Exercise # 1

Q.1 Ratio of O_2 and N_2 in a mixture .of these gases is 1 : 4, then what will be the ratio of numbers of molecules in the mixture of the gases?

(1) 1:4 (2) 7 : 32 (3) 3 : 16 (4) 3:32

Q.2 What should be the ratio of root mean square velocity of molecular hydrogen and molecular oxygen, respectively?

(1) 4 : 1 (2) 1 : 4 (3) 1 : 2 (4) 1 : 8

Q.3 Maximum number of molecules are present in

(1) 54 g of N_2O_5 (2) 28 g of CO (3) 36 g of H_2O (4) 46 g of C_2H_5OH.

Q.4 Number of atoms in 12 gram of $_6C^{12}$ is

(1) 6 (2) 6×10^{-23} (3) 12 (4) $12 \times 6 \times 10^{23}$

Q.5 A gas at 30° C is Compressed to reduce its volume to half of its initial volume. At what temperature will it become double of its initial volume?

(1) 60°C (2)303°C (3) 240°C (4) 606°C

Q.6 Volume of a gas at 35° C and 1 atmospheric pressure is 3.75 litre. If volume is to be made 3.0 litre at same pressure, then the temperature will be

(1) –26.6ºC (2) 0ºC (3) 3.98ºC (4) 28ºC

Q.7 Which of the following is incorrect relation in the critical constants Vc, Tc and Pc?

(1) $a = 3 PcVc^2$ (2) $b = Vc/3$ (3) $Tc = 8a/27Rb$ (4) $b = 3 \times Vc$

Q.8 At what temperature, the RMS velocities of hydrogen (1 atm. pressure) and oxygen (NTP) will be same

(1) 37 K (2) 17 K (3) 512K (4) 27 K

Q.9 5 grams each of HF, HCI, HBr and HI have been taken at 87° C and 750 mm pressure. Which of the following should have maximum volume?

(1) HF (2) HCI (3) HBr (4) HI

Q.10 Temperature of 20 lit res of nitrogen at constant pressure is increased from 100 K to 300 K, then the change in volume will be

(1) 80 litre (2) 60 litre (3) 40 litre (4) 20 litre

Q.11 Value of average free path at 1 atmospheric pressure is L, then what should be its value at 5 atmospheric pressure?

(1) 2/5 L (2) 5 L (3) L/5 (4) Uncertain

Q.12 Equal molecules of N_2 and O_2 are kept in a closed container at pressure P. If N_2 is removed from the system, then the pressure will be

(1) P (2) 2P (3) P/2 (4) P^2

Q.13 Order of the rate of diffusion of SO_2, CO_2, PCl_3 and SO_3 will be

(1) $SO_2 > SO_3 > PCl_3 > CO_2$ (2) $CO_2 > SO_2 > SO_3 > PCl_3$

(3) $PCl_3 > SO_3 > SO_2 > CO_2$ (4) $CO_2 > SO_2 > PCl_3 > SO_3$

Q.14 What should be the pressure of 2 mole of an ideal gas at 546 K and 44.8 litre volume? .

(1) 2 atm. (2) 1 atm. (3) 4 atm. (4) 5 atm.

Q.15 At 27° C and 750 mm pressure, volume of a gas is 38 ml, then its volume at STP will be

(1) 34 ml (2) 43 ml (3) 4.3 ml (4) 3.4 ml

Q.16 At which temperature, the average velocity of N_2 molecules will be equal to the velocity of He molecules at 300 K?

(1) 2100 K (2) 1100 K (3) 420 K (4) None of the above

Q.17 What should be the partial pressure of H_2 in a flask, if 2.016 gram of H_2 and 16.0 gram of O_2 are present in it?

(1) 1/8 of total pressure (2) 1/6 of total pressure

(3) 1/4 of total pressure (4) 2/3 or total pressure

Q.18 What should be the volume of O_2 obtained on decomposition of 15 ml 20% H_2O_2 at STP?
(1) 150 ml (2) 300 ml (3) 200 ml (4) 250 ml

Q.19 21 % by volume of oxygen is present in one litre of air. What should be the number of moles in oxygen ?
(1) 0.186 (2) 0.21 (3) 2.10 (4) 0.93

Q.20 If the density of a gas A is 1.5 times that of B then the molecular mass of A is M. The molecular mass of B will be
(1) 1.5M (2) M/1.5 (3) 3M (4) M/3

Q.21 Which of the following is not heavier than dry air
(1) Moist air (2) SO_2 (3) Cl_2 (4) O_2

Q.22 When the pressure-of 5L of N_2 is doubled and its temperature is raised from 300K to 600K, the final volume of the gas would be
(1) 10L (2) 5L (3) 15L (4) 20L

Q.23 One mole of CO_2 contain
(1) 6.02×10^{23} atoms of C (2) 6.02×10^{23} atoms of O
(3) 18.1×10^{23} molecules of CO_2 (4) 3 gm atoms of CO_2

Q.24 In the gas equation PV = nRT, the value of universal gas constant would depend only on
(1) The nature of the gas (2) The pressure of the gas
(3) The temperature of the gas (4) The units of measurement

Q.25 At constant temperature, in a given mass of an ideal gas
(1) The ratio of pressure and volume always remains constant
(2) Volume always remains constant
(3) Pressure always remains constant.
(4) The product of pressure and volume always remains constant.

Q.26 Which of the following does not represents ideal gas equation
(1) PV = 1/3m Nu (2) PV = nRT (3) $P = \rho RT/M$ (4) PV = RT

Q.27 The Vander Waals' equation explains the behaviour of
(1) Ideal gases (2) Real gases (3) Vapours (4) Non-real gases.

