Kinetic Molecular Model of Gas

1. The kinetic gas equation for 1 mole of a gas

1) $PV = \frac{1}{3}mC^2$ 2) $PV = \frac{1}{3}MC^2$ 3) $PV = \frac{1}{3}C^2$ 4) $PV = \frac{1}{3}(mC)^2$

2. At the same temperature and pressure which of the following gas will have highest K.E per mol.

1) H_2 2) O_2 3) CH_4 4) Same for all

3. The molecular velocities of two gases at the same temperature are U_1 and U_2 their masses are m_1 and m_2 respectively. Which of the following expression is correct?

1) $\frac{m_1}{U_1^2} = \frac{m_2}{U_2^2}$ 2) $m_1U_1 = m_2U_2$ 3) $\frac{m_1}{U_1} = \frac{m_2}{U_2}$ 4) $m_1U_1^2 = m_2U_2^2$

4. The ratio of kinetic energies of equal weights of CH_4 and SO_2 gases under similar conditions is

1) 1 : 1 2) 2 : 1 3) 4 : 1 4) 1 : 2

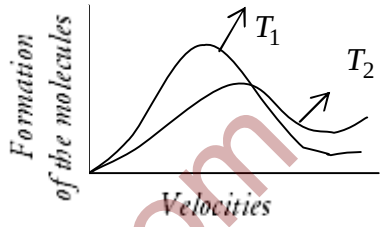
Hint: KE1:KE2=n1:n2

5. At what temperature the velocity of SO_2 molecule is same as velocity of O_2 molecule at 27°C

1) 127°C 2) 327°C 3) 927°C 4) 527°C

Hint: T1/M1=T2/M2

6. The velocity distribution curve is given below. The correct statement regarding it is



1) As temperature increases the fraction of the molecular having C_P increases

2) $T_1 > T_2$

3) At any temperature $C_P = \overline{C}$

4) A small fraction of the molecules have very low velocities

7. SO_2 molecules is 32 times heavier than hydrogen molecules. What will be the ratio of their average kinetic energies at 420K

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

Hint: K.E of molecule is same for all gases at a given temperature.

8. The average velocity of a gas at 273K is $7.5\times10^4 cm/s$. What is its r.m.s. velocity at the same temperature

1) $8.13\times10^4 cm/s$ 2) $6.9\times10^4 cm/s$ 3) $6.124\times10^4 cm/s$ 4) $9.9\times10^4 cm/s$

Hint: **C = 1.128 ×** $\overline{C}$

9. In the kinetic gas equation 'n' represents

1) Number of molecules 2) Number of moles

3) An integer including zero 4) A constant

10. A cubical vessel of side length 2cm contain 100 molecules with mass of each molecule as $2\times10^{-27} g$. If the r.m.s. velocity of the molecules is $4\times10^4 cm/s$, what is the rate of change of momentum

1) $3.2\times10^{-19} dyne/cm^2$ 2) $3.2\times10^{19} dyne/cm^2$

3) $3.2\times10^{18} dyne/cm^2$ 4) $3.2\times10^{-16} dyne/cm^2$

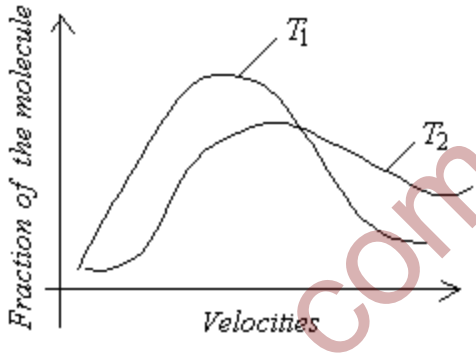
Hint: The rate of change of momentum=mn**c²**

11. The correct statements regarding max well – Boltzmann velocity distribution curve (that is given below)

a) $T_1 > T_2$

b) As the temperature increases the fraction of the molecules having most probable velocity decreases

c) As the temperature increases the value of C_P increases



d) As the temperature increases r.m.s. velocity of the gas decreases

The correct answer is

1) All are correct 2) Only a, b and d

3) Only b and c 4) Only a, b and c

12. The average velocity of a gas is 100 m/s. At the same temperature what is its r.m.s. velocity

1) 112.8 m/s 2) 92.13 m/s 3) 81.66 m/s 4) 88.66 m/s

Hint: **C = 1.128 ×** $\bar{C}$

13. R.M.S. velocity of a gas molecule is given by

1) $\sqrt{\frac{3RT}{\pi M}}$ 2) $\sqrt{\frac{3KT}{m}}$ 3) $\sqrt{\frac{8RT}{\pi M}}$ 4) $\sqrt{\frac{3PV}{T}}$

