QB365 Question Bank Software Study Materials

Kinetic Theory of Gases 50 Important 1 Marks Questions With Answers (Book Back and Creative)

11th Standard

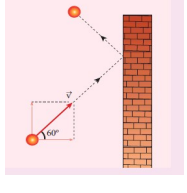
Physics

Total Marks : 50

Multiple Choice Question

50 x 1 = 50

1) A particle of mass m is moving with speed u in a direction which makes 60° with respect to x axis. It undergoes elastic collision with the wall. What is the change in momentum in x and y direction?



(a) $\Delta p_x = -mu, \Delta p_y = 0$ (b) $\Delta p_x = -2mu, \Delta p_y = 0$ (c) $\Delta p_x = 0, \Delta p_y = mu$ (d) $\Delta p_x = mu, \Delta p_y = 0$

2) A sample of ideal gas is at equilibrium. Which of the following quantity is zero?

(a) rms speed (b) average speed **(c) average velocity** (d) most probable speed

3) An ideal gas is maintained at constant pressure. If the temperature of an ideal gas increases from 100K to 1000K then the rms speed of the gas molecules

(a) increases by 5 times **(b) increases by 10 times** (c) remains same (d) increases by 7 times

4) Two identically sized rooms A and B are connected by an open door. If the room A is air conditioned such that its temperature is 4°C lesser than room B, which room has more air in it?

(a) Room A (b) Room B (c) Both room has same air (d) Cannot be determined

5) The average translational kinetic energy of gas molecules depends on

(a) number of moles and T (b) only on T (c) P and T (d) P only

6) If the internal energy of an ideal gas U and volume V are doubled then the pressure

(a) doubles **(b) remains same** (c) halves (d) quadruples

7) The ratio $\gamma = \frac{C_p}{C_V}$ for a gas mixture consisting of 8 g of helium and 16 g of oxygen is

(a) 23/15 (b) 15/23 **(c) 27/11** (d) 17/27

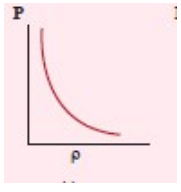
8) A container has one mole of monoatomic ideal gas. Each molecule has f degrees of freedom. What is the ratio of $\gamma = \frac{C_p}{C_V}$

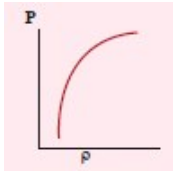
(a) f (b) $\frac{f}{2}$ (c) $\frac{f}{f+2}$ **(d)** $\frac{f+2}{f}$

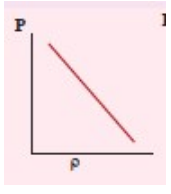
9) If the temperature and pressure of a gas is doubled the mean free path of the gas molecules

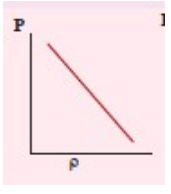
(a) remains same (b) doubled (c) tripled (d) quadrapoled

10) Which of the following shows the correct relationship between the pressure and density of an ideal gas at constant temperature?

(a) 

(b) 

(c) 

(d) 

11) A sample of gas consists of μ_1 moles of monoatomic molecules, μ_2 moles of diatomic molecules and μ_3 moles of linear triatomic molecules. The gas is kept at high temperature. What is the total number of degrees of freedom?

(a) $[3\mu_1 + 7(\mu_2 + \mu_3)] N_A$ (b) $[3\mu_1 + 7\mu_2 + 6\mu_3] N_A$ (c) $[7\mu_1 + 3(\mu_2 + \mu_3)] N_A$ (d) $[3\mu_1 + 6(\mu_2 + \mu_3)] N_A$

12) If s_P and s_V denote the specific heats of nitrogen gas per unit mass at constant pressure and constant volume respectively, then
(a) $s_P - s_V = 28R$ **(b) $s_P - s_V = R/28$** (c) $s_P - s_V = R/14$ (d) $s_P - s_V = R$

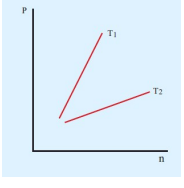
13) Which of the following gases will have least rms speed at a given temperature?

(a) Hydrogen (b) Nitrogen (c) Oxygen **(d) Carbon dioxide**

14) For a given gas molecule at a fixed temperature, the area under the Maxwell-Boltzmann distribution curve is equal to

(a) $\frac{PV}{KT}$ (b) $\frac{KT}{PV}$ (c) $\frac{P}{NKT}$ (d) PV

15) The following graph represents the pressure versus number density for ideal gas at two different temperatures T_1 and T_2. The graph implies



(a) $T_1 = T_2$ **(b) $T_1 > T_2$** (c) $T_1 < T_2$ (d) Cannot be determined

16) Kinetic theory explains the behavior _____.

(a) of solids and liquid Based on the idea that the gas consists of rapidly vibrating atoms or molecules.