Q.28 8.2 L of an ideal gas weighs 9.0 gm at 300 K and 1 atm pressure. The molecular mass of gas is
(1) 9 (2) 27 (3) 54 (4) 81

Q.29 Energy in an ideal gas is
(1) Completely kinetic (2) Completely potential (3) KE + PE (4) All the above

Q.30 The value of gas constant per mole is approximately
(1) 1cal (2) 2 cal (3) 3 cal (4) 4 cal

Q.31 When gases are heated from 20°C to 40°C at constant pressure, the volumes
(1) Increase by the same magnitude (2) become double
(3) Increase in the ratio of their molecular masses
(4) increases but to different extent

Q.32 Dalton's law of partial pressure is not applicable to
(1) H_2 and N_2 mixture (2) H_2 and Cl_2 mixture
(3) H_2 and CO_2 mixture (4) None

Q.33 A cylinder is filled with a gaseous mixture containing equal masses of CO and N_2. The ratio of their partial pressure is-

(1) $P_{N_2} = P_{CO}$ (2) $P_{CO} = 0.875\, P_{N_2}$ (3) $P_{CO} = 2\, P_{N_2}$ (4) $P_{CO} = \frac{1}{2}\, P_{N_2}$

Q.34 A certain mass of a gas occupies a volume of 21itres at STP. Keeping the pressure constant at what temperature would the gas occupy a volume of 4 litres
(1) 546°C (2) 273°C (3) 100°C (4) 50°C

Q.35 If 500 ml of a gas 'A' at 1000 torr and 1000 ml of gas 'B' at 800 torr are placed in a 2L container, the final pressure will be-
(1) 100 torr (2) 650 torr (3) 1800 torr (4) 2400 torr

Q.36 The total pressure of a mixture of two gases is
(1) The sum of partial pressures of each gas (2) The difference in partial pressures
(3) The product of partial pressures (4) The ratio of partial pressures.

Q.37 Equal masses of SO_2, CH_4 and O_2 are mixed in empty container at 298 K, when total pressure is 2.1 atm. The partial pressures of CH_4 in the mixture is
(1) 0.5 atm (2) 0.75 atm (3) 1.2 atm (4) 0.6 atm.

Q.38 A 0.5 dm^3 flask contains gas 'A' and 1 dm^3 flask contains gas 'B' at the same temperature. If density of A = 3.0 gm dm^{-3} and that of B = 1.5 gm dm^{-3} and the molar mass of A = 1/2 of B, then the ratio of pressure exerted by gases is-
(1) $P_A/P_B = 2$ (2) $P_A/P_B = 1$ (3) $P_A/P_B = 4$ (4) $P_A/P_B = 3$

Q.39 Avogadro's number of helium atom weighs
(1) 1 gm (2) 4 gm (3) 8 gm (4) $4 \times 6.02 \times 10^{23}$ gm

Q.40 Equal volumes of all gases under the same conditions of temperature and pressure contain equal number of-.
(1) Atoms (2) Molecules (3) Radicals (4) Compound atoms.

Q.41 Two flasks A and B of 500 ml each are respectively filled with O_2 and SO_2 at 300 K and 1 atm. pressure. The flasks will contain -
(1) The same number of atoms (2) The same number of molecules
(3) More number of moles in flask A as compared to flask B
(4) The same amount of gases

Q.42 Number of molecules in one litre of water is close to
(1) $18 \times 6.023 \times 10^{23}$ (2) $\frac{18}{22.4 \times 10^{23}}$
(3) $55.5 \times 6.023 \times 10^{23}$ (4) None of these

Q.43 While He is allowed to expand through a small jet under adibetic condition heating effect is observed. This is due to the fact that
(1) Helium is an inert gas (2) Helium is a noble gas
(3) Helium is an ideal gas (4) The inversion temp. of helium is very low

Q.44 A gas 'A' having molecular weight 4 diffuses thrice as fast as the gas B. The molecular weight of gas B is
(1) 36 (2) 12 (3) 18 (4) 24

Q.45 The increasing order of effusion among the gases, H_2, O_2, NH_3 and CO_2 is
(1) H_2, CO_2, NH_3, O_2 (2) H_2, NH_3, O_2, CO_2
(3) H_2, O_2, NH_3, CO_2 (4) CO_2, O_2, NH_3, H_2

Q.46 The rate of diffusion of methane at a given temperature is twice that of a gas X. The molecular weight of X is
(1) 64 (2) 32 (3) 4 (4) 8

Q.47 A gas X diffuses three times faster than another gas Y the ratio of their densities i.e., D_x: D_y is
(1) 1/3 (2) 1/9 (3) 1/6 (4) 1/12

Q.48 A gas is found to have a formula $[CO]_x$. If its-vapour density is 70 the value of x is
(1) 2.5 (2) 3.0 (3) 5.0 (4) 6.0

Q.49 The density of a gas is equal to ? (P = pressure; V = volume; T = temperature, R = gas constant, n = number of moles and M = molecular wt)–
(1) nP (2) PM / RT (3) P / RT (4) M/V

Q.50 In which of the following pairs the gaseous species diffuse through a porous plug with the same rate of diffusion
(1) NO, CO (2) NO, CO_2 (3) NH_3, PH_3 (4) NO, C_2H_6

Q.51 Gases deviate from ideal gas behaviour at high pressure. Which of the following is correct for non ideality
(1) At high pressure, the collision between the gas molecules becomes enormous
(2) At high pressure, the gas molecules move only in one direction
(3) At high pressure, the volume of gas becomes insignificant
(4) At high pressure the intermolecular interaction become significant

