 at STP.

IV) AH_2 molecule travels 10 times faster than Ne atom at same temperature.

V) At STP, one litre of Ne has 10 times the density of 1 litre of H_2

A. II, IV, V

B. I,III,V

C. I, II, III

D. I, II

Answer: B

Watch Video Solution

4. Which of the following is NOT a postulate of the kinetic molecular theory of gases ?

A. The molecules possess a volume that is negligibly samll compared o the container

B. The pressue and volume of a gas are inversely related

C. Gases consist of discrete particles that are in constant chaotic motion

D. The average kinetic energy of the molecules is directly proportional to the temperature.

Answer: B

Watch Video Solution

5. Consider three one-litre flasks labeled A, B and C filled with the gases NO, NO_2 and N_2O respectively, each at 1 atm and 273 K. In which flask do the molecules have the highest average kinetic energy?

A. Flask C

B. All are the same

C. Flask A

D. None

Answer: B

Watch Video Solution

6. Two flasks A and B have equal volumes. A is maintained at 300 K and B at 600 K, while A contains H_2 gas, B has an equal mass of CO_2 gas. Find the ratio of total K.E. of gases in flask A to that of B.

A. $1:2$

B. $11:1$

C. $33:2$

D. $55:7$

Answer: B

Watch Video Solution

7. In two vessels of 1 litre each at the same temperature lg of H_2 and 1 g of CH_4 are taken, for these :

A. Vrms values will be same

B. Kinetic energy per mol will be same

C. Total kinetic energy will same

D. Pressure will be same

Answer: B

Watch Video Solution

8. Four particles have speed 2,3,4 and 5 cm/s respectively. Their rms speed is :

A. 3.5cm/s

B. (27/2) cm/s

C. $\sqrt{54}$ cm/s

D. $\left(\sqrt{53}/2\right)$ cm/s

Answer: D

Watch Video Solution

9. A gaseous mixture contains 4 molecules with a velocity of 6 cm $\sec^{-1}$, 5 molecules with a velocity of 2 cm $\sec^{-1}$ and 10 molecules with a velocity of 3 cm $\sec^{-1}$. What is the RMS velocity of the gas :

A. $2.5cm\ \sec^{-1}$

B. $1.9cm\ \sec^{-1}$

C. $3.6cm\ \sec^{-1}$

D. $4.6cm\ \sec^{-1}$

Answer: C

Watch Video Solution

10. The most probable speed of 8 g of $H_2 200 ms^{-1}$ average kinetic energy (neglect rotational and vibrational energy) of H_2 gas is :

A. 480 J

B. 240 J

C. 120 J

D. none of these

Answer: B

Watch Video Solution

11. If U_{RMS} of a gas is 30 $R^{1/2}ms^{-1}$ [at 27°C then the molar mass of gas is]

A. 0.02 kg/mol

B. 0.001 kg/mol

C. 0.003 kg/mol

D. 1 kg/mol

Answer: D

Watch Video Solution

12. The root mean square speed of 8 g of He is 300 ms 1. Total kinetic energy of He gas is :

A. 120 J

B. 240 J

C. 360 J

D. None of these

Answer: C

Watch Video Solution

13. The density of a gas filled electric lamp is 0.75 kg/m^3. After the lamp has been switched on, the presure in it increases from 4×10^4 Pa t 9×10^4 Pa. What is increases in U_{RMS}

Watch Video Solution

Practice Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency Level Ii Straight Objective Type Questions

1. The rms speed of N_2 molecules in a gas is u. If the temperature is doubled and the nitrogen molecules dissociate into nitrogen atoms, the rms speed becomes :

A. $\mu/2$

B. 2u

C. 4u

D. 14u

Answer: B

Watch Video Solution

2. Select the correct statement:

A. Internal energy of a real gas at a given temperature increases as the volume increases

B. Inernal energy of an ideal gas at given temperature increase as the volume increases

C. Internal energy of an ideal gas molecules is not a function of temperature

D. The internal energy of a real gas at a constant temperature is independent of change in volume

Answer: A

View Text Solution

3. Let u_{av}, u_{rms} and u_{mp} are average, root means square and most probable speed the molcules in an ideal monoatomic gas at absolute temperature T. The mass of molecule is m, then :

A. none of the moelcue can have a speed greater than -$\sqrt{2}u_{rms}$

B. none of the molecule can have a speed less than $u_{mp}\sqrt{2}$

C. $u_{av} < u_{rms} < u_{mp}$

D. the average kinetic energy of molecule is $\frac{3}{2}mu_{mp}^2$

Answer: D

Watch Video Solution

4. What is r.m.s speed of O_2 molecule if its kinetic energy is 2 k cal mol^{-1}?

A. 7.24×10^2 m/sec

B. 3.5×10^2 m/sec

C. 2×10^1 m/sec

D. 3.5×10^4 m/sec

Answer: A

Watch Video Solution

5. Mean free path of O_2 at 27°C and 1 atm is 10^{-5} cm. The mean free path at high altitude of pressure 100 mm and 200°C is :

A. 1×10^{-5}

B. 10^{-5}

C. 1.2×10^{-4}

D. 1.2×10^{-5}

Answer: C

Watch Video Solution

6. If the ratio of molar masses of two gases A and B is 1 : 4. What is the ratio of the average speeds ?

A. 2

B. 4

C. 1

D. 4

Answer: A

Watch Video Solution

7. A liquid is in equilibrium with its vapours at its boiling point. On the average, the molecules in the two phases have euqal :

A. intermolecular forces

B. potential energy

C. total energy

D. kinetic energy

Answer: D

Watch Video Solution

8. Two vessels having equal volumes conain H_2 and He at 1 and 2 atm respectively at same temperature. Then which one correct :

(i) $U_{rms}, H_2 = U_{rms}He$, (ii) $r_{H_2} = \frac{r_{He}}{\sqrt{2}}$, (iii) $U_{rms}H_2 = \sqrt{2}U_{rms}He$, (iv) $r_{H_2} = \sqrt{8} \times r_{He}$

A. I,ii,iii

B. ii,iii

C. I,iv

D. iii,iv

Answer: B

Watch Video Solution

Practice Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency Level Ii More Than One Correct Answer Type Questions

1. P and Q are ideal gases which do not react with each other. The mass of one mole of P is four times that of Q. At STP, which of the following are true?

A. The. average K.E of molecules of P is equal to that of Q

B. The mass of $1dm^3$ of P is four times that of $1dm^3$ of Q

C. On mixing $1dm^3$ of P with $1dm^3$ of Q the partial pressure of each gas in the mixture will be 0.5 atm

D. The rate of diffusion of P is 4 times less than that of Q

Answer: A::B::C

Watch Video Solution

2. Which of the following statements are true?

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

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

C. Mean kinetic energy of fixed number of gas molecules at any given temperature is independent of the molecular weight of the gas.

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

Answer: A::C::D

Watch Video Solution

Questions Passage I

1. The total energy of molecules is divided equally amongst the various degrees of freedom of a molecule. The distribution of kinetic energy along x, y, z axis are E_{K_x}, E_{K_y}, E_{K_z}

Total K.e $= E_{K_x} + E_{K_y} + E_{K_z}$

Since the motion of molecule is equally probable in all the three directions, therefore

$E_{K_x} = E_{K_y} = E_{K_z} = \frac{1}{3}E_K = \frac{1}{3} \times \frac{3}{2}kT = \frac{1}{2}kT$, where $k = \frac{R}{N_A}$ = Botzman constant.

$K.\,E. = \frac{1}{2}kT$ per molecule or $= \frac{1}{2}RT$ per mole.

In vibration motion, molecules possess both kinetic energy as well as potential energy. This means energy of vibration involves two degrees of fiuedom.