14. At what temperature the r.m.s. velocity of nitrogen gas is twice the most probable velocity of Helium gas at 27°C

1) 5327°C 2) 5600°C 3) 400K 4) 600K

Hint: $\frac{C_{N_2}}{C_p \text{ of He}} = \frac{\sqrt{3RT_1 / M_{N_2}}}{\sqrt{\frac{2RT_2}{M_{He}}}}$

15. The r.m.s. velocity of carbon dioxide gas at 167°C is m/s

1) 500 2) 5000 3) 50 4) 50,000

Hint: $1.58 \times 10^4 \sqrt{\frac{T}{M}} cm/sec$

16. What is the increase in K.E. of 10 moles of an ideal gas, when the temperature is increased by 10°C

1) 200 cal 2) 300 cal 3) 600 cal 4) 900 cal

Hint: Increase in K.E= (3/2) nR (dT)

17. 1 litre vessel and 2 litre vessel contained 1 mole each of O_2, the temperature are so adjusted such that the velocity of molecules in 1 litre vessel is twice that of 2 litre vessel. At what ratio their pressures will be

1) 4 : 1 2) 8 : 1 3) 6 : 2 4) 1 : 8

18. At what temperature the rms velocity of oxygen is equal to the most probable velocity of SO_2 at 27°C

1) 100K 2) 200K 3) 400K 4) 92.6K

Hint: Refer q.no.14

19. The K.E. of 'N' molecules of CH_4 is x Joules at –123°C. another sample of CH_4 at 27°C has K.E. of 2x Joules. The latter sample contains

1) N molecules of CH_4 2) N/2 molecules of CH_4

3) 2N molecules of CH_4 4) N/4 molecules of CH_4

Hint: KE1/KE2= n1 T1/n2T2

20. K.E. of one mole of gas is

1) 1.5T Cal 2) 3T Cal 3) 3RT Cal 4) 4.5RT Cal

Hint: KE= (3/2) RT

21. The ratio of kinetic energies of equal weights of CH_4 at 100K and SO_2 at 400K is

1) 4 : 1 2) 1 : 4 3) 1 : 1 4) 3 : 4

Hint: KE1/KE2= M2 T1/M1T2

22. The temperature at which ethane molecules have the same average kinetic energy as that of methane molecules at 27°C is

1) 327°C 2) 27°C 3) 927°C 4) 627°C

Hint: K.E of molecule is same for all gases at a given temperature

23. R.M.S. velocity of O_2 molecules at 27°C is x cm/sec at what temperature the velocity of O_2 molecules become 2x cm/sec

1) 600 K 2) 327°C 3) 927°C 4) 127°C

Hint: $\frac{C_1}{C_2} = \sqrt{\frac{T_1}{T_2}}$

24. At what temperature the R.M.S. velocity of C_2H_4 molecules is same as that of N_2 molecules at 300K?

1) 300°C 2) 27°C 3) 600K 4) 927°C

Hint: $\frac{T_1}{M_1} = \frac{T_2}{M_2}$

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

1) $\sqrt{\frac{2}{3}}$ 2) $\sqrt{\frac{3}{2}}$ 3) $\sqrt{\frac{1}{4}}$ 4) $\sqrt{\frac{3}{5}}$

Hint: $\frac{C_1}{C_2} = \sqrt{\frac{T_1 M_2}{T_2 M_1}}$,T1=T2

26. The R.M.S. velocity of an ideal gas at 0°C is 12240 cm/sec. Then its most probable velocity in cm/sec at the same temperature

1) 11280 2) 10850 3) 10000 4) 1224

Hint: Most Probable velocity= 0.8166X r.m.s.