Q.52 If saturated vapours are compressed slowly (temperature remaining constant) to half the initial volume, the vapour pressure will
(1) Become four times (2) Become doubled (3) Remain unchanged (4) Become half

Q.53 If a gas is expanded at constant temperature
(1) Number of molecules of the gas decreases
(2) The kinetic energy of the molecule decreases
(3) The kinetic energy of the molecules remains the same
(4) The kinetic energy of the molecules increases

Q.54 Four rubber tubes are respectively filled with H_2, O_2, N_2 and He. The tube which will be reinflated first is
(1) H_2 filled tube (2) O_2 filled tube (3) N_2 filled tube (4) He filled tube

Q.55 A vessel has two equal compartmemts A and B containing H_2 and O_2 respectively, each at 1 atm pressure. If the wall separating the compartment is removed, the pressure
(1) Will remain unchanged in A and B (2) Will increase in A and decrease in B
(3) Will decrease in A and increase in B (4) Will increase in both A and B

Q.56 The P of real gases is less than the ρ of an ideal gas because,of
(1) Increase in number of collisions (2) 'Finite size of molecule
(3) Increase in KE of molecules (4) Intermolecular forces

Q.57 In the Haber process metallic oxides catalyse reaction between gaseous nitrogen and hydrogen to yield ammonia whose volume (STP) relative to the total volume of reactants (STP) would be
(1) One-fourth (2) Half (3) The same (4) Three - fourth

Q.58 A flask of methane (CH_4) was weighed. Methane was then pushed out and the flask again weighed when filled with oxygen at the same temperature and pressure. The mass of oxygen would be
(1) The same as the methane (2) Half of the methane.
(3) Double of that of methane (4) Negligible in comparison to that of methane

Q.59 A balloon filled with methane (CH_4) is pricked with a sharp point and quickly plunged into a tank of hydrogen at the same pressure. After sometime, the balloon will have -
(1) Enlarged (2) Collapsed
(3) Remain unchanged in size (4) Ethylene (C_2H_4) inside it

Q.60 A gas approaches an ideal gas behaviour when
(1) Compressed to a smaller volume at constant temp.
(2) Temperature is raised keeping the volume constant
(3) More gas is introduced into the same volume at the same temperature
(4) Volume is increased keeping the temp. constant

Q.61 Longest mean free path stands for
(1) Nitrogen (N_2) (2) Oxygen (O_2) (3) Hydrogen (H_2) (4) Chlorine (Cl_2)

Q.62 A gas can be liquefied by
(1) Cooling (2) Compressing (3) Both (4) None of these.

Q.63 Two flasks X and Y have capacity 1 Land 2L respectively and each of them contains 1 mole of a gas. The temperature of the flask are so adjusted that average speed of molecules in X is twice as those in Y. The pressure in flask X would be
(1) Same as that in Y (2) Half of that in Y
(3) Twice of that in Y (4) 8 times of that in Y

Q.64 The partial pressure of hydrogen in a flask containing 2gm of H_2 & 32gm of SO_2 is

(1) $\frac{1}{16}$ of total pressure (2) $\frac{1}{2}$ of total pressure

(3) $\frac{2}{3}$ of total pressure (4) $\frac{1}{8}$ of total pressure.

Q.65 At relatively high pressure, Vander Waals equation reduces to - (For 1 mole)

(1) PV = RT (2) PV = RT - a/V (3) PV = RT + Pb (4) PV = RT - a/ V^2

Q.66 Which set of conditions represents easiest way to liquify a gas

(1) Low temperature and high pressure (2) High temperature and low pressure.

(3) Low temperature and low pressure (4) High temperature and high pressure

Q.67 One litre of an unknown gas weighs 1.25 gm at N.T.P. which of the foliowing gas pertains to the above data -

(1) CO_2 (2) NO_2 (3) N_2 (4) O_2

Q.68 Solubility of a gas in water

(1) Increases with temperature (2) Decreases with pressure

(3) Decreases with temperature (4) None

Q.69 Which is not correct in terms of kinetic theory of gases

(1) Gases are made up of small particles called molecules

(2) The molecules are in constant motion

(3) When molecules collide, they lose energy

(4) When the gas is heated, the molecules moves faster

Q.70 The kinetic energy of 1 mole of gas is equal to

(1) $\frac{3}{2}$RT (2) $\frac{3}{2}$ KT (3) $\frac{RT}{2}$ (4) $\frac{2R}{3}$

Q.71 Which of the following expression does not give root mean square velocity

(1) $\left(\frac{3RT}{M}\right)^{1/2}$ (2) $\left(\frac{3P}{DM}\right)^{1/2}$ (3) $\left(\frac{3P}{M}\right)^{1/2}$ (4) $\left(\frac{3PV}{M}\right)^{1/2}$

Q.72 Which one of the following gases would have the highest R.M.S.velocity at 25°C

(1) Oxygen (2) Carbon dioxide (3) Sulphur dioxide (4) Carbon monoxide.

Q.73 If the r.m.s. velocity of nitrogen molecules is 5.15 ms^{-1} at 298 K,.then a velocity of 10.30 ms^{-1} will be possessed at a temp-

(1) 149K (2) 172.6 K (3) 596 K (4) 1192K

Q.74 Among the following gases which one has the lowest root mean square velocity at 25°C

(1) SO_2 (2) N_2 (3) O_2 (4) Cl_2

Q.75 By how many folds the temp of a gas would increase when the r.m.s. velocity of gas molecules in a closed container of fixed volume is increased from 5 x 10^4 cm S^{-1} to 10 x 10^4 cm s^{-1}

(1) 0.5 times (2) 2 times (3) 4 times (4) 16 times.