Vibration energy $= 2 \times \frac{1}{2}kT = 2 \times \frac{1}{2}RT$ [$\therefore$ two degrees of freedom per mole]

If the gas molecules have n_1 translational degrees of freedom, n_2 rotational degrees of freedom and n_3 vibrational degrees of freedom,

that total energy = $n_1\left[\frac{kT}{2}\right] + n_2\left[\frac{kT}{2}\right] + n_3\left[\frac{kT}{2}\right] \times 2$

Types of gases	Translational	Rotational	Vibrational
Monoatomic	3	0	0
Diatomic	3	2	(3n – 5) = 1
Triatomic	3 for linear	2 for linear	(3n – 5) for linear
	3 for non-linear	3 for non-linear	(3n – 6) for non-linear

Where 'n' is atomicity of gas.

How many total degrees of freedom are present in H_2 molecules in all types of motions ?

A. 3

B. 5

C. 6

D. 4

Answer: C

Watch Video Solution

2. The total energy of molecules is divided equally amongst the various degrees of freedom of a molecule. The distribution of kinetic energy along x, y, z axis are E_{K_x}, E_{K_y}, E_{K_z}

Total K.e $= E_{K_x} + E_{K_y} + E_{K_z}$

Since the motion of molecule is equally probable in all the three directions, therefore

$E_{K_x} = E_{K_y} = E_{K_z} = \frac{1}{3}E_K = \frac{1}{3} \times \frac{3}{2}kT = \frac{1}{2}kT$, where $k = \frac{R}{N_A}$ = Botzman constant.

$K.\,E. = \frac{1}{2}kT$ per molecule or $= \frac{1}{2}RT$ per mole.

In vibration motion, molecules possess both kinetic energy as well as potential energy. This means energy of vibration involves two degrees of fiuedom.

Vibration energy $= 2 \times \frac{1}{2}kT = 2 \times \frac{1}{2}RT$ [$\therefore$ two degrees of freedom per mole]

If the gas molecules have n_1 translational degrees of freedom, n_2 rotational degrees of freedom and n_3 vibrational degrees of freedom, that total energy = $n_1\left[\frac{kT}{2}\right] + n_2\left[\frac{kT}{2}\right] + n_3\left[\frac{kT}{2}\right] \times 2$

Types of gases	Translational	Rotational	Vibrational
Monoatomic	3	0	0
Diatomic	3	2	(3n – 5) = 1
Triatomic	3 for linear	2 for linear	(3n – 5) for linear
	3 for non-linear	3 for non-linear	(3n – 6) for non-linear

Where 'n' is atomicity of gas.

The vibrational kinetic energy of CO_2 molecule is

A. 2kT

B. 4kT

C. 8kT

D. kT

Answer: B

Watch Video Solution

3. The total energy of molecules is divided equally amongst the various degrees of freedom of a molecule. The distribution of kinetic energy along x, y, z axis are E_{K_x}, E_{K_y}, E_{K_z}

Total K.e $= E_{K_x} + E_{K_y} + E_{K_z}$

Since the motion of molecule is equally probable in all the three directions, therefore

$E_{K_x} = E_{K_y} = E_{K_z} = \frac{1}{3}E_K = \frac{1}{3} \times \frac{3}{2}kT = \frac{1}{2}kT$, where $k = \frac{R}{N_A}$ = Botzman constant.

$K.E. = \frac{1}{2}kT$ per molecule or $= \frac{1}{2}RT$ per mole.

In vibration motion, molecules possess both kinetic energy as well as potential energy. This means energy of vibration involves two degrees of fiuedom.

Vibration energy $= 2 \times \frac{1}{2}kT = 2 \times \frac{1}{2}RT$ [$\therefore$ two degrees of freedom per mole]

If the gas molecules have n_1 translational degrees of freedom, n_2 rotational degrees of freedom and n_3 vibrational degrees of freedom, that total energy = $n_1\left[\frac{kT}{2}\right] + n_2\left[\frac{kT}{2}\right] + n_3\left[\frac{kT}{2}\right] \times 2$

Types of gases	Translational	Rotational	Vibrational
Monoatomic	3	0	0
Diatomic	3	2	(3n – 5) = 1
Triatomic	3 for linear	2 for linear	(3n – 5) for linear
	3 for non-linear	3 for non-linear	(3n – 6) for non-linear

Where 'n' is atomicity of gas.

The rotational kinetic energy of H20 molecule is equal to

A. $\frac{3}{2}kT$

B. $\frac{1}{2}kT$

C. kT

D. 2kT

Answer: A

Watch Video Solution

Practice Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency Level Ii Matrix Matching Type Questions

1. Match the experimental facts (in List-I) with the explanation according to kinetic theory (in List-II):

List-I	List-II
A) Compressibility of gases	P) Molecules attract other at close range
B) Diffusibility of gases	Q) Molecules strike each other and the walls of the container without loss of energy
C) Expansion of gases on heating	R) The speed of molecules increases as the temperature increases
D) Gases exert pressure	S) Molecules are in rapid, haphazard motion

Watch Video Solution

Practice Sheet Exercise Iii Kinetic Molecular Theory Molecular Velocity Mean Free Path Collision Frequency Level Ii Integer Type Questions

1. The RMS velocity of nitrogen gas molecules is 'V cm/sec at a certain temperature. When the temperature is doubled, the molecules dissociated into individual atoms. Now the RMS velocity of nitrogen atoms is x V cm/sec. What is the value of 'x'?

Watch Video Solution

Practice Sheet Exercise Iv Vanderwaal S Eqn Critical Constants Level I Straight Objective Type Questions

1. In Vander Waal's equation of state of the gas law, the constant 'b' is a measure of

A. Intermoleculer repulsions

B. Intermolecular collisions per unit volume

C. Volume occupied by the molecules

D. Intermolecular attraction

Answer: C

Watch Video Solution

2. Which of the following are correct statements ?

X) Vander Waal's constant a is a measure of attractive force

Y) Vander Waal's constant b is also called co-volume or excluded volume

Z) b is expressed in L mol^{-1}

A. X,Y

B. Y,Z

C. X,Z

D. X,Y,Z

Answer: D

Watch Video Solution

3. Compressibility factor for H2 behaving as real gas is

A. 1

B. $\left(1-\frac{a}{RTV}\right)$

C. $\left(1+\frac{Pb}{RT}\right)$

D. $\frac{RTV}{1-a}$

Answer: C

Watch Video Solution

4. Volume of a molecule is related to Vander Waal's constant 'b' and Avagadro Number 'N_0' by the equation :

A. $V = \frac{b}{N_0}$

B. $V = 4bN_0$

C. $V = \frac{4b}{N_0}$

D. $V = \frac{b}{4N_0}$

Answer: D

Watch Video Solution

5. What are the reasons for deviations from ideal gas behaviour ?

A. $Z = \frac{P}{VRT}$

B. $Z = \frac{PV}{nRT}$

C. $Z = \frac{nRT}{PV}$

D. $Z = \frac{VR}{PT}$

Answer: B

Watch Video Solution

6. NH_3 gas is liquified more easily than N_2 . Hence :

A. Vander Waal's constant a and b of $NH_3 >$ that of N_2

B. Vander Walal's constant a and b of $NH_3 >$ that of N_2

C. $a(NH_3) > a(N_2)$ but $b(NH_3) > b(N_2)$

D. 34

Answer: C

Watch Video Solution

7.

Gas	O_2	N_2	NH_3	CH_4
a	1.360	1.390	4.170	2.253

The table indicates the value of vander Waal's constant a in L^2 atm mol 2. The gas which can most easily be liquefied is ?

A. O_2

B. N_2

C. NH_3

D. CH_4

Answer: C

Watch Video Solution

8. Under critical states for one mole of a gas, compressibility factor is

A. $\frac{3}{8}$

B. $\frac{8}{3}$

C. 1

D. $\frac{1}{4}$

Answer: A

Watch Video Solution

9. Consider following statements :

(A): The gas whose critical temperature is above room temperature can be liquified by applying sufficient pressure to the gas.

(B): The gas whose critical temperature is below room temperature can be liquified by the temperature below T_c.

