CHEMISTRY

VMC MODULES ENGLISH

STATES OF MATTER

LEVEL -0 (Very Short Answer Type)

1. The van der Waals constant 'b' for oxygen is 0.0318 L mol^{-1}. Calculate the diameter of the oxygen molecule.

Watch Video Solution

2. A gas is filled into a bulb connected to an open limb manometer. The level of mercury in the open arm is 2.1 cm lower than that in the other

arm of the manometer. The atmospheric pressure is 740 mm. What is the pressure of the gas?

Watch Video Solution

3. Why in the case of hydrogen and helium, the compressibility factor is always greater than 1 and increases with increase of pressure?

Watch Video Solution

4. What do you understand by 'triple point' of a substance?

Watch Video Solution

5. What is Boyle's temperature?

Watch Video Solution

6. What is the effect of temperature on surface tension and viscosity?

Watch Video Solution

LEVEL -0 (Short Answer Type)

1. An iron cylinder contains helium at a pressure of 250 k Pa at 300 K. The cylinder can withstand a pressure of 1×10^6 Pa. The room in which cylinder is placed catches fire. Predict the temperature (in K) at which the cylinder will blow up before it melts or not (m.p.t. of the cylinder =1800K)..

Watch Video Solution

2. A large flask fitted with a stop-cock is evacuated and weighted, its mass is found to be 134.567 g. It is then filled to a pressure of 735 mm at $31^\circ C$ with a gas of unknown molecular mass and then reweighed, its mass is 137.456g. The flask is then filled with water and weighed again, its mass is

now 1067.9g. Assuming that the gas is ideal, calculate the molar mass of the gas.

Watch Video Solution

3. Calculate the pressure exerted by 110 g of carbon dioxide in a vessel of 2 L capacity at $37^{\circ}C$. Given that the van der Waal's constants are $a = 3.59L^2 \text{ atm } mol^{-2}$ and $b = 0.0427Lmol^{-1}$. Compare the value with the calculated value if the gas were considered as ideal.

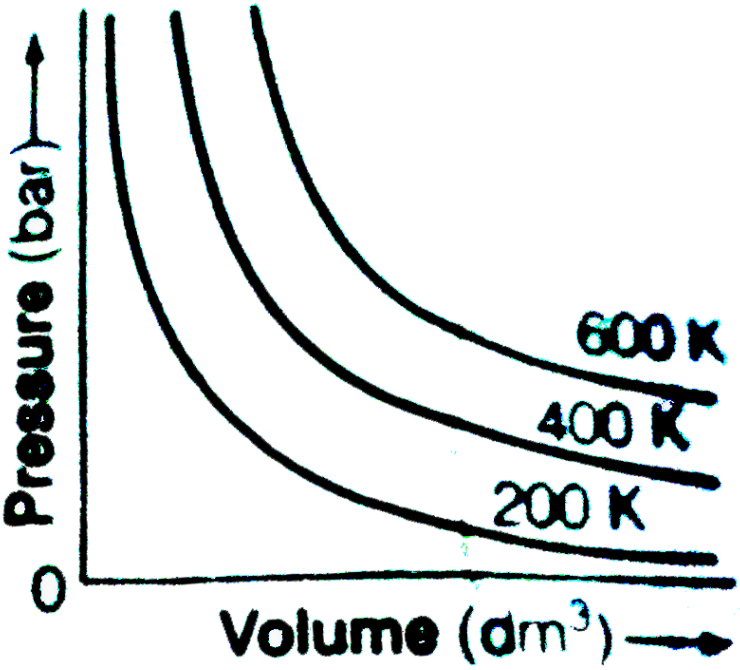
Watch Video Solution

4. The variation of pressure with volume of the gas at different temperatures can be graphically represented as shown in figure. On the basis of this graph answer the following question.

(i) How will the volume of a gas change if its pressure is increased at constant temperature ?

(ii) At a constant pressure, how will the volume of a gas change if the

temperature is increased from 200 K to 400 K ?

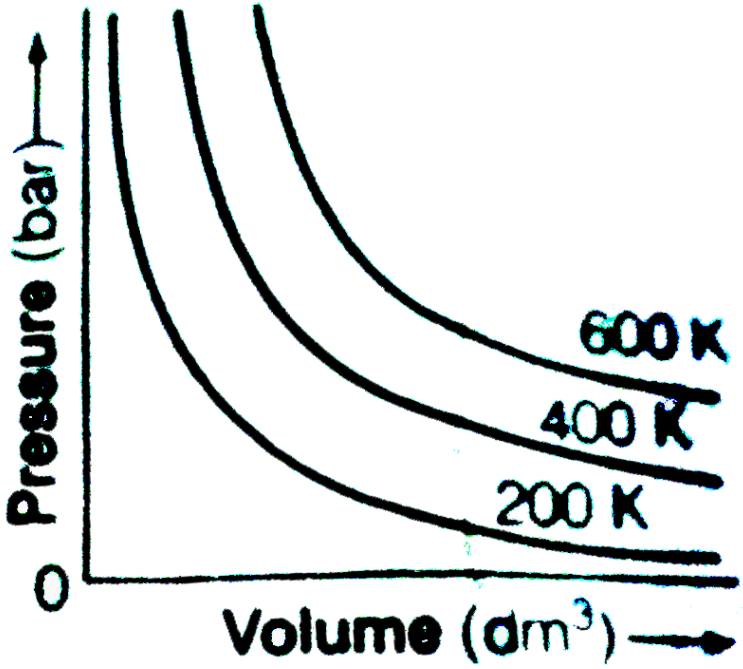


Watch Video Solution

5. The variation of pressure with volume of the gas at different temperatures can be graphically represented as shown in figure. On the basis of this graph answer the following question.

(i) How will the volume of a gas change if its pressure is increased at constant temperature ?

(ii) At a constant pressure, how will the volume of a gas change if the temperature is increased from 200 K to 400 K ?



Watch Video Solution

6. Why does the boundary between liquid phase and gaseous phase disappear on heating a liquid upto critical temperature in a closed vessel ? In this situation what will be the state of the substance ?

Watch Video Solution

7. Explain the term 'laminar flow'. Is the velocity of molecules same in all the layers in Laminar flow ? Explain you answer.

Watch Video Solution

8. Assuming the same pressure in each case calculate the mass of hydrogen required to inflate a balloon to a certain volume V at $100^\circ C$ if $3.5g$ helium is required to inflate the balloon to half the volume V at $25^\circ C$.

Watch Video Solution

LEVEL -0 (Short Answer Type-II)

1. An open flask containing air is heated from 300 K to 500 K. What percentage of air will be escaped to the atmosphere, if pressure is

keeping constant?

Watch Video Solution

2. 2.9 g of a gas at $95^{\circ}C$ occupied the same volume as 0.184 g of dihydrogen at $17^{\circ}C$, at the sam e pressure. What is the molar mass of the gas?

Watch Video Solution

3. Use the information and data given below to answer the question (a) to (c),

Stronger intermolecular forces result in higher boiling point.

Strength of London forces increases with the number of electrons in the molecule.

Boiling point of HF, HCl, HBr and HI are 293 K, 189 K, 206 K and 238 K respectively.

(a) which type of intermolecular forces are present in the molecules HF, HCl, HBr and HI ?

(b) Looking at the trend of boiling points of HCl, HBr and HI, explain out of dipole-dipole interaction and London interaction, which one is predominant here.

(c) Why is boiling point of hydrogen fluoride highest while that of hydrogen chloride lowest ?

Watch Video Solution

4. Use the information and data given below to answer the question (a) to (c),

Stronger intermolecular forces result in higher boiling point.

Strength of London forces increases with the number of electrons in the molecule.

Boiling point of HF, HCl, HBr and HI are 293 K, 189 K, 206 K and 238 K respectively.

(a) which type of intermolecular forces are present in the molecules HF, HCl, HBr and HI ?

(b) Looking at the trend of boiling points of HCl, HBr and HI, explain out of dipole-dipole interaction and London interaction, which one is

predominant here.

(c) Why is boiling point of hydrogen fluoride highest while that of hydrogen chloride lowest ?

Watch Video Solution

5. Use the information and data given below to answer the question (a) to (c),

Stronger intermolecular forces result in higher boiling point.

Strength of London forces increases with the number of electrons in the molecule.

Boiling point of HF, HCl, HBr and HI are 293 K, 189 K, 206 K and 238 K respectively.

(a) which type of intermolecular forces are present in the molecules HF, HCl, HBr and HI ?

(b) Looking at the trend of boiling points of HCl, HBr and HI, explain out of dipole-dipole interaction and London interaction, which one is predominant here.

(c) Why is boiling point of hydrogen fluoride highest while that of hydrogen chloride lowest ?

Watch Video Solution

6. Explain the following:

The size of a weather balloon becomes larger and larger as it ascends into higher altitudes.

Watch Video Solution

7. Explain the following:

The tyre of an automobile is inflated to a lesser pressure in summer than in winter.

Watch Video Solution

8. For real gases the relation between p, V and T is given by c=van der Waal's equation

$$\left(p+\frac{an^2}{V^2}\right)(V-nb)=nRT$$

where, 'a' and 'b' are van der Waal's constanrs, 'nb' is approximately equal to the total volume of the molecules of a gas. 'a' is the measure of magnitude of intermolecular attraction.

(i) Arrange the following gases in the increasin order of 'b'. give reason.

O_2, CO_2, H_2, He

(ii) Arrange the following gases in the decreasing order of magnitude of 'a'. Give reason.

CH_4, O_2, H_2

Watch Video Solution

9. The relation between pressure exerted by an ideal gas (p_{ideal}) and observed pressure (p_{real}) is given by the equation,

$$p_{\text{ideal}}=p_{\text{real}}+\frac{an^2}{V^2}$$

(i) If pressure is taken in NM^{-2}, number of moles in mol and volume in

m^3, calculate the unit of 'a'.

(ii) What will be the unit of 'a' when pressure is in atmosphere and volume in dm^3?

Watch Video Solution

10. The relation between pressure exerted by an ideal gas (p_{ideal}) and observed pressure (p_{real}) is given by the equation,

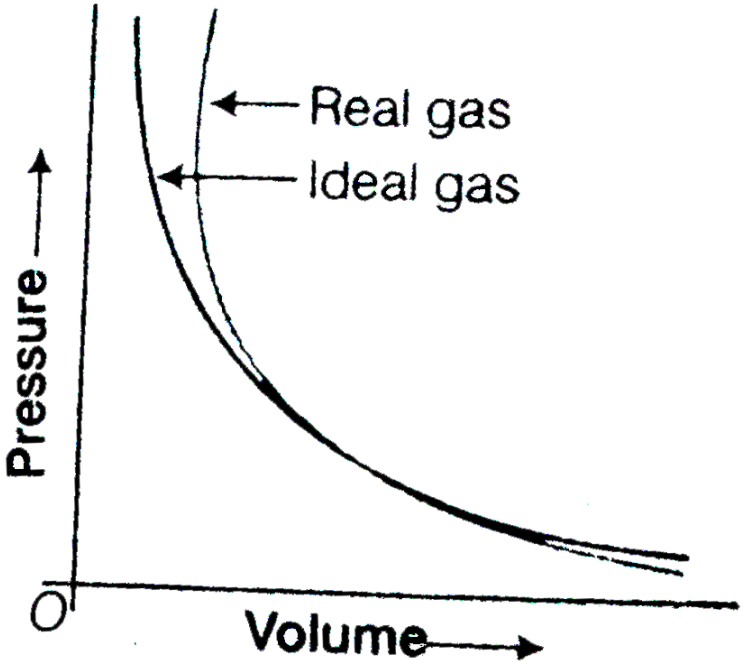
$$p_{\text{ideal}} = p_{\text{real}} + \frac{an^2}{V^2}$$

(i) If pressure is taken in NM^{-2}, number of moles in mol and volume in m^3, calculate the unit of 'a'.

(ii) What will be the unit of 'a' when pressure is in atmosphere and volume in dm^3?

Watch Video Solution

11. Pressure versus volume graph for real gas and are shown in figure. Answer the following question on the basis of this graph.



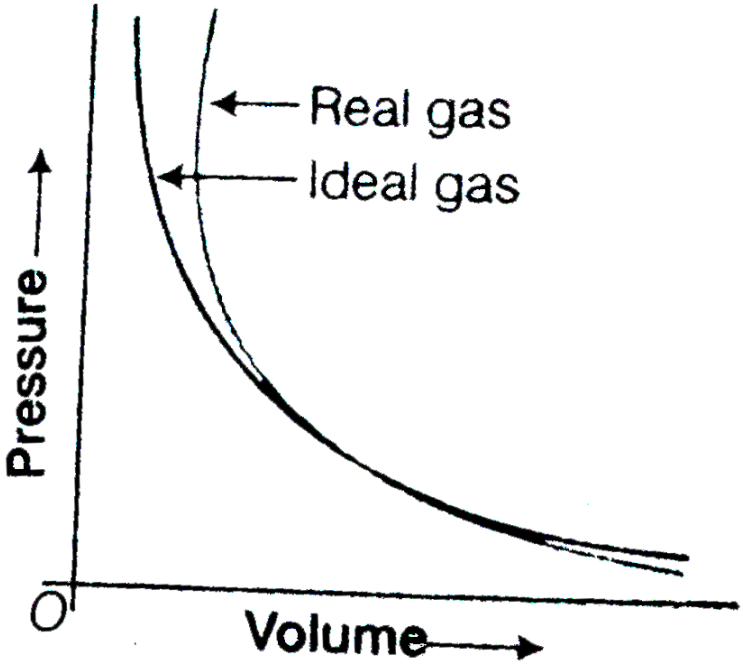
(i) Interpret the behaviour of real gas with respect to ideal gas at low pressure.

(ii) Interpret the behaviour of real gas with respect to ideal gas at high pressure.

(iii) Mark the pressure and volume by drawing a line at the point where real gas behaves as an ideal gas.

Watch Video Solution

12. Pressure versus volume graph for real gas and are shown in figure. Answer the following question on the basis of this graph.



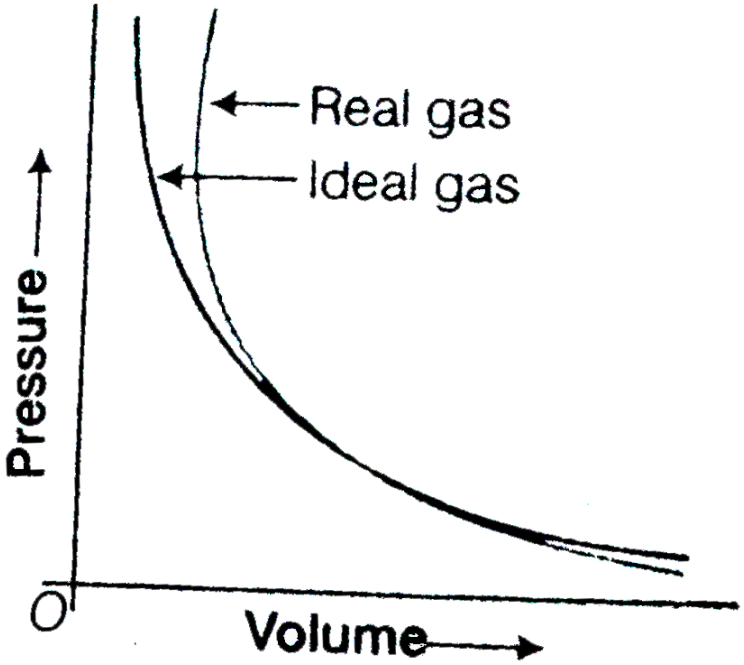
(i) Interpret the behaviour of real gas with respect to ideal gas at low pressure.

(ii) Interpret the behaviour of real gas with respect to ideal gas at high pressure.

(iii) Mark the pressure and volume by drawing a line at the point where real gas behaves as an ideal gas.

Watch Video Solution

13. Pressure versus volume graph for real gas and are shown in figure. Answer the following question on the basis of this graph.



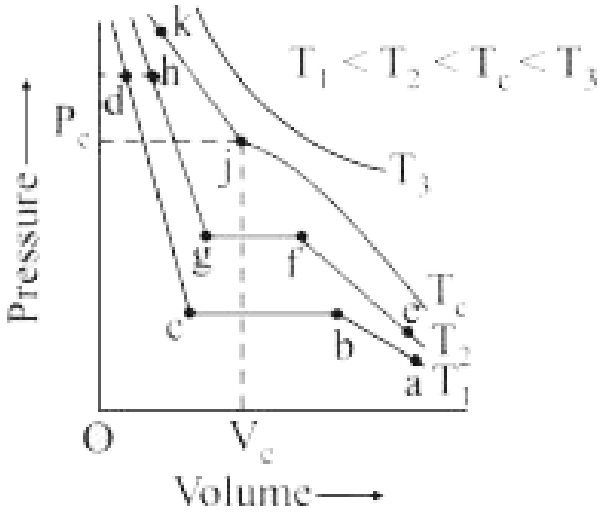
(i) Interpret the behaviour of real gas with respect to ideal gas at low pressure.

(ii) Interpret the behaviour of real gas with respect to ideal gas at high pressure.

(iii) Mark the pressure and volume by drawing a line at the point where real gas behaves as an ideal gas.

Watch Video Solution

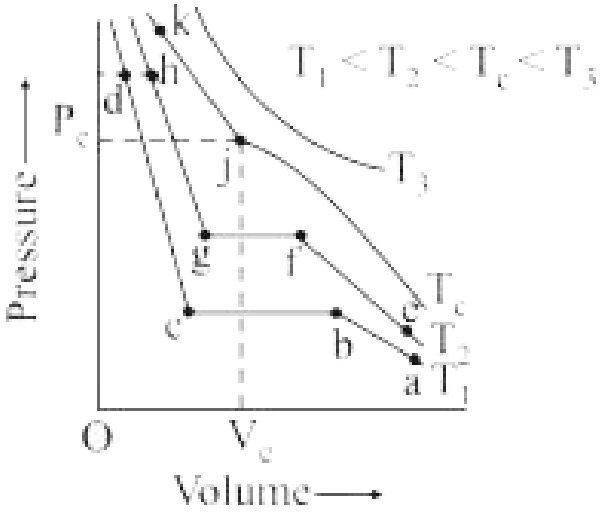
14. Isotherms of carbon dioxide at various temperatures are represented in figure. Answer the following questions based on this figure.



In which state will CO_2 exist between the points a and b at temperature T_1 ?

Watch Video Solution

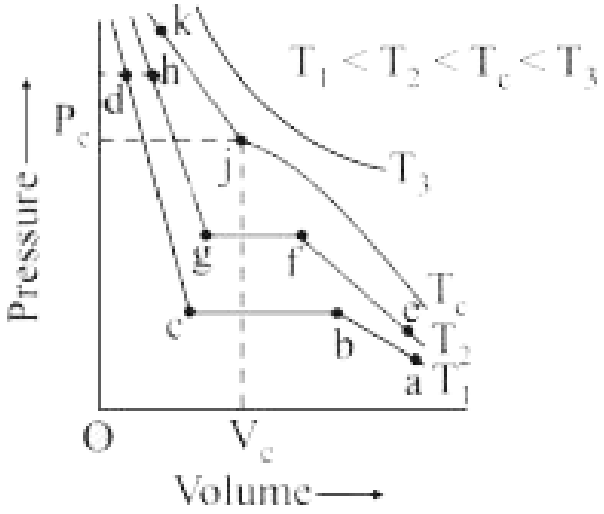
15. Isotherms of carbon dioxide at various temperatures are represented in figure. Answer the following questions based on this figure.



At what point will CO_2 start liquefying when temperature is T_1?

Watch Video Solution

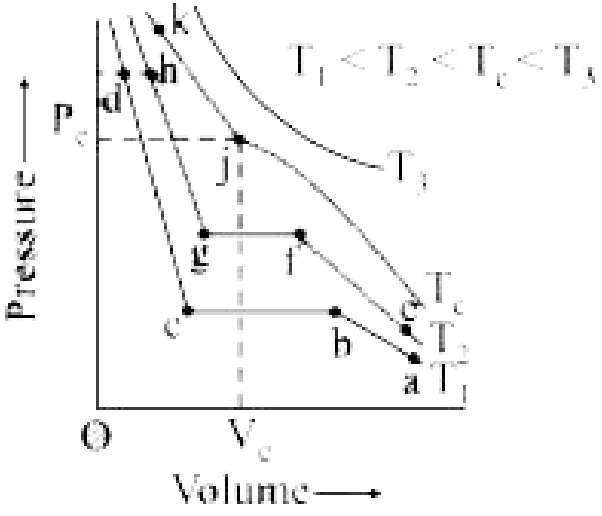
16. Isotherms of carbon dioxide at various temperatures are represented in figure. Answer the following questions based on this figure.



At what point will CO_2 be completely liquefied when temperature is T_2 ?