Q.76 At S.T.P. the order of mean square velocity of molecules H_2, N_2, O_2 and HBr is

(1) $H_2 > N_2 > O_2 > HBr$ (2) $HBr > O_2 > N_2 > H_2$

(3) $HBr > H_2 > O_2 > N_2$ (4) $N_2 > O_2 > H_2 > HBr$

Q.77 Most probable speed, average speed and RMS speed are related as

(1) 1: 1.128 : 1.224 (2) 1: 1.128 : 1.424 (3) 1: 2.128: 1.224 (4) 1 : 1.428 : 1.442

Q.78 The root mean square velocity of an ideal gas in a closed container of fixed volume is increased from 5×10^4 cm. s^{-1} to 10×10^4 cm. s^{-1}. Which of the following statements might correctly explain how the change accomplished

(1) By heating the gas, the temperature is doubled

(2) By heating the gas, the pressure is made four times

(3) By heating the gas, the volume is tripled'

(4) By heating the gas, the pressure is doubled.

Q.79 With increase in pressure, the mean free path

(1) Increases. (2) Becomes zero (3) Decreases (4) Remains constant

Q.80 If the mean free path is l at one atm pressure then its value at 5 atm pressure

(1) $5l$ (2) $\frac{2}{5}l$ (3) $\frac{\ell}{5}$ (4) Unpredictable.

Q.81 The free path of a gas molecule is the distance

(1) Between the two opposite walls of the container

(2) Which molecules travel inone second

(3) Through which a molecule moves between two successive collisions

(4) None of these

Q.82 Which of the following substances can be used for drying of gases

(1) P_2O_5 (2) H_2SO_4 (3) CaO (4) all

Q.83 With increase of pressure, the mean free path

(1) Decreases (2) Increases (3) Becomes zero (4) Remains same

Q.84 Collision frequency (Z) of a gas at a particular pressure

(1) Decreases with the rise in temperature (2) Increases with the rise in temperature

(3) Decreases initially and thereafter increases (4) Unpredictable.

Q.85 If X is the total number of collision which a gas molecule registers with others per a gas molecule registers with others per unit time under particular conditions, then the collision frequency of the gas containing N molecules per unit volume is

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

Answer Key - 1

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	2	1	3	2	4	1	4	2	1	3	3	3	4	1	1	4	4	2	2	2	1	2	1	4	4
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	1	2	2	1	2	4	2	1	2	2	1	3	3	2	2	2	3	4	1	4	1	2	3	2	4
Qus.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	4	3	3	1	1	4	2	3	1	4	3	3	4	3	3	1	3	3	3	1	2	4	4	4	3
Qus.	76	77	78	79	80	81	82	83	84	85															
Ans.	1	1	2	3	3	3	4	1	2	4															

Exercise # 2

Q.1 If the collision frequency of a gas at 1 atm pressure is Z then its collision frequency at 0.5 atm. is

[1]1.0Z [2] 0.707Z [3] 2 Z [4] 0.50 Z

Q.2 The correct expression for the vander waal's equation of states is-

[1] $(p + a/n^2 V^2)(V - nb) = nRT$ [2] $(p + an^2/V^2)(V - nb) = \Delta nRT$

[3] $(p + an^2/V^2)(V - b) = nRT$ [4] $(p + an^2/V^2)(V - nb) = nRT$

Q.3 The term that accounts for intermolecular force in vander Waal's equation" for non ideal gas is

[1] RT [2] V - b [3] $(P + a / V^2)$ [4] $[RT]^{-1}$

Q.4 The critical temperature of a substance is

[1] The temperature above which the substance undergoes decomposition

[2] The temperature above which a substance can exist only as a ga,s

[3] Boiling point of the substance [4] All are wrong

Q.5 Critical temperature of the gas is the temperature

[1] Below which it cannot be liquified [2] Above which it cannot be liquified

[3] At which it occupies 22.4 L of volume [4] At which one mole of it occupies volume of 22.4 L

Q.6 Molecular attraction and size of the molecules in a gas are negligible at- .

[1] Critical point [2] High pressure

[3] High temperature and low pressure [4] Low temperature and high pressure.

Q.7 A box of 1 L capacity is divided into two equal compartments by a thin partition which are filled with 2g H_2 and 16gm CH_4 respectively. The pressure in each compartment is recorded as P atm. The total pressure when partition is removed will be

[1] P [2] 2P [3] P/2 [4] P/4

Q.8 Which mixture of gases at room temperature does not obey Dalton's law of parttarpressure'

[1] NO_2 and O_2 [2] NH_3 and HCl [3] CO and CO_2 [4] SO_2 and SO_3

Q.9 Average K. E. of CO_2 at 27°C is E. The average kinetic energy of N_2 at the same temperature will be

[1] E [2] 22E [3] E/22 [4] E / $\sqrt{2}$

Q.10 Helium atom is twice times heavier than a hydrogen molecule. At 25°C the average KE.of helium atom is - .

[1] Twice that of hydrogen [2] Same as that of hydrogen

[3] Four times that of hydrogen [4] Half that of hydrogen .

Q.11 The rate of diffusion of hydrogen is about

[1] One half that of He [2] 1.4 times that of He

[3] Twice that of He [4] Four times that of He

Q.12 The velocity possessed by most of the gaseous molecules is

[1] Average velocity [2] Most probable velocity

[3] R.M.S. velocity [4] None of these.

Q.13 Which is not true in case of an ideal gas

[1] It can be converted into a liquid [2] There is no interaction between the molecules

[3] All molecules of the gas move with same speed

[4] At a given temperature PV is proportional to the amount of the gas. .

