Exercise-1

Marked Questions may have for Revision Questions.

OBJECTIVE QUESTIONS

(OBJECTIVE QUESTIONS)

Section (A) : Daltons law of partial pressure

A-1. A cylinder is filled with a gaseous mixture containing equal masses of CO and N_2. The partial pressure ratio is :

(1) $P_{N_2} = P_{CO}$ (2) $P_{CO} = 0.875 P_{N_2}$ (3) $P_{CO} = 2 P_{N_2}$ (4) $P_{CO} = 1/2$

A-2. The ratio of partial pressure of a gaseous component to the total vapour pressure of the mixture is equal to :

(1) mass of the component (2) mole fraction of the component
(3) mass % of the component (4) molecular mass of the component

A-3. Equal volumes of two gases which do not react together are enclosed in separate vessel. Their pressure at 100 mm and 400 mm respectively. If the two vessel are joined together, then what will be the pressure of the resulting mixture (temperature remaining constant) ?

(1) 125 mm (2) 500 mm (3) 1000 mm (4) 250 mm

A-4. a gaseous mixture contains 56 g of N_2, 44 g CO_2 and 16 g of CH_4. The total pressure of the mixture is 720 mm Hg. The partial pressure of CH_4 is

(1) 180 mm (2) 360 mm (3) 540 mm (4) 720 mm

A-5. Equal weights of two gases of molecular weight 4 and 40 are mixed. The pressure of the mixture is 1.1 atm. The partial pressure of the light gas in this mixture is

(1) 0.55 atm (2) 0.11 atm (3) 1 atm (4) 0.11 atm

A-6. What will be the partial pressure of H_2 in a flask containing 2 g of H_2, 14 g of N_2 and 16 g of O_2 : s

(1) 1/2 the total pressure (2) 1/3 the total pressure
(3) 1/4 the total pressure (4) 1/16 the total pressure

A-7. Equal weights of ethane and hydrogen are mixed in an empty container at 25°C. The fraction of the total pressure exerted by hydrogen is :

(1) 1 : 2 (2) 1 : 1 (3) 1 : 16 (4) 15 : 16

A-8. A sample of O_2 gas is collected over water at 23°C at a barometric pressure of 751 mm Hg (vapour pressure of water at 23°C is 21 mm Hg). The partial pressure of O_2 gas in the sample collected is

(1) 21 mm Hg (2) 751 mm Hg (3) 0.96 atm (4) 1.02 atm

A-9. Same mass of CH_4 and H_2 is taken in a container. The partial pressure caused by H_2 (where total pressure is P) is

(1) $\frac{8}{9}P$ (2) $\frac{1}{9}P$ (3) $\frac{1}{2}P$ (4) P

Section (B) : Grahams Law of diffusion

B-1. If 4g of oxygen diffuse through a very narrow hole, how much hydrogen would have diffused under identical conditions ?

(1) 16 g (2) 1 g (3) 1/4 g (4) 64 g

B-2. Two gram of hydrogen diffuse from a container in 10 minutes. How many grams of oxygen would diffuse through the same container in the same time under similar conditions ?
(1) 0.5 g (2) 4 g (3) 6 g (4) 8 g

B-3. If some moles of O_2 diffuse in 18 sec. and same moles of other gas diffuse in 45 sec. then what is the molecular weight of the unknown gas ?
(1) $\frac{45^2}{18^2} \times 32$ (2) $\frac{18^2}{45^2} \times 32$ (3) $\frac{18^2}{45^2 \times 32}$ (4) $\frac{45^2}{18^2 \times 32}$

B-4. The ratio of the rate of diffusion of a given element to that of helium is 1 : 4. The molecular weight of the element is
(1) 32 (2) 64 (3) 16 (4) None of these

B-5. The molecular weight of a gas which diffuse through a porous plug at 1/6th of the speed of hydrogen under identical conditions is
(1) 27 (2) 72 (3) 36 (4) 48

B-6. The time taken for a certain volume of a gas 'X' to diffuse through a small hole is 2 minutes. It takes 5.65 minutes for oxygen to diffuse under the similar conditions. The molecular weight of 'X' is
(1) 8 (2) 4 (3) 16 (4) 32

B-7. The rate of diffusion of SO_2 and O_2 are in the ratio :
(1) 1 : (2) 1 : 32 (3) 1 : 2 (4) 1 : 4