Select correct statement

A. A

B. B

C. both

D. none

Answer: C

Watch Video Solution

10. NH_3 can be liquefied at ordinary temperature without the application of pressure. But O_2 cannot, because

A. its critical tempereture is very high

B. its critical tempereture is low

C. its critical tempereture is moderate

D. its critical tempereture is higher than that of ammonia

Answer: B

Watch Video Solution

11. A gas can be liquefied by pressure alone when its temperature is

A. Higher than its critical temperature

B. Lower than its critical temperature

C. Equal to its critical temperature

D. Equal to its Boyle's temperature

Answer: B

Watch Video Solution

12. The vander Waal's parameters of two gases are given as:

	a (dm^6 bar mol^{-2})	b (dm^3 mol^{-1})
Gas A	6.5	0.056
Gas B	18.0	0.011

Considering the value of parameters, which of the following statement's is/are correct?

A. Critical volume of A $<$ critical volume of B

B. Critical pressure of A $>$ critical pressure of B

C. Critical temperature of A $<$ critical temperature of B

D. Ease of liquification of A $>$ ease of liquification of B

Answer: C

Watch Video Solution

13. At low pressure Vander Waal's equation for 3 moles of a real gas will have its simplified from

A. $\frac{PV}{RT-(3a/V)}=3$

B. $\frac{PV}{RT+Rb}=3$

C. $\frac{PV}{RT-3Pb}=1$

D. $\frac{PV}{RT-(9/V)}=3$

Answer: A

Watch Video Solution

14. Choose the wrong statement from among the following

A. The corrected pressure $P + \frac{an^2}{V^2}$ in Vander Waals equation (symbols have their usual meanings) is the pressure which the gas would exert if it were ideal

B. Above their respective Boyle's temperatures, H_2 shows positive deviation throughout ($z > 1$) while O_2 shows negative deviation ($z < 1$) followed by positive deviation (z $>$ 1)

C. A gas shows negative deviation when long range attractive intermolecular forces are dominating

D. The intercept of PV vs P isotherm of any gas at 27°C is equal to 24.4 L atm mol^{-1}

Answer: B

Watch Video Solution

15. Boyle's temperature of various gases are given below:

Gas	A_1	A_2	A_3	A_4
$T_B(K)$	117	23	498	406

Which can be liquefied most easily

A. A

B. A_2

C. A_3

D. A_4

Answer: C

Watch Video Solution

Practice Sheet Exercise Iv Vanderwaal S Eqn Critical Constants Level Ii Straight Objective Type Questions

1. At 273 K temperature and 9 atm pressure, the compresibility for a gas is 0.9. The volume of 1 milli- moles of gas at this temperature and pressure is

A. 2.24 litre

B. 0.020 mL

C. 2.24 mL

D. 22.4 mL

Answer: C

Watch Video Solution

2. What is the compressibility facto (Z) for 0.02 mole of a van der Waal's gas at pressure of 0.1 atm. Assume the size of gas molecules is

neligible.

Given : RT = 20 L. atm mol^{-1} and α = 1000 atm $L^2 mol^{-2}$

Watch Video Solution

3. The excluded volume of a gas will be larger, if $\frac{T_c}{P_c}$ is:

A. small

B. large

C. equal to 1

D. less than unit

Answer: B

Watch Video Solution

4. Inversion temperature (Ti=2aRb) is defined as the temperature above which if gas is expanded adiabatically it gets warm up but if

temperature of gas is lower than Ti then it will cool down. What will happen to gas if it is adiabatically expanded at 50∘C if its Boyle's temperature is 20∘C

A. Heating

B. Cooling

C. Constant

D. None

Answer: A

Watch Video Solution

5. The. van der Waal's equation of law of corresponding states for 1 mole of gas is :

A. $\left(P_r + \frac{3}{V_t^2}\right)(3V_r - 1) = 8T_r$

B. $\left(P_t - \frac{3}{V_t^2}(3V_r - 1) = 8T_r\right.$

C. $\left(P_r + \frac{3}{V_r^2}\right)(3V_r + 1) = 8\pi T_t$

D. $\left(P_r + \frac{3}{V_r^2}\right)(3V_t + 1) = 8$

Answer: A

Watch Video Solution

6. Calculate the volume occupied by 16 grm O_2 at 300 K and 8.31 MPa if $\frac{P_c V_c}{RT_c} = \frac{3}{8}$ and $\frac{P_t V_t}{T_t} = 2.21$ (Given : R = 8.314 Mpa/K-mol)

A. 125.31 mL

B. 124.41 mL

C. 248.62 mL

D. none of these

Answer: B

Watch Video Solution

Practice Sheet Exercise Iv Vanderwaal S Eqn Critical Constants Level Ii More Than One Correct Answer Type Questions

1. Which are true ?

A. A gas can be liquified above in Tc

B. A gas behaves as a vapour below its Tc

C. A gas with higher Tc is more liquifiable

D. All gases possess same Vc

Answer: B::C

Watch Video Solution

2. Select incorect statements(s)

A. At very low pressure real gases show minimum deviation from ideal behaviour

B. The compressibility factor for an ideal gas is zero.

C. At Boyle temperature eal gas behave as ideal gas in high pressure region

D. Real gas show maximum deviation at high pressure and low temperature

Answer: B::C

Watch Video Solution

3. Which is/are correct for real gases ?

A. $Lt_{P \to 0}(PV_m)$ =constant at constant high temperature

B. $Lt_{V_m \to 0}(PV_m)$= constant at constant low temperature

C. As the temperature is reduced, the pressure decreases

D. A point is reached where, theoretically, the volume become zero

Answer: A

Watch Video Solution

4. At Boyl temperatur

A. the effects of the repulsive and atractive intermolecular forces just cancelled each other

B. the repulsive intermolecular forces are greater than the attractive intermolecular forces

C. the repulsive intermolecular forces are less than the attractive intermolecular forces

D. $b - \frac{a}{RT} > 0$

Answer: A

Watch Video Solution

Practice Sheet Exercise Iv Vanderwaal S Eqn Critical Constants Level Ii Linked Comprehension Type Questions Passage I

1. Gases tend to behave non-ideally at low temperatures and high pressures. The deviation from ideal behaviour can be explained by considering two types of corrections. They are volume correction and pressure correction.

Select incorrect statement(s) :

A. a)Volume correction is due to finite size of molecules and pressure correction is due to force of attraction between molecules

B. b)At high temperatures, molecules have greater kinetic energy, and attractive forces are smaller and the behaviour of gases is close to the ideal gas behaviour

C. c)Volume correction is also called covolume or excluded volume and is four times the volume of spherical molecules present in

one mole of the gas

D. d)At very low pressure, force of attraction is effective and pressure correction needs further resolution.

Answer: D

View Text Solution

2. Gases tend to behave non-ideally at low temperatures and high pressures. The deviation from ideal behaviour can be explained by considering two types of corrections. They are volume correction and pressure correction.

Following represents equation of state for a mules of real gas $\left[P+\frac{n^2a}{V^2}\right][V-nb]=nRT$.Select incorrect statement for a real gas

A. Constant 'a' is a measure of force of attraction among gas molecules

B. a is expressed in atm $L^2 \text{mol}^{-2}$ b is expressed in L mol^{-1}

C. At high pressure, compression factor is $\left(1 + \frac{Pb}{RT}\right)$

D. $\frac{n^2 a}{V^2}$ is also called internal volume.

Answer: D

Watch Video Solution

Practice Sheet Exercise Iv Vanderwaal S Eqn Critical Constants Level Ii Integer Type Questions

1. What is the value of $\sqrt[3]{\frac{a}{P_c b^2}}$?

Watch Video Solution

2. The volume to be excluded due to only two molecules of a gas in collision with a fixed point of impact is $\frac{0.09}{N_A}$ litre (NA = Avogadro

number). If the value of 'a' is 3.6 atm L^2mol^{-2} , then the value of Boyle's temperature is, 10^x K. What is the value of 'x' ? (R = 0.08 L atm $K^{-1}m^{-1}$)

Watch Video Solution

3. For a real gas critical volume (Vc) is '2x' times the actual volume occupied by gas molecules, 'x' value is

Watch Video Solution

Practice Sheet Exercise V Vapour Pressure Viscosity Surface Tension Level I Straight Objective Type Questions

1. When mercury is dropped over a glass surface the globules are spherical which is due to its

A. Viscosity

B. Surface tension

C. Fluidity

D. Metallic nature

Answer: B

Watch Video Solution

2. Liquids show viscosity which is due to

X) Creation of friction between the layers of the fluid.