Q.14 A 2.24L cyclinder of oxygen at N. T. P. is found to develop a leakage. When the leakage was plugged the pressure dropped to 570 mm of Hg. The number of moles of gas that escaped will be

[1] 0.025 [2] 0.050 [3] 0.075 [4] 0.09

Q.15 A football bladder contains equimolar proportions of H_2 and O_2. The composition by mass of the mixture effusing out of punctured football is in the ratio (H_2 : O_2)

[1] 1:4 [2] $2.\sqrt{2}$: 1 [3] 1 : $2\sqrt{2}$ [4] 4: 1

Q.16 Which of the following samples weighing 10g. contains the greatest number of atoms -

[1] NH_3 [2] O_2 [3] C_2H_6 [4] CO_2

Q.17 At constant temperature 200 cm^3 of N_2 at 720 mm and 400 cm^3 of O_2 at 750 mm pressure are put together in a one litre flask. The final pressure of mixture is

[1] 111 mm [2] 222 mm [3] 333 mm [4] 444 mm

Q.18 10 gm of a gas at NTP occupies 5 litres. The temp. at which the volume becomes double for the same mass of gas at the same pressure is

[1] 273 K [2] –273°C [3] 273°C [4] 546°C

Q.19 A gas is said to behave like an ideal gas when the reaction PV/T = constant, holds. When do you expect a real gas to behave like and ideal gas

[1] When temperature and pressure are low

[2] When temperature and pressure are high

[3] When temperature is low and pressure is high

[4] When temperature is high and pressure is low.

Q.20 26 c.c. of CO_2 are passed over red. hot coke. The volume of CO evolved is

[1] 15 c.c [2] 10 c.c. [3] 32 c.c. [4] None

Q.21 The oxygen and hydrogen formed during electrolysis of Water are in the weight ratio of

[1] 2 : 1 [2] 8 : 1 [3] 16 : 1 [4] 1 : 8

Q.22 If temperature and volume are same; the pressure of a gas obeying Vander Waals equation is

[1] Smaller than that of an ideal gas [2] Larger than that of an ideal gas

[3] Same as that of an ideal gas [4] None of these.

Q.23 An open vessel containing air is heated from 27°C to 127°C. The fraction of air originally present which goes out of it is

[1] $\frac{3}{4}$ [2] $\frac{1}{4}$ [3] $\frac{2}{3}$ [4] $\frac{1}{8}$

Q.24 A closed vessel contains equal number of oxygen and hydrogen molecules at a total pressure of 740 mm. If oxygen is removed from the system, the pressure - .

[1] Becomes half of 740 mm. [2] Remains unchanged

[3] Becomes 1/9th of 740 mm. [4] Becomesdouble of 740 mm.

Q.25 Which of the following is valid at absolute zero - .

[1] KE of the gas becomes zero, but molecular motion does not become zero.

[2] KE of the gas becomes zero and the molecular motion also becomes zero.

[3] KE of the gas decreases but does not become zero.

[4] None of these.

Q.26 If a gas is expanded at constant temperature - .

[1] The pressure decreases [2] The K.E. of molecules remains the same

[3] The K.E. ofthemolecules decreases [4] The No. of molecules of the gas increases.

Q.27 Which of the following gas when passed through dilute blood will imparts a cherry red colour to the solution

[1] CO_2 [2] $COCl_2$ [3] NH_3 [4] CO

Q.28 Most probable velocity, average velocity and root mean square velocity are related as

[1] 1:1.128 :1.224 [2]1:1.128:1.424 [3]1:2.128:1.224 [4]1:1.428:1.442

Q.29 The behaviour of temporary gases like CO_2 approaches that of permanent gases like N_2, O_2 etc. as we go - .

[1] Below critical temp. [2] Above critical temp.

[3] Above absolute zero [4] Below absolute zero.

Q.30 Which of the following gases is adsorbed strongly by charcoal

[1] CO [2] N_2 [3] H_2 [4] NH_3

Q.31 Which of the following does not change during compression of a gas at constant temperature

[1] Density of a gas [2] The distance between molecules

[3] Average velocity of molecules [4] The number of collisions on one sq. cm per sec.

Q.32 To which of the following gaseous mixture, the Dalton's law of partial pressure will not apply

[1] Hydrogen and carbon dioxide [2] Hydrogen and nitrogen

[3] Nitric oxide and oxygen [4] Oxygen and nitrogen.

Q.33 Reducing the pressure from 1.0 atm to 0.5 atm would change the number of molecules in one mole of ammonia to -

[1] 75% of initial volume [2] 50% of initial volume

[3] 25% of initial volume [4] None ofthese

Q.34 In a closed flask of 5litres, 1.0 gm of H_2 is heated from 300 to 600 K. Which statem.ent is not correct

[1] Pressure of the gas increases [2] The rate of collision increases

[3] The number of moles of gas increases [4] The energy of gaseous molecules increases.

Q.35 In case of hydrogen and helium the Vander Waals-forces are

[1] Strong [2] Very strong [3] Weak [4] Very weak

Q.36 Which of the following represents the avogadro number

[1] Number of molecules present-in 1 L of gas at N.T.P.

[2] Number of molecules present in 22.4 ml of gas at N. T. P.

[3] Number of molecules present in 22.4 L of gas at 298K and 1 atm. pressure

[4] Number of molecules present in one mole of gas at any temp. and pressure.

Q.37 The mean values of densities of liquid and saturated vapour for any stable substance are a linear function of

[1] Temperature [2] Pressure [3] Volume [4] None ofthese.

Q.38 Adiabatic demagnetisation is a technique used for - .