B-8. The ratio of rates of diffusion of SO_2, O_2 and CH_4 is :
(1) $1 : \sqrt{2} : 2$ (2) 1 : 2 : 4 (3) $1 : \sqrt{2} : 1$ (4) $1 : 2 : \sqrt{2}$

B-9. X ml of H_2 gas effuses through a hole in a container in 5 sec. The time taken for the effusion of the same volume of the gas specified below under identical conditions is :
(1) 10 sec. He (2) 20 sec. O_2 (3) 25 sec. CO_2 (4) 55 sec. CO_2

B-10. 50 ml of gas A diffuse through a membrane in the same time as 40 ml of a gas B under identical pressure-temperature conditions. If the molecular weight of A is 64, that of B would be
(1) 100 (2) 250 (3) 200 (4) 80

B-11. The densities of hydrogen and oxygen are 0.09 and 1.44 g L^{-1}. If the rate of diffusion of hydrogen is 1 then that of oxygen in the same units will be :
(1) 4 (2) 1/4 (3) 16 (4) 1/16

B-12. Molecular weight of a gas that diffuses twice as rapidly as the gas with molecular weight 64 is
(1) 16 (2) 8 (3) 64 (4) 6.4

B-13. If rate of diffusion of A is 5 times that of B, what will be the density ratio of A and B ?
(1) 1/25 (2) 1/5 (3) 25 (4) 4

B-14. 50 ml of hydrogen diffuses out through a small hole from a vessel in 20 minutes. The time needed for 40 ml of oxygen to diffuse out is
(1) 12 min (2) 64 min (3) 8 min (4) 32 min

B-15. The densities of two gases are in the ratio of 1 : 16. The ratio of their rates of diffusion is
(1) 16 : 1 (2) 4 : 1 (3) 1 : 4 (4) 1 : 16

B-16. Three footballs are respectively filled with nitrogen , hydrogen and helium. If the leaking of the gas occurs with time from the filling hole, then the ratio of the rate of leaking of gases $(r_{N_2} : r_{H_2} : r_{He})$ from three footballs (in equal time interval) is

(1) $(1 : \sqrt{14} : \sqrt{7})$ (2) $(\sqrt{14} : \sqrt{7} : 1)$ (3) $(\sqrt{7} : 1 : \sqrt{14})$ b (4) $(1 : \sqrt{7} : \sqrt{14})$

Section (C) : Kinetic theory of gases

C-1. The ratio of root mean square velocity to average velocity of gas molecules at a particular temperature is

(1) 1.086 : 1 (2) 1 : 1.086 (3) 2 : 1.086 (4) 1.086 : 2

C-2. Kinetic energy of a gas depends upon its

(1) Molecules mass (2) Atomic mass (3) Equivalent mass (4) None of these

C-3. Which of the following is valid at absolute zero ?

(1) Kinetic energy of the gas becomes zero but the molecuar motion does not become zero

(2) Kinetic energy of the gas becomes zero and the molecular motion also becomes zero

(3) Kinetic energy of the gas decreases but does not become zero

(4) None of the above

C-4. If a gas is expanded at constant temperature

(1) the pressure increase

(2) the kinetic energy of the molecules remains the same

(3) the kinetic energy of the molecules decrease

(4) the number of molecules of the gas increases

C-5. At the same temperature and pressure, which of the following gases will have the highest kinetic energy per mole ?

(1) Hydrogen (2) Oxygen (3) Methane (4) All the same

C-6. The ratio among most probable velocity, mean velocity and root mean square velocity is given by

(1) 1 : 2 : 3 (2) 1 : $\sqrt{2}$: $\sqrt{3}$ (3) $\sqrt{2}$: $\sqrt{3}$: $\sqrt{8/\pi}$ (4) $\sqrt{2}$: $\sqrt{8/\pi}$: $\sqrt{3}$

C-7. The root mean square speeds at STP for the gases H_2, N_2, O_2 and HBr are in the order :

(1) $H_2 < N_2 < O_2 < HBr$ (2) $HBr < O_2 < N_2 < H_2$ (3) $H_2 < N_2 = O_2 < HBr$ (4) $HBr < O_2 < H_2 < N_2$

C-8. What is the relationship between the average velocity (ν), root mean square velocity (u) and most probable velocity (1) ?