Y) Inter molecular attraction forces of the liquid.

Z) Inter molecular repulsion forces of the liquid.

A. Y,Z

B. X,Y

C. X,Z

D. X,Y,Z

Answer: D

Watch Video Solution

3. Find incorrect statement

A. Due to viscosity, velocity of flow of water at the surface is more than that at the bottom in a river

B. Due to vislosity, velocity of flow nf water at the surface is less than that at the hottom in a river

C. Velocity gradient = $\frac{du}{dx}$

D. Viscosity coefficient is related to absolute temperature as $\eta = Ae^{E/RT}$

Answer: B

Watch Video Solution

4. What is laminar flow of liquid?

A. Regular gradation of velocity for layers in passing from one layer to the next layer of a liquid

B. Showing constancy in the velocity of layers of a liquid

C. Increase in the velocity of layers from surface to bottom of a liquid

D. All

Answer: A

Watch Video Solution

5. The viscosity of four liquids P, Q, R and S are 85, 11.4, 18 and 12.3 respectively, then which flows slowly

A. P

B. Q

C. R

D. S

Answer: A

Watch Video Solution

6. The thickness of window panes of old buildings is more at the bottom than at the top, which is due to

A. Surface tension of glass

B. Viscosity of glass

C. Expansion of solid at a given temperature

D. Expansion of liquid at a given temperature

Answer: B

Watch Video Solution

Watch Video Solution

7. The graph of viscosity coefficient (T|) and absolute temperature (T) is

_____

A. Straight line passing through origin

B. Straight line parallel to temperature axis

C. Straight line with (+)ve slope

D. Exponential graph

Answer: D

Watch Video Solution

8. The internal resistance to flow in liquid is called

A. Fluidity

B. Specific resistance

C. Viscosity

D. Surface tension

Answer: C

Watch Video Solution

9. Which has the maximum viscosity ?

A. Water

B. Glycol

C. Acetone

D. Ethanol

Answer: B

Watch Video Solution

Practice Sheet Exercise V Vapour Pressure Viscosity Surface Tension Level Ii Straight Objective Type Questions

1. Poise stands for

A. 1 dynes cm $\sec^{-2}$

B. 1 dyne sec cm^{-2}

C. 10^{18} e.s.u-cm

D. 10^{-7} erg sec.

Answer: B

Watch Video Solution

2. In SI system, the units of coefficient of viscosity, η are

A. $Kgs^{-1}m^{-2}$

B. $Kgm^{-1}s^{-1}$

C. $Kgcm^{-1}s^{-1}$

D. $gm^{-1}s^{-1}$

Answer: B

Watch Video Solution

3. With rise in temperature of a liquid, the viscosity

A. Increases

B. Decreases

C. Remains constan

D. May increase or decrease

Answer: B

Watch Video Solution

4. The presence of ionic salts in a liquid

A. Decreases the viscosity of the liquid

B. Increases the viscosity of the liquid

C. Does not effect the viscosity of the liquid

D. None of the above is correct

Answer: B

Watch Video Solution

Practice Sheet Exercise V Vapour Pressure Viscosity Surface Tension Level Ii More Than One Correct Answer Type Questions

1. A cylinder fitted with movable piston contains liquid water in equilibrium with water vapour at 25°C. Which operation would result in a increase in the equilibrium vapour pressure.

A. Moving the piston downwards a short distance

B. Removing a small amount of vapours

C. Removing a small amount of liquid water

D. Decreasing the temperature.

Answer: A::B::C

Watch Video Solution

Practice Sheet Exercise V Vapour Pressure Viscosity Surface Tension Level Ii Integer Type Questions

1. How many of the following effect the vapour pressure developed in a container ?

A. nature of liquid

B. surface area of the liquid

C. temperature ,

D. quantity of the liquid

Answer: B

Watch Video Solution

Additional Practice Exercise Level I Main Straight Objective Type Questions

1. Among the following which can be liqufied easily ('a' values given in bracket in L^2. atm mol^{-2})

A. He (0.034)

B. Xe(4.19)

C. $NH_3(4.17)$

D. $CO_2(3.59)$

Answer:

Watch Video Solution

2. 4.0g of argon gas has pressure P and temperature TK in a vessel. On keeping the vessel at $50^{\circ}C$ higher, 0.8g of argon was given out to maintain the pressure at P. The original temperature was ____ $\times 10^{-2}K$.

A. 400K

B. 150K

C. 200 K

D. 273 K

Answer:

Watch Video Solution

3. An LPG cylinder contains 15kg of butane gas at 27°C and 10 atmospheric pressure. It was leaking and its pressure fell down to 8 atmospheric pressure after one day. The gas leaked is_____kg.

A. 5

B. 2

C. 1

D. 3

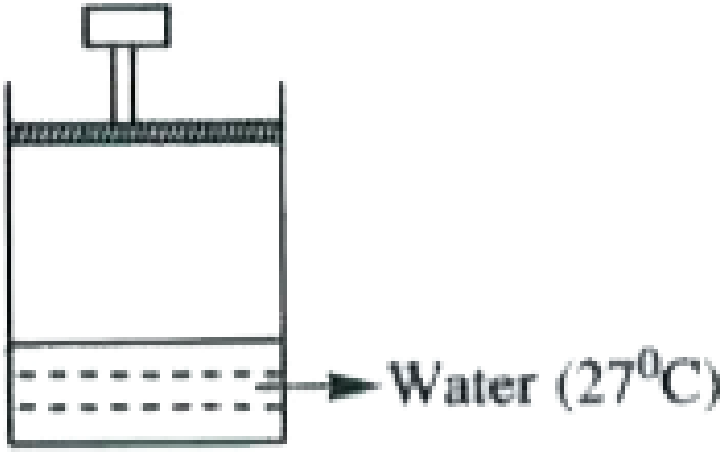
Answer:

Watch Video Solution

4. Two flasks of equal volumes have been joined by a narrow tube of negligible volume. Initially, both the flasks are 300K containing 0.6 mole of gas is present. One of the flasks is then placed in a thermostat at 600K. How many moles of gas are present in hot bulb?

Watch Video Solution

5. The piston shown in the figure is moved downwards such that the vapour volume is decreased by 246.3cc. How many grams of H_2O is condensed? (Assume aqueous tension at 27°C is 360 mm Hg).