[1] Adiabatic expansion of a gas [2] Production of low temperature

[3] Production of high temperatures [4] None of these

Q.39 Which of the following can be most readily liquefied? Given value of 'a' for $NH_3 = 4.17$, $CO_2 = 3.59$, $SO_2 = 6.71$ $CI_2 = 6.49$)

[1] NH_3 [2] CI_2 [3] SO_2 [4] CO_2

Q.40 Which of the following is true

[1] $u_{rms} > \bar{v} > \alpha$.. [2] $u_{rms} < \bar{v} < \alpha$.. [3] $u_{rms} > \bar{v} < \alpha$.. [4] $u_{rms} < \bar{v} > \alpha$

Q.41 Hydrogen and Argon are kept in two separate vessels at constant temperature and pressure

[1] Both contain same number of atoms [2] The number of atoms of argon is half that of hydrogen.

[3] The number of atoms of argon is double that of hydrogen

[4] None ofthese.

Q.42 The vapour densities of CH_4 and O_2 are in the ratio 1 : 2 . The ratio of rates of diffusions of O_2 and CH_4 at same P and T is

[1] 1: 2 [2] 2 : 1 [3] 1 : 1.424 [4] 1 : 414 : 1

Q.43 In a closed flask of 5 litre, 1.0g of H_2 is heated from 300 to 600K. Which statement is not correct

[1] Pressure of the gas increases [2] The rate of collision increases

[3] The number of moles of gas increases [4] The energy of gaseous molecules increases

Q.44 If pressure of a gas contained in a closed vessel is increased by 0.4% when heated by 1°C its initial temperature must be

[1] 250K [2] 250°C [3] 2500K [4] 25°C

Q.45 The volume of ammonia obtained by the combination of 10ml of N_2 and 30ml H_2 is

[1] 20ml [2] 40ml [3] 30ml [4] 10ml

Q.46 There is 10 litre of a gas at STP. Which of the following changes keeps the volume constant

[1] 273 K and 2 atm [2] 273°C and 2 atm [3] 546°C and 0.5 atm [4] 0°C and 0 atm

Q.47 The density of oxygen gas at 25°C is 1.458 mg/litre at one atmosphere. At what pressure will oxygen have the density twice the value

[1] 0.5 atm/25°C [2] 2 atm/25°C [3] 4 atm/25°C [4] None

Q.48 Air contains 79% N_2 and 21% O_2 by volume. If the barometric pressure is 750mm Hg the partial pressure of oxygen is

[1] 157.7mmofHg [2] 175.5mmofHg [3] 315.0mmofHg [4] None

Q.49 At what temperature will be total kinetic energy (KE) of 0.30 mole of He be the same as the total KE of 0.40 mole of Ar at 400K

[1] 400K [2] 373 K [3] 533K [4] 300 K

Q.50 Four particles have speed 2,3,4 and 5 cm/s respectively. Their rms speed is

[1] 3.5cm/s [2] (27/2) cm/s [3] $\sqrt{54}$ cm/s [4] ($\sqrt{54}$/2) cm/s

Answer Key - 2

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	2	4	3	2	2	3	1	2	1	2	2	2	1	1	4	3	4	3	4	4	2	1	2	1	2
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	1	4	1	2	4	3	3	4	3	4	4	2	2	3	1	2	3	3	1	1	2	2	1	3	4

Exercise # 3

Q.1 The density of the gas is equal to **[CBSE 1991]**

(1) P/RT (2) nP (3) MP/RT (4) M/V

Q.2 Some moles of O_2 diffuse through a small opening in 18 seconds. Same number of moles of an unknown gas diffuse through the same opening in 45 seconds. Molecular mass of the unknown gas is : **[CPMT 1989]**

(1) $32 \times \frac{(18)^2}{(45)^2}$ (2) $32 \times \frac{(45)^2}{(18)^2}$ (3) $(32)^2 \times \frac{18}{45}$ (4) $(32)^2 \times \frac{45}{18}$

Q.3 Which of the following gases will have the highest rate of diffusion? **[CPMT 1990]**

(1) O_2 (2) NH_3 (3) CO_2 (4) N_2

Q.4 The mass of 6.02×10^{23} molecules of CO is **[CPMT 1986]**

(1) 14 g (2) 7.0g (3) 28 g (4) 56g

Q.5 50 ml of a gas A diffuse through a membrane in same time as for the diffusin of 40 ml of gas B under identical conditions of pressure and temperature. If the molecular mass of A is 64, that of B would be **[CBSE 1992]**

(1) 250 (2) 200 (3) 80 (4) 100

Q.6 Select one correct statements : In the gas equation PV = nRT **[CBSE 1992]**

(1) V denotes volume of one mole (2) n is the number of molecules of a gas

(3) n moles of the gas have volume V (4) P is pressure of the gas when only one mole of gas is present

Q.7 3.2 gofoxygen(at. mass = 16) and 0.2g of hydrogen (at. mass = 1) are placed in a 1.12 litre flask at 0ºC. The total pressure of the gas mixture will be: **[C.B.S.E.1992]**

(1) 4atm (2) 1atm (3) 2 atm (4) 3 atm

Q.8 The number ofmoles of H_2 in 0.224 litre of hydrogen gas at STP is: **[M.L.N.R..1994]**

(1) 0.1 (2) 0.01 (3) 0.001 (4) 1

Q.9 If a gas is allowed to expand at constasnt temperature then: **[I.I.T.1986]**

(1) Number, of molecules of the gas decreases

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

(3) The,kinetic energy of gas molecules increases

(4) The kinetic energy of gas molecules decreases

Q.10 If the pressure and absolute temperature of 2 litres of CO_2 are doubled, the volume of CO_2 would become:

(1) 2 litres (2) 4 litres (3) 5 litres (4) 7 litres **[C.B.S.E.1991]**

Q.11 0.24 g of a volatile gas upon vapourisation gives 45 ml vapour at N.T.P. What will be vapour: density of the substance? (Density of H_2 =0.089) **[C.B.S.E.1996]**

(1) 95.39 (2) 5.993 (3) 95.93 (4) 59.93

Q.12 3.2g of oxygen (At. wt. = 16) and 0.2 gm of hydrogen (At.wt = 1) are placed in a 1.12 litre flask at 0ºC. The total pressure of the gas mixture will be : **[IIT 1993]**

(1) 1 atm (2) 4 atm (3) 3 at m (4) 2 atm

Q.13 Equal weights of ethane and hydrgoen are mixed in an empty container at 25ºC. The fraction of the total pressure exerted by hydrogen is : **[IIT 1993]**

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

Q.14 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 : **[C.B.S.E 1994]**

(1) 12 min (2) 64 min (3) 8 min (4) 32 min

Q.15 A gas 'A' diffuses 5 times faster than gas 'B'. Density of 'A' com pared with 'B' is: **[A.F.M.C.1994]**

(1) 5 (2) 25 (3)1/5 (4) 1/25

Q.16 At STP the order of mean square velocity of molecules of H_2, N_2, O_2 and HBr is: **[C.B.S.E.1991]**

(1) $H_2 > N_2 > O_2 > HBr$ (2) $HBr > O_2 > N_2 > H_2$ (3) $HBr > H_2 > O_2 > N_2$ (4) $N_2 > O_2 > H_2 > HBr$

Q.17 A container contains 1 mole of a gas at 1 atm pressure and 27ºC and its volume is 24.6 litres. If pressure is 10 atm and temperature 327ºC, then new volume is approximately : **[BHU 1998]**

(1) 2 litres (2) 48 litres (3) 10 litres (4) 15 litres

Q.18 The gas molecules have rms velocity of its molecules as 1000 m/s. What is its average velocity? **[BHU 1998]**

(1) 1012 m/s (2) 921.58 m/s (3) 546 m/s (4) 960 m/s

Q.19 If the volume of 2 moles of an ideal gas at 540 K is 44.8 litre then its pressure will be : **[AFMC 1998]**

(1) 1 atmosphere (2) 2 atmosphere (3) 3 atomsphere (4) 4 atmosphere

Q.20 The compressibility factor of an ideal gas is **[AIIMS 1997]**

(1) 0 (2) 1 (3) 2 (4) 4

Q.21 3.2 g oxygen is diffused in 10 minutes. In similar conditions 2.8 g nitrogen will diffuse in : **[CET 1998]**

(1) 9.3 minutes (2) 8.2 minutes (3) 7.6 minutes (4) 11.8 minutes

Q.22 Wt. of 22.4 litres of Cl_2 gas is :

(1) 17.25g (2) 35.5g (3) 73 g (4) None

Q.23 The mass of 1×10^{22} molecules of chlorine is (approximately) : **(C.E.T.1998)**

(1) 0.3 g (2) 0.6 g (3) 1.2 g (4) 2.4 g

Q.24 One mole of $N_2O_4(g)$ at 300 K is kept in a closed container under one atmospheric pressure. It is heated to 600 K when 20% by mass of $N_2O_4(g)$ decomposes to $NO_2(g)$. The resultant pressure is : **(I.I.T.1996)**

(1) 1.2 atm (2) 2.4 atm (3) 2.0 atm (4) 1.0 atm

Q.25 The ratio between the root mean square speed of H_2 at 50 K and that of O_2 at 800 K is: **(I.I.T 1996)**

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

Q.26 At which one ofthe following temperature-pressure conditions, the deviation of a gas from ideal behaviour is expected to be minimum ? **(C.B.S.E 1996)**

(1) 550Kand 1 atm (2) 350K and 3 atm (3) 250K and 4 atm (4) 450K and 2 atm

Q.27 Consider. the following statements: **(I.C.S.Pr.1996)**

(a) Molecules of different gases have the same kinetic energy at a given temperature

(b) The total kinetic energy for two moles of an ideal gas is equal to 3 RT.

(c) The ratio of specific heat at constant pressure and the specific heat at constant volume for noble gases is 1.33 .

(d) The gas with a larger value of the ratio of critical temperature to critical pressure (T_c / P_c) will have larger value of excluded volume "b"

Of these statements:

(1) a, b and c are correct (2) b,c and d are correct

(3) a,c and dare correct (4) a, band d are correct

Q.28 lnversion temperature of a gas is the temperature: **(I.C.S.Pr.1996)**

(1) Above which no amount of pressure can liquefy a gas

(2) Below which a gas has to be cooled before itcan show Joule Thomson cooling

(3) At which on the application of pressure.a gas is completely converted into a liquid without having to be in equilibrium.

(4) Atwhich the distinction between a liquid and a gas disappears.