(1) α : ν : u : : 1 : 1.128 : 1.224 (2) α : ν : u : : 1.128 : 1 : 1.224

(3) α : ν : u : : 1.128 : 1.224 : 1 (4) α : ν : u : : 1.124 : 1.228 : 1

C-9. The kinetic energy of N molecules of O_2 is x joule at − 123ºC. Another sample of O_2 at 27ºC has a kinetic energy of 2 x. The latter sample contains _______ molecules of O_2

(1) N (2) N/2 (3) 2 N (4) 3 N

C-10. The average kinetic energy in joules of molecules in 8.0 g of methane at 27º C is :

(1) 6.21×10^{-20} J/molecule (2) 6.21×10^{-21} J/molecule

(3) 6.21×10^{-22} J/molecule (4) 3.1×10^{-22} J/molecule

C-11. The kinetic energy for 14 grams of nitrogen gas at 127°C is nearly (mol. mass of nitrogen = 28 and gas constant = 8.31 JK^{-1} mol^{-1})

(1) 1.0 J (2) 4.15 J (3) 2493 J (4) 3.3 J

C-12. The temperature at which RMS velocity of SO_2 molecules is half that of He molecules at 300 K is :
(1) 150 K (2) 600 K (3) 900 K (4) 1200 K

C-13. The rms velocity of an ideal gas at 27°C is 0.3 ms^{-1}. Its rms velocity at 927°C (in m^{-1}) is :
(1) 3.0 (2) 2.4 (3) 0.9 (4) 0.6

C-14. At 27°C, the ratio of rms velocities of ozone to oxygen is :
(1) $\sqrt{3/5}$ (2) $\sqrt{4/3}$ (3) $\sqrt{2/3}$ (4) 0.25

C-15. The average kinetic energy of an ideal gas per molecule in SI units at 25°C will be :
(1) 6.17×10^{-21} kJ (2) 6.17×10^{-21} J (3) 6.17×10^{-20} J (4) 7.16×10^{-20} J

Section (D) : Real gases

D-1. The values of Vander Waals constant "a" for the gases O_2, N_2, NH_3 & CH_4 are 1.36, 1.39, 4.17, 2.253 L^2 atm $mole^{-2}$ respectively. The gas which can most easily be liquified is:
(1) O_2 (2) N_2 (3) NH_3 (4) CH_4

D-2. NH_3 gas is liquefied more easily than N_2. Hence:
(1) van der Waal's constants 'a' and 'b' of NH_3 > that of N_2
(2) van der Waal's constants 'a' and 'b' of NH_3 < that of N_2
(3) a (NH_3) > a (N_2) but b (NH_3) < b (N_2)
(4) a (NH_3) < a (N_2) but b (NH_3) > b (N_2)

D-3. The pressure of real gases is less than that of ideal gas because of
(1) increase in the number of collisions (2) finite size of particles
(3) intermolecular attraction (4) increase in kinetic energy of the molecules

D-4. At lower temperature, all gases show
(1) negative deviation (2) positive deviation
(3) positive and negative deviation (4) None

D-5. The units of the van der Waal's constant 'a' are
(1) atm L^2 mol^{-2} (2) atm L^{-2} mol^{-2} (3) atm L mol^{-1} (4) atm mol L^{-1}

D-6. The units of the van der Waal's constant 'b' are
(1) atmosphere (2) joules (3) L mol^{-1} (4) mol L^{-1}

D-7. For the non-zero values of force of attraction between gas molecules, gas equation will be :
(1) $PV = nRT - \frac{n^2a}{V}$ (2) PV = nRT + nbP (3) PV = nRT (4) $P = \frac{nRT}{V-b}$

D-8. At low pressures, the van der Waal's equation is written as :

$$\left[p + \frac{a}{V^2}\right] V = RT$$

The compressibility factor is then equal to:
(1) $\left(1 - \frac{a}{RTV}\right)$ (2) $\left(1 - \frac{RTV}{a}\right)$ (3) $\left(1 + \frac{a}{RTV}\right)$ (4) $\left(1 + \frac{RTV}{a}\right)$

D-9. Gases deviate from the ideal gas behaviour because their molecules
(1) possess negligible volume (2) have forces of attraction between them