A. 0.09 gm

B. 2.3 gm

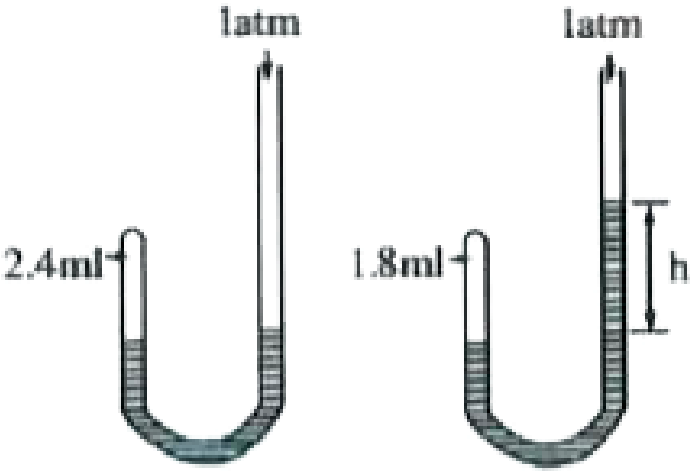
C. 1.6 gm

D. 0.25 gm

Answer:

Watch Video Solution

6. By taking two J- tubes at constant temperature what is the difference in the levels of mercury in two columns ?



A. 179.6 mm

B. 253.3 mm

C. 347.8 mm

D. 672 mm

Answer:

Watch Video Solution

7. Average kinetic energy, in Joules of the molecules in 8.0 g of methane at 27°C.

A. 3.1×10^{-22} J

B. 12.4×10^{-20} J

C. 6.21×10^{-21} J

D. 1.24×10^{-22} J

Answer:

Watch Video Solution

Additional Practice Exercise Level Ii Lecture Sheet Advanced Straight Objective Type Questions

1. How many of the following have hydrogen bonding ?

$HCHO, CH_3OH, CH_3COOH, CH_3CHO, (CH_3)_2O, (CH_3)_3N, KHF_2$

A. 2

B. 3

C. 1

D. 4

Answer:

Watch Video Solution

2. In how many solids only london dispersion forces exist ? Dry ice, Ice, Solid I_2, Solid 'Xe', Rocksalt, 'He' gas

A. 4

B. 5

C. 2

D. 1

Answer:

Watch Video Solution

3. How many cases have 'Dipole-induced dipole' interaction ?

(a) Br_2 in water , (b) NH_3 in HgO , (c) CO_2 in water , (d) O_2 in water ,

(e) 'Xe' in water

A. 5

B. 4

C. 3

D. 1

Answer:

Watch Video Solution

4. How many of the following effect the vapour pressure developed in a container ?

A. 3

B. 2

C. 1

D. 1

Answer:

Watch Video Solution

5. A hydrocarbon contains 10.5 g of carbon per gram of hydrogen. 1 litre of the vapour of the hydrocarbon 127°C and 1 atmosphere pressure weighs 2.8g. Find the molecular formula of the hydrocarbon.

A. C_3H_4

B. C_4H_6

C. C_7H_8

D. C_5H_7

Answer:

Watch Video Solution

6. A straight glass tube has two inlets X and Y at the two ends. The length of the tube is 200 cm. HCl gas through inlet X and NH_3 gas through inlet Y are allowed to enter the tube at the same time. White fumes appear at a point P inside the tube. Find the distance of P from X.

A. 14.2 cm

B. 85.2 cm

C. 62.3 cm

D. 54.7 cm

Answer:

Watch Video Solution

7. A spherical balloon of 21 cm diameter is to be filled up with hydrogen at NTP from a cylinder containing the gas at 20 atmospheres at 27°C. If the cylinder can hold 2.82 litres of water, calculate the number of balloons that can be filled up

A. 10

B. 4

C. 6

D. 8

Answer:

Watch Video Solution

8. Two closed vessel A and B of equal volume containing air at pressure P_1 and temperature T_1 are connected to each other through a naroow open tube. If th temperature of one is now maintained at T_1 and other at T_2 (wehre $T_1 > T_2$) then that what will be the final pressure ?

A. $\frac{T_1}{2P_1T_2}$

B. $\frac{2P_1P_2}{T_1+T_2}$

C. $\frac{2P_1T_1}{T_1-T_2}$

D. $\frac{2P_1}{T_1+T_2}$

Answer:

Watch Video Solution

Additional Practice Exercise Level Ii Lecture Sheet Advanced More Than One Correct Answer Type Questions

1. P and Q are ideal gases which do not react with each other. The mass of one mole of P is four times that of Q. At STP, which of the following are true?

A. The average K.E of molecules of P is equal to that of Q

B. The mass of 1 dm^3 of P is four times that of 1dm^3 of Q

C. On mixing 1dm^3 of P with 1dm^3 of Q the partial pressure of each gas in the mixture will be 0.5 atm

D. The rate of diffusion of P is 4 times less than that of Q

Answer:

Watch Video Solution

2. Which processes will increase the number of molecules, to have an energy greater than a particular value

A. increasing the temperature

B. introducing more of the same gas at the same temperature

C. compressing the gas at constant temperature

D. decreasing the temperature

Answer:

Watch Video Solution

3. If two gases of molecular weights M_A and M_B at temperature T_A and T_B are taken such that, $T_A M_B = T_B M_A$, then which property has the same magnitude for both the gases.

A. Density

B. pressure

C. KE per mole

D. u_{rms}

Answer:

Watch Video Solution

4. Which of the following are independent on quantity of the gas ?

A. rms velocity

B. density

C. average kinetic energy

D. kinetic energy

Answer:

Watch Video Solution

5. If a gas expands at constant temperature.

A. the pressure decreases

B. the kinetic energy of the molecules remains the same

C. the K.E. of the molecules decreases

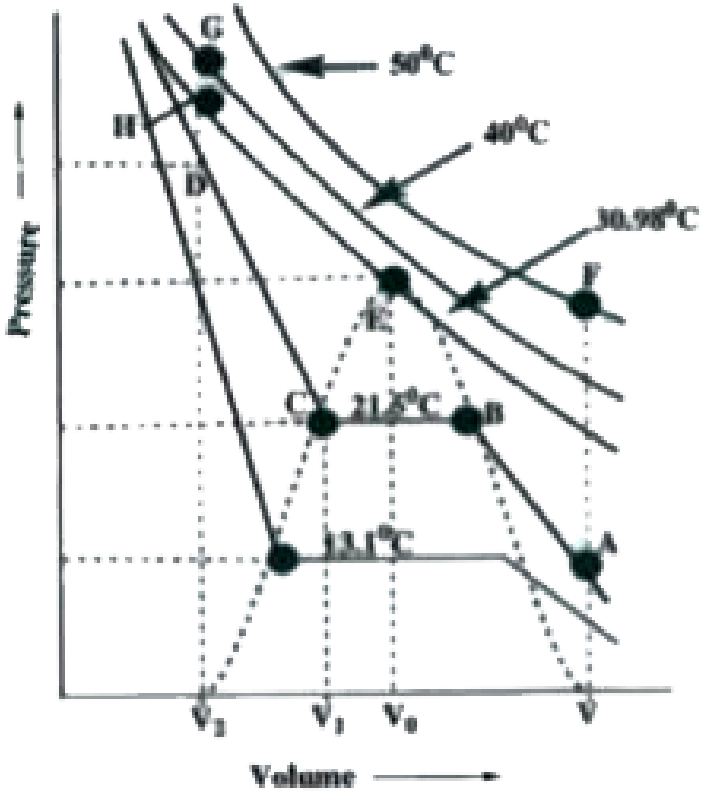
D. the number of molecules of the gase increase

Answer:

Watch Video Solution

Additional Practice Exercise Level Ii Lecture Sheet Advanced Linked Comprehension Type Questions Passage I

1. Study the following isotherms of carbondioxide at various temperature and answer the following questions based on that:



Choose the temperature above which CO_2 cannot be liquified whatsoever applied pressure is

A. 290K

B. 294.5 K

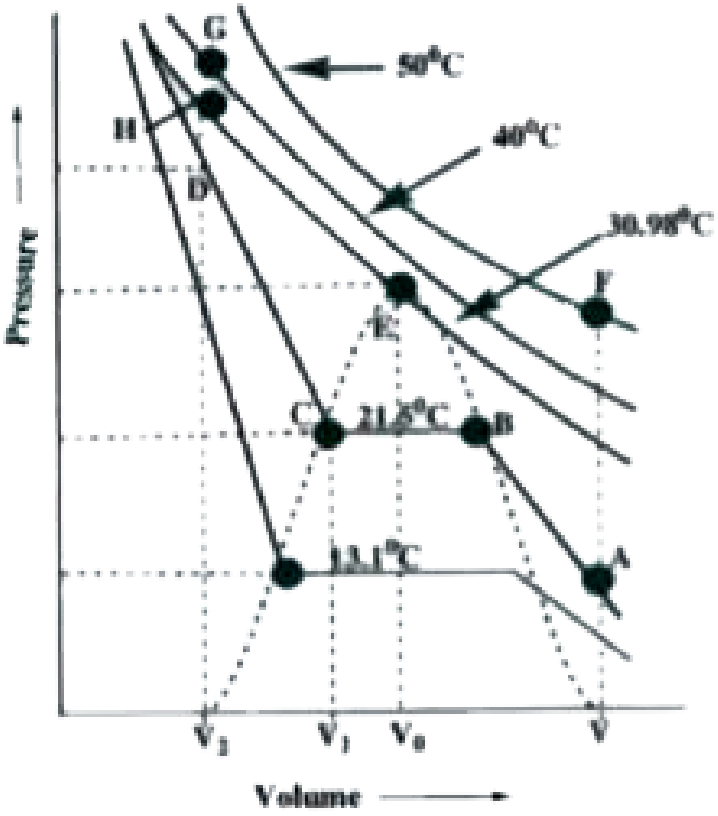
C. 302K

D. 304 K

Answer:

Watch Video Solution

2. Study the following isotherms of carbondioxide at various temperature and answer the following questions based on that:



At 21.5°C decrease in volume(B-C) doesn't result into increase in pressure because

A. The compression causes increase in solidification

B. At point B only all gases convert into solid

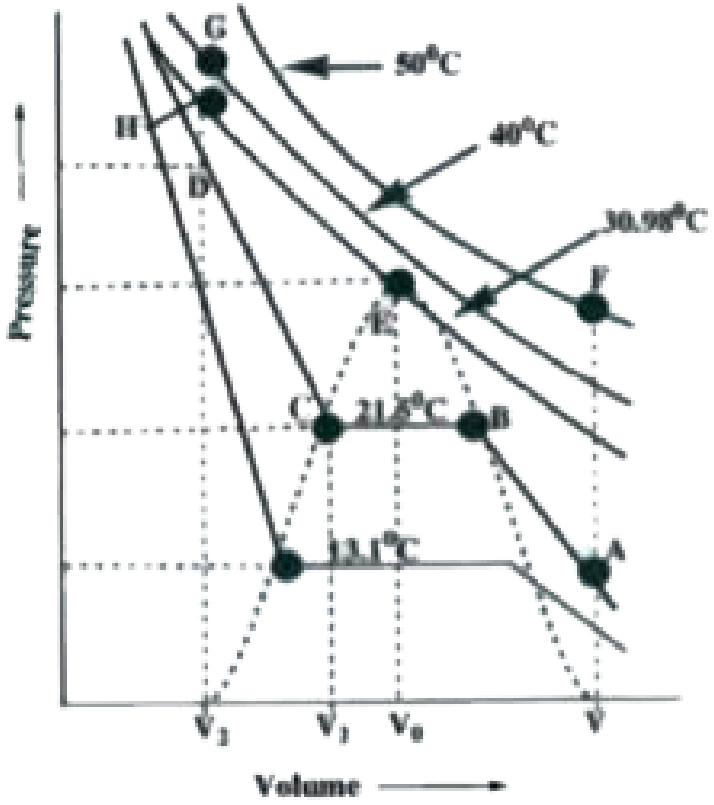
C. The compression causes further increase in condensation

D. Carbon dioxide is real gas

Answer:

Watch Video Solution

3. Study the following isotherms of carbondioxide at various temperature and answer the following questions based on that:



Carbondioxide present at F can be liquified

A. At critical volume by compression

B. At critical pressure by compression

C. By compression at any temperature

D. By compression and lowering the temperature

Answer:

Watch Video Solution

Additional Practice Exercise Level Ii Lecture Sheet Advanced Linked Comprehension Type Questions Passage Ii

1. In a various form of matter the constituent particles are held together with different types of forces. The extent of forces depends on the nature of the substances.

The forces operating in solid xenon are_____

A. dipole-dipole

B. dipole-induced dipole

C. london dispersion

D. ion-dipole

Answer:

Watch Video Solution

2. In a various form of matter the constituent particles are held together with different types of forces. The extent of forces depends on the nature of the substances.

Solubility of NH_3 in water is influenced by _____ interactions.

A. ion-dipole

B. ion-ion

C. dipole-dipole

D. dipole-induced dipol

Answer:

Watch Video Solution

3. In a various form of matter the constituent particles are held together with different types of forces. The extent of forces depends

on the nature of the substances.

Solubility of O_2 in water is due to_____

A. dipole-dipole forces

B. dipole-induced dipole forces

C. ion-dipole forces

D. hydrogen bonding

Answer:

Watch Video Solution

Additional Practice Exercise Level Ii Lecture Sheet Advanced Matrix Matching Type Questions

1.

List-I (T = moderate)	List-II
A) H_2 at low P	P) +ve deviation
B) He at high P	Q) Z < 1
C) CO_2 at low P	R) dominating attractive forces
D) CO_2 at high P	S) dominating repulsive forces

Watch Video Solution

Additional Practice Exercise Level Ii Lecture Sheet Advanced Integer Type Questions

1. How many factors can influence the coefficient of viscocity of a liquid ?

A. surface area ,

B. quantity of liquid ,

C. temperature ,

D. external pressure

Answer:

Watch Video Solution

2. How many of the following factors effect the surface tension of a liquid ?

A. surface area ,

B. quantity of liquid ,

C. temperature ,

D. external pressure

Answer:

Watch Video Solution

Additional Practice Exercise Practice Sheet Advanced Straight Objective Type Questions

1. 2gm of 'He' exerts a pressure of 2 atmospheres in a rigid flask. How many grams of H_2 should be pumped into the flask such that the

pressure raises to 4 atm

A. 2 gm

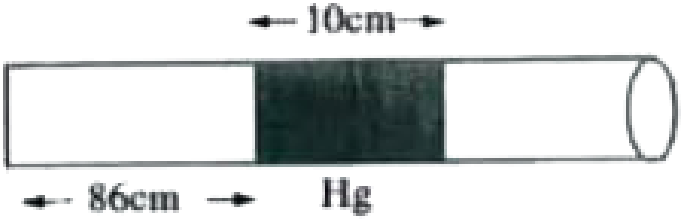
B. 0.5

C. 1 gm

D. 4 gm

Answer:

Watch Video Solution



2.

If the above tube is kept in vertical position by how much length the mercury column descends ?

A. 20 cm

B. 10 cm

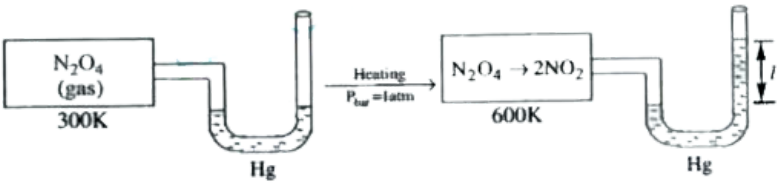
C. 15 cm

D. 25 cm

Answer:

Watch Video Solution

3.



If the value of 7' in the above diagram is 114 cm. What is the percentage dissociation of N_2O_4 due to heating.

A. $40\ \%$

B. $50\ \%$

C. $25\ \%$

D. $12.5\ \%$

Answer:

Watch Video Solution

4. The compression factor (compressibility factor) for one mole of a van der Waals gas at $0^{o}C$ and 100 atmospheric pressure is found to be 0.5. Assuming that the volume of a gas molecule is negligible, calculate the van der Waals constant a.

A. 2.6

B. 1.25

C. 1.4

D. 1.75

Answer:

Watch Video Solution

5. Using van der Waals equation, calculate the constant, a when two moles of a gas confined in a four litre flask exerts a pressure of 11.0 atmospheres at a temperature of 300 K. The value of b is 0.05 L mol^{-1}

A. 6.46

B. 3.82

C. 5.2

D. 1.23

Answer:

Watch Video Solution

6. A graph is plotted between PV_m along y-axis and P along x-axis, where V_m is the molar volume of a real gas. Find the intercept along y-axis.