Q.29 The compressiblility of a gas is less than unity at STP therefore **[IIT 2000]**

(1) $V_m > 22.4$ litres (2) $V_m < 22.4$ litres (3) $V_m = 22.4$ litres (4) $V_m = 44.8$ litres

Q.30 Which one of the following is the ratio of the average molecular kinetic energies of helium (atomic weight 4) and sulphur dioxide (molecular weight 64) at 300K **[ICS Pr. 1997]**

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

Q.31 A 0.5 litres flask contains gas 'A' and a one litre flask contains gas 'B' at the temperature. The density of gas 'A' is 3.0 grams/litre and that of gas 'B' is 1.5 grams/litre. The molar mass of gas 'A' is one half that of gas 'B'. The ratio of pressure P_A/P_B exerted by the two gases is : **[ICS.Pr. 1997]**

(1) 4 (2) 3 (3) 2 (4) 1

Q.32 At a temperature TK, the pressure of 4.0g argon in a bulb is P. The bulb is put in a bath having temperature higher by 50 K than the first one. 0.8g of argon gas had to be reomved to maintain original pressure the temperature T is equal to : **[Roorkee Screening. 1999]**

(1) 510 K (2) 200 K (3) 100 K (4) 73 K

Q.33 The rate of diffusion of a gas having molecular weight just double of nitrogen gas is 56 ml s^{-1}. the rate of diffusion of nitrogen will be : **[C.P.M.T. 2000]**

(1) 79.19 ml s^{-1} (2) 56 ml s^{-1} (3) 112.0 ml s^{-1} (4) 90.00 ml s^{-1}

Q.34 An ideal gas will have maximum density when : **[CPMT 2000]**

(1) P = 1 atm, T = 300 K (2) P = 2 atm, T = 150 K

(3) P = 0.5 atm, T = 600 K (4) P = 1.0 atm, T = 500K

Q.35 Two separate bulbs contain ideal gases A and B. The density of gas A is twice that of B. The molecular weight of A is half that of B. The two gases are at the same temperature. The ratio of the pressure of A to that of B gas is : **[BHU 2000]**

(1) 2 (2) ½ (3) 4 (4) ¼

Q.36 PV/T = constant. A real gas will behave as an ideal gas : **[AFMC 2000]**

(1) When both pressure and temperature are high (2) Both pressure and temperature are low.

(3) Temperature high and pressure low. (4) Pressure high and temperature low

Q.37 A particular gas application requires gaseous nitrogen (N_2) with a density of 1.4 g/L at 27ºC. (Atomic weight of nitrogen = 14, gas constant R = 0.0821 lit. atm. per deg. per mole). The gas pressure is equal to

(1) 0.123 atm (2) 1.23 atm (3) 1.0 atm (4) 10.0 atm **[ICS Pr 2000]**

Q.38 The root mean square velocity of an ideal gas at constant pressure varies with density (d) as : **[IIT 2001]**

(1) d^2 (2) $\sqrt{d}$ (3) d (4) $1/\sqrt{d}$

Q.39 The Beans are cooked earlier in pressure cooker, because : **[CBSE 2001]**

(1) B.P. increases with increasing pressure

(2) B.P. decreases with increasing pressure

(3) Extra pressure of pressure cooker, softens the beans

(4) Internal energy is not lost while cooking in pressure cooker

Q.40 The temperature below which a gas cannot be liquified is called : **[AFMC 2001]**

(1) Inversion temperature (2) Critical temperature

(3) Neutral temperature (4) Curie temperature

Q.41 A mixture of NO_2 and N_2O_4 has a vapour density of 38.3 at 300 K. What is the number of moles of NO_2 in 100 gm. of the mixture? **[AFMC 2001]**

(1) 0.437 (2) 4.4 (3) 3.4 (4) 3.86

Q.42 20% N_2O_4 molecules are dissociated in a sample of gas at 27ºC and 760torr. The density of equilibrium mixture is : **[Roorkee 1996]**

(1) 3.1 gL^{-1} (2) 6.2 gL^{-1} (3) 12.4 gL^{-1} (4) 18.6 gL^{-1}

Q.43 If 1 litre of N_2 is mixed with 2 litres of O_2 at constant temperature. The phenomenon in operation is

(1) Kinetic energy (2) Partial pressure (3) Diffusion (4) None **[AFMC 2001]**

Q.44 An ideal gas expands in volume from 1×10^{-3} m^3 to 1×10^{-2} m^3 at 300K against a constant pressure of 1×10^{-5} Nm^{-2}. The work done is– **[AIEEE 2004]**

(1) 900 KJ (2) –900KJ (3) 270KJ (4) –900J

Q.45 Which one of the following statements is NOT true about the effect of an increase in temperature on the distribution of molecular speed in a gas ? **[AIEEE 2005]**

(1) The fraction of the molecules with the most probable speed increases

(2) The most probable speed increases

(3) The area under the distribution curve remains the same as under the lower temperature

(4) The distribution becomes broader

Q.46 The relative rate of diffusion of Helium w.r.t. Methane under similar conditions of pressure and temperature is **[JEE 2005]**

(1) 2 (2) 0.5 (3) 4 (4) 0.25

Q.47 One mole of a monoatomic gas was expanded adiabatically agains constant external pressure (1 atm) from volume 1 litre to 2 litre at an initial temperature of TK. The final temperature of the gas will be **[JEE 2005]**

(1) $\frac{T}{2^{(5/3-1)}}$ (2) T (3) $T-\frac{2}{3\times 0.0821}$ (4) $T+\frac{2}{3\times 0.0821}$

Q.48 An ideal is allowed to expand both reversibly and irreversibly in an isolated system. If T_i is the initial temperature and T_f is the final temperature, which of the following statements is correct ? **[AIEEE 2006]**

[1] $T_f > T_i$ for reversible process but $T_f = T_i$ for irreversible process

[2] $(T_f)_{rev} = (T_f)$irrev

[3] $T_f = T_i$ for both reversible and irreversible processes

[4] $(T_f)_{irrev} > (T_f)_{rev}$

Answer Key - 3

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	3	2	2	3	4	3	1	2	2	1	4	2	4	2	4	1	4	2	2	3	1	4	3	2	3
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48		
Ans.	1	2	2	2	3	4	2	1	2	3	3	2	4	1	2	1	1	3	4	1	1	3	4		