(3) are polyatomic (4) are not attracted to one another

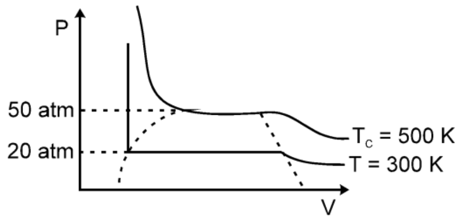
D-10. In van der Wall's equation of state for a non-ideal gas, the term that accounts for intermolecular forces is :

(1) (V–b) (2) $(RT)_{-1}$ (3) $\left(p+\frac{a}{V^2}\right)$ (4) RT

D-11. A real gas most closely approaches the behaviour of an ideal gas at

(1) 15 atm and 200 K (2) 1 atm and 273 K (3) 0.5 atm and 500 K (4) 15 atm and 500 K

D-12. For a real gas the P-V curve was experimentally plotted, and it had the following appearance. With respect to liquefaction. Choose the ***correct*** statement.



(1) at T = 500 K, P = 40 atm, the state will be liquid.
(2) at T = 300 K, P = 50 atm, the state will be gas
(3) at T < 300 K, P > 20 atm, the state will be gas
(4) at 300 K < T < 500 K, P > 50 atm, the state will be liquid.

D-13. The compressibility factor for an ideal gas is

(1) 1.5 (2) 1.0 (3) 2.0 (4) ∞

D-14. When is deviation more in the behaviour of a gas from the ideal gas equation PV = nRT ?

(1) At high temperature and low pressure (2) At low temperature and high pressure
(3) At high temperature and high pressure (4) At low temperature and low high pressure

D-15. The van der Waal's parameters for gases W,X,Y and Z are

Gas	a (atm L^2 mol^{-2})	b (L mol^{-1})
W	4.0	0.027
X	8.0	0.030
Y	6.0	0.032
Z	12.0	0.027

Which one of these gases has the highest critical temperature ?

(1) W (2) X (3) Y (4) Z

Exercise-2

✍ **Marked Questions may have for Revision Questions.**

OBJECTIVE QUESTIONS

1. Two flasks of equal volume are connected by a narrow tube (of negligible volume) all at 27ºC and contain 0.70 mole of H_2 at 0.5 atm. One of the flask is then immersed into a bath kept at 127ºC, while the other remains at 27ºC. The final pressure in each flask is :

(1) Final pressure = 0.5714 atm (2) Final pressure = 1.5714 atm
(3) Final pressure = 0.5824 atm (4) None of these

2. Two flasks of equal volume are connected by a narrow tube (of negligible volume) all at 27ºC and contain 0.70 moles of H_2 at 0.5 atm. One of the flask is then immersed into a bath kept at 127ºC, while the other remains at 27ºC. The number of moles of H_2 in flask 1 and flask 2 are :

(1) Moles in flask 1 = 0.4, Moles in flask 2 = 0.3 (2) Moles in flask 1 = 0.2, Moles in flask 2 = 0.3
(3) Moles in flask 1 = 0.3, Moles in flask 2 = 0.2 (4) Moles in flask 1 = 0.4, Moles in flask 2 = 0.2

3. One litre of a gaseous mixture of two gases effuses in 311 seconds while 2 litres of oxygen takes 20 minutes. The vapour density of gaseous mixture containing CH_4 and H_2 is :

(1) 4 (2) 4.3 (3) 3.4 (4) 5

4. Pure O_2 diffuses through an aperture in 224 second, whereas mixture of O_2 and another gas containing 80% O_2 diffuses from the same in 234 second. The molecular mass of gas will be

(1) 51.5 (2) 48.6 (3) 55 (4) 46.6

5. A straight glass tube as shown , has 2 inlets X & Y at the two ends of 200 cm long tube. HCl gas through inlet X and NH_3 gas through inlet Y are allowed to enter in the tube at the same time and under the identical conditions. At a point P inside the tube both the gases meet first. The distance of point P from X is :

(1) 118.9 cm (2) 81.1 cm (3) 91.1 cm (4) 108.9 cm

6. 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

(1) 7 (2) 10 (3) 9 (4) 8

7. A certain volume of argon gas (Mol. Wt. = 40) requires 45 s to effuse through a hole at a certain pressure and temperature. The same volume of another gas of unknown molecular weight requires 60 s to pass through the same hole under the same conditions of temperature and pressure. The

(1) 53 (2) 35 (3) 71 (4) 120

8. A sample of an ideal gas was heated from 30ºC to 60ºC at constant pressure. Which of the following statement(s) is/are true.