Watch Video Solution

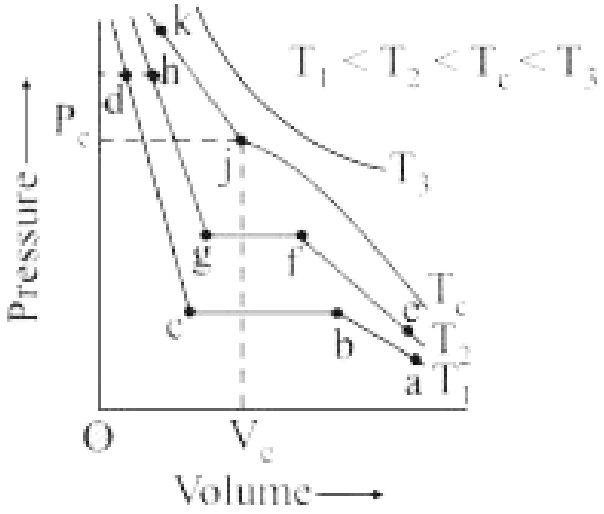
17. Isotherms of carbon dioxide at various temperatures are represented in figure. Answer the following questions based on this figure.



Will condensation take place when the temperature is T_3?

Watch Video Solution

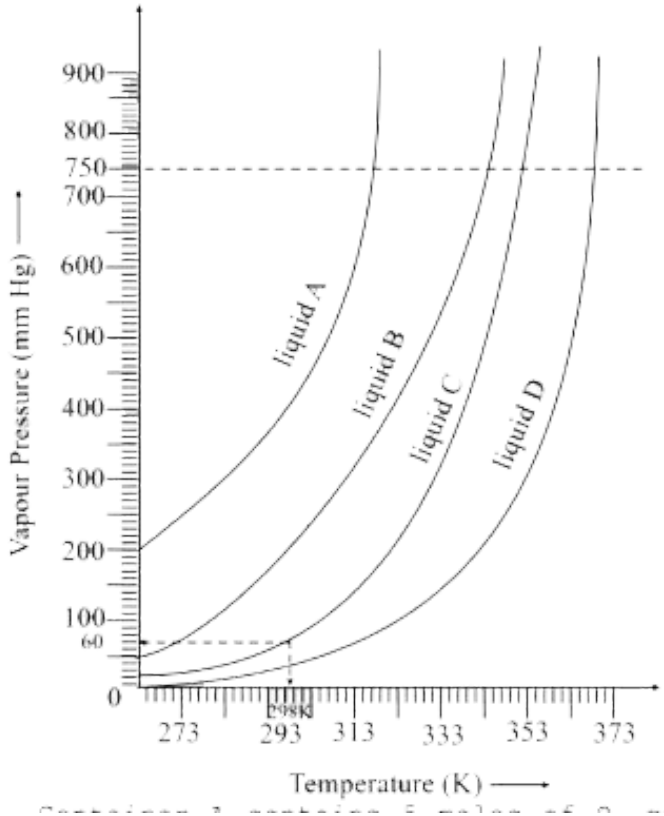
18. Isotherms of carbon dioxide at various temperatures are represented in figure. Answer the following questions based on this figure.



What portion of the isotherm at T_1 represent liquid and gaseous CO_2 at equilibrium?

Watch Video Solution

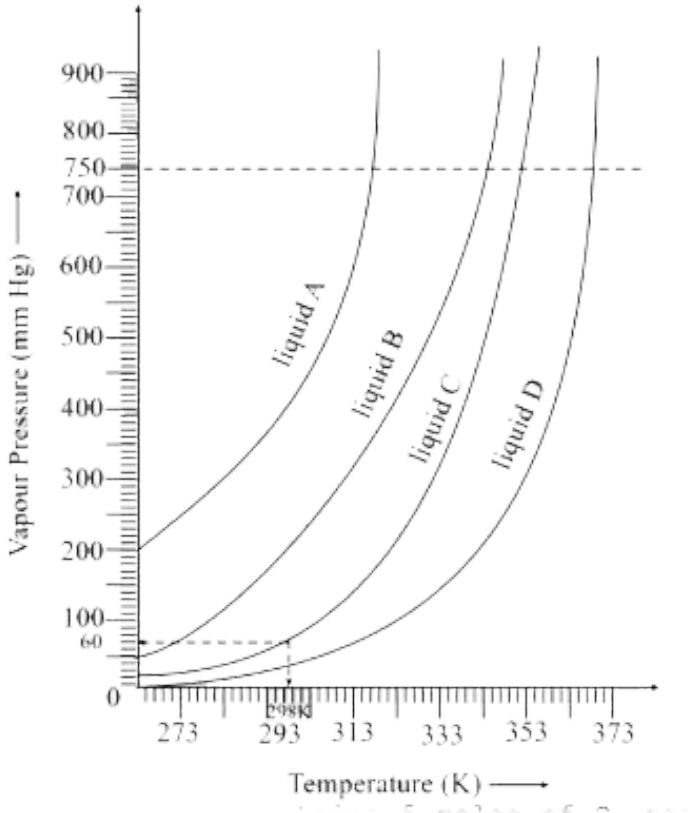
19. The variation of vapour pressure of different liquids with temperature is shown in figure



Calculate graphically boiling points of liquids A and B.

Watch Video Solution

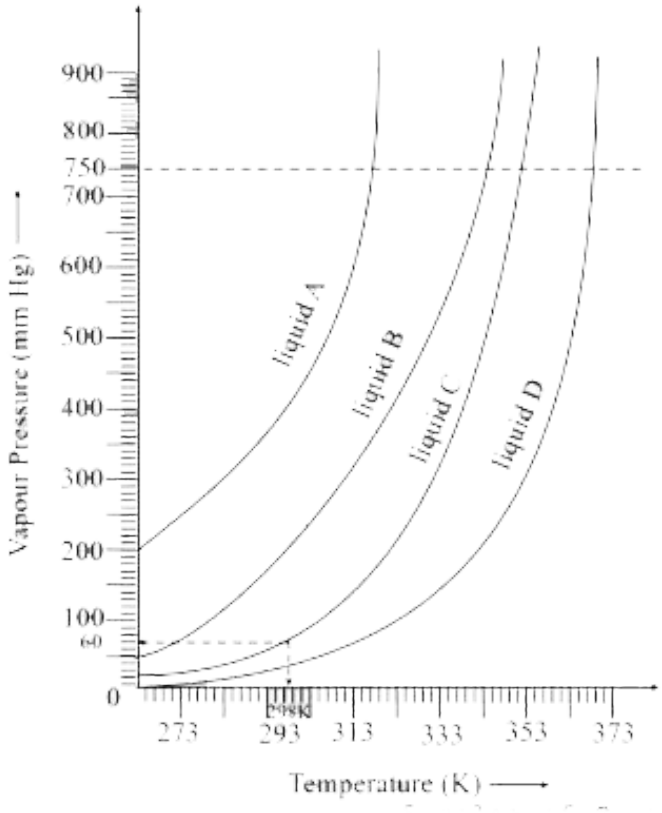
20. The variation of vapour pressure of different liquids with temperature is shown in figure



If we take liquid C in a closed vessel and heat it continuously. At what temperature will it boil?

Watch Video Solution

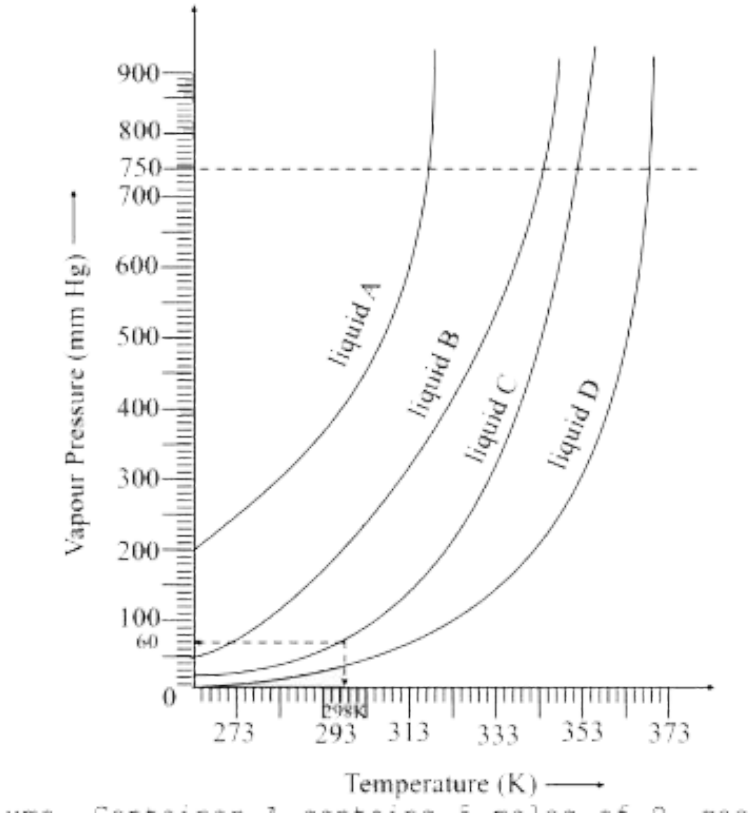
21. The variation of vapour pressure of different liquids with temperature is shown in figure



At high altitude, atmospheric pressure is low (say 60 mm Hg). At what temperature liquid D boils?

Watch Video Solution

22. The variation of vapour pressure of different liquids with temperature is shown in figure



Pressure cooker is used for cooking food at hill station. Explain in terms of vapour pressure why is it so ?

Watch Video Solution

23. Two containers A and B have the same volume. Container A contains 5 moles of O_2 gas. Container B contains 3 moles of He and 2 moles of N_2. Both the containers are separately kept in vacuum at the same

temperature. Both the containers have very small orifices of the same area through which the gases leak out. Compare the rate of effusion of O_2 with that of He gas mixture.

Watch Video Solution

24. A balloon of diameter 21 meter weight 100 kg. Calculate its pay-load, if it is filled with He at 1.0 atm and $27^\circ C$. Density of air is 1.2 kg m^{-3} . (Given : R=0.082 L atm $K^{-1}mol^{-1}$)

Watch Video Solution

25. An open vessel at $27^\circ C$ is heated until three fifth of the air in it has been expelled! Assuming volume of vessel constant find the temperature to which the vessel has been heated

Watch Video Solution

26. An open vessel at $27^{\circ}C$ is heated until $3/5^{th}$ of the air in it has been expelled. Assuming that the volume of the vessel remains constant find the air escaped out if vessel is heated to 900 K?

Watch Video Solution

27. An open vessel at $27^{\circ}C$ is heated until $3/5^{th}$ of the air in it has been expelled. Assuming that the volume of the vessel remains constant find temperature at which half of the air escapes out?

Watch Video Solution

Level-1

1. Which of the following represents the highest pressure?

A. One atmosphere

B. Five pounds per square inch

C. One mm of Hg

D. One hundred Pascal

Answer: A

Watch Video Solution

2. The VD of gas is 11.2. The volume occupied by 11.2g of this gas at NTP is:

A. 22.4 L

B. 11.2 L

C. 1 L

D. 2.2 L

Answer: B

Watch Video Solution

3. A sealed container with gas at 2.00 atm is heated from 20.0 K to 40.0 K. The new pressure is:

A. 0.050 atm

B. 1.00 atm

C. 4.00 atm

D. 2.14 atm

Answer: C

Watch Video Solution

4. If 4g of oxygen diffuses through a very narrow hole, how much hydrogen would have diffused under identical conditions?

A. 16 g

B. 1 g

C. $1/4$ g

D. 64 g

Answer: B

Watch Video Solution

5. A gas at a pressure of 5 atm is heated from 0° to 546° C and simultaneously compressed to $\frac{1}{3}$ rd of it original volume . Hence final pressure is

A. 15.0 atm

B. 30.0 atm

C. 45.0 atm

D. $5/9$ atm

Answer: C

Watch Video Solution

6. For an ideal gas which of the following graphs will not be straight line when all the other variables are held constant?

A. P vs T

B. V vs T

C. P vs 1/V

D. n vs T

Answer: D

Watch Video Solution

7. $1gH_2, 2g$ He and 3g NO are contained in 1.1 L flask at 300 K. Total pressure exerted by the mixture is :

A. 5.45 atm

B. 6.0 atm

C. 24.63 atm

D. 134.34 atm

Answer: C

Watch Video Solution

8. At the same temperature and pressure, which of the following will have highest KE per mole

A. H_2

B. O_2

C. CH_4

D. equal

Answer: D

Watch Video Solution

9. At what temperature will the molar kinetic energy of 0.3 mol of He be the same as that of 0.4 mol of argon at 400 K ?

A. 533 K

B. 400 K

C. 346 K

D. 300 K

Answer: A

Watch Video Solution

10. The molecular velocities of two gases at same temperature are u_1 and u_2, their masses are m_1 and m_2 respectively, which of the following expression is correct ?

A. $\frac{m_1}{u_1^2} = \frac{m_2}{u_2^2}$

B. $m_1 u_1 = m_2 u_2$

C. $\frac{m_1}{u_1} = \frac{m_2}{u_2}$

D. $m_1 u_1^2 = m_2 u_2^2$

Answer: D

Watch Video Solution

11. 50 mL of hydrogen diffuses out through a small hole from a vessel in 20 minutes, time needed for 40 mL of oxygen to diffuse out is: 1) 12 min 2)64 min 3)8 min 4)32 min

A. 12 min

B. 64 min

C. 8 min

D. 32 min

Answer: B

Watch Video Solution

12. The average kinetic energy of an ideal gas per molecule in SI units at $25^\circ C$ will be

A. $6.17 \times 10^{-21} kJ$

B. $6.17 \times 10^{-21} J$

C. $6.17 \times 10^{-20} J$

D. $6.17 \times 10^{-20} kJ$

Answer: B

Watch Video Solution

13. KE per unit volume is:

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

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

C. $\frac{3}{2}\frac{RN}{N_0}$

D. $\frac{3}{2}\frac{RT}{n}$

Answer: A

Watch Video Solution

14. Select correct statement(s):

A. The velocity at which distribution of molecules is maximum is called most probable velocity

B. Most probable velocity of a gas is larger than root mean square velocity

C. Both statements are correct

D. None is correct

Answer: A

Watch Video Solution

15. Select correct statement(s)

A. Kinetic energy is zero at $0^\circ C$

B. RMS velocity of O_2 $\text{at} 27^\circ C$ is $= \sqrt{\frac{3 \times 8.314 \times 300}{32}} ms^{-1}$

C. Distribution of molecules is very small when $u \to 0$ or $u \to \infty$

D. All the statements are correct

Answer: C

Watch Video Solution

16. The expression of average speed of molecules of a gas is given as :

A. $u_{av} = \sqrt{\frac{8RT}{\pi m}}$

B. $u_{av} = \sqrt{\frac{8RT}{\pi M}}$

C. $u_{av} = \sqrt{\frac{8kT}{\pi M}}$

D. $u_{av} = \sqrt{\frac{8RT}{M}}$

Answer: B

Watch Video Solution

17. For a given gas, which of the following relationships is correct at a given temperature ?

A. $u_{rms} > u_{av} > u_{mp}$

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

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

D. $u_{rms} < u_{av} > u_{mp}$

Answer: A

Watch Video Solution

18. Which of the following is expected to possess the largest root mean square speed at the same temperature?

A. H_2S

B. NH_3

C. SO_2

D. CO_2

Answer: B

Watch Video Solution

19. The RMS velocity of hydrogen is $\sqrt{7}$ times the RMS velocity of nitrogen. If T is the temperature of the gas

A. $T(H_2) = T(N_2)$

B. $T(H_2) > T(N_2)$

C. $T(H_2) < T(N_2)$

D. $T(H_2) = \sqrt{7}T(N_2)$

Answer: C

Watch Video Solution

20. The density of a gas at $27^\circ C$ and 1 atm is d. At what temperature would its density be 0.75d, if the pressure is kept constant?

A. $20^\circ C$

B. $30^\circ C$

C. 400K

D. 300K

Answer: C

Watch Video Solution

21. A certain gas effuses through a small opening of a vessel at a rate which is exactly one-fifth the rate at which helium does the same. Thus, the molecular weight of the gas is :

A. 100

B. 75

C. 50

D. 25

Answer: A

Watch Video Solution

22. The weight of CH_4 in a 9L cylinder at $27^\circ C$ temperature and 16 atm pressure is (R = 0.08 L atm $K^{-1}mol^{-1}$)

A. 9.6g

B. 96.0 g

C. 4.8 g

D. 48.0 g

Answer: B

Watch Video Solution

23. The ratio of most probable speed, average speed and rms speed of gas molecules is.....

A. $1:1.128:1.224$

B. $1:1.128:1.424$

C. $1:2.128:1.224$

D. $1:1.428:1.442$

Answer: A

Watch Video Solution

24. Equal weights of methane and hydrogen are mixed in an empty container at $25^{\circ}C$. The fraction of the total pressure exerted by hydrogen is

A. $1/12$

B. $8/9$

C. $1/6$

D. $16/17$

Answer: B

Watch Video Solution

25. A gas cylinder containing cooking gas can withstand a pressure of $14.9atm$. The pressure gauge of cylinder indicates $12atm$ at $27^\circ C$. Due to sudden fire in building the temperature starts rising. The temperature at which the cylinder will explode is

A. $87.5^\circ C$

B. $99.5^\circ C$

C. $115.5^\circ C$

D. $135.5^\circ C$

Answer: B

Watch Video Solution

26. At what temperature do the average speed of $CH_4(g)$ molecules equal the average speed of O_2 molecules at 300 K ?

A. 150 K

B. 900 K

C. 600 K

D. 300 K

Answer: A

Watch Video Solution

27. Which of the following expressions is correct ?

A. $V_{rms} = \sqrt{\frac{3RT}{M}}$

B. $V_{rms} = \sqrt{\frac{3p}{\rho}}$

C. $PV = \frac{1}{3}mV_{rms}^2$

D. All of these

Answer: D

Watch Video Solution

28. Consider the reaction $2Al(g) + 3Cl_2(g) \Rightarrow 2AlCl_3(g)$. The approximate volume of chlorine that would react with 324 g of aluminium at STP is :

A. 112 L

B. 134 L

C. 260 L

D. 403 L

Answer: D

Watch Video Solution

29. A teacher enters a classroom from front door while a student from back door. There are 13 equidistant rows of benches in the classroom. The teacher releases N_2O, the laughing gas, from the first bench while the student releases the weeping gas $(C_6H_{11}OBr)$ from the last bench. At which row will the students starts laughing and weeping simultaneously?

A. 9^{th} row

B. 12^{th} row

C. 7^{th} row

D. 10^{th} row

Answer: A

Watch Video Solution

30. The vapour density of a mixture containing $N_2(g)$ and $O_2(g)$ is 14.4. The percentage of N_2 in the mixture is :

A. 20

B. 80

C. 60

D. 50

Answer: B

Watch Video Solution

31. A sample of a gas at $100^\circ C$ and 0.80 atm pressure has a density of 1.15 g L^{-1}. What is the molecular weight of the gas?

A. 88.0

B. 44.0

C. 28.0

D. 46.0

Answer: B

Watch Video Solution

32. Which of the following expressions is correct ?

A. $M = \left(\frac{\rho}{p}\right)RT$

B. $M = \left(\frac{p}{\rho}\right)RT$

C. $M = \left(\frac{1}{p}\right)RT$

D. $M = (p)RT$

Answer: A

Watch Video Solution

33. If a gas expands at constant temperature:

A. The pressure decreases

B. The kinetic energy of the molecules increases

C. The kinetic energy of the molecules decreases

D. The number of molecules of the gas increases

Answer: A

Watch Video Solution

34. Helium atom is two times heavier than a hydrogen molecule. At 289 K, the average kinetic energy of a helium atom is

A. Two times that of a hydrogen molecule

B. Same as that of a hydrogen molecule

C. Four times that of a hydrogen molecule

D. Six times that of a hydrogen molecule

Answer: B

Watch Video Solution

35. Identify the process in which heterogeneous catalysis is involved

A. Average molar translational KE depends only upon absolute temperature

B. Lighter gases will have more uniform speed distribution pattern as compared to heavier gases at same temperature

C. All the molecules of heavier gas will move at a slower speed as compared to any molecule of a lighter gas

D. Collision frequency is directly proportional to square root of absolute temperature in a closed rigid vessel.

Answer: C

Watch Video Solution

36. At $27^\circ C$, the ratio of RMS velocities of ozone to oxygen is

A. $\sqrt{3/5}$

B. $\sqrt{4/3}$

C. $\sqrt{2/3}$

D. $\sqrt{1/16}$

Answer: C

Watch Video Solution

37. Which of the following combinations is correct ?

A. $U_{rms} \propto \sqrt{T}$ and $U_{rms} \propto \sqrt{M}$

B. $U_{rms} \propto \sqrt{T}$ and $U_{rms} \propto \frac{1}{\sqrt{M}}$

C. $U_{rms} \propto \frac{1}{\sqrt{T}}$ and $U_{rms} \propto \frac{1}{\sqrt{M}}$

D. $U_{rms} \propto \frac{1}{\sqrt{T}}$ and $U_{rms} \propto \sqrt{M}$

Answer: B

Watch Video Solution

38. Which of the following expressions correctly represents the relationship between the average molar kinetic energy, $\overline{KE}$ of CO and N_2 molecules at the same temperature?