A. $\frac{RT}{2}$

B. $\sqrt{RT}$

C. RT

D. $(RT)^{1/2}$

Answer:

Watch Video Solution

7. At 400 K, the root mean square (rms) speed of a gas X (molecular weight = 40) is cgual to the most probable speed of gas Y at 60K. The molecular weight of the gas Y is

A. 40

B. 16

C. 20

D. 4

Answer:

Watch Video Solution

8. One way of writing the equation of state for real gases is $PV = RT\left[1 + \frac{R}{V} + \ldots\right]$? Where B is constant. Derive an approximate expression for B in terms of the van der Waals constant a and b. $NH_3 + HCl \rightarrow NH_4Cl$ (solid)

A. $\frac{b - a/RT}{V}$

B. 0

C. $\left(b - \frac{a}{RT}\right)$

D. $\frac{a}{VRT}$

Answer:

Watch Video Solution

9. Calculate the pressure exerted by one moe of CO_2 gas at 273 K if the van der Waals constant a = 3.592 dm^6 atm mol^{-2}. Assume that the volume occupied by CO_2 molecules is negligible

A. 0.99 atm

B. 0.25 atm

C. 0.8 atm

D. 1.4 atm

Answer:

Watch Video Solution

10. If 250 ml. of N_2 over water at 30°C and a total pressure of 740 torr is mixed with 300 mL of Ne over water at 25°C and a total pressure of 780 torr, what will be total pressure if the mixture is in a 500 mL vessel over water at 35 °C. (Given : Vapour pressrue (Aqueous tension) of

H_2O at 25°C, 30°C and 35°C are 23.8, 31.8 and 42.2 torr respectively. Assume volume of H_2O (l) is negligible in final vessel)

A. 760 torr

B. 828.4 torr

C. 807.6 torr

D. 870.6 torr

Answer:

Watch Video Solution

Additional Practice Exercise Practice Sheet Advanced More Than One Correct Answer Type Questions

1. Which of the following graphs give a straight lines for the given properties of an ideal gas

A. P versus V at constant temperature

B. PV versus P at constant temperature

C. P versus 1/V at constant temperature

D. V versus T at constant temperature

Answer:

Watch Video Solution

2. Which of the following statements are correct

A. Gaserous phase below critical temperature is called vapour state

B. Vapour pressure of all liquids is same at their freezing point

C. Vapour pressure of all liquids is same at their boiling point

D. H_2O_v can not exist below 0°C

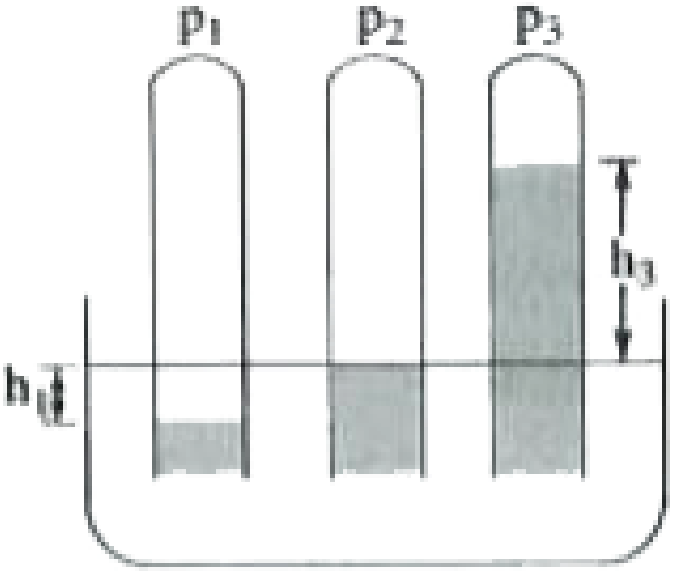
Answer:

Watch Video Solution

1. Consider gases confined by a liquid, as shown below.

Density of the liquid = d. gmL^{-1}

h_1 and h_3 in mm and p_1, p_2 and p_3 in mm Hg.



Select correct relation for pressure p_3

A. $p_{\mathrm{atm}} + 0.1h_1d$

B. $p_{\mathrm{atm}} - 0.1h_1d$

C. $p_{\text{atm}} + h_1 d$

D. $p_{\text{atm}} - h_1 d$

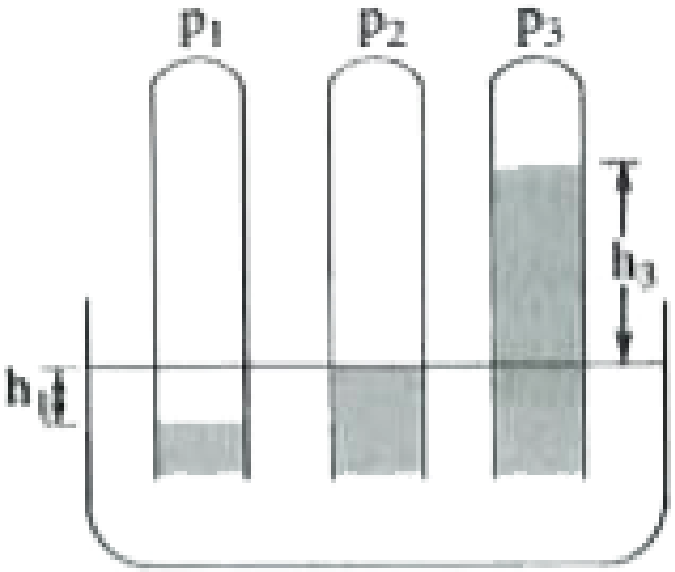
Answer:

Watch Video Solution

2. Consider gases confined by a liquid, as shown below.

Density of the liquid = d. gmL^{-1}

h_1 and h_3 in mm and p_1, p_2 and p_3 in mm Hg.



Select correct relation for pressure p_3

A. p_1

B. p_2

C. p_3

D. $p_1 + p_2 + p_3$

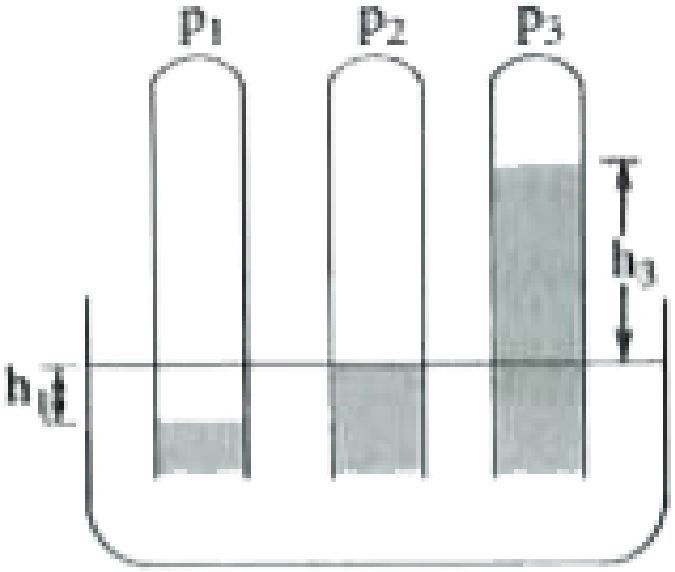
Answer:

Watch Video Solution

3. Consider gases confined by a liquid, as shown below.

Density of the liquid = d. gmL^{-1}

h_1 and h_3 in mm and p_1, p_2 and p_3 in mm Hg.