(1) Kinetic energy of the gas is doubled (2) Boyle's law will apply

(3) Volume of the gas will be doubled (4) None of the above

9. A real gas obeying Vander Waal's equation will resemble ideal gas, if the :

(1) constants a & b are small (2) a is large & b is small

(3) a is small & b is large (4) constant a & b are large

10. The correct order of normal boiling points of O_2, N_2, NH_3 and CH_4, for whom the values of vander Waal's constant 'a' are 1.360, 1.390, 4.170 and 2.253 L^2. atm. mol^{-2} respectively, is :

(1) $O_2 < N_2 < NH_3 < CH_4$ (2) $O_2 < N_2 < CH_4 < NH_3$

(3) $NH_3 < CH_4 < N_2 < O_2$ (4) $NH_3 < CH_4 < O_2 < N_2$

11. What is the compressibility factor (Z) for 0.02 mole of a van der Waals' gas at pressure of 0.1 atm. Assume the size of gas molecules is negligible.

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

(1) 2 (2) 1 (3) 0.02 (4) 0.5

12. Which of following statement (s) is true

I – Slope of isotherm at critical point is maximum.

II – Larger is the value of T_C easier is the liquification of gas.

III – Vander waals equation of state is applicable below critical temperature at all pressure.

(1) only I (2) I & II (3) II & III (4) only II

13. Consider the following statements: If the van der Waal's parameters of two gases are given as

	a (atm lit^2 mol^{-2})	b (lit mol^{-1})
Gas X:	6.5	0.056
Gas Y:	8.0	0.011

then (i) : V_C (X) < V_C (Y) (ii) : P_C (X) < P_C (Y) (iii) : T_C (X) < T_C(Y)

Select correct alternate:

(1) (i) alone (2) (i) and (ii) (3) (i), (ii) and (iii) (4) (ii) and (iii)

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

(1) $\frac{25}{\pi N}$ (2) $\frac{100}{\pi N}$ (3) $\frac{6}{\pi N}$ (4) $\frac{25}{4N\pi}$

Exercise-3

PART - I : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

OFFLINE JEE-MAIN

1. Value of gas constant R is : **[AIEEE 2002, 3/225]**

(1) 0.082 litre atm. (2) 0.987 cal mol^{-1} K^{-1} (3) 8.3 J mol^{-1} K^{-1} (4) 83 erg mol^{-1} K^{-1}

2. Kinetic theory of gases proves : **[AIEEE 2002, 3/225]**

(1) Only Boyle's law (2) Only Charles law

(3) Only Avagadro's law (4) All of these

3. For an ideal gas, number of moles per litre in terms of its pressure P, gas constant R and temperature T is: **[AIEEE 2002, 3/225]**

(1) PT/R (2) PRT (3) P/RT (4) RT/P

4. According to kinetic theory of gases in an ideal gas between two successive collisions a gas molecule travels: **[AIEEE 2003, 3/225]**

(1) In a straight line path (2) With an accelerated velocity

(3) In a circular path (4) In a wavy path

5. What volume of hydrogen gas, at 273 K and 1 atm pressure will be consumed in obtaining 21.6g of elemental boron (atomic mass = 10.8) from the reduction of boron trichloride by hydrogen?

[AIEEE 2003, 3/225]

[AIEEE 2003, 3/225]

(1) 89.6 L (2) 67.2 L (3) 44.8 L (4) 22.4 L

6. As the temperature is raised from 20^oC to 40^oC, the average kinetic energy of neon atoms changes by a factor : **[AIEEE 2004, 3/225]**

(1) 2 (2) $\sqrt{\frac{313}{293}}$ (3) $\frac{313}{293}$ (4) $\frac{1}{2}$

7. In vander Waal's equation of state of the gas law, the constant 'b' is a measure of: **[AIEEE 2004, 3/225]**

(1) Intermolecular collisions per unit volume (2) Intermolecular attractions

(3) Volume occupied by the molecules (4) Intermolecular repulsions

8. Which one of the following statements regarding helium is incorrect ? **[AIEEE 2004, 3/225]**

(1) It is used to fill gas balloons instead of hydrogen because it is lighter and non-inflammable
(2) It is used as a cryogenic agent for carrying out experiments at low temperatures
(3) It is used to produce and sustain powerful superconducting magnets
(4) It is used in gas-cooled nuclear reactors