A. KE (CO) = KE (N_2)

B. KE (CO) $> KE(N_2)$

C. KE $(CO) < KE(N_2)$

D. Cannot be predicted unless the volumes of the gases are given

Answer: A

Watch Video Solution

39. According to Graham's law, at a given temperature the ratio of diffusion $\frac{r_A}{r_B}$ of gases A and B is given by

(where P and M are pressures and molecular weights of gases A and B respectively)

A. $(p_A/p_B)(M_A/M_B)^{1/2}$

B. $(M_A/M_B)(p_A/p_B)^{1/2}$

C. $(p_A/p_B)(M_B/M_A)^{1/2}$

D. $(M_A/M_B)(p_B/P_A)^{1/2}$

Answer: C

Watch Video Solution

40. The density of air is 0.001293 gm/ml at S.T.P. It's vapour density is -

A. $10.0gm$

B. $15.0gm$

C. $1.44gm$

D. $14.4gm$

Answer: D

Watch Video Solution

41. 3.2 g of oxygen gas is placed in a vessel of 10 litre at 1000 K so that 60% oxygen is dissociated to gaseous oxygen atoms. Assuming ideal gas nature, the final pressure at 1000 K is:

A. 0.821 atm

B. 1.31 atm

C. 0.33 atm

D. 0.49 atm

Answer: B

Watch Video Solution

42. Which of the following assumptions of the kinetic-molecular theory best explains the observation that a balloon collapses when exposed to liquid nitrogen (which is much colder than a cold winter day)?

A. Gas molecules move at random with no attractive forces between them

B. The velocity of gas molecules is proportional to their Kelvin temperature

C. The amount of space occupied by a gas is much greater than the space occupied by the actual gas molecules

D. Collisions with the walls of the container or with other molecules are elastic

Answer: B

Watch Video Solution

43. Select the correct statement(s).

I. The velocity at which distribution of molecules is maximum is called most probable velocity

II. Most probable velocity of a gas is larger than root mean square velocity .

The correct option is:

A. I

B. II

C. I , II

D. None of these

Answer: A

Watch Video Solution

44. Gaseous benzene reacts with hydrogen gas in presence of a nickel catalyst to form gaseous cyclohexane according to the reaction:

$C_6H_6(g) + 3H_2(h) \Rightarrow C_6H_{12}(g)$

A mixture of C_6H_6 and excess H_2 has a pressure of 60 mm of Hg in an unknown volume. After the gas has been passed over a nickel catalyst and all the benzene converted to cyclohexane, the pressure of the gas was 30 mm of Hg in the same volume and temperature. The fraction of C_6H_6 (by volume) present in the original mixture is :

A. ½

B. ¼

C. $.^1/_5$

D. $.^1/_6$

Answer: D

Watch Video Solution

45. The rms speed of the molecule of enclosed gas is v. What will be the rms speed if pressure is doubled keeping the temperature same?

A. 2x

B. 4x

C. $x/2$

D. x

Answer: D

Watch Video Solution

46. Which pair of molecules has the strongest dipole – dipole interactions ?

A. NH_3 and CH_4

B. NH_3 and NH_3

C. CH_4 and CH_4

D. CO_2 and CO_2

Answer: B

Watch Video Solution

47. The ratio of Van Der Waal's constants a and b, $\left(\frac{a}{b}\right)$ has the dimension of :

A. atm L^{-1}

B. L atm mol^{-1}

C. L mol^{-2}

D. atm L mol^{-2}

Answer: B

Watch Video Solution

48. Van Der Waal's equation reduces itself to the ideal gas equation at

A. High pressure and low temperature

B. Low pressure and low temperature

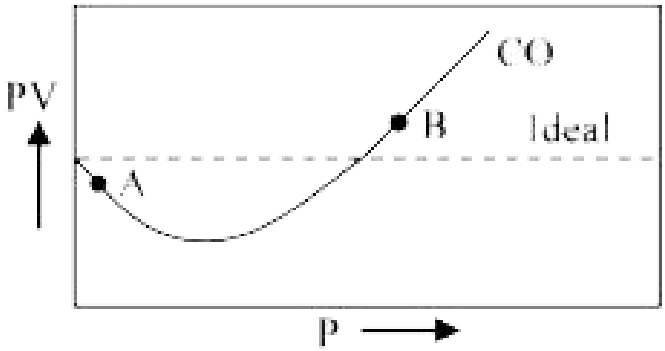
C. Low pressure and high temperature

D. High pressure and high temperature

Answer: C

Watch Video Solution

49. For CO, isotherm is of the type as shown:



Near the point A, compressibility factor Z (for 1 mol of CO) is :

A. $\left(1+\frac{b}{V}\right)$

B. $\left(1-\frac{b}{V}\right)$

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

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

Answer: D

Watch Video Solution

50. In the above Question, near the point B, compressibility factor Z is about :

A. $\left(1-\frac{Pb}{RT}\right)$

B. 1

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

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

Answer: C

Watch Video Solution

51. The van der Waals equation for one mol of CO_2 gas at low pressure will be

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

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

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

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

Answer: A

Watch Video Solution

52. Express the average kinetic energy per mole of a monoatomic gas of molar mass M, at temperature T K in terms of the average speed of the molecules U_{avg} :

A. $\frac{8M}{3\pi}U_{avg}^2$

B. $\frac{4M}{3\pi}U_{avg}^2$

C. $\left(\frac{2M}{\pi}\right)U_{avg}^2$

D. $\left(\frac{3\pi M}{16}\right)U_{avg}^2$

Answer: D

Watch Video Solution

53. Ice, water and steam can exist simultaneously at:

A. All temperatures

B. All pressures

C. All temperatures and pressure

D. Triple point

Answer: D

Watch Video Solution

54. 1 mole of each of X_1, X_2, X_3 with van der Waal's constants a (in atm $L^3 mol^{-2}$) 1.0, 3.8, 2.1 respectively is kept separately in three different vessels of equal volume at identical temperature. Their pressures are observed to $P_1, P_2,$ and P_3 respectively. On the basis of this data alone, select the correct option (neglect the effect of 'b') :

A. $P_1 < P_2 < P_3$

B. $P_2 < P_1 < P_3$

C. $P_2 < P_3 < P_1$

D. $P_1 = P_2 = P_3$

Answer: C

Watch Video Solution

55. At a high pressure, the compressibility factor (Z) of a real gas is usually greater than one. This can be explained from van der Waals equation by neglecting the value of:

A. (a) b

B. (b) a

C. (c) Both a and b

D. (d) V

Answer: B

Watch Video Solution

56. At a constant pressure, what should be the percentage increase in the temperature in kelvin for a 10 % increase in the volume

A. 0.1

B. 0.2

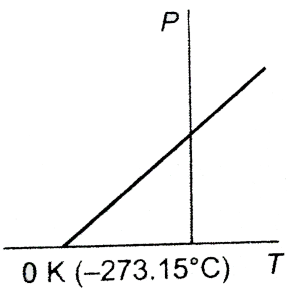
C. 0.05

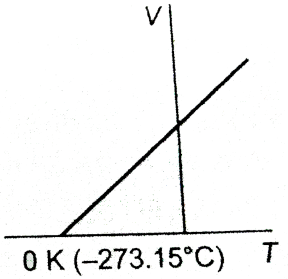
D. 0.5

Answer: A

Watch Video Solution

57. What conclusion would you draw from the following graphs for an ideal gas?





A. As the temperature is reduced, the volume as well as the pressure increases

B. As the temperature is reduced, the volume becomes zero and the pressure reaches infinity

C. As the temperature is reduced, the pressure decreases

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

Answer: C::D

Watch Video Solution

Watch Video Solution

58. Which of the following represents the van der Walls equation for n moles of a real gas ?

A. (a) $\left(P+\frac{a}{V^2}\right)(V-b)=nRT$

B. (b) $\left(P+\frac{a}{nV^2}\right)(V-nb)=nRT$

C. (c) $\left(P+\frac{n^2a}{V^2}\right)(V-nb)=nRT$

D. (d) $\left(P+\frac{na}{V^2}\right)(V-nb)=nRT$

Answer: C

Watch Video Solution

59. Which of the following equations represents the compressibility factor for 1 mol of gas.

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

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

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

D. $Z = \frac{PV}{RT}$

Answer: D

Watch Video Solution

60. At high pressure , the van der Waals equation is reduced to

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

B. $P(V - B) = nRT$

C. $P(V - nb) = nRT$

D. PV = nRT

Answer: C

Watch Video Solution

61. The Boltzmann constant k is given by k = ...

A. RN_A

B. $\frac{N_A}{R}$

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

D. $\frac{R}{N_A} \times T$

Answer: C

Watch Video Solution

62. Units of van der Waal's constants 'a' and 'b' are respectively

A. bar L^2mol^{-2} and $Lmol^{-1}$

B. bar L^2mol^{-1} and $L^{-1}mol^{-1}$

C. bar L^2mol^2 and $L^{-1}mol^{-1}$

D. bar $^{-1}L^2mol^{-2}$ and $L^{-2}mol^{-1}$

Answer: A

Watch Video Solution

63. Which of the following gas will have highest value of van der Waal's constant 'a' ?

A. CCl_4 (g)

B. NH_3 (g)

C. CO_2 (g)

D. H_2O (g)

Answer: D

Watch Video Solution

64. The Boyle temperature for real gases is given by :

A. (a) a / R

B. (b) a / bR

C. (c) $2a / bR$

D. (d) None of these

Answer: B

Watch Video Solution

65. A 4.40 g piece of solid CO_2 (dry ice) is allowed to sublime in a balloon. The final volume of the balloon is 1.00 L at 300 K. What is the pressure (atm) of the gas?

A. 0.122

B. 2.46

C. 122

D. 24.6

Answer: B

Watch Video Solution

66. A He atom at 300 K is released from the surface of the earth to travel upwards. Assuming that it undergoes no collision with other molecules, how high will it be before coming to the rest?

A. 9.53 m

B. 95.3 m

C. 953 m

D. 9.53×10^4 m

Answer: D

Watch Video Solution

67. An ideal gas obeying the kinetic theory of gases can be liquefied if

A. Its temperature is more than critical temperature

B. Its pressure is more than critical pressure

C. Its pressure is more than critical pressure but temperature is less than critical temperature

D. It cannot be liquefied at any value of P and T

Answer: D

Watch Video Solution

68. The pressure of a real gas is less than the pressure of an ideal gas because of :

A. Increase in collisions

B. Increase in intermolecular forces

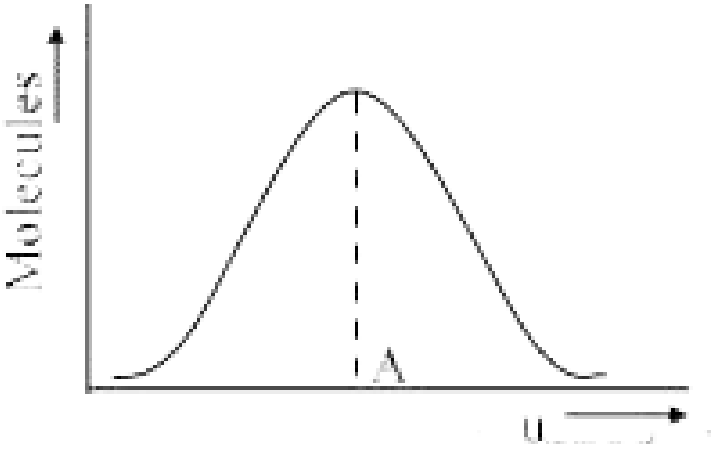
C. Finite size of molecules

D. Statement is incorrect

Answer: B

Watch Video Solution

69. Distribution of molecules with velocity is represented by the curve as shown, velocity at point A is :



A. $\sqrt{\frac{3RT}{M}}$

B. $\sqrt{\frac{2RT}{M}}$

C. $\sqrt{\frac{8RT}{\pi M}}$

D. $\sqrt{\frac{RT}{M}}$

Answer: B

Watch Video Solution

70. A ballon filled with ethyne is pricked with a sharp point and quickly dropped in a tank of H_2 gas under indentical conditions. After a while the balloon will

A. Shrunk

B. Enlarged

C. Completely collapsed

D. Remained unchanged in size

Answer: B

Watch Video Solution

71. If X_M, X_P, and X_V are mole fraction, pressure fraction and volume fraction respectively of a gaseous mixture, then:

A. $X_m = X_p = X_v$

B. $X_m = \frac{1}{X_p} = \frac{1}{X_v}$

C. $X_m = X_p = \frac{1}{X_v}$

D. $\frac{1}{X_m} = \frac{1}{X_p} = X_v$

Answer: A

Watch Video Solution

72. A 100 mL flask contained H_2 at 200 Torr, and a 200 mL flask contained He at 100 Torr. The two flask were then connected so that each gas filled their combined volume. Assuming no change in temperature,total pressure is

A. 300 Torr

B. 66.66 Torr

C. 150 Torr

D. 133.33 Torr

Answer: D

Watch Video Solution

73. Ratio of the rate of diffusion of He to H_2 at $0^\circ C$ is same in the case :

A. (a) When temperature is changed to $100^\circ C$

B. (b) When O2 and CH4 are taken instead of He and H_2

C. (c) When volume of the flask is doubled

D. (d) All the above are correct

Answer: D

Watch Video Solution

74. Which one of the following statement is not true about the effect of an increase in temperature on the distribution of molecular speed of gas ? .

A. The most probable velocity increases

B. The fraction of the molecules with the most probable speed increases

C. The distribution becomes broader

D. The area under the curve remains unaffected

Answer: B

Watch Video Solution

75. Which of the following comparisons of the average kinetic energy and the average molecular speeds of H_2 and N_2 gases at 300 K is CORRECT?

	List 1 [Average kinetic energy]	List 2 [Average molecular speed]
(A)	$H_2 = N_2$	$H_2 = N_2$
(B)	$H_2 < N_2$	$H_2 > N_2$
(C)	$H_2 = N_2$	$H_2 < N_2$
(D)	$H_2 = N_2$	$H_2 > N_2$

Watch Video Solution

Level-2

1. At $27^\circ C$, hydrogen is leaked through a tiny hole into a vessel for 20 min. Another unknown gas at the same temperature and pressure as that of hydrogen is leaked through same hole for 20 min. After the effusion of the gases the mixture exerts a pressure of 6 atm. The hydrogen content of the mixture is 0.7 mole. If the volume of the container is 3L. What is the molecular weight of the unknown gas?

A. 1088

B. 10.88

C. 108.8

D. None of these

Answer: A

Watch Video Solution

2. 10 mL of a gaseous organic compound containing C, H and O only was mixed with 100 mL of O_2 and exploded under condition which allowed the H_2O formed to condense. The volume of the gas after explosion was 90 mL. On treatment with KOH solution, a further contraction of 20 mL in volume was observed. The vapour density of the compound is 23. All volume measurements were made under the same condition.

The molecular formula of the compound is

A. C_2H_4O

B. C_2H_6O

C. C_3H_6O

D. None of these

Answer: B

Watch Video Solution

3. 5 " mL of " a gas A containing only C and H was mixed with an excess of O_2 (30 mL) and the mixture was exploded by means of electric sperk. After explosion, the remaining volume of the mixed gases was 25 mL. On adding a concentrated solution of KOH, the volume further diminished to 15 mL. The residual gas was pure oxygen, The molecular formula of the gas A is.

A. C_2H_6

B. C_3H_6

C. C_2H_4

D. None of these

Answer: C

Watch Video Solution

4. Consider the following statements :

The mean free path of gas molecules

I. decreases with increase in concentration

II. increases with decrease in pressure at constant temperature

III. decreases with increase in molecular size

Which of the above statements are correct?

A. I , II

B. I, III

C. II, III

D. I, II, III

Answer: D

Watch Video Solution

5. One mole of nitrogen gas at 0.8 atm takes 38 s to diffuse through a pinhole, whereas one mole of an unknown compound of xenon with fluorine at 1.6 atm takes 57s to diffuse through the same hole. Calculate the molecular formula of the compound.

A. (a) XeF_6

B. (b) XeF_2

C. (c) XeF_4

D. (d) None of these

Answer: A

Watch Video Solution

6. The average velocity of gas molecules is $400ms^{-1}$. Calculate their rms velocity at the same temperature.

A. 434.1 ms^{-1}

B. 368.5 ms^{-1}

C. 489.9 ms^{-1}

D. None of these

Answer: A

Watch Video Solution

7. A graph is plotted between PV_m along Y-axis and P along X-axis whre V_m is the molar volume of a real gas Find the intercept along Y-axis .

A. $(RT)^{-1}$

B. RT

C. 1

D. None of these

Answer: B

Watch Video Solution

8. 1 litre of N_2 and $7/8$ litre of O_2 at the same temperature and pressure were mixed together. What is the relation between the masses of the two gases in the mixture ?

A. $M(N_2) = 3M(O_2)$

B. $M(N_2) = M(O_2)$

C. $M(N_2) = M(O_2)$

D. $M(N_2) = 16M(O_2)$

Answer: A

Watch Video Solution

9. The volumes of two vessels at same temperature are in the ratio of $2:3$. One vessel contains H_2 and other N_2 at 600 mm and 900 mm respectively. The final pressure when they are connected together is : (Assume that N_2 and H_2 react to form NH_3)

A. 620 mm

B. 760 mm

C. 780 mm

D. 800 mm

Answer: A

Watch Video Solution

10. The rate of effusion of two gases $'a'$ and $'b'$ under identical conditions of temperature and pressure are in the ratio of $2:1$ What is the ratio of rms velocity of their molecules if T_a and T_b are in the ratio of $2:1$?

A. $2:1$

B. $\sqrt{2}:1$

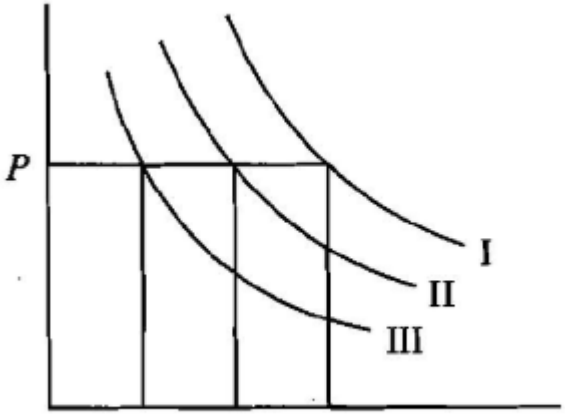
C. $2\sqrt{2}:1$

D. $1:\sqrt{2}$

Answer: C

Watch Video Solution

11. I , II , III are three isotherms respectively at T_1, T_2, T_3 . Temperature will be in order



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: C

Watch Video Solution

12. An evacuated glass vessel weighs $50.0g$ when empty, $148.0g$ when filled with a liquid of density $0.98gmL^{-1}$, and $50.5g$ when filled with an ideal gas at $760mmHg$ at $300K$. Determine the molar mass of the gas.

A. 100

B. 110

C. 123

D. 90

Answer: C

Watch Video Solution

13. At identical temperature and pressure, the rate of diffusion of hydrogen gas is $3\sqrt{3}$ times that of a hydrocarbon having molecular formula C_nH_{2n-2}. What is the value of n ?

A. n = 2

B. n = 4

C. n = 3

D. n = 1

Answer: B

Watch Video Solution

14. For an ideal gas, under isobaric condition, a graph between log V vs log T :

A. is linear with unit slope

B. represents Boyle's Law

C. represents Charle's Law

D. represents Gay-Lussac's Law

Answer: A::C

Watch Video Solution

15. At STP, a container has 1 mole of Ar, 2 mole of CO_2, 3 moles of O_2 and 4 moles of N_2. Without changing the total pressure if one mole of O_2 is removed, the partial pressure of O_2

A. is changed by about 26%

B. is halved

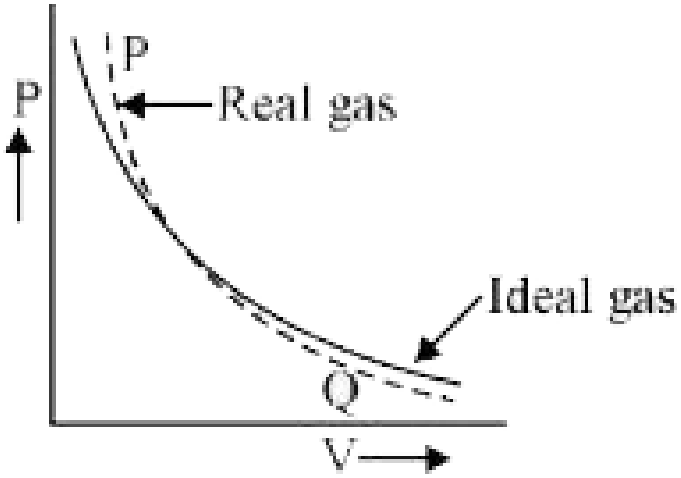
C. is unchanged

D. changed by 33%

Answer: A

Watch Video Solution

16. At point P and Q, the real gas deviation with respect to ideal gas is respectively :



A. Positive, negative

B. Positive, positive

C. Negative, positive

D. Negative, negative

Answer: A

Watch Video Solution

Watch Video Solution

17. At what temperature will the molar kinetic energy of 0.3 mol of He be the same as that of 0.4 mol of argon at 400 K ?