(b) of gases based on the idea that the gas consists of rapidly moving atoms or molecules.

(c) of solids based on the idea that the solid consists of rapidly vibrating atoms or molecules.

(d) of liquid based on the idea that the liquid consist of rapidly moving atoms or molecules.

17) Kinetic theory _____.

(a) Correctly explains specific heat capacities of many liquid

(b) Correctly explains specific heat capacities of many gases

(c) Correctly explains specific heat capacities of many solids

(d) Correctly explains specific heat capacities of many super cooled liquid

18) The average distance a molecule can travel without colliding is called _____.

(a) mean free distance **(b) mean free path** (c) mean free length (d) mean free motion

19) In dynamic equilibrium, molecules of gas collide and change their speeds during the collision _____.

(a) but the average properties vary **(b) but the average properties constant** (c) but the peak properties constant

(d) but the rms properties constant

20) The perfect gas equation can be written as _____.

(a) PV = μRT (b) PV = μR (c) PV = RT (d) P = μRTV

21) According to Dalton's law of partial pressures _____

(a) total pressure of a mixture of real gases is the sum of factored in - virtual pressure

(b) total pressure of a mixture of ideal gases is the difference partial pressure

(c) total pressure of a mixture of real gases is the sum of pressures

(d) total pressure of a mixture of real gases is the sum of partial pressure

22) In ideal gas is expanding such that PT^2 = constant. The coefficient of volume expansion of the gas is _____.

(a) $\frac{1}{T}$ (b) $\frac{2}{T}$ **(c) $\frac{3}{T}$** (d) $\frac{4}{T}$

23) Moving with uniform speed. The temperature of the gas molecules inside will _____.

(a) increase (b) decrease **(c) remain the same** (d) decrease for some, while increases for others.

24) During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature the ratio $\frac{C_p}{C_v}$ for the gas is _____.

(a) $\frac{4}{3}$ (b) 2 (c) $\frac{5}{3}$ **(d)** $\frac{3}{2}$

25) The gas having average speed four times as that of SO_2 (molecule mass 64) is _____.

(a) He (molecule mass 64) (b) O_2 (molecule mass 4) (c) M_2 (molecule mass 32) (d) CH_4 (molecule mass 16)

26) The ratio of the vapour densities of two gases at a gn is 9 : 8. The ratio of the r_{ms} velocity of their molecules is _____.

(a) 3: $2\sqrt{2}$ **(b) $2\sqrt{2}$:3** (c) 9:8 (d) 8:9

27) In an adiabatic change, the pressure and temperature of a mono - atomic gas are related as $p \times TC$, where C equals _____.

(a) $\frac{2}{5}$ **(b)** $\frac{5}{2}$ (c) $\frac{3}{5}$ (d) $\frac{5}{3}$

28) Gas exerts pressure on the walls of the container _____.

(a) gas has weight (b) gas molecules have momentum (c) gas molecule collide with each other

(d) gas molecules collide with the walls of the container

29) According to the kinetic theory of gases _____.

(a) the pressure of a gas is proportional to the rms speed of the molecules

(b) the rms speed of the molecules of a gas is proportional to the absolute temperature

(c) the rms speed of the molecules of a gas is proportional to the square root of the absolute temperature

(d) the pressure of a gas is proportional to the square root of the rms speed of the molecules

30) The temperature of an ideal gas is increased from 27°C to 927°C. The root mean square speed of its molecules becomes _____.

(a) 3 times **(b) double** (c) 4 times (d) 6 times

31) Two gases are enclosed in a container at constant temperature. One of the gases, which is diatomic, has relative molecular mass eight times the other, which is monoatomic. The ratio of the rms speed of the molecules of the monoatomic gas to that of the molecules of the diatomic gas is _____

(a) 8 (b) 4 **(c) $2\sqrt{2}$** (d) 2

32) If the absolute temperature of a gas is increased 3 times the rms velocity of the molecules will be _____.

(a) 3 times (b) 9 times **(c) $\sqrt{3}$ times** (d) $\sqrt{6}$ times

33) The mean translational K.E. of a perfect gas molecule at absolute temperature T is _____ (K is Boltzmann constant)

(a) $\frac{1}{2}$kT (b) kT **(c) $\frac{3}{2}$kT** (d) $\frac{5}{2}$kT

34) A jar has mixture of hydrogen and Oxygen gases in the ratio 1: 5. The ratio of mean kinetic energies of hydrogen and Oxygen molecules is _____.

(a) 1: 5 (b) 5: 1 **(c) 1: 1** (d) 1: 25

35) Pressure exerted by a gas is _____.