9. Which one of the following statements is not true about the effect of an increase in temperature on the distribution of molecular speeds in a gas ? **[AIEEE 2005, 3/225]**

(1) The area under the distribution curve remains the same as under the lower temperature
(2) The distribution becomes broader
(3) The fraction of the molecules with the most probable speed increases
(4) The most probable speed increases

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

[JEE(Main) 2013, 4/120]

(1) C* : $\bar{C}$: C = 1.225 : 1.128 : 1 (2) C* : $\bar{C}$: C = 1.128 : 1.225 : 1

(3) C* : $\bar{C}$: C = 1 : 1.128 : 1.225 (4) C* : $\bar{C}$: C = 1 : 1.225 : 1.128

11. A gaseous hydrocarbon gives upon combustion 0.72 g of water and 3.08 g. of CO_2. The empirical formula of the hydrocarbon is : **[JEE(Main) 2013, 4/120]**

(1) C_2H_4 (2) C_3H_4 (3) C_6H_5 (4) C_7H_8

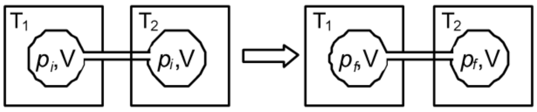
12. If Z is a compressibility factor, vander Waals equation at low pressure can be written as :

[JEE(Main) 2014, 4/120]

[JEE(Main) 2014, 4/120]

(1) $Z = 1 + \frac{RT}{Pb}$ (2) $Z = 1 - \frac{a}{VRT}$ (3) $Z = 1 - \frac{Pb}{RT}$ (4) $Z = 1 + \frac{Pb}{RT}$

13. 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 p_f is: **[JEE(Main) 2016, 4/120]**



(1) $2p_i\left(\frac{T_1}{T_1+T_2}\right)$ (2) $2p_i\left(\frac{T_2}{T_1+T_2}\right)$ (3) $2p_i\left(\frac{T_1T_2}{T_1+T_2}\right)$ (4) $p_i\left(\frac{T_1T_2}{T_1+T_2}\right)$

ONLINE JEE-MAIN

1. Vander Waal's equation for a gas is stated as, $P = \frac{nRT}{V-nb} - a\left(\frac{n}{V}\right)^2$.

This equation reduces to the perfect gas equation, $P = \frac{nRT}{V}$ when,
[JEE(Main) 2014 Online (09-04-14), 4/120]

(1) temperature is sufficiently high and pressure is low.
(2) temperature is sufficiently low and pressure is high.
(3) both temperature and pressure are very high.
(4) both temperature and pressure are very low.

2. The temperature at which oxygen molecules have the same root mean square speed as helium atoms have at 300 K is : (Atomic masses : He = 4 u, O = 16 u) **[JEE(Main) 2014 Online (09-04-14), 4/120]**
(1) 300 K (2) 600 K (3) 1200 K (4) 2400 K

3. The initial volume of a gas cylinder is 750.0 mL. If the pressure of gas inside the cylinder changes from 840.0 mm Hg to 360.0 mm Hg, the final volume the gas will be :
[JEE(Main) 2014 Online (11-04-14), 4/120]
(1) 1.750 L (2) 3.60 L (3) 4.032 L (4) 7.50 L

4. Sulphur dioxide and oxygen were allowed to diffuse through a porpus partition. 20 dm^3 of SO_2 diffuses through the porous partition is 60 seconds. The volume of O_2 in dm^3 which diffuses under the similar condition in 30 seconds will be (atomic mass of sulphur = 32 u) :
[JEE(Main) 2014 Online (19-04-14), 4/120]
(1) 7.09 (2) 14.1 (3) 10.0 (4) 28.2

5. Which of the following is not an assumption of the kinetic theory of gases ?
[JEE(Main) 2015 Online (10-04-15), 4/120]
(1) Gas particles have negligible volume
(2) A gas consists of many identical particels which are in continual motion
(3) At high pressure, gas particles are difficult to compress
(4) Collisions of gas particles are perfectly elastic