A. 533 K

B. 400 K

C. 346 K

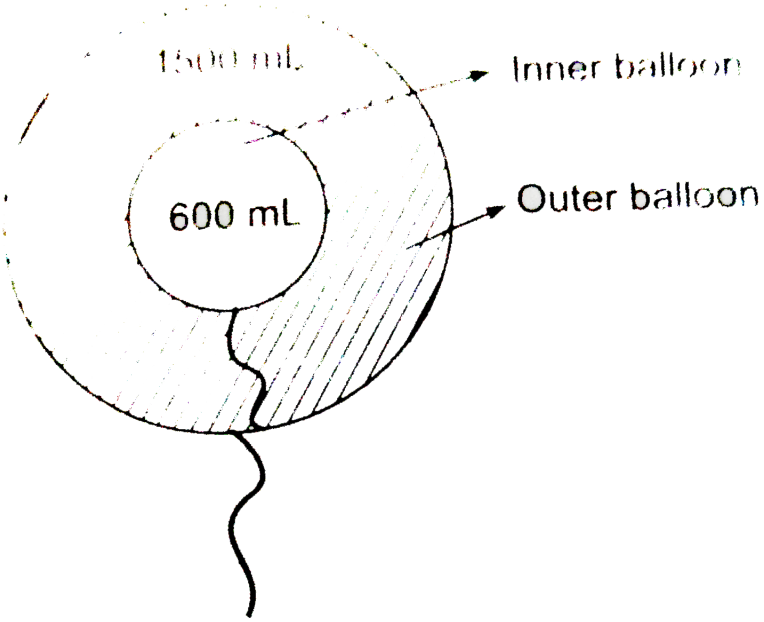
D. 300 K

Answer: A

Watch Video Solution

18. Two inflated ballons I and II (thin skin) having volume 600 mL and 1500 mL at 300 K are taken as shown in diagram. If maximum volume of inner and outer balloons are 800 mL and 1800 mL respectively then find the

balloon which will burst first on gradual heating.



A. inner balloon

B. outer balloon

C. both simultaneously

D. unpredictable

Answer: B

Watch Video Solution

19. The volume of a gas increases by a factor of 2 while the pressure decrease by a factor of 3 Given that the number of moles is unaffected, the factor by which the temperature changes is :

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

B. 3×2

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

D. $\frac{1}{2} \times 3$

Answer: C

Watch Video Solution

20. Oxygen gas generated by the decomposition of potassium chorate is collected over water. The volume of wxygen collected at $24^{\circ}C$ and atmospheric pressure of 760 mmHg is 128 mL. Calculate the mass of oxygen gas obtained. The pressure of the water vapour at $24^{\circ}C$ is 22.4 mmHg.

A. 1.36

B. 1.52 g

C. 0.163 g

D. 1.63 g

Answer: C

Watch Video Solution

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

A. 15 atm and 200 K

B. 1 atm and 273 K

C. 0.5 atm and 500 K

D. 15 atm and 500 K

Answer: C

Watch Video Solution

22. Which of the following statement is(are) correct?

A. The slope of Z vs P at constant temperature for all real gases, is

$$\frac{b}{RT}$$

B. The slope of Z vs P at constant temperature for both He and H_2 is

$$\frac{b}{RT}$$

C. The slope of Z vs P at low pressure for all real gases, at constant temperature is $\frac{b}{RT}$

D. The slope of Z vs P at high pressure and at constant temperature for real gas is $\frac{-b}{RT}$

Answer: B

View Text Solution

23. Which of the following statements is(are) correct for a gas X having molar mass 5g and density 0.3g/litre at 0.5 atmospheric pressure at 300 K?

A. The gas "X" will behave ideally

B. The force of attraction will dominate over the force of repulsion among the gas molecules

C. The force of repulsion will dominate over the force of attraction among the gas molecules

D. None of these

Answer: B

Watch Video Solution

24. At $47^{\circ} C$ and 16.0 atm, the molar volume of NH3 gas is about 10% less than the molar volume of an ideal gas. This is due to :

A. NH_3 decomposes to N_2 and H_2 at

B. The force of attraction between NH_3 molecules is significant at this temperature and pressure

C. The volume occupies by NH_3 molecules themselves is a significant fraction of the volume of the container at this temperature and pressure

D. at 16 atm , NH_3 molecules no longer move randomly

Answer: B

Watch Video Solution

25. A gaseous mixture $(He \text{ and } CH_4)$ which has density $\frac{64}{246.3}$ gm/litre at 1 atm & 300 K is kept in a container. Now a pinhole is made on the wall of the container through which He(g) and CH_4 effuses. What will be the composition of the gas mixture $[n_{He} : n_{CH_4}]$ effusing out initially?

A. $4:1$

B. $8:1$

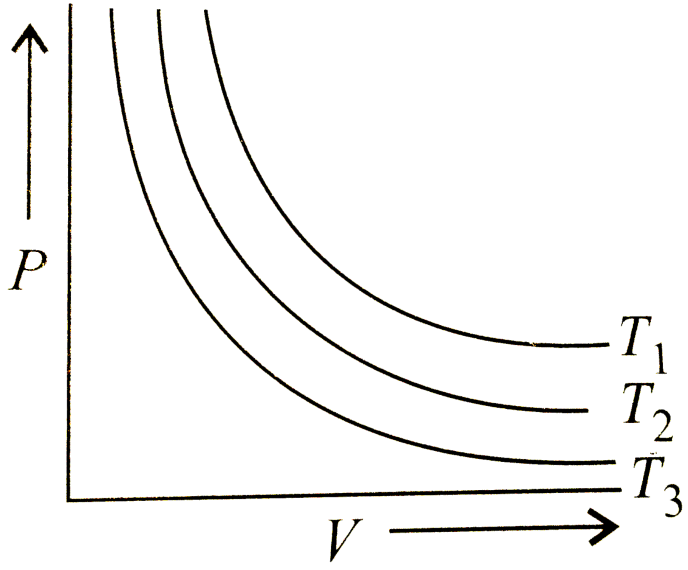
C. $2:1$

D. $16:1$

Answer: B

Watch Video Solution

26. The graph of P vs V is given at different temperature



The correct relationship is

A. $\frac{a}{b} < 0.4 kcal mol^{-1}$

B. $0.4 cal mol^{-1} < \frac{a}{b} < 2 kcal mol^{-1}$

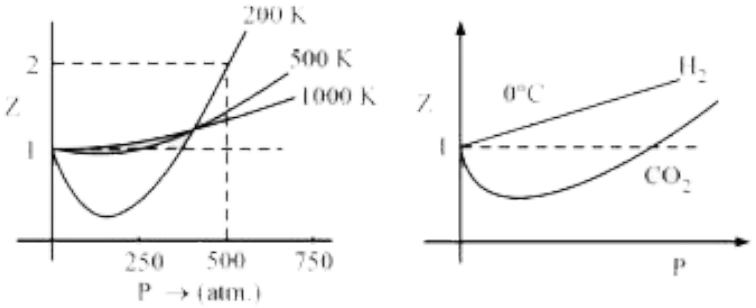
C. $\frac{a}{b} > 0.4 kcal mol^{-1}$

D. $\frac{a}{b} = 1 kcal mol^{-1}$

Answer: D

Watch Video Solution

27. Sketch shows the plot of Z vs P for 1 mol of a hypothetical gas at three distinct temperature.



Boyle's temperature is the temperature at which a gas shows ideal behaviour over a pressure range in the low pressure region. Boyle's

temperature $(T_b) = \frac{a}{Rb}$. If a plot is obtained at temperatures well below Boyle's temperature then the curve will show negative deviation, in low pressure region and positive deviation in the high pressure region. Near critical temperature the curve is more like CO_2 and the temperature well above critical temperature curve is more like H_2 as shown above. At high pressure suppose all the constant temperature curve varies linearly with pressure according to the following equation: $Z = 1 + \frac{Pb}{RT}(R = 2calmol^{-1}K^{-1})$

For 500 K plot the value of Z changes from 2 to 2.2 if pressure is varied from 1000 atm to 1200 atm (high pressure) then the value of $\frac{b}{RT}$ will be :

A. $10^{-3}atm^{-1}$

B. $2 \times 10^{-3}atm^{-1}$

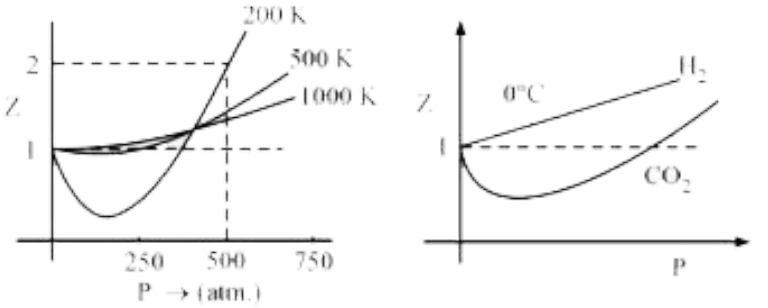
C. $5 \times 10^{-4}atm^{-1}$

D. $10^{-4}atm^{-1}$

Answer: A

Watch Video Solution

28. Sketch shows the plot of Z vs P for 1 mol of a hypothetical gas at three distinct temperature.



Boyle's temperature is the temperature at which a gas shows ideal behaviour over a pressure range in the low pressure region. Boyle's temperature $(T_b) = \frac{a}{Rb}$. If a plot is obtained at temperatures well below Boyle's temperature then the curve will show negative deviation, in low pressure region and positive deviation in the high pressure region. Near critical temperature the curve is more like CO_2 and the temperature well above critical temperature curve is more like H_2 as shown above. At high pressure suppose all the constant temperature curve varies linearly with pressure according to the following equation: $Z = 1 + \frac{Pb}{RT}(R = 2calmol^{-1}K^{-1})$

As shown in the figure at 200 K and 500 atm value of compressibility factor is 2 (approx). Then volume of the gas at this point will be :

A. 0.01 L

B. 0.09 L

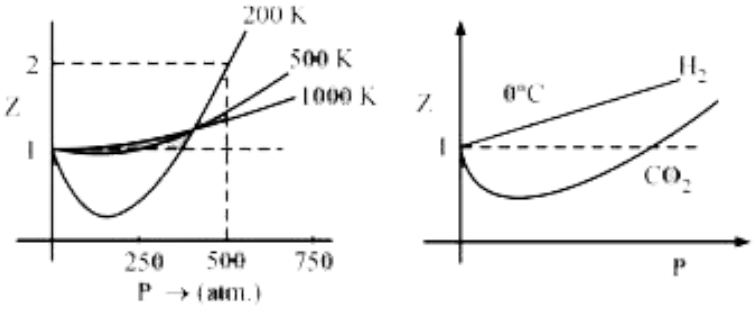
C. 0.065 L

D. 0.657 L

Answer: C

View Text Solution

29. Sketch shows the plot of Z vs P for 1 mol of a hypothetical gas at three distinct temperature.

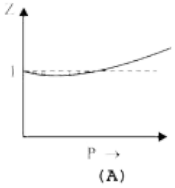


Boyle's temperature is the temperature at which a gas shows ideal behaviour over a pressure range in the low pressure region. Boyle's temperature $(T_b) = \frac{a}{Rb}$. If a plot is obtained at temperatures well below Boyle's temperature then the curve will show negative deviation, in low pressure region and positive deviation in the high pressure region. Near critical temperature the curve is more like CO_2 and the temperature well above critical temperature curve is more like H_2 as shown above. At high pressure suppose all the constant temperature curve varies linearly with pressure according to the following equation:

$$Z = 1 + \frac{Pb}{RT}\left(R = 2calmol^{-1}K^{-1}\right)$$

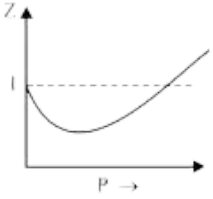
Plot at Boyle's temperature for the gas will be :

A.

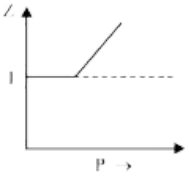


(A)

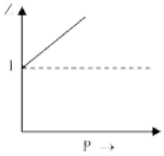
B.



(B)



C.



D.

Answer: A

View Text Solution

30. Compressibility factor for H_2 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

31. A real gas obeying van der Waals equation will resemble ideal gas , if the

A. constants a & b are small

B. a is large & b is small

C. a is small & b is large

D. constant a & b are large

Answer: A

Watch Video Solution

32. If temperature and volume are same, the pressure of a gas obeying van der Waal's equation is :

A. Smaller than that of an ideal gas

B. Larger than that of an ideal gas

C. Same as that of an ideal gas

D. None of these

Answer: A

Watch Video Solution

33. The critical pressure P_C and critical temperature T_C for a gas obeying van der Waal's equation are 80 atm at 87° C. molar mass of the gas is 130 g/mole. The compressibility factor for the above gas will be smaller than unity under the following condition:

A. 1 atm and 800° C

B. 1 atm and 1200° C

C. 1 atm and 1000° C

D. 1 atm and 1100° C

Answer: A

Watch Video Solution

34. For non-zero value of force of attraction between gas molecular at large volume, gas equation will be :

(a) $PV = nRT - \frac{n^2 a}{V}$

(b) $PV = nRT + nbP$

(c) $P = \frac{nRT}{V - b}$

(d) $PV = nRT$

A. $PV = nRT - \frac{n^2 a}{V}$

B. $PV = nRT + nbP$

C. $PV = nRT$

D. $P = \frac{nRT}{V - b}$

Answer: A

Watch Video Solution

35. At Boyle's temperature the value of compressibility factro $Z = \left(PV_{m(\ /RT = V_{real}\ /\ V_{ideal})}\right.$ has a value of 1 over a wide range of pressure. This is due to the fact that in the van der Waal's equation

A. The constant 'a' is negligible and not 'b'

B. The constant 'b' is negligible and not 'a'

C. Both the constant 'a' and 'b' are negligible

D. The effect produced due to the molecular attraction compensates the effect produced due to the molecular volume

Answer: D

Watch Video Solution

36. The critical density of the gas CO_2 is $0.44 gcm^{-3}$ at a certain temperature. If r is the radius of the molecules, r^3 in cm^3 is approximately. (N is Avogadro number)

A. $\frac{25}{\pi N}$

B. $\frac{100}{\pi N}$

C. $\frac{6}{\pi N}$

D. $\frac{25}{4N\pi}$

Answer: D

Watch Video Solution

37. Which of the following is correct for critical temperature ?

A. It is the highest temperature at which liquid and vapour can coexist

B. Beyond this temperature, the gas and the liquid phase have different critical densities

C. At this temperature, the gas and the liquid phase have different critical densities

D. All are correct

Answer: A::B

Watch Video Solution

38. The vander waal gas constant $'a'$ is given by

A. $\frac{1}{3}V_C$

B. $3P_CV_C^2$

C. $\frac{1}{8}\frac{RT_C}{P_C}$

D. $\frac{27}{64}\frac{R^2T_C^2}{P_C}$

Answer: B::D

Watch Video Solution

39. Which of the following is/are correct?

A. $\underset{p\to 0}{Lt}(pV_m) =$ constant at constant high temperature

B. $\underset{V_m \to 0}{Lt}(pV_m)$= constant at constant low temperature

C. $\underset{p \to 0}{Lt}\left(\frac{pV_m}{RT}\right)$ = 1 at high temperature

D. $\underset{V \to 0}{Lt}\left(\frac{pV_m}{RT}\right) = R$

Answer: A::C

Watch Video Solution

40. Which of the following statements are incorrect?

A. Molar volume of every gas at STP is 22.4 L

B. Under critical states compressibility factor is 1

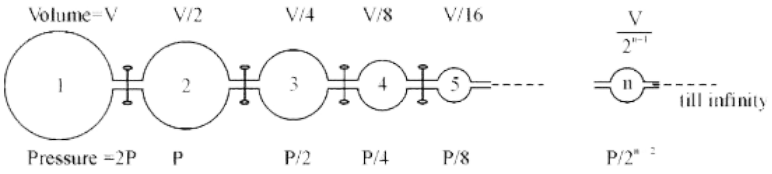
C. All gases will have equal value of average KE at a given temperature

D. At absolute zero, KE is $3/2$ R

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

Watch Video Solution

41.



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

A. P

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

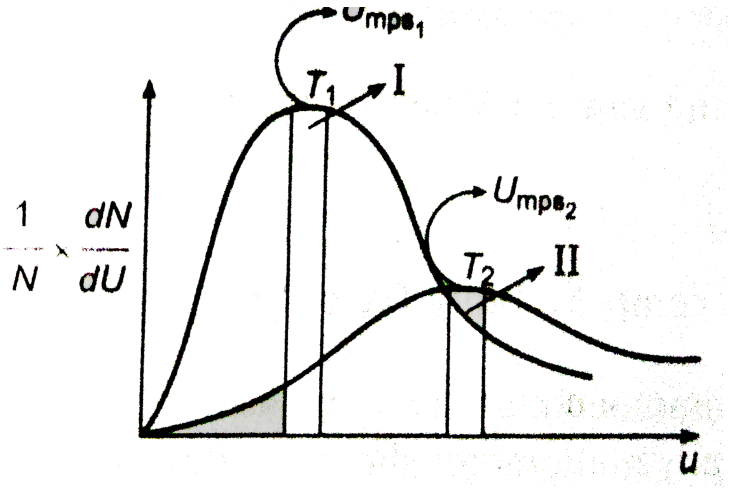
C. $\frac{P}{4}$

D. $\frac{4}{3}$P

Answer: D

Watch Video Solution

42. Following represents the Maxwell distribution curve for an ideal gas at two temperature T_1 and T_2 . Which of the following option(s) is/are true?



A. Total area under the two curves is independent of moles of gas

B. u_{mp} decreases as temperature decreases

C. $T_1 > T_2$ and hence higher the temperature, sharper the curve

D. The fraction of molecules having speed u_{mp} decreases as temperature increases

Answer: A::B::D

Watch Video Solution

Watch Video Solution

43. At low pressure the van der Waals' equation is reduced to $\left[P + \frac{a}{V^2}\right]V = RT$ The compressibility factor can be given as .

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

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

C. $1 + \frac{a}{RTV}$

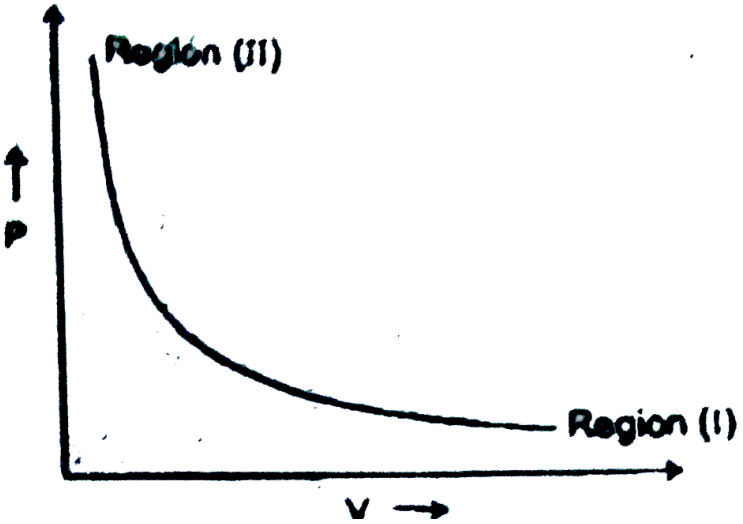
D. $1 + \frac{RTV}{a}$

Answer: A

Watch Video Solution

44. Following graph represents a pressure (P) volume (V) relationship at a fixed temperature (T) for n moles of a real gas. The graph has two

regions marked (I) and (II). Which of the following options is true.



A. $Z < 1$ in the region (II)

B. Z = 1 in the region (II)

C. Z = 1 for the curve

D. Z approaches 1 as we move from region (II) to region

Answer: D

Watch Video Solution

45. Density of dry air (only N_2 and O_2) is $1.24g\ litre^{-1}$ at $760mm$ and $300K$. Find the partial pressure of N_2 gas in aire. (Take $R = \frac{1}{12}$ litre litre atm / mol K, mol. Wt. of $N_2 = 28$)

A. 0.25

B. 0.365

C. 0.5

D. 0.75

Answer: B

Watch Video Solution

46. The root mean square speed of hydrogen is $\sqrt{5}$ times than that of nitrogen. If T is the temperature of the gas, then :

A. $T_{H_2} = T_{N_2}$

B. $T_{H_2} > T_{N_2}$

C. $T_{H_2} < T_{N_2}$

D. $T_{H_2} < \sqrt{7}T_{N_2}$

Answer: C

Watch Video Solution

47. A gaseous mixture containing He, CH_4 and SO_2 in $1:2:3$ mole ratio, calculate the molar ratio of gases effusing out initially.

A. $2:2:3$

B. $6:6:1$

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

D. $4:4$

Answer: D

Watch Video Solution

48. 6×10^{22} gas molecules each of mass $10^{-24} kg$ are taken in a vessel of 10 litre. What is the pressure exerted by gas molecules? The root mean square speed of gas molecules is 100 m/s.

A. 20 Pa

B. 2×10^4 Pa

C. 2×10^5 Pa

D. 2×10^7 Pa

Answer: B

Watch Video Solution

49. Two flask A and B of equal volumes maintained at temperature 300 K and 700 K contain equal mass of He(g) and $N_2(g)$ respectively. What is the ratio of translational kinetic energy of gas in flask A to that of flask B?