Select correct relation for pressure p_3

A. $p_3 = p_{atm} + 0.1h_3d$

B. $p_3 = p_{\mathrm{atm}} + 0.1h_3d$

C. $p_3 = p_{\mathrm{atm}} - h_3d\mathrm{g}$

D. $p_3 = p_{\mathrm{atm}} + h_3d\ \mathrm{g}$

Answer:

Watch Video Solution

Additional Practice Exercise Practice Sheet Advanced Linked Comprehension Type Questions Passage Ii

1. The intermolecular forces operating between two constituent particles depends on the distance between the centres of the molecules. Dipole-dipole interactions are inversely proportional to 3rd power of the distance where as dipole induced dipole interaction are inversely proportional to the sixth power of intermolecular distances. The forces in dry ice are proportional to (r = intermolecular distance)

A. $\frac{1}{r^3}$

B. $\frac{1}{r^4}$

C. $\frac{1}{r^6}$

D. $\frac{1}{r^2}$

Answer:

Watch Video Solution

2. The intermolecular forces operating between two constituent particles depends on the distance between the centres of the molecules. Dipole-dipole interactions are inversely proportional to 3rd power of the distance where as dipole induced dipole interaction are inversely proportional to the sixth power of intermolecular distances.

In which of the following the extent of interaction is proportional to $\frac{1}{r^6}$ where (r = intermolecular distance)

A. $NH_3 - H_2O$ mixture

B. ice

C. Xe in water

D. Solid I_2

Answer:

Watch Video Solution

Additional Practice Exercise Practice Sheet Advanced Linked Comprehension Type Questions Passage Iii

1. Density of gas is inversely proportional to absolute temperature and directly proportional to pressure

$\Rightarrow d \propto \frac{P}{T} \Rightarrow \frac{dT}{P}$ = constant $\Rightarrow \frac{d_1 T_1}{P_1} = \frac{d_2 T_2}{P_2}$

Density at a particular temperature and pressure can be calculated bousing ideal gas equation

$$PV = nRT \Rightarrow PV = \frac{\text{mass}}{\text{molar mass (M)}} xRT$$

$$P \times M = \frac{\text{mass}}{\text{volume}} \times RT \Rightarrow P \times M = d \times RT$$

$$d = \frac{PM}{RT}$$

Which of the following has maximum density?

A. O_2 at 25° C and 1 atm

B. O_2 at 0° C and 2 atm

C. O_2 at 273° C and 1 atm

D. O_2 at 0° C and 1 atm

Answer:

Watch Video Solution

2. Density of gas is inversely proportional to absolute temperature and directly proportional to pressure

$$\Rightarrow d \propto \frac{P}{T} \Rightarrow \frac{dT}{P} = \text{constant} \Rightarrow \frac{d_1 T_1}{P_1} = \frac{d_2 T_2}{P_2}$$

Density at a particular temperature and pressure can be calculated bousing ideal gas equation

$$PV = nRT \Rightarrow PV = \frac{\text{mass}}{\text{molar mass (M)}} xRT$$

$$P \times M = \frac{\text{mass}}{\text{volume}} \times RT \Rightarrow P \times M = d \times RT$$

$$d = \frac{PM}{RT}$$

The density of at 1 atm and 273K is

A. $1.96 gL^{-1}$

B. $2.12 gL^{-1}$

C. $1.09gL^{-1}$

D. $2.02gL^{-1}$

Answer:

Watch Video Solution

3. Density of gas is inversely proportional to absolute temperature and directly proportional to pressure

$$\Rightarrow d \propto \frac{P}{T} \Rightarrow \frac{dT}{P} = \text{constant} \Rightarrow \frac{d_1T_1}{P_1} = \frac{d_2T_2}{P_2}$$

Density at a particular temperature and pressure can be calculated bousing ideal gas equation

$$PV = nRT \Rightarrow PV = \frac{\text{mass}}{\text{molar mass (M)}} xRT$$

$$P \times M = \frac{\text{mass}}{\text{volume}} \times RT \Rightarrow P \times M = d \times RT$$

$$d = \frac{PM}{RT}$$

The density of gas is 3.8 g L^{-1} at STP. The density at 27°C and 700 mm Hg pressure will be

A. $3.185gL^{-1}$

B. $3.185gml^{-1}$

C. $3.185KgL^{-1}$

D. $3.185Kgml^{-1}$

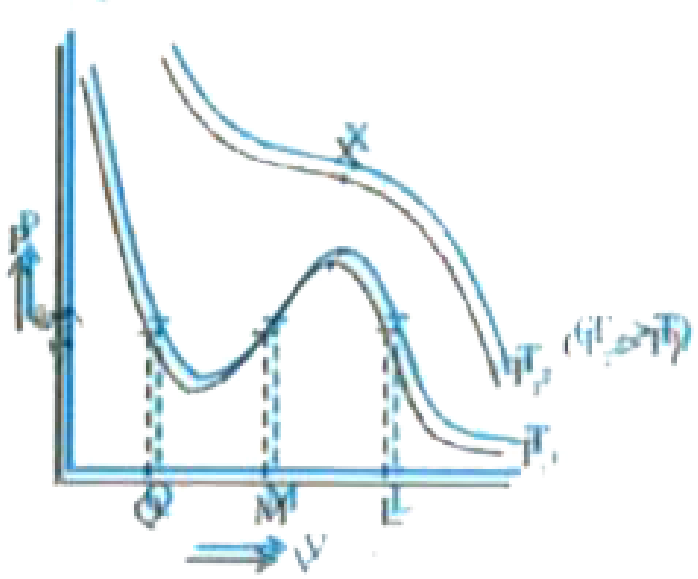
Answer:

Watch Video Solution

Additional Practice Exercise Practice Sheet Advanced Linked Comprehension Type Questions Passage Iv

1. At a particular temperature and pressure for a real gas Van der Waal's equation can be written as:

$$\left(P+\frac{a}{V^2m}\right)(V_m-b)=RT$$



where Vm is molar volume of gas. This is cubic equation in the variable Vm and therefore for any single value of P & T there should be 3 values of Vm. Which are shown in graph as Q, M and L.

As temperature is made to increase at a certain higher temperature the three values of Vm becomes identical. The temperature, pressure & molar volume at point X are called Tc, Pc & Vc for real gas. The compressibility factor in terms of Pc, Vc and T is called Zc.

The expression of Van dcr Waal's constant 'a' can be given as

A. $\frac{27RT_c}{16P_c}$

B. $\frac{27(RT_c)^2}{64P_c}$

C. $\frac{64(RT_c)^2}{Pc}$

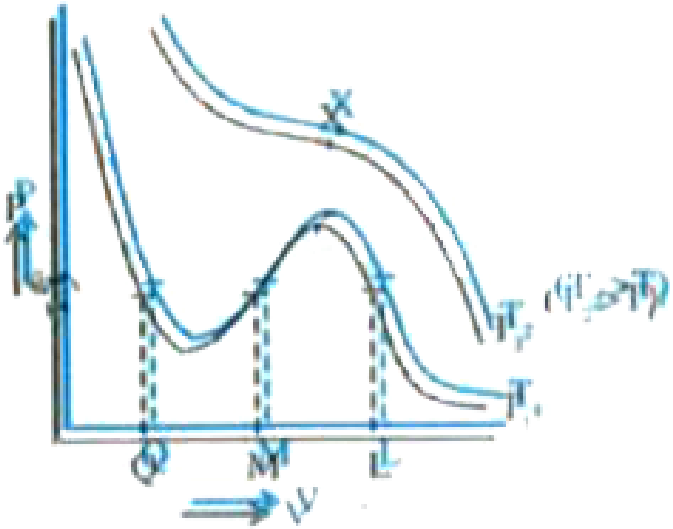
D. $\frac{27P_c}{(RTc)^2}$

Answer:

Watch Video Solution

2. At a particular temperature and pressure for a real gas Van der Waal's equation can be written as:

$$\left(P+\frac{a}{V^2m}\right)(V_m-b)=RT$$



where Vm is molar volume of gas. This is cubic equation in the variable Vm and therefore for any single value of P & T there should be 3 values of Vm. Which are shown in graph as Q, M and L.

As temperature is made to increase at a certain higher temperature the three values of Vm becomes identical. The temperature, pressure & molar volume at point X are called Tc, Pc & Vc for real gas. The compressibility factor in terms of Pc, Vc and T is called Zc.

The value of critical compressibility factor Zc is approximately

A. 0.4

B. 2.6

C. 0.6

D. 1.3

Answer:

Watch Video Solution