6. When does a gas deviate the most from its ideal behaviour ?
[JEE(Main) 2015 Online (11-04-15), 4/120]
(1) At low pressure and low temperature (2) At low pressure and high temperature
(3) At high pressure and low temperature (4) At high pressure and high temperature

7. At very high pressures, the compressibility factor of one mole of a gas is given by :
[JEE(Main) 2016 Online (09-04-16), 4/120]
(1) $1 + \frac{pb}{RT}$ (2) $\frac{pb}{RT}$ (3) $1 - \frac{b}{(VRT)}$ (4) $1 - \frac{pb}{RT}$

8. Initially, the root mean square (rms) velocity of N_2 molecules at certain temperature is u. If this temperature is doubled and all the nitrogen molecules dissociate into nitrogen atoms, then the new *rms* velocity will be : **[JEE(Main) 2016 Online (10-04-16), 4/120]**
(1) 2 u (2) 14 u (3) u / 2 (4) 4 u

9. 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 : **[JEE(Main) 2017 Online [09-04-2017]**
(1) 56 g mol^{-1} (2) 112 g mol^{-1} (3) 224 g mol^{-1} (4) 28 g mol^{-1}

PART - II : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

*** Marked Questions are having more than one correct option.**

1. The compressibility of a gas is less than unity at S.T.P. therefore, **[JEE-2000, 1/35]**

(A) V_m > 22.4 litres (B) V_m < 22.4 litres (C) V_m = 22.4 litres (D) V_m = 44.8 litres

2. The rms velocity of hydrogen is $\sqrt{7}$ times the rms velocity of nitrogen. If T is the temperature of the gas, then **[JEE-2000, 1/35]**

(A) $T_{(H_2)} = T_{(N_2)}$ (B) $T_{(H_2)} > T_{(N_2)}$ (C) $T_{(H_2)} < T_{(N_2)}$ (D) $T_{(H_2)} = \sqrt{7}\ \ T_{(N_2)}$

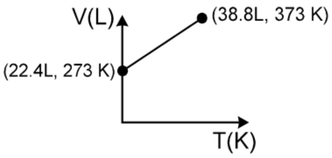
3. At 100°C and 1 atm, if the density of liquid water is 1.0 g cm^{-3} and that of water vapour is 0.0006 g cm^{-3}, that the volume occupied by water molecules in 1 liter of st eam at that temperature is :

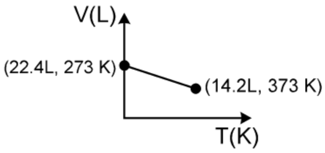
(A) 6 cm^3 (B) 60 cm^3 (C) 0.6 cm^3 (D) 0.06 cm^3 **[JEE-2000, 1/35]**

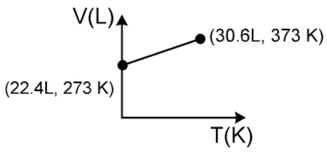
4. The root mean square velocity of an ideal gas at constant pressure varies with density (d) as :

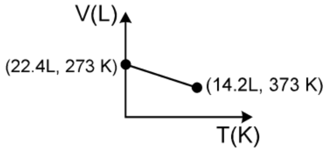
(A) d^2 (B) d (C) $\sqrt{d}$ (D) $1/\sqrt{d}$

5. Which of the following volume (v)-temperature (T) plots represent the behaviour of one mole of an ideal gas at one atmospheric pressure. **[JEE-2002, 3/90]**

(A) 

(B) 

(C) 

(D) 

6. For one mole of gas the average kinetic energy is given as E. The U_{rms} of gas is : **[JEE-2004, 3/84]**

(A) $\sqrt{\frac{2E}{M}}$ (B) $\sqrt{\frac{3E}{M}}$ (C) $\sqrt{\frac{2E}{3M}}$ (D) $\sqrt{\frac{3E}{2M}}$

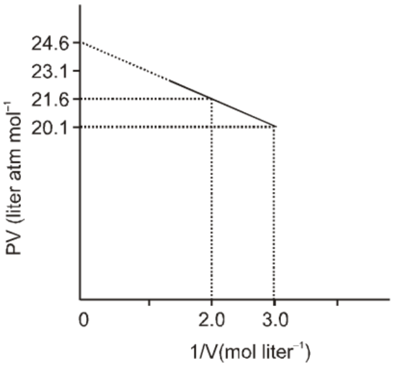
7. Ratio of rates of diffusion of He and CH_4 (under identical conditions). **[JEE-2005, 3/84]**