A. $1:3$

B. $3:1$

C. $3:49$

D. None of these

Answer: B

Watch Video Solution

50. The density of gas A is twice that to B at the same temperature. The molecular weight of gas B is twice that of A. The ratio of pressure of gas A and B will be :

A. $1:6$

B. $1:1$

C. $4:1$

D. $1:4$

Answer: C

Watch Video Solution

Level-2 (NUMBERICAL VALUE TYPE FOR JEE MAIN

1. A container having 3 mole of ideal gas occupies 60 litres at pressure P and temperature T. If 0.1 mole of gas is introduced at same P and T in container the change in volume will be _____ litre.

Watch Video Solution

2. An ideal gas on heating from 100 K to 109 K shows an increase by $a\ \%$ in its volume at constant P. The value of a is _____.

Watch Video Solution

3. A bulb is having ideal gas at $27^\circ C$. On heating the bulb to $227^\circ C$, 2 litre of gas measured at $227^\circ C$ is expelled out. The volume of bulb in litre is _____.

Watch Video Solution

4. A cylinder containing 5 litre of O_2 at $25^\circ C$ was leaking. When the leakage was detected and checked, the pressure inside cylinder was reduced from 8 atm to 2 atm. The ratio of mass of O_2 initially present to that left after leakage is equal to _____.

Watch Video Solution

5. 16 mL of He gas effuses through a pin hole in 4 sec from a container having P_{He} equal to 1 atm. If same container is filled with CH_4 having pressure 2 atm, how much volume (in mL) of CH_4 will be leaked through same pin hole in 2 sec?

Watch Video Solution

6. Root mean square speed of a gas is $5ms^{-1}$ If some molecules out of 10 molecules in all are moving with $7ms^{-1}$ and rest all the molecules

moving with $3m\,\sec^{-1}$ then number of molecules moving with higher speed is _____.

Watch Video Solution

7. A metallic carbonyl $M(CO)_x$ is in gaseous state. The rate of diffusion of CH_4 is 3.31 time faster than this gaseous carbonyl under identical conditions. If atomic mass of metal is 63.29, the closest integer value of X is_____.

Watch Video Solution

8. A gas has molecular formula O_n. If its vapour density is 24, the value of n is _____.

Watch Video Solution

9. The density of vapours of a substance at 1 atm and 500 K is $0.3kgm^{-3}$. The vapours effuse 0.4216 times faster than O_2 through a pin hole under identical conditions. If R= 0.08 litre atm $K^{-1}mol^{-1}$. The molar volume of gas is $a \times 10^2$ litre. The value of a is _____.

Watch Video Solution

10. A flask of capacity 10 litre containing air is heated from $27^\circ C$ to $327^\circ C$. The ratio of mole of air present at $27^\circ C$ to mole present at $327^\circ C$ is _____.

Watch Video Solution

11. 0.75 mole of solid A_4 and 2 mole of gaseous O_2 are heated to react completely in a sealed bottle to produce gaseous compound A_3O_n. After the compound is formed, the vessel is brought to initial temperature, the pressure is found to half of initial pressure. The value of n is _____.

Watch Video Solution

12. A graph is plotted for a vanderwaal's gas between PV_m vs P leading to an intercept of 22.16 litre-atm. The temperature of gas at which these observations of P and V_m were made is _____ $^\circ C$

$\left(R = 0.08 \ \ \text{litre atm} K^{-1} mol^{-1}\right)$

Watch Video Solution

13. Two boxes A and B having their volume ratio $1:4$ and filled with Ne are inter connected through a narrow tube of negligible volume. Box A is kept at 300 K and box B at 600 K. The ratio of mole of Ne gas in box B to box A is _____?

Watch Video Solution

14. The density of the vapour of a substance at 1 atm and 500 K is $0.36 kgm^{-3}$. If molar mass of gas is $18 gmol^{-1}$ the molar volume of gas is

$5 \times 10^{a} m^{3} / mol$ What is the value of a ?

Watch Video Solution

15. The ratio of final to initial pressures of a gas when u_{rms} of a gas in a container is increased from $5 \times 10^{4} cm \sec^{-1}$ to $10 \times 10^{4} cm \sec^{-1}$

Watch Video Solution

JEE-Main (ARCHIVE)

1. Equal mass of methane and oxygen are mixed in an empty container at 25° C. The fraction of the total pressure exerted by oxygen is:

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

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

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

D. $\frac{1}{3} \times \frac{273}{298}$

Answer: A

Watch Video Solution

2. The rate of diffusion of methane at a given temperature is twice that of a gas X. The molecular weight of X is

A. 64.0

B. 32.0

C. 4.0

D. 8.0

Answer: A

Watch Video Solution

3. Equal weights of ethane and hydrogen are mixed in an empty container at $25^{\circ}C$. The fraction of the total pressure exerted by hydrogen is

A. $1:2$

B. $1:1$

C. $1:16$

D. $15:16$

Answer: D

Watch Video Solution

4. One mole of nitrogen gas at 0.8 atm takes 38 s to diffuse through a pinhole, whereas one mole of an unknown compound of xenon with fluorine at 1.6 atm takes 57s to diffuse through the same hole. Calculate the molecular formula of the compound.

Watch Video Solution

5. The pressure exerted by $12g$ of an ideal gas at temperature $t^{\circ}C$ in a vessel of volume $Vlitre$ is $1atm$. When the temperature is increased by

$10^{\circ} C$ at the same volume, the pressure increases by $10\ \%$. Calculate the temperature t and volume V. (Molecular weight of the gas is 120).

Watch Video Solution

6. For gaseous state, if most probable speed is denoated by C^*, average speed by C and mean square speed by $\overline{C}$, then for a large number of molecules the ratios of these speeds are:

A. $C^* : \overline{C} = 1.225 : 1.128 : 1$

B. $C^* : \overline{C} : C = 1.128 : 1.225 : 1$

C. $C^* : \overline{C} : C = 1 : 1.28 : 1.225$

D. $C^* : \overline{C} : C = 1 : 1.225 : 1.128$

Answer: C

Watch Video Solution

7. If Z is a compressibility factor, van der Waals equation at low pressure can be written as:

A. $Z = 1 + \frac{RT}{pb}$

B. $Z = 1 - \frac{a}{VRT}$

C. $Z = 1 - \frac{pb}{RT}$

D. $Z = 1 + \frac{pb}{RT}$

Answer: B

Watch Video Solution

8. Which one of the following is not an assumption in the kinetic theory of gases?

A. A gas consists of many identical particles which are in continual motion

B. Gas particles have negligible volume

C. At high pressure, gas particles are difficult to compress

D. Collisions of gas particles are perfectly elastic.

Answer: C

Watch Video Solution

9. Under which of the following conditions applied together, a gas deviates most from the ideal behaviour ?

A. At low pressure and low temperature

B. At low pressure and high temperature

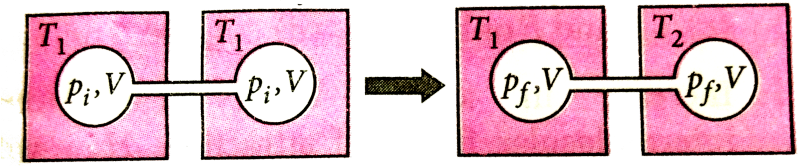
C. At high pressure and low temperature

D. At high pressure and high temperature

Answer: C

Watch Video Solution

10. Two closed bulbs of equal volume (V) containing an ideal gas initially at pressure P_i and temperature T_1 are connected through a narrow tube of negligible volume as shown in the figure below . The temperature of one of the bulbs is then raised to T_2 . the final pressure Pf is



A. $2p_i\left(\frac{T_1}{T_1+T_2}\right)$

B. $\frac{2p_i(T_2)}{T_1+T_2}$

C. $2p_i\left(\frac{T_1T_2}{T_1+T_2}\right)$

D. $p_i\left(\frac{T_1T_2}{T_1+T_2}\right)$

Answer: B

Watch Video Solution

11. Among the following, the incorrect statement is :

A. at very large volume, real gases show ideal behavior

B. at very low temperature, real gases show ideal behaviour

C. at Boyle's temperature, real gases show ideal behaviour

D. at low pressure, real gases show ideal behaviour

Answer: B

Watch Video Solution

12. At 300 K, the density of a certain gaseous molecule at 2 bar is double to that of dinitrogen (N_2) at 4 bar. The molar mass of gaseous molecule is:

A. $56gmol^{-1}$

B. $112gmol^{-1}$

C. $224gmol^{-1}$

D. $28gmol^{-1}$

Answer: B

Watch Video Solution

13. Assuming ideal gas behaviour, the ratio of density of ammonia to that of hydrogen chloride at same temperature and pressure is : (Atomic wt. of Cl = 35.5 u)

A. 1.46

B. 0.46

C. 1.64

D. 64

Answer: B

Watch Video Solution

14. An open vessel at $27^\circ C$ is heated untill two fifth of the air (assumed as an ideal gas) in it has escaped from the vessel. Assuming that the volume of the vessel remains constant, the temperature at which the vessel has been heated is :

A. $500^\circ C$

B. $750^\circ C$

C. 750 K

D. 500 K

Answer: D

Watch Video Solution

15. Consider the van der Waals' constants, a and b, for the following gases:

gas	Ar	Ne	Kr	Xe
$a/\left(atm\ \ \mathrm{dm}^6 mol^{-2}\right)$	1.3	0.2	5.1	4.1
$b/\left(10^{-2} dm^3 mol^{-1}\right)$	3.2	1.7	1.0	5.0

Which gas is expected to have the highest critical temperature?

A. Ar

B. Ne

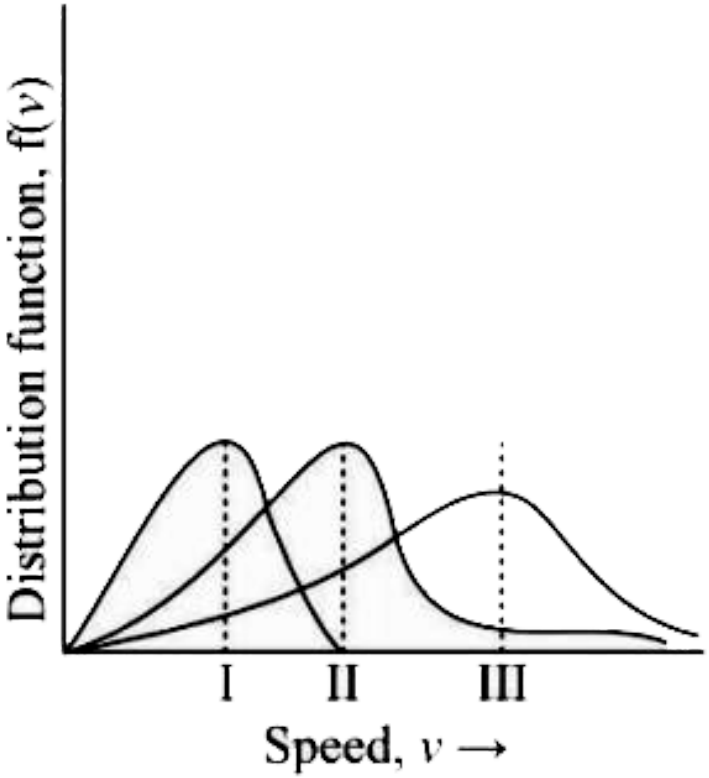
C. Kr

D. Xe

Answer: C

Watch Video Solution

16. Points I, II and III in the following plot respectively correspond to (V_{mp}: most probable velocity)



A. V_{mp} of $N_2(300K)$, V_{mp} of $H_2(300K)$, V_{mp} of $O_2(400K)$

B. V_{mp} of $N_2(300K)$, V_{mp} of $O_2(400K)$, V_{mp} of $H_2(300K)$

C. V_{mp} of $H_2(300K)$, V_{mp} of $N_2(300K)$, V_{mp} of $O_2(400K)$

D. V_{mp} of $O_2(400K)$, V_{mp} of $N_2(300K)$, V_{mp} of $H_2(300K)$

Answer: B

Watch Video Solution

17. At a given temperature T, gases Ne, Ar, Xe and Kr are found to deviate from ideal gas behavior.

Their equation of state is given as $P = \frac{RT}{V - b}$ at T. Here, b is the van der Waals constant. Which gas will exhibit steepest increase in the plot of Z (compression factor) vs P?

A. Xe

B. Ne

C. Kr

D. Ar

Answer: A

Watch Video Solution

JEE-Advanced

1. The density of ammonia at $30^\circ C$ and 5 atm pressure is

Watch Video Solution

2. 4.215 g a metallic carbonate was heated in a hard glass tube and CO_2 evolved was found to measure 1336 mL at 27°C and 700 mm pressure. What is the equivalent mass of the metal ?

Watch Video Solution

3. 3.7 g of a gas at 25°C occupies the same volume as 0.184 g of hydrogen at 17°C and at the same pressure. What is the molecular mass of the gas ?

Watch Video Solution

4. A hydrocarbon contains $10.5g$ of carbon per gram of hydrogen. $1L$ of vapour of the hydrocarbon at $127^\circ C$ and 1 atm pressure weighs $2.8g$.

Find the molecular formula of the hydrocarbon.

Watch Video Solution

5. The pressure in a bulb dropped from 2000 to $1500 mmHg$ in 47 min when the contained oxygen leaked through a small hole. The bulb was then evacuated. A mixture of oxygen and another gas of molecular weight 79 in the molar ratio of $1:1$ at a total pressure of $4000 mm$ of mercury was introduced. Find the molar ratio of the two gases remaining in the bulb after a period of 74 min .

Watch Video Solution

6. The ratio of root mean square velocity to average velocity of a gas molecule at a particular temperature is

A. $1.085:1$

B. $1:1.086$

C. $2:1.086$

D. $1.086:2$

Answer: A

Watch Video Solution

7. Temperature at which gas behave ideally over a wide range of pressure is called as

A. critical temperature

B. Boyle temperature

C. Inversion temperature

D. reduced temperature

Answer: B

Watch Video Solution

8. Calculate the average kinetic energy in joules of the molecules in 8.0 g of methane at $27^{\circ} C$.

Watch Video Solution

9. Helium atom is two times heavier than a hydrogen molecule. At 289 K, the average kinetic energy of a helium atom is

A. two times that of a hydrogen molecule

B. same as that of a hydrogen molecule

C. four times that of a hydrogen molecule

D. half that of a hydrogen molecule

Answer: B

Watch Video Solution

10. A gas in a closed container will exert much higher pressure due to gravity at the bottom than at the top.

Watch Video Solution

11. Give reasons for the following in one or two sentences.

(i) Equal volumes of gases contain equal number of moles.

(ii) A bottle of liquid ammonia should be cooled before opening the stopper.

Watch Video Solution

12. When 2g of a gas A is introduced into an evacuated flask kept at $25^{\circ}C$, the pressure is found to be one atmosphere. If 3 g of another gas B are then added to the same flask, the total pressure becomes 1.5 atm. Assuming ideal gas behaviour, calculate the ratio of molecular weights $M_A : M_B$.

Watch Video Solution

Watch Video Solution

13. Oxygen is present in a 1 litre flask at a pressure of $7.6 \times 10^{-10} mm$ of Hg. Calculate the number of oxygen molecules in the flask at $0^{\circ} C$

Watch Video Solution

14. When an ideal gas undergoes unrestrained expansion, no cooling occurs because the molecules

A. are above the inversion temperature

B. exert no attractive forces on each other

C. do work equal to loss in kinetic energy

D. collide without loss of energy

Answer: B

Watch Video Solution

15. Calculate the root mean square velocity of ozone kept in a closed vessel at $20^\circ C$ and $82 cm Hg$ pressure.

Watch Video Solution

16. The rate of diffusion of a gas is

A. directly proportional to its density

B. directly proportional to its molecular weight

C. directly proportional to the square root of its molecular weight

D. inversely proportional to the square root of its molecular weight

Answer: D

Watch Video Solution

17. Kinetic energy of a molecule is zero at $0^\circ C$. T / F

Watch Video Solution

18. The rate of diffusion of a gas is.....proportional to both ..... And square root of molecular mass.

Watch Video Solution

19. The average speed of ideal gas molecule at $27^\circ C$ is 0.3 ms^{-1} . Calculate average speed at $927^\circ C$

A. $0.6m/s$

B. $0.3m/s$

C. $0.9m/s$

D. $3.0m/s$

Answer: A

Watch Video Solution

20. A spherical balloon of 21 cm diameter is to the filled up with H_2 at NTP from a cylinder containning the gas at 20 atm at 27° C . The cylinder can hold 2.82 litre of water. The number of balloons that can be filled up

Watch Video Solution

21. The value of PV for $5.6L$ of an ideal gas is ..... RT at NTP.

Watch Video Solution

22. A bottle of dry ammonica and a bottle of dry hydrogen choride conncted through a long fube are opened simulaneously at both ends. The while ammonium chloride ring first formed will be

A. at the centre of the tube

B. near the hydrogen chloride bottle

C. near the ammonia bottle

D. throughout the length of the tube

Answer: B

Watch Video Solution

23. In van der Waals equation for non - ideal gas , the term that accounts for intermolecular force is

A. $(V - b)$

B. RT

C. $\left(p + \frac{a}{V^2}\right)$

D. $(RT)^{-1}$

Answer: C

Watch Video Solution

24. $8g$ each of oxygen and hydrogen at $27^\circ C$ will have the total kinetic energy in the ratio of .....

Watch Video Solution

25. Real gases approach ideal behaviour at

A. low temperature and low pressure

B. low temperature and high pressure

C. high temperature and low pressure

D. high temperature and high pressure

Answer: C

Watch Video Solution

26. The values of van der Waals' constant 'a' for O_2, N_2, NH_3 and CH_4 are $1.360, 1.390, 4.170$ and $2.253 L^2$ atm mol respectively. The most easily liquefiable gas among these is

A. O_2

B. N_2

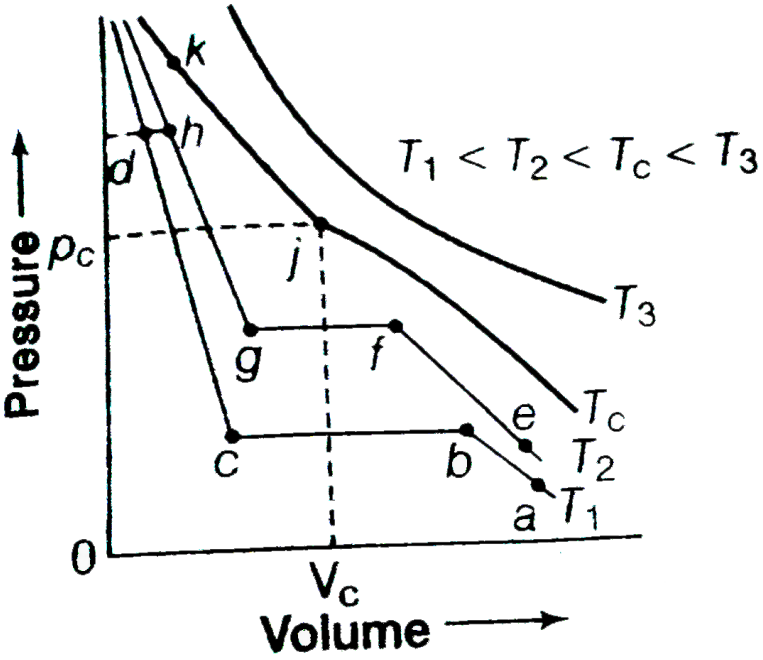
C. NH_3

D. CH_4

Answer: C

Watch Video Solution

27. Isotherms of carbon dioxide at various temperatures are repersented in figure. Answer the following questions based on this figures.



(i) In which state will CO_2 exist between the points a and b at temperature T_1 ?

(ii) At what point will CO_2 start liquefyinh when temperature is T_1 ?

(iii) At what point will CO_2 be completely liquefued when temperature is T_2 ?

(iv) Will condensation take place when the temperature is T_3 ?

(v) What portion of the isotherm at T_1 represent liquid and gaseous CO_2 at equilibrium ?

Watch Video Solution

28. The density of neon will be highest at

A. STP

B. $0^\circ C$, 2 atm

C. $273^\circ C$, 1 atm

D. $273^\circ C$, 2 atm

Answer: B

Watch Video Solution

29. Calculate the volume occupied by $5.0g$ of acetylene gas at $50^\circ C$ and $740mm$ pressure.

Watch Video Solution

30. According to kinetic theory of gases, for a datomic molecule.

A. the pressure exerted by the gas, is proportional to mean velocity of the molecule

B. the pressure exerted by the gas is proportional to the root mean velocity of the molecule

C. the root mean square velocity of the molecule is inversely proportional to the temperature

D. the mean translational kinetic energy of the molecule is proportional to the absolute temperature

Answer: D

Watch Video Solution

31. At constant volume, for a fixed number of moles of a gas, the pressure of the gas increases with increase in temperature due to:

A. increases in average molecular speed

B. increase rate of collisions amongst molecules

C. increase in molecular attraction

D. decrease in mean free path

Answer: A

Watch Video Solution

32. At room temperature, ammonia gas at 1 atm pressure and hydrogen chloride gas at P atm pressure are allowed to effuse through identical pin holes from opposite ends of a glass tube of one metre length and of uniform cross section. Ammonium chloride is first formed at a distance of 60 cm from the end through which HCl gas is sent in. What is the value of P?