(a) independent of the density of the gas (b) inversely proportional to the density of the gas

(c) directly proportional to the density of the gas (d) directly proportional to the square of the density of the gas

36) Four molecules have speed 2 km/s, 3 km/s, 4 km/s and 5 km/s. The rms speed of these molecules in km/s is _____

(a) $\sqrt{\frac{27}{2}}$ (b) $\sqrt{27}$ (c) $2\sqrt{27}$ (d) $\sqrt{54}$

37) Two different ideal gases are enclosed in two different vessels at the same pressure. If ρ_1 and ρ_2 are their densities and v_1 and v_2 their rms speeds, respectively then - is equal to _____.

(a) $\frac{\rho_1^2}{\rho_2^2}$ (b) $\frac{\rho_2^2}{\rho_1^2}$ (c) $\sqrt{\frac{\rho_1}{\rho_2}}$ **(d)** $\sqrt{\frac{\rho_2}{\rho_1}}$

38) The average energy of a molecules of a mono atomic gas at temperature T is _____ (K = Boltzmann constant).

(a) $\frac{1}{2}$kT (b) kT **(c) $\frac{3}{2}$kT** (d) $\frac{5}{2}$kT

39) The temperature of an ideal gas is increased from 120 K to 480 K If at 120 K the root mean square velocity of the gas molecules is v, at 480 K it becomes _____.

(a) 4v **(b) 2v** (c) $\frac{v}{2}$ (d) $\frac{v}{4}$

40) The KE. of one mole of a gas at normal temperature and pressure is (R = 8.31 J mol^{-1} K^{-1})_____.

(a) 0.56×10^4 J (b) 1.3×10^2 J (c) 2.7×10^2 J **(d) 3.4×10^3 J**

41) To what temperature should the hydrogen at room temperature (27°C) be heated at constant pressure so that the RMS velocity of its molecules becomes double its previous value?

(a) 1200°C **(b) 927°C** (c) 600°C (d) 108°C

42) A vessel contains oxygen at 400 K Another similar vessel contains an equal mass of hydrogen at 300K The ratio of the rms speeds of molecules of hydrogen and oxygen is _____.

(a) $\frac{4}{3}$ (b) $\frac{3}{4}$ (c) $3\sqrt{2}$ **(d) $2\sqrt{3}$**

43) On colliding with the walls in a closed container, the ideal gas molecules _____

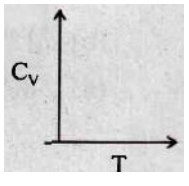
(a) transfer momentum to the walls (b) lose momentum completely (c) move with smaller speeds

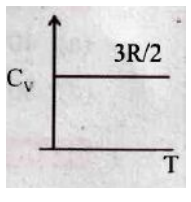
(d) perform Brownian motion.

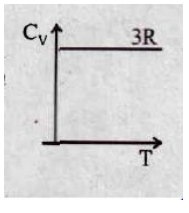
44) The mean kinetic energy of one mole of gas per degree of freedom is

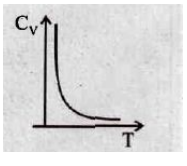
(a) $\frac{1}{2}kT$ (b) $\frac{3}{2}kT$ (c) $\frac{3}{2}RT$ **(d) $\frac{1}{2}RT$**

45) Which of the following graph exhibits specific heat at constant volume for a monoatomic gas?

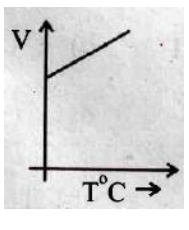
(a) 

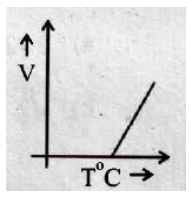
(b) 

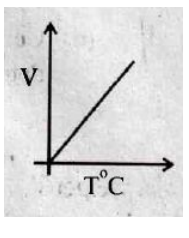
(c) 

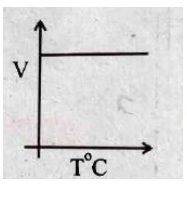
(d) 

46) Volume temperature graph at atmospheric pressure for a monoatomic gas is

(a) 

(b) 

(c) 

(d) 

47) If the temperature is changed from 27°C to 327°C. Then the ratio of kinetic energy of molecules at two temperature is

(a) 3:2 (b) 2:3 **(c) 1:2** (d) 2:1

48) If average velocity of a gas becomes 4 times then effect on rms velocity at the same Temperature is

(a) 1.4 v_{rms} (b) 8 rms **(c) 4 v_{rms}** (d) 2 rms

49) rms speed of hydrogen molecule at 27°C:

(a) 193 kms^{-1} **(b) 1.93 kms^{-1}** (c) 19.3 kms^{-1} (d) 0.193 kms^{-1}

50) The ratio between the rms speed and most probable speed of gas molecules at a given temperature is

(a) $2\sqrt{2}:\sqrt{1}$ **(b) $\sqrt{3}:\sqrt{2}$** (c) $\sqrt{2}:\sqrt{3}$ (d) $\sqrt{1}:2\sqrt{2}$