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

8. The term that corrects for the attractive forces present in a real gas in the vander Waals equation is : **[JEE-2009, 3/80]**

(A) nb (B) $\frac{an^2}{V^2}$ (C) $-\frac{an^2}{V^2}$ (D) –nb **[JEE-2009, 3/80]**

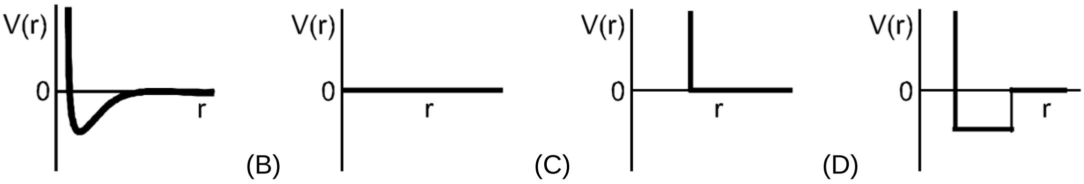
9. For one mole of a van der Waals gas when b = 0 and T = 300 K, the PV vs.1/V plot is shown below. The value of the vanderWaals constant a (atm.liter^2 mol^{-2}) : **[JEE-2012, 3/136]**



(A) 1.0 (B) 4.5 (C) 1.5 (D) 3.0

10. 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 the gas is given by

[JEE(Advanced)-2015, 4/168]



(A) (B) (C) (D)

Answers

EXERCISE - 1

A-1.	(1)	**A-2.**	(2)	**A-3.**	(4)	**A-4.**	(1)	**A-5.**	(3)
A-6.	(1)	**A-7.**	(4)	**A-8.**	(3)	**A-9.**	(1)	**B-1.**	(2)
B-2.	(4)	**B-3.**	(1)	**B-4.**	(2)	**B-5.**	(2)	**B-6.**	(2)
B-7.	(1)	**B-8.**	(1)	**B-9.**	(2)	**B-10.**	(1)	**B-11.**	(2)
B-12.	(1)	**B-13.**	(1)	**B-14.**	(2)	**B-15.**	(2)	**B-16.**	(1)
C-1.	(1)	**C-2.**	(4)	**C-3.**	(2)	**C-4.**	(2)	**C-5.**	(4)
C-6.	(4)	**C-7.**	(2)	**C-8.**	(1)	**C-9.**	(1)	**C-10.**	(2)
C-11.	(3)	**C-12.**	(4)	**C-13.**	(4)	**C-14.**	(3)	**C-15.**	(2)
D-1.	(3)	**D-2.**	(3)	**D-3.**	(3)	**D-4.**	(1)	**D-5.**	(1)
D-6.	(3)	**D-7.**	(1)	**D-8.**	(1)	**D-9.**	(2)	**D-10.**	(3)
D-11.	(3)	**D-12.**	(4)	**D-13.**	(2)	**D-14.**	(2)	**D-15.**	(4)

EXERCISE - 2

1.	(1)	**2.**	(1)	**3.**	(2)	**4.**	(1)	**5.**	(2)
6.	(3)	**7.**	(3)	**8.**	(4)	**9.**	(1)	**10.**	(2)
11.	(4)	**12.**	(2)	**13.**	(4)	**14.**	(4)		

EXERCISE - 3

PART - I
OFFLINE JEE-MAIN

1.	(3)	**2.**	(4)	**3.**	(3)	**4.**	(1)	**5.**	(2)
6.	(3)	**7.**	(3)	**8.**	(3)	**9.**	(3)	**10.**	(3)
11.	(4)	**12.**	(2)	**13.**	(2)				

ONLINE JEE-MAIN

1.	(1)	**2.**	(4)	**3.**	(1)	**4.**	(2)	**5.**	(3)
6.	(3)	**7.**	(1)	**8.**	(1)	**9.**	(2)		

PART - II

1.	(B)	**2.**	(C)	**3.**	(C)	**4.**	(D)	**5.**	(C)
6.	(A)	**7.**	(D)	**8.**	(B)	**9.**	(C)	**10.**	(C)