Watch Video Solution

33. At room temperature, the following reaction proceeds nearly to completion:

$2NO + O_2 \rightarrow 2NO_2 \rightarrow N_2O_4$

The dimer, N_2O_4, solidfies at $262K$. A $250mL$ flask and a $100mL$ flask are separated by a stopcock. At $300K$, the nitric oxide in the larger flask exerts a pressure of $1.053atm$ and the smaller one contains oxygen at $0.789atm$. The gase are mixed by opening the stopcock and after the end of the reaction the flasks are cooled to $220K$. Neglecting the vapour pressure of the dimer, find out the pressure and composition of the gas remaining at $220K$. (Assume the gases to behave ideally)

Watch Video Solution

34. At $27^\circ C$, hydrogen is leaked through a tiny hole into a vessel for $20\ \text{min}$. Another unknown gas at the same temperature and pressure as that of hydrogen is leaked through the same hole for $20\ \text{min}$. After the effusion of the gases, the mixture exerts a pressure of $6atm$. The

hydrogen content of the mixture is $0.7mol$. If the volume of the container is $3L$, what is the molecular weight of the unknown gas?

Watch Video Solution

35. A gas bulb of 1 litre capacity contains 2.0×10^{21} molecules of nitrogen exerting a pressure of $7.57 \times 10^3 Nm^{-2}$. Calculate the root mean square speed and the temperature of gas molecules. If the ratio of most probable speed to the root mean square speed is 0.82, calculate the most probable speed for the molecules at this temperature.

Watch Video Solution

36. In the van der Waals equation

$$\left(P + \frac{n^2 a}{V^2}\right)(V - nb) = nRT$$

the constant a reflects the actual volume of the gas molecules.

Watch Video Solution

37. A 4: 1 molar mixture of He and CH4 is contained in a vessel at 20 bar pressure. Due to a hole in the vessel, the gas mixture leaks out. What is the composition of the mixture effusing out initially?

Watch Video Solution

38. An LPG (liquefied petroleum gas) cylinder weighs 14.8 kg when empty. When full it weighs 29.0 kg and shows a pressure of 2.5 atm. In the course of use at $27^{\circ}C$, the weight of the full cylinder reduces to 23.2 kg. Find out the volume of the gas in cubic metres used up at the normal usage conditions, and the final pressure inside the cylinder. Assume LPG to be n-butane with normal boiling point of $0^{\circ}C$.

Watch Video Solution

39. A mixture of ethane (C_2H_6) and ethene (C_2H_4) occupies $40L$ at $1.00atm$ and at $400K$. The mixture reacts completely with $130g$ of O_2 to

produce CO_2 and H_2O. Assuming ideal gas behaviour, calculate the mole fractions of C_2H_4 and C_2H_6 in the mixture.

Watch Video Solution

40. The composition of the equilibrium mixture (Cl_2  $2Cl$) , which is attained at $1200^\circ C$, is determined by measuring the rate of effusion through a pin hole. It is observed that a $1.80mmHg$ pressure, the mixture effuses $1.16\times$ as fact as krypton effuses under the same conditions. Calculate the fraction of chlorine molecules dissociated into atoms (atomic weight of Kr is 84).

Watch Video Solution

41. The ratio between the root mean square speed of H_2 at $50K$ and that of O_2 at $800K$ is

A. (a) 4

B. (b) 2

C. (c) 1

D. (d) $\frac{1}{4}$

Answer: C

Watch Video Solution

42. A mixture of ideal gases is cooled up to liquid helium temperature $(4.22K)$ to form an ideal solution. Is this statement true or false? Justify your answer in not more than two lines.

Watch Video Solution

43. The compressibility factor for an ideal gas is

A. (a) 1.5

B. (b) 1

C. (c) 2

D. (d) ∞

Answer: B

Watch Video Solution

44. The absolute temperature of an ideal gas is..... to/than the average kinetic energy of the gas molecules.

Watch Video Solution

45. According to Graham's law, at a given temperature the ratio of diffusion $\frac{r_A}{r_B}$ of gases A and B is given by

(where P and M are pressures and molecular weights of gases A and B respectively)

A. $\left(\frac{p_A}{p_B}\right)\left(\frac{M_A}{M_B}\right)^{\frac{1}{2}}$

B. $\left(\frac{M_A}{M_B}\right)\left(\frac{p_A}{p_B}\right)^{\frac{1}{2}}$

C. $\left(\frac{p_A}{p_B}\right)\left(\frac{M_B}{M_A}\right)^{\frac{1}{2}}$

D. $\left(\frac{M_A}{M_B}\right)\left(\frac{p_B}{p_A}\right)^{\frac{1}{2}}$

Answer: C

Watch Video Solution

46. An evacuated glass vessel weighs 50 gm when empty, 148.0 gm filled with a liquid of density 0.98 gm ml^{-1} and 50.5 gm when filled with an ideal gas at 760 mm of Hg at 300 K. What is the molecular weight of the gas ?

Watch Video Solution

47. STATEMENT-1 : The value of the van der Waals' constant 'a' is larger for ammonia than for nitrogen.

STATEMENT-2 : Hydrogen bonding is present in ammonia.

A. Statement-I is True, Statement-II is True and Statement-II is a correct explanation for Statement-I

B. Statement-I is True, Statement-II is True and Statement-II is NOT a correct explanation for Statement-I

C. Statement-I is True, Statement-II is False

D. Statement-I is False, Statement-II is True

Answer: A

Watch Video Solution

48. Using van der Waals' equation, find the constant 'a' (in atm $L^2 mol^{-2}$) when two moles of a gas confined in 4 L flask exerts a pressure of 11.0 atmospheres at a temperature of 300 K. The value of b is 0.05 L mol^{-1} .(R = 0.082 atm.L/K mol)

Watch Video Solution

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

Watch Video Solution

50. The compressibility factor of gases is less than unity at STP. Therefore,

A. (a) $V_m > 22.4$ litres

B. (b) $V_m < 22.4$ litres

C. (c) $V_m = 22.4$ litres

D. (d) $V_m = 44.8$ litres

Answer: B

Watch Video Solution

51. The RMS velocity of hydrogen is $\sqrt{7}$ times the RMS velocity of nitrogen. If T is the temperature of the gas

A. $T_{H_2} = T_{N_2}$

B. $T_{H_2} > T_{N_2}$

C. $T_{H_2} < T_{N_2}$

D. $T_{H_2} = \sqrt{7} T_{N_2}$

Answer: C

Watch Video Solution

52. Assertion: The pressure of a fixed amount of an ideal gas is proportional to its temperature.

Reason: Frequency of collisions and their impact both increase in proportion of the square root of temperature.

A. Statement-I is True, Statement-II is True and Statement-II is a correct explanation for Statement-I.

B. Statement-I is True, Statement-II is True and Statement-II is NOT a correct explanation for Statement-I.

C. Statement-I is True, Statement-II is False.

D. Statement-I is False, Statement-II is True.

Answer: D

Watch Video Solution

53. The root mean square velocity of an ideal gas at constant pressure varies with density d as

A. d^2

B. d

C. $\sqrt{d}$

D. $1/\sqrt{d}$

Answer: D

Watch Video Solution

54. The compression factor (compressibility factor) for $1mol$ of a van der Waals gas at $0^\circ C$ and $100atm$ pressure is found to be 0.5. Assuming that the volume of a gas molecule is neligible, calculate the van der Waals constant a.

Watch Video Solution

55. The density of the vapour of a substance at 1 atm pressure and 500 K is 0.36 kg m^{-3}. The vapour effuses through a small hole at a rate of 1.33 times faster than oxygen under the same condition.

Determine, (a) molecular weight (b) molar volume (c) compression factor (Z) of the vapour and (d) which forces among the gas molecules are dominating, the attractive or the repulsive?

Watch Video Solution

56. The density of the vapour of a substance at 1 atm pressure and 500 K is 0.36 kg m^{-3}. The vapour effuses through a small hole at a rate of 1.33 times faster than oxygen under the same condition.

If the vapour behaves ideally at 1000 K, determine the average translational kinetic energy of a molecule.

Watch Video Solution

57. On increasing temperature , surface tension of water

A. increases

B. decreases

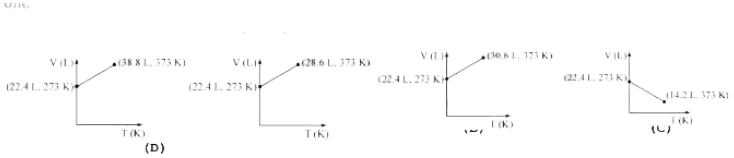
C. remains constant

D. shows irregular behavior

Answer: B

Watch Video Solution

58. Which of the following volume (V) –temperature (T) plots represents the behaviour of one mole of an ideal gas at one atmospheric pressure?



Watch Video Solution

59. The average velocity of gas molecules is $400ms^{-1}$. Calculate their rms velocity at the same temperature.

Watch Video Solution

60. Positive deviation from ideal behaviour takes place because of

A. molecular interaction between atoms and $PV/nRT > 1$

B. molecular interaction between atoms and $PV/nRT < 1$

C. finite size of atoms and $PV/nRT > 1$

D. finite size of atoms and $PV/nRT < 1$

Answer: A

Watch Video Solution

61. The root mean square speed of one mole of a monoatomic gas having molecular mass M is u_{rms} The relation between the average kinetic energy (E) of the gas and $u_9rms)$ is .

A. $V_{r.m.s} = \sqrt{\frac{3E}{2M}}$

B. $V_{r.m.s} = \sqrt{\frac{2E}{3M}}$

C. $V_{r.m.s} = \sqrt{\frac{2E}{M}}$

D. $V_{r.m.s} = \sqrt{\frac{E}{3M}}$

Answer: C::D

Watch Video Solution

62. The ratio of the rate of diffusion of helium and methane under indentical conditions of pressure and temperature will be

A. 4

B. 2

C. 1

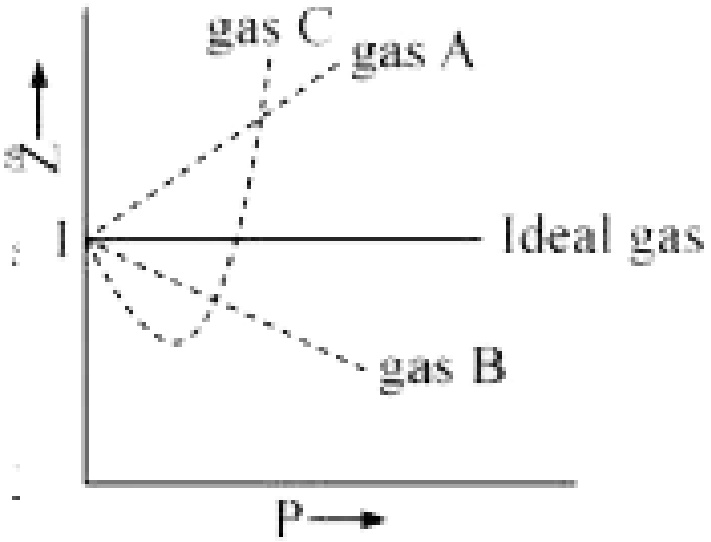
D. 0.05

Answer: B

Watch Video Solution

63. The given graph represents the variations of compressibility factor $Z = pv/nRT$ vs P for three real gases Which of the following

statements is wrong?



A. For gas A, a=0 and Z will linearly depend on pressure

B. For gas B, b=0 and Z will linearly depend on pressure

C. Gas C is a real gas and we can find 'a' and 'b' if intersection data is given

D. At high pressure, the slope is positive for all real

Answer: B

Watch Video Solution

64. Match gases under specified condition listed in Column I with their proerties/laws in Column II.

Column I	Column II
(A) Hydrogen gas ($P = 200$ atm, $T = 273$K)	(P) Compressibility factor $\neq 1$
(B) Hydrogen gas ($P \sim 0, T = 273$ K)	(Q) Attractive forces are dominant
(C) CO_2 ($P = 1$ atm, $T = 273$ K)	(R) $PV = nRT$
(D) Real gas with very large molar volume	(S) $P(V - nb) = nRT$

Watch Video Solution

65. A gas described by van der Waals equation

A. behaves similar to an ideal gas in the limit of large molar volumes

B. behaves similar to an ideal gas in limit of large pressures

C. is characterized by van der Waals coefficients that are dependent on the identity of the gas but are independent of the temperature

D. has the pressure that is lower than the pressure exerted by the same gas behaving ideally

Answer: A::C::D

Watch Video Solution

66. If a gas expands at constant temperature:

A. the pressure decreases

B. the kinetic energy of the molecules remains the same

C. the kinetic energy of the molecules decreases

D. the number of molecules of the gas increases

Answer: A::B

Watch Video Solution

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

Watch Video Solution

68. The term that corrects for the attractive forces present in a real gas in the van der Waal's equation is

A. nb

B. $\frac{an^2}{V^2}$

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

D. $-nb$

Answer: B

Watch Video Solution

69. To an evacuated vessel with movable piston under external pressure of 1 atm and 0.1mole of He and 1 mole of an unknown compound (vapour pressure 0.68 atm at 0°C) are introduced. Considering the ideal behaviour, the volume (in litre) of the gases at 0°C is close to:

Watch Video Solution

70. According to kinetic theory of gases:

A. collisions are always elastic

B. heavier molecules transfer more momentum to the wall of the container

C. only a small number of molecules have very high velocity

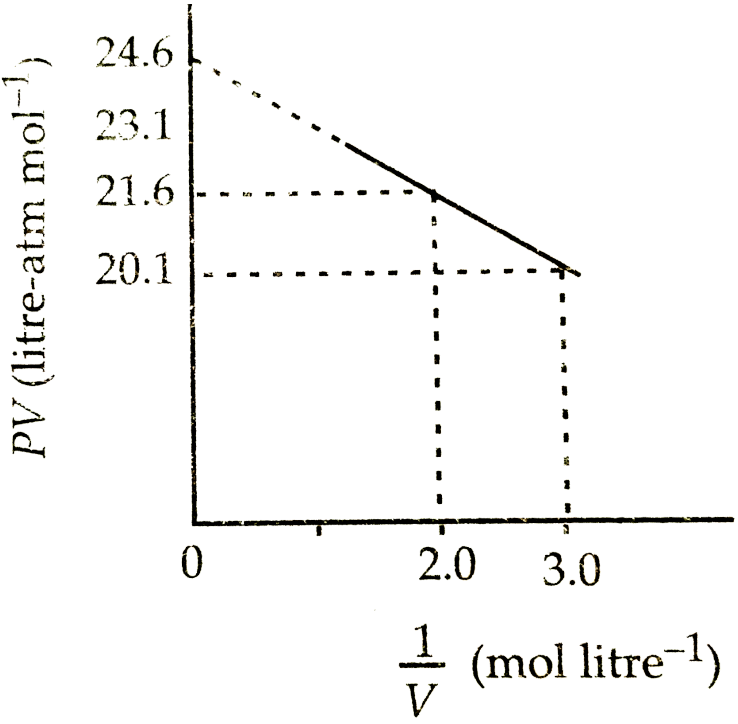
D. between collisions, the molecules move in straight lines with constant velocities

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

Watch Video Solution

71. For one mole of a van der Waals gas when b = 0 and T = 300 K , the PV vs 1/V plot is shown below . The value of the van der Waals constant a

(atm litre$^2 mol^{-2}$) is



A. (a) 1.0

B. (b) 4.5

C. (c) 1.5

D. (d) 3.0

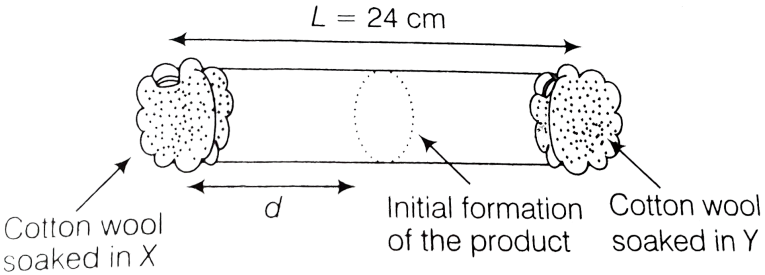
Answer: C

Watch Video Solution

72. X and Y are two volatile liquids with molar weights of $10gmol^{-1}$ and $40gmol^{-1}$ respectively. Two cotton plugs, one soaked in X and the other soaked in Y, are simultaneously placed at the ends of a tube of length $L = 24$ cm, as shown in the figure.

The tube is filled with an inert gas at 1 atm pressure and a temperature of $300K$. Vapours of X and Y react to form a product whichh is first observed at a distance $d$cm from the plug soaked in X.

Take X and Y to have equal molecular diameters and assume ideal behaviour for the inert gas and two vapours.



The value of d in cm (shown in figure), as estimated from Graham's law, is

A. 8

B. 12

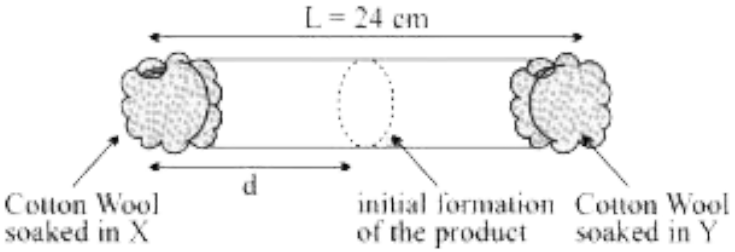
C. 16

D. 20

Answer: C

Watch Video Solution

73. X and Y are two volatile liquids with molar weights of $10gmol^{-1}$ and $40gmol^{-1}$ respectively. Two cotton plugs, one soaked in X and the other soaked in Y, are simultaneously placed at the ends of the tube of length L=24cm, as shown in the figure. The tube is filled with an inert gas at 1 atmosphere pressure and a temperature of 300 K. Vapours of X and Y react to form a product which is first observed at a distance from the plug soaked in X. Take X and Y to have equal molecular diameters and assume ideal behavior for the inert gas and the two vapours.



The value of d in cm (shown in the figure), as estimated from Graham's law, is:

A. larger mean free path for X as compared to that of Y

B. larger mean free path for Y as compared to that of X

C. increased collision frequency of Y with the inert gas as compared to that of X with the inert gas

D. increased collision frequency of X with the inert gas as compared to that of Y with the inert gas

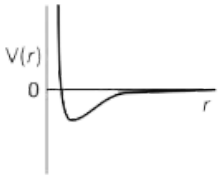
Answer: B::D

Watch Video Solution

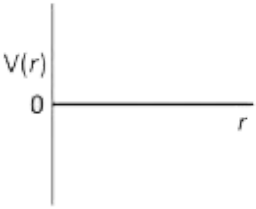
74. If the value of Avogadro numberis $6.023 \times 10^{23} mol^{-1}$ and the vaueof Boltzmann constant is $1.380 \times 10^{-23} JK^{-1}$, then the number of significant digits in the calculated value of the universal gas constant is

Watch Video Solution

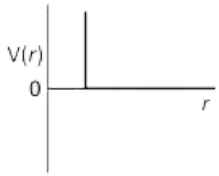
75. One mole of a monoatomic real gas satisfies the equation $p(V-b) = RT$ where b is a constant. The relationship of interatomic potential $V(r)$ and interatomic distance r for gas is given by



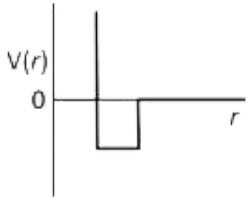
A.



B.



C.



D.

Answer: C

Watch Video Solution

76. The diffusion coefficient of an ideal gas is proportional to its mean free path and mean speed. The absolute temperature of an ideal gas is increased 4 times and its pressure is increased 2 times.As a result, the diffusion coefficient of this gas increases x times. The value of x is.....

Watch Video Solution

77. A closed tank has two compartments A and B, both filled with oxygen (assumed to be ideal gas). The partition separating the two compartments is fixed and is a perfect heat insulator (Figure 1). If the old partition is replaced by a new partition which can slide and conduct heat but does NOT allow the gas to leak across (Figure 2), the volume (in m^3) of the compartment A after the system attains equilibrium is ___.

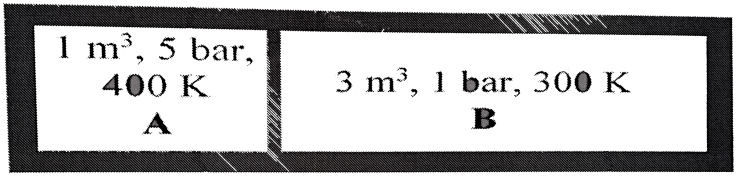
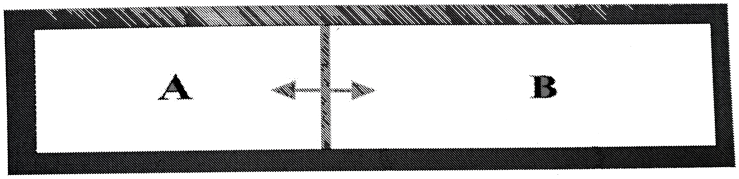


Figure 1



Watch Video Solution

78. Which of the following is/are correct regarding root mean square speed (U_{rms}) & average translation K.E. (E_{av}) of molecules in a gas at

equilibrium

A. U_{rms} is inversely proportional to square root of its molecular mass

B. U_{avg} at a given temperature does not depend on its molecular mass

C. U_{avg} is doubled when its temperature is increased four times

D. U_{rms} is doubled when its temperature is increased four times

Answer: A::B::D

Watch Video Solution

ILLUSTRATION

1. Temperature of a gas is $98.6^{\circ} F$. Convert this into Kelvin.

Watch Video Solution

2. Why mercury is used in barometer for measuring atmospheric pressure?

Watch Video Solution

3. What is the type of graph between log P and $\log\left(\frac{1}{V}\right)$ at constant temperature for a given amount of gas ?

Watch Video Solution

4. A 10.0 L cylinder of H_2 gas is connected to an evacuated 290.0 L tank. If the final pressure is 700 mm Hg, what must have been the original gas pressure in the cylinder?

Watch Video Solution

5. 500 ml of air at 760 mm Hg pressure were compressed to 200 ml. What will be new pressure, if the temperature remains constant?

Watch Video Solution

6. 500 mL of nitrogen at $27^\circ C$ is cooled to $-5^\circ C$ at the same pressure. The new volume becomes

Watch Video Solution

7. An open flask contains air at $27^\circ C$. Calculate the fraction of air that would be expelled out, at $477^\circ C$.

Watch Video Solution

8. An iron cylinder contains helium at a pressure of 250 k Pa at 300 K. The cylinder can withstand a pressure of 1×10^6 Pa. The room in which

cylinder is placed catches fire. Predict the temperature (in K) at which the cylinder will blow up before it melts or not (m.p.t. of the cylinder =1800K)..

Watch Video Solution

9. At 3 atm and $17^\circ C$ a gas cylinder has a volume of 10 litre. If the temperature of cylinder is increased to $47^\circ C$, how many litres of air measured at $47^\circ C$ and pressure of 1 atm should be let out to restore the pressure to 3 atm at $47^\circ C$?

Watch Video Solution

10. A certain quantity of a gas occupied $100ml$ when collected over water at $15^\circ C$ and $750mm$ pressure . It occupies $91.9ml$ in dry state at NTP. Find the $V.\ P.$ of water at $15^\circ C$

Watch Video Solution

11. What is the volume of 6 g of hydrogen at 1.5 atm and $273^{\circ} C$?

Watch Video Solution

12. Calculate the volume occupied by 7 g of nitrogen gas at $27^{\circ} C$ and 750 mm Hg pressure

Watch Video Solution

13. Calculate the temperature of 2.0 moles of a gas occupying a volume of 5.0 litres at 2.46 atmosphere.

Watch Video Solution

14. The density of ammonia at $30^{\circ} C$ and 5 atm pressure is

Watch Video Solution

15. Pressure of 1 g of an ideal gas A at $27^\circ C$ is found to be 2 bar. When 2 g of another ideal gas B is introduced in the same flask at same temperature the pressure becomes 3 bar. Find a relationship between their molecular masses.

Watch Video Solution

16. 2 g of a gas collected over water at $20^\circ C$ and under a pressure of 770mm Hg occupied 800ml. Calculate the volume of dry gas at S.T.P. condition. Vapour pressure of water at $20^\circ C$ is 15mm Hg.

Watch Video Solution

17. If 250ml of N_2 at $30^\circ C$ and a pressure of 250mm Hg are mixed with 400ml of CH_4 at $30^\circ C$ and pressure of 300mm Hg so that the volume of the resulting mixture is 350ml, what will be the final pressure of the mixture at $30^\circ C$?

Watch Video Solution

18. 20 dm^3 of SO_2 diffuse through a porous partition in 60 s. what volume of O_2 will diffuse under similar conditions in 30 s ?

Watch Video Solution

19. Through the two ends of a glass tube of length $200cm$ hydrogen chloride gas and ammonia are allowed to enter At what distance ammonium chloride will first appear ? .

Watch Video Solution

20. From two identical holes, nitrogen and an unknown gas are leaked into a common vessel of $3L$ capacity for $10\ \min$, at $27^\circ C$. The resulting pressure is 4.18 bar and the mixture contains $0.4mol$ of nitrogen. What is the molar mass of the unknown gas?

Watch Video Solution

21. The pressure in a vessel that contained pure oxygen dropped from 2000 torr to 1500 torr in 50 minutes as the oxygen leaked through a small hole into a vacuum. When the same vessel was filled with another gas, the pressure dropped from 2000Torr to 1600Torr in 80 minutes. What is the molar mass of unknown gas?

Watch Video Solution

22. One mole of He gas at 0.6 atm takes 40 s to diffuse through a pin hole. Calculate the time required for diffusion of half mole of CH_4 gas at 1.2 atm through the same hole.

Watch Video Solution

23. 8.4 " mL of " gaseous hydrocarbon A was burnt with 50 " mL of " O_2 in a eudiometer tube. The volume of the products after cooling to room

temperature was 37.4 mL. When reacted with NaOH, the volume contracted to 3.8 mL. What is the molecular formula of A.

Watch Video Solution

24. Calculate the root mean square, average and most probable speeds of oxygen molecules at $27^{\circ} C$

Watch Video Solution

25. At a certain temperature 6% molecules of a gas have speed $2m/s$, 9% have speed $3m/s$, 30% have speed $9m/s$, 28% have speed $11m/s$, 20% have speed $13m/s$ and 7% have speed $18m/s$. Calculate U_{mp}, U_{av} and U_{rms} at that temperature.

Watch Video Solution

26. Calculate the pressure exerted by 10^{23} gas particles each of mass 10^{-22} g in a container of volume $1dm^3$. The root mean square speed is $10^5 cms^{-1}$

Watch Video Solution

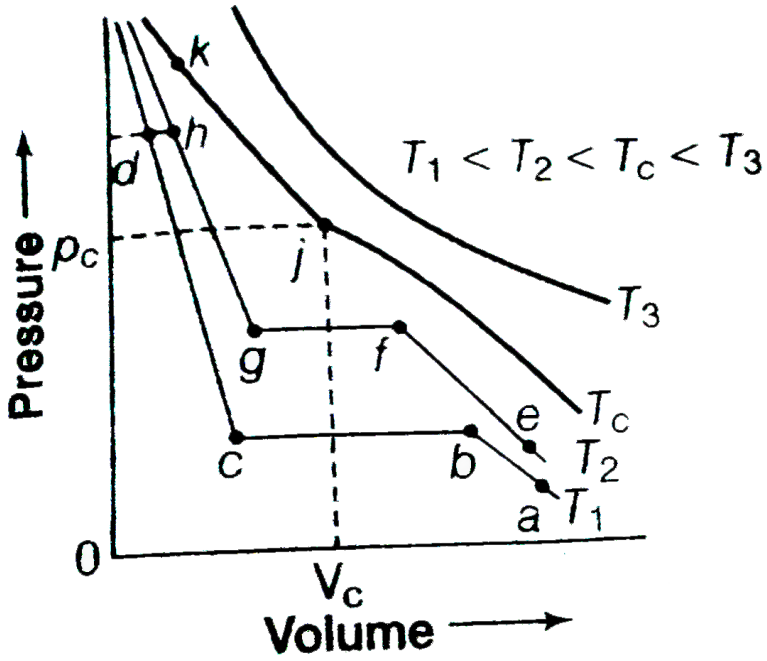
27. A gas container of $1.5dm^3$ capacity contains 3.011×10^{23} molecules of H_2 gas at 101.325kPa. Calculate mean (or average) square speed of gaseous molecules.

Watch Video Solution

28. Calculate the total and average kinetic energy of $32g$ methane molecules at $27^\circ C$. $\left(R = 8.314JK^{-1}mol^{-1}\right)$

Watch Video Solution

29. Isotherms of carbon dioxide at various temperatures are repersented in figure. Answer the following questions based on this figures.



(i) In which state will CO_2 exist between the points a and b at temperature T_1 ?

(ii) At what point will CO_2 start liquefyinh when temperature is T_1 ?

(iii) At what point will CO_2 be completely liquefued when temperature is T_2 ?

(iv) Will condensation take place when the temperature is T_3 ?

(v) What portion of the isotherm at T_1 represent liquid and gaseous CO_2 at equilibrium ?

Watch Video Solution

30. The kinetic molecular theory attributes an average kinetic theory of $\frac{3RT}{2N}$ to each particle. What rms speed would a mist particle of mass $10^{-12}g$ have at room temperature $27^{\circ}C$ according to kinetic theory of gases?

Watch Video Solution

SOLVED EXAMPLES

1. Helium atom is two times heavier than a hydrogen molecule. At 289 K, the average kinetic energy of a helium atom is

A. two times that of hydrogen molecule.

B. same as that of a hydrogen molecule.

C. four times that of a hydrogen molecule.

D. half that of a hydrogen molecule.

Answer: B

Watch Video Solution

2. A balloon filled with ethyne is pricked with a sharp point and quickly dropped in a tank of H_2 gas under identical conditions. After a while the balloon will have

A. shrunk

B. enlarged

C. completely collapsed

D. remain unchanged in size

Answer: B

Watch Video Solution

3. At which of the following four conditions will the density of nitrogen be the largest?

A. STP

B. 273 K and 2 atm

C. 546 K and 1 atm

D. 546 K and 2 atm

Answer: B

Watch Video Solution

4. The ratio between the root mean square velocity of H_2 at 50 K and that of O_2 at 800 K is:

A. 4

B. 2

C. 1

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

Answer: C

Watch Video Solution

5. What percent of a sample of nitrogen must be allowed to escape if its temperature , pressure and volume are to be chaged from $220^{\circ}C$,3 atm and 1.65 litre to $110^{\circ}C$ atm and 1.00 litre respectively ?

A. 41.4%

B. 0.0818

C. 0.0414

D. 0.818

Answer: D

Watch Video Solution

6. Van der Waal equation for CH_4 at low pressure is

A. $PV = RT - Pb$

B. $PV = RT - \frac{a}{V}$

C. $PV = RT + \frac{a}{V}$

D. $PV = RT + Pb$

Answer: B

Watch Video Solution

7. The internal pressure loss of one mole of vander Waal gas over an ideal gas is equal to

A. zero

B. b^2

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

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

Answer: C

Watch Video Solution

8. The compressibility of a gas is less than unity at STP. Therefore,

A. $V_m > 22.4 \text{liters}$

B. $V_m < 22.4 \text{liters}$

C. $V_m = 22.4 \text{liters}$

D. $V_m = 4.8 \text{liters}$

Answer: B

Watch Video Solution

9. 20 ml of a mixture of C_2H_2 and CO was exploded with 30 ml of oxygen. The gases after the reaction had a volume of 34 ml. On treatment with KOH, 8 ml of oxygen gas remain unreacted. Which of the following options show a correct composition of the mixture?

A. $V_{\text{ethyne}} = 6ml$ and $V_{\text{co}} = 14ml$

B. $V_{\text{ethyne}} = 4ml$ and $V_{\text{co}} = 16ml$

C. $V_{\text{ethyne}} = 2ml$ and $V_{\text{co}} = 18ml$

D. $V_{\text{ethyne}} = 5ml$ and $V_{\text{co}} = 15ml$

Answer: A

Watch Video Solution

10. What will be the passenger carrying capacity of a balloon of diameter 20 m and mass 100 kg filled with helium at 1.0 atm at $27^\circ C$. Density of air is $1.2\text{kg}/m^3$ and average weight of a passenger is 65 kg.

A. 55

B. 60

C. 65

D. 70

Answer: C

Watch Video Solution

11. The temperature of 20 litres of nitrogen was increased from 100 K to 300 K at a constant pressure. Change in volume will be

A. 80 litre

B. 60 litre

C. 40 litre

D. 20 litre

Answer: C

Watch Video Solution

12. 10 g of a gas at NTP occupies a volume of 2 litres. At what temperature will the volume be double, pressure and amount of the gas remaining same?

A. 273 K

B. 546 K

C. $-273^{\circ}C$

D. $546^{\circ}C$

Answer: B

Watch Video Solution

13. 300 ml of a gas at 300 K is cooled to 276 K at constant pressure. The final volume is

A. 540 ml

B. 276 ml

C. 350 ml

D. 135 ml

Answer: B

Watch Video Solution

14. If 1 litre of N2 at $27^\circ C$ and 760 mm Hg contains N molecules, 4 litres of O_2 under the same conditions of temperature and pressure, shall contain

A. N molecules

B. 2N molecules

C. $\frac{N}{4}$ molecules

D. 4N molecules

Answer: D

Watch Video Solution

15. A gas occupies 300 ml at $27^{\circ} C$ and 740 mm Hg pressure. Calculate its volume at S.T.P. ?

A. 0.3650 L

B. 0.2658 L

C. 200 L

D. 365 L

Answer: B

Watch Video Solution

16. Calculate the density of N_2 gas at S.T.P. ?

A. $1.250 g / L$

B. $0.628 g / L$

C. $2.450 g / L$

D. $1.42 g / L$

Answer: A

Watch Video Solution

17. The volume occupied by 22.4 g of a gas (vap. $\mathrm{Density} = 11.2$) at NTP is

A. 22.4 litre

B. 11.2 litre

C. 44.8 litre

D. 1 litre

Answer: A

Watch Video Solution

18. A mixture of CO and CO_2 is found to have a density of 1.5 g/L at $30^\circ C$ and 740 torr. What is the composition of the mixture.

A. $CO = 0.35775, CO_2 = 0.64225$

B. $CO = 0.64225, CO_2 = 0.3575$

C. $CO = 0.500, CO_2 = 0.500$

D. $CO = 0.2500, CO_2 = 0.7500$

Answer: A

Watch Video Solution

19. If 500 mL of gas A at 1000 torr and 1000 mL of gas B at 800 torr are placed in a 2 L container, the final pressure will be

A. 100 torr

B. 650 torr

C. 1800 torr

D. 2400 torr

Answer: B

Watch Video Solution

20. If the aboslute temperature of a gas having volume Vcm^3 is doubled and the pressure is reduced to half, the final volume will be

A. 0.25 V

B. 0.50 V

C. 40 V

D. 4 V

Answer: D

Watch Video Solution

PRACTICE EXERCISE-1

1. What would be the height of column in barometer if water $\left(\text{density} = 1000 Kg/m^3\right)$ is used instead of mercury for measuring atmospheric pressure?

Watch Video Solution

2. If a pressure of 76 torr has to be expressed in terms of bar, then what would be the value of pressure?

Watch Video Solution

3. At what temperature do the Celsius and Fahrenheit readings have the same numerical value ?

Watch Video Solution

PRACTICE EXERCISE-2

1. What is the type of graph between log P and log V at constant temperature?

Watch Video Solution

2. If the pressure of 2 litres of an ideal gas is 4 atm then what will be the pressure of the gas if the volume is reduced to one- fourth of its present value?

Watch Video Solution

3. What will be the expression for the differential form of Boyle's law?

Watch Video Solution

PRACTICE EXERCISE-3

1. What is the type of graph that would result between $\log(V)$ and $\log(T)$ at constant pressure?

Watch Video Solution

2. If the temperature of an ideal gas is increased by 25% then by what percentage would its volume increase?

Watch Video Solution

3. Explain application of Charle's Law for the case of Hot Air Balloons.

Watch Video Solution

4. What will be the slope of a $\log P$ Vs $\log T$ graph plotted at constant volume?

Watch Video Solution

PRACTICE EXERCISE-4

1. If a cylinder at NTP contains a gas and it can withstand a temperature of 473K then pressure inside the cylinder at the time of explosion will be?

Watch Video Solution

2. State Gay-Lusaac's law

Watch Video Solution

PRACTICE EXERCISE-5

1. How can the ideal gas equation be expressed in terms of density of the gas?

Watch Video Solution

2. What does the universal gas constant signify?

Watch Video Solution

3. What will be the pressure of 14g N_2 (in atm) present in a 2 litre cylinder at 300K?

Watch Video Solution

PRACTICE EXERCISE-6

1. What is partial pressure?

Watch Video Solution

2. How is partial pressure of a gas related to its mole fraction?

Watch Video Solution

Watch Video Solution

3. Why doesn't Dalton's law of partial pressures apply to a mixture of NH_3 and HCl?

Watch Video Solution

PRACTICE EXERCISE-7

1. How is rate of diffusion of a gas proportional to the density of the gas?

Watch Video Solution

2. How is rate of diffusion expressed in terms of volume of gas diffused?

Watch Video Solution

3. If the rate of diffusion of gas X (Molecular mass 64 amu) is 1.4 times the rate of diffusion of gas Y at the same pressure then the molecular mass of gas Y is?

Watch Video Solution

PRACTICE EXERCISE-8

1. What will be the total kinetic energy of 3 moles of methane at $200^{\circ} C$?

Watch Video Solution

2. What will be the root mean square velocity of oxygen gas in $m / \sec$ at 300K?

Watch Video Solution

3. At what temperature will the rms velocity of CO_2 be same as the average velocity of SO_2 at 500K?

Watch Video Solution

PRACTICE EXERCISE-9

1. What is critical point?

Watch Video Solution

2. Why are all real gases practically incompressible at high pressures?

Watch Video Solution

3. What conditions of temperature and pressure are suitable for a real gas to show ideal gas behaviour?

Watch Video Solution

IN-CHAPTER EXERCISE-A

1. A temperature of $-40^{\circ}C$ shall be equal to

A. 233 K

B. $-40^{\circ}F$

C. $-32^{\circ}F$

D. $2^{\circ}F$

Answer: B

Watch Video Solution

2. 70 torr will be same as which of the following

A. 9332.0325 Pa

B. 70 mm Hg

C. 0.0933 bar

D. All of these

Answer: D

Watch Video Solution

3. Which of these is true regarding the gaseous state?

A. Gases have the least inter-particle motion

B. Gases can never be heterogeneously mixed

C. Particles of a gas have the highest mobility

D. All of these are correct

Answer: C

Watch Video Solution

4. A volume of $50.7m_3$ can be expressed in litres as

A. 50.7 litres

B. 507 litres

C. 5070 litres

D. 50700 litres

Answer: D

Watch Video Solution

5. $24^\circ F$ can be given in Kelvin as

A. 26.87 K

B. 268.7 K

C. 2687 K

D. 2.687 K

Answer: B

Watch Video Solution

6. Which of these is the correct relationship between bar and atmosphere?

A. $1\text{atm} = 1.013\text{bar}$

B. $1\text{atm} = 0.987\text{bar}$

C. $1\text{atm} = 105\text{bar}$

D. $1\text{atm} = 0.101325\text{bar}$

Answer: A

Watch Video Solution

7. Which of these is the correct relationship between liter and mm^3?

A. $1\text{liter} = 10^3 mm^3$

B. $1\text{liter} = 10^4 mm^3$

C. $1\text{liter} = 10^5 mm^3$

D. $1\text{liter} = 10^6 mm^3$

Answer: D

Watch Video Solution

8. 32 grams of O_2 at STP will occupy volume equal to

A. 22.4 liters

B. 28 liters

C. 22400 liters

D. 2.24 liters

Answer: A

Watch Video Solution

9. If 16 g of H_2 and 56 g of N_2 are present in a 2 liter vessel at STP then the total number of molecules in the vessel will be

A. 6.022×10^{23}

B. 6.022×10^{24}

C. 6.022×10^{25}

D. 6.022×10^{22}

Answer: B

Watch Video Solution

10. 403K can be expressed in degree celcius as

A. $12.98^\circ C$

B. $1298^\circ C$

C. $129.8^\circ C$

D. $1.298^{\circ} C$

Answer: C

Watch Video Solution

IN-CHAPTER EXERCISE-B

1. If $20 cm^3$ gas at $1 atm$ is expanded to $50 cm^3$ at constant T, then what is the final pressure

A. $20 \times \frac{1}{50}$

B. $50 \times \frac{1}{20}$

C. $20 \times \frac{1}{50} \times 2$

D. 50

Answer: A

Watch Video Solution

2. A fixed mass of an ideal gas of volume 50 litre measured at 2 atm and $0^{\circ} C$. At the same temperature but at 5 atm its volume will be

A. 20 litres

B. 40 litres

C. 60 litres

D. 80 litres

Answer: A

Watch Video Solution

3. At constant temperature, in a given mass of an ideal gas

A. The ratio of pressure and volume always remains constant

B. Volume always remains constant

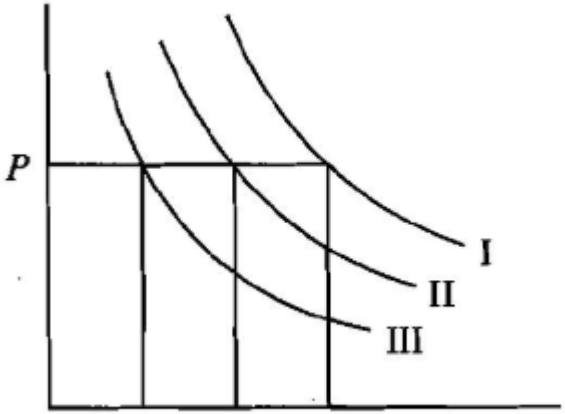
C. Pressure always remains constant

D. The product of pressure and volume always remains constant

Answer: D

Watch Video Solution

4. I , II , III are three isotherms respectively at T_1, T_2, T_3 . Temperature will be in order



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: C

Watch Video Solution

5. Which of the following curve does not represent Boyle's law?

A. 

B. 

C. 

D. 

Answer: C

Watch Video Solution

6. At constant temperature if the pressure of an ideal gas is increased by 10% then its volume must decrease by

A. 0.1

B. 0.0901

C. 0.1525

D. 0.1101

Answer: B

Watch Video Solution

7. If for an ideal gas with 2 litres volume, pressure was increased by 0.25 atm then volume became 555 ml. At what initial pressure was the gas present?

A. 0.096 mm Hg

B. 0.96 mm Hg

C. 73 mm Hg

D. 73 atm

Answer: C

Watch Video Solution

8. At constant temperature if a graph plotted between logP and $\log\left(\frac{1}{V}\right)$ has an intercept of unity then what will be the value of constant (k)

A. 1

B. 10

C. 100

D. 1000

Answer: B

Watch Video Solution

9. If $PV = \text{constant}(k)$ at constant temperature then the value of $\frac{d^2P}{dV^2}$ will be

A. $-\frac{k}{V^2}$

B. $-\frac{3k}{V^3}$

C. $-\frac{2k}{3V^3}$

D. $\frac{2k}{V^3}$

Answer: D

Watch Video Solution

10. At constant temperature if an air bubble present at the bottom of a lake at 8 atm pressure and with radius 0.1 cm rises to the surface then its new radius will become

A. 0.4 cm

B. 0.3 cm

C. 0.2 cm

D. 0.1 cm

Answer: C

Watch Video Solution

IN-CHAPTER EXERCISE-C

1. For a given mass of a gas, if pressure is reduced to half and temperature is doubled, then volume V will become

A. 4V

B. $2V^2$

C. $\frac{V}{4}$

D. 8V

Answer: A

Watch Video Solution

2. At what temperature would the volume of a given mass of a gas at constant pressure be twice its volume at $0^\circ C$

A. $546^\circ C$

B. $100^\circ C$

C. $273^\circ C$

D. $373^\circ C$

Answer: C

Watch Video Solution

3. The temperature of a given mass of a gas is increased from $19^\circ C$ to $20^\circ C$ at constant pressure. The volume V of the gas is

A. to $V\left(\frac{20}{19}\right)$.

B. by $\frac{1}{273.15}$ of its volume at $0^\circ C$.

C. by $\frac{1}{273.15}$ of its volume at 0K.

D. by a factor of $\frac{1}{273.15}$ of its volume at $19^\circ C$.

Answer: B

Watch Video Solution

4. A cylinder with a movable piston is filled at $25^\circ C$ with a gas that occupies a volume of $30.5 cm^3$. If the maximum capacity of the cylinder is $45.8 cm^3$, what is the highest temperature to which the cylinder can be heated at constant pressure without having the piston come out?

A. $50^\circ C$

B. $147.5^\circ C$

C. $174.5^\circ C$

D. $120^\circ C$

Answer: C

Watch Video Solution

5. A sample of gas occupies $100mL$ at $27^\circ C$ and $740mm$ pressure. When its volume is changed to $80mL$ at $740mm$ pressure, the temperature of the gas will be

A. $21.6^\circ C$

B. $240^\circ C$

C. $-33^\circ C$

D. $89.5^\circ C$

Answer: C

Watch Video Solution

6. A certen sample of gas has a volume of 0.2 litre measured at 1 atm pressure and $0^\circ C$. At the same pressure but at $273^\circ C$, its volume will be:

A. 0.4 litres

B. 0.8 litres

C. 27.8 litres

D. 55.6 litres

Answer: A

Watch Video Solution

7. $400cm^3$ of oxygen at $27^\circ C$ were cooled to $-3^\circ C$ without change in pressure. The contraction in volume will be as per Charle's law?

A. 40

B. 30

C. 44.4

D. 360

Answer: A

Watch Video Solution

8. Pressure remaining the constant, the volume of a given mass of an ideal gas increases for every degree centigrade rise in temperature by definite fraction of its volume at:

A. $0^{\circ}C$

B. Its critical temperature

C. Absolute zero

D. Its Boyle temperature

Answer: A

Watch Video Solution

9. Which of the following expression at constant pressure represents Charles's law?

A. $V \propto \frac{1}{T}$

B. $V \propto \frac{1}{T^2}$

C. $V \propto T$

D. $V \propto d$

Answer: C

Watch Video Solution

10. Use of hot air ballons in sports and meteorological observations in an application of

A. Boyle's law

B. Gay-Lusaac's law

C. Kelvin's law

D. Charle's law

Answer: D

Watch Video Solution

IN-CHAPTER EXERCISE-D

1. If $10g$ of a gas at atmospheric pressue is cooled from $273^\circ C$ to $0^\circ C$, keeping the volume constant, its pressure would become

A. $\frac{1}{2}\text{atm}$

B. $\frac{1}{273}\text{atm}$

C. 2 atm

D. 273 atm

Answer: A

Watch Video Solution

2. Two colsed vessel A and B of equal volume containing air at pressure P_1 and temperature T_1 are connected to each other through a narrow

open tube . If the temperature of one is now maintained at T_1 and other at T_2 (where $T_1 > T_2$) then that what will be the final pressure ?

A. $\frac{2P_1T_1}{T_1 + T_2}$

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

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

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

Answer: C

Watch Video Solution

3. At what pressure a quantity of gas will occupy a volume of 60 mL, if it occupies a volume of 100mL at a pressure of 720 mm (while temperature is constant) :

A. 700 mm

B. 800 mm

C. 100 mm

D. 1200 mm

Answer: D

Watch Video Solution

4. If the pressure of a gas contained in a closed vessel is increased by 0.4 % when heated by 1°C then its initial temperature must be

A. 250 K

B. $250^\circ C$

C. 2500 K

D. $25^\circ C$

Answer: A

Watch Video Solution

5. A gas cylinder containing cooking gas can withstand a pressure of $14.9atm$. The pressure gauge of cylinder indicates $12atm$ at $27^\circ C$. Due to sudden fire in building the temperature starts rising. The temperature at which the cylinder will explode is

A. $42.5^\circ C$

B. $67.8^\circ C$

C. $99.5^\circ C$

D. $425.7^\circ C$

Answer: C

Watch Video Solution

6. If the pressure of an ideal gas at constant volume is decreased by 20% then the percentage change in temperature will be

A. 20% increase

B. 20% decrease

C. 80% increase

D. 80% decrease

Answer: B

Watch Video Solution

7. For a fixed amount of an ideal gas present at STP, if temperature is doubled keeping volume same then the final pressure of

A. 1 atm

B. 2 atm

C. 3 atm

D. 4 atm

Answer: B

Watch Video Solution

8. What will be the final pressure of an ideal gas present in a cylinder at 2 atm when the temperature of the gas is increased from $100^\circ C$ to $500^\circ C$?

A. 3.68 atm

B. 4.14 atm

C. 1.77 atm

D. 8.42 atm

Answer: B

Watch Video Solution

9. Steam is present in a pressure cooker at 1.5 atm pressure and $150^\circ C$. If the pressure cooker can withstand a maximum of 4 atm pressure and there is no provision of a weight atop the cooker then at what temperature will the cooker explode?

A. $1128^\circ C$

B. 564K

C. $564^\circ C$

D. 1128K

Answer: D

Watch Video Solution

10. If 2g neon gas is present in a vessel at 3 atm and 300 K and temperature is doubled and pressure becomes triple then the mass of neon that must be added or subtracted must be

A. 1 g neon must be removed

B. 1 g neon must be added

C. 2g neon must be added

D. 3g neon must be removed

Answer: B

Watch Video Solution

IN-CHAPTER EXERCISE-E

1. If two mole of an ideal gas at $546K$ occupies a volume of $44.8litres$, the pressure must be :

A. 2 atm

B. 3 atm

C. 4 atm

D. 1 atm

Answer: A

Watch Video Solution

2. How many moles of He gas occupy 22.4 litres at $30^{\circ}C$ and one atmospheric pressure

A. 0.9

B. 1.11

C. 0.11

D. 1

Answer: A

Watch Video Solution

3. At $0^{\circ}C$ and one atm pressure, a gas occupies 100 cc. If the pressure is increased to one and a half-time and temprature is increased by one-third of absolute temperature, then final volume of the gas will be:

A. 80 cc

B. 88.9 cc

C. 66.7 cc

D. 100 cc

Answer: B

Watch Video Solution

4. Two separate bulbs contain ideal gases A and B. The density of gas A is twice that of gas B. The molecular mass of A is half that of gas B. The two gases are at the same temperature. The ratio of the pressure of A to that of gas B is:

A. 2

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

C. 4

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

Answer: C

Watch Video Solution

5. Pure hydrogen sulphide is stored in a tank of 100 litre capacity at 20° C and 2 atm pressure. The mass of the gas will be

A. 34 g

B. 340 g

C. 282.4 g

D. 28.24 g

Answer: C

Watch Video Solution

6. A weather balloon filled with hydrogen at 1 atm and $27^\circ C$ has volume equal to 1200 litres. On ascending, it reaches a place where temperture is $-23^\circ C$ and pressure is 0.5 atm. The volume of the balloon is

A. 24000 litres

B. 20000 litres

C. 10000 litres

D. 12000 litres

Answer: B

Watch Video Solution

7. Containers A and B have same gases. Pressure, volume and temperature of A are all twice that of B, then the ratio of number of molecules of A and B are

A. $1:2$

B. 2

C. $1:4$

D. 4

Answer: B

Watch Video Solution

8. A gas occupies a volume of 300 cm^3 at $27.^\circ C$ and 620 mm pressure . The volume of gas at $47.^\circ C$ and 640 mm pressure is

A. 400 c.c.

B. 510 c.c.

C. 310 c.c.

D. 350 c.c.

Answer: C

Watch Video Solution

9. At what temperature, the sample of neon gas would be heated to double of its pressure, if the initial volume of gas is/are reduced to 15% at 44.4 K

A. $319^\circ C$

B. $592^\circ C$

C. $128^\circ C$

D. $90^\circ C$

Answer: A

Watch Video Solution

IN-CHAPTER EXERCISE-F

1. Which mixture of gases of room temperature does not obey Dalton's law of partial pressure ?

A. O_2 and CO_2

B. N_2 and O_2

C. Cl_2 and O_2

D. NH_3 and HCl

Answer: D

Watch Video Solution

2. The pressure of a mixtures of equal weights of two gases X and Y with molecular weight 4 and 40 respectively is 1.1 atm . The partial pressure of the gas X in the mixture is

A. 0.55 atm

B. 0.11 atm

C. 1 atm

D. 0.12 atm

Answer: C

Watch Video Solution

3. At room temperature Dalton's law of partial pressure is not applicable to :

A. H_2 and SO_2

B. H_2 and Cl_2

C. H_2 and CO_2

D. CO_2 and Cl_2

Answer: B

Watch Video Solution

4. When a jar containing gaseous mixture of equal volumes of CO_2 and H_2 is placed in a solution of sodium hydroxide, the solution level will

A. Rise

B. Fall

C. Remain constant

D. Become zero

Answer: A

Watch Video Solution

5. A closed vessel contains equal number of nitrogen and oxygen molecules at pressure of Pmm. If nitrogen is removed from the system, then the pressure will be:

A. P

B. 2P

C. $\frac{P}{2}$

D. P^2

Answer: C

Watch Video Solution

6. A sample of gas is collected over water at at a barometric pressure of 751 mm Hg (vapour pressure of water at is 21 mm Hg).The partial pressure of gas in the sample collected is

A. 21 mm Hg

B. 751 mm Hg

C. 0.96 atm

D. 1.02 atm

Answer: C

Watch Video Solution

7. 4g of O_2 and $2g$ of H_2 are confined in a vessel of capacity 1 litre at $0^\circ C$. Calculate

the total pressure of the gaseous mixture.

A. 25.215 atm

B. 31.205 atm

C. 45.215 atm

D. 15.210 atm

Answer: A

Watch Video Solution

8. If 1 mole of H_2, 2 moles of O_2 and 3 moles of N_2 are mixed in a vessel and total pressure was found to be 12 atm then the partial pressure exerted by N_2 in the vessel will be

A. 2 atm

B. 4 atm

C. 6 atm

D. 12 atm

Answer: C

Watch Video Solution

9. If 2 moles each of CO, N_2 and CO_2 were taken in a 5 litre vessel at 300K and the entire CO_2 was absorbed into KOH, then the partial pressure exerted by CO in the vessel after absorption will be

A. 9.852 atm

B. 29.55 atm

C. 19.22 atm

D. 40 atm

Answer: A

Watch Video Solution

10. 1 gram H_2 and 8g O_2 were taken in a 10 liter vessel at 300 K. The partial pressure exerted by O_2 will be

A. 1.84 atm

B. 0.88 atm

C. 1.03 atm

D. 0.61 atm

Answer: D

Watch Video Solution

IN-CHAPTER EXERCISE-G

1. The ratio of the rate of diffusion of a given element to that of helium at the same pressure is 1.4. The molecular weight of the element is

A. 2

B. 4

C. 8

D. 16

Answer: A

Watch Video Solution

2. A gas diffuse $\frac{1}{5}$ times as fast as hydrogen at same pressure. Its molecular weight is

A. 50

B. 25

C. $25\sqrt{2}$

D. $50\sqrt{2}$

Answer: A

Watch Video Solution

3. The molecular weight of a gas which diffuses through a porous plug at $1/6^{th}$ of the speed of hydrogen under identical condition is:

A. 27

B. 72

C. 36

D. 48

Answer: B

Watch Video Solution

4. Molecular weight of a gas that diffuses twice as rapidly as the gas with molecular weight 64 is

A. 16

B. 8

C. 64

D. 6.4

Answer: A

Watch Video Solution

5. If the rate of diffusion of A is 5 times that of B, what will be the density ratio of A and B?

A. $\frac{1}{25}$

B. $\frac{1}{5}$

C. 25

D. 4

Answer: A

Watch Video Solution

6. The densities of two gases are in the ratio of 1:16. The ratio of their rates of diffusion is

A. $16:1$

B. $4:1$

C. $1:4$

D. $1:16$

Answer: B

Watch Video Solution

7. At constant volume and temperature conditions, the rates of diffusion r_A and r_B of gases A and B having densities P_A and P_B are related by the expression :

A. $D_A = \left[D_B . \frac{P_A}{P_B}\right]^{\frac{1}{2}}$

B. $D_A = \left[D_B . \frac{P_B}{P_A}\right]^{\frac{1}{2}}$

C. $D_A = D_B\left(\frac{P_A}{P_B}\right)^{\frac{1}{2}}$

D. $D_A = D_B\left(\frac{P_B}{P_A}\right)^{\frac{1}{2}}$

Answer: D

Watch Video Solution

8. At what temperature, the rate of effusion of N_2 would be 1.625 times that of SO_2 at $50^\circ C$?

A. 110K

B. 173K

C. 373 K

D. 273K

Answer: C

Watch Video Solution

9. If the four tubes of a car are filled to the same pressure with N_2, O_2, H_2, and helium separately , then which one will be filled first ?

A. N_2

B. O_2

C. H_2

D. Ne

Answer: C

Watch Video Solution

10. Which of the following gaseous mixture does not follow Dalton's law of partial pressure?

A. SO_2 and Cl_2

B. CO_2 and N_2

C. CO and CO_2

D. CO and N_2

Answer: A

Watch Video Solution

IN-CHAPTER EXERCISE-H

1. The ratio among most probable speed, mean speed and root mean square speed is given by

A. $1:2:3$

B. $1:\sqrt{2}:\sqrt{3}$

C. $\sqrt{2}:\sqrt{3}:\sqrt{\frac{8}{\pi}}$

D. $\sqrt{2}:\sqrt{\frac{8}{\pi}}:\sqrt{3}:$

Answer: D

Watch Video Solution

2. Which of the following has maximum root mean square velocity at the same temperature ?

A. SO_2

B. CO_2

C. O_2

D. H_2

Answer: D

Watch Video Solution

3. Which option is valid for zero order reaction.

A. Kinetic energy of the gas becomes zero but the molecular motion does not become zero

B. Kinetic energy of the gas becomes zero and molecular motion also becomes zero

C. Kinetic energy of the gas decreases but does not become zero

D. None of the above

Answer: B

Watch Video Solution

4. According to kinetic theory of gases, for a diatomic molecule

A. The pressure exerted by the gas is proportional to the mean velocity of the molecules

B. The pressure exerted by the gas is proportional to the root mean square velocity of the molecules

C. The root mean square velocity is inversely proportional to the temperature

D. The mean translational kinetic energy of the molecules is proportional to the absolute temperature

Answer: D

Watch Video Solution

5. Indicate the correct statement for equal volumes of $N_2(g)$ and $CO_2(g)$ at $25^\circ C$ and 1 atm.

A. The average translational KE per molecule is the same in N_2 and CO_2

B. The rms speed remains same for both N_2 and CO_2

C. The density of N_2 is less than that of CO_2

D. The total translational KE of both N_2 and CO_2 is the same

Answer: B

Watch Video Solution

6. The molecular velocities of two gases at same temperature are u_1 and u_2, their molar mass are m_1 and m_2 respectively. Which of the following expression is correct ?

A. $\frac{m_1}{u_1^2} = \frac{m_2}{u_2^2}$

B. $m_1 u_1 = m_2 u_2$

C. $\frac{m_1}{u_1} = \frac{m_2}{u_2}$

D. $m_1 u_1^2 = m_2 u_2^2$

Answer: D

Watch Video Solution

7. The average kinetic energy of an ideal gas per molecule in SI unit at $25^\circ C$ will be:

A. $6.17 \times 10^{-21} kJ$

B. $6.17 \times 10^{-21} J$

C. $6.17 \times 10^{-20} J$

D. $7.16 \times 10^{-20} J$

Answer: B

Watch Video Solution

8. At what temperature will the rms velocity of SO_2 be the same as that of O_2 at $303K$?

A. 273 K

B. 606 K

C. 303 K

D. 403 K

Answer: B

Watch Video Solution

9. The root mean square velocity of an ideal gas in a closed container of fixed volume is increased from $5 \times 10^4 cms^{-1}$ to $10 \times 10^4 cms^{-1}$. Which of the following statements correctly explains how the change is accomplished?

A. By heating the gas, the temperature is doubled

B. By heating the gas, the pressure is quadrupled

C. By heating the gas, the temperature is quadrupled

D. By heating the gas, the pressure is doubled

Answer: C

Watch Video Solution

IN-CHAPTER EXERCISE-I

1. Which one of the following gases has the highest critical temperature ?

A. W

B. X

C. Y

D. Z

Answer: D

Watch Video Solution

2. The values of van der Waals' constant 'a' for O_2, N_2, NH_3 and CH_4 are $1.360, 1.390, 4.170$ and $2.253 L^2$ atm mol respectively. The most easily liquefiable gas among these is

A. O_2

B. N_2 and O_2

C. NH_3

D. CH_4

Answer: C

Watch Video Solution

3. However great the pressure , a gas cannot be liquified above its :

A. Boyle temperature

B. Inversion temperature

C. Critical temperature

D. Room temperature

Answer: C

Watch Video Solution

4. Which of the following is correct for critical temperature ?

A. It is the highest temperature at which liquid and vapour can coexist

B. Beyond the critical temperature, there is no distinction between the two phases and a gas cannot be liquefied by compression

C. At critical temperature the surface tension of the system is zero

D. At critical temperature the gas and the liquid phases have different critical densities

Answer: D

Watch Video Solution

5. In van der Waals equation for non - ideal gas , the term that accounts for intermolecular force is

A. (V - b)

B. (RT)-1

C. $\left(P + \frac{a}{V^2}\right)$

D. RT

Answer: C

Watch Video Solution

6. Any gas shows maximum deviation from ideal gas behaviour at

A. $0^\circ C$ and 1 atmospheric pressure

B. $100^\circ C$ and 2 atmospheric pressure

C. $-100^\circ C$ and 5 atmospheric pressure

D. $500^\circ C$ and 1 atmospheric pressure

Answer: C

Watch Video Solution

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

A. 15 atm and 200 K

B. 1 atm and 273 K

C. 0.5 atm and 500 K

D. 15 atm and 500 K

Answer: C

Watch Video Solution

8. At low pressure, vander waal's equation is reduced to $\left[P+\frac{a}{V^2}\right]V=RT$. The compressibility factor can be given as :

A. $Z=\frac{PV_m}{RT}=1-\frac{aP}{RT}$

B. $Z=\frac{PV_m}{RT}=1+\frac{bP}{RT}$

C. $PV_m=RT$

D. $Z=\frac{PV_m}{RT}=1-\frac{a}{RT}$

Answer: D

Watch Video Solution

9. Pressure exerted by 1 mole of methane in a 0.25 litre container at 300K using Vander Waal's equation : (Given : $a=2.253\text{atm}l^2\text{mol}^{-2}$ and $b=0.0428l\text{mol}^{-1}$) is

A. 82.82 atm

B. 152.51 atm

C. 190.52 atm

D. 70.52 atm

Answer: A

Watch Video Solution

10. An ideal gas obeying kinetic gas equation can be liquefied if :

A. Its temperature is more than critical temperature T_c

B. Its pressure is more than critical pressure P_c

C. Its pressure is more than P_c at a temperature less than T_c

D. It cannot be liquefied at any value of P and T

Answer: D

Watch Video Solution