27. 'X' is an oxide formed in the first excited state of sulphur. 'Y' is a fluoride formed in the second excited state of sulphur. The ratio of average velocities of molecules of 'X' and 'Y' at 25°C and 1 atm is approximately (at. Wts. O = 16 , F = 19 , S = 32)

1) 3 : 2 2) 9 : 10 3) 2 : 3 4) 1 : 2

Hint: $\frac{C_1}{C_2} = \sqrt{\frac{T_1 M_2}{T_2 M_1}}$,T1=T2

28. Boltzmann constant represents the gas constant per

1) One mole of gas 2)An Avogadro's number of molecules

3.) Any number of molecules 4) One molecule

29. According to kinetic theory, Kinetic Energy =

1) $\frac{4}{3}nRT\ (or)\frac{1}{2}mv^2$ 2) $\frac{2}{3}nRT\ (or)\frac{3}{2}mv^2$

3) $\frac{3}{2}nRT\ (or)\frac{1}{2}mv^2$ 4) $\frac{3}{4}nRT\ (or)2mv^2$

30. Helium atom is two times heavier than a hydrogen molecule at 298^0 K the average kinetic energy of helium is

1) Two times that of hydrogen molecule
2) Same as that of a hydrogen molecule
3) Four times that of a hydrogen molecule
4) Half that of a hydrogen molecule

Hint: K.E of molecule is same for all gases at a given temperature

31. The value of Boltzmann constant is

1) $1.38\times10^{-16}\,\text{Joule}.\text{K}^{-1}.\text{Molecule}^{-1}$
2) $1.38\times10^{-23}\,\text{erg}.\text{K}^{-1}.\text{Molecule}^{-1}$
3) $0.0821\times10^{-16}\,\text{Joule}.\text{K}^{-1}.\text{Molecule}^{-1}$
4) 4. 1.38 x 10^{-23}J K^{-1} molecule $^{-1}$

32. The ratio between kinetic energies of 3g of Hydrogen gas and 4g of Oxygen gas at a given temperature and pressure is

1) 3 : 4 2) 4 : 3 3) 12 : 1 4) 16 : 1

Hint: KE1: KE2=n1: n2

33. If the rms velocity of a gas is 1000 metres/sec ; its most probable velocity under similar conditions in metres/sec

1) 1128 2) 816.6 3) $\frac{1224}{1000}$ 4) $\frac{1000}{1224}$

34. Kinetic energy of 140 g of Carbon monoxide gas at 27°C in K.Cals is

1) 3.0 2) 6.0 3) 4.5 4) 9.0

Hint: KE= (3/2) nRT

35. The ratio of the kinetic energies of equal masses of CH_4 and He at 27°C temperature is

1) 1 : 1 2) 1 : 4 3) 4 : 1 4) 2 : 1

Hint: kE1:KE2=M2:M1

36. The kinetic energy in K.Cals of 6.4 gm of O_2 at 27°C is

1) 1.8 K.Cals 2) 18 K.Cals

3) 180 K.Cals 4) 0.18 K.Cals

37. Kinetic theory of gases proves

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

2) Avogadro's law 4) All these laws

38. Which of the following posses greatest amount of Kinetic energy

1) 4gm of H_2 at 27°C

2) 32gm of O_2 at 0°C

3) 16gm of CH_4 at 27°C

4) 64gm of O_2 at 0°C

Hint: KE is proportional to n x T

39. Which of the following is not the statement of kinetic theory of gases

1) The kinetic energy depends on the temperature of the gas

2) The K.E. depends on pressure of the gas

3) The collisions are elastic

4) Pressure of the gas is due to the collision of the gas molecules with the walls of the vessel

40. At what temperature will the total kinetic energy of 0.3 mole of He be the same as the total kinetic energy of 0.4 mole of Ar at 400K

1) 400 K 2) 300 K 3) 373 K 4) 533 K

Hint: $\mathbf{n_1}T1 = \mathbf{n_2}T2$

KEY

		1) **2**	2) **4**	3) **4**	4) **3**	5) **2**	6) **4**	7) **4**	8) **1**
9) **1**	10) **4**	11) **3**	12) **1**	13) **2**	14) **1**	15) **1**	16) **2**	17) **2**	18) **1**
19) **1**	20) **2**	21) **3**	22) **2**	23) **3**	24) **2**	25) **1**	26) **3**	27) **1**	28) **4**
29) **3**	30) **2**	31) **4**	32) **3**	33) **2**	34) **4**	35) **2**	36) **4**	37) **4**	38) **1**
39) **4**	40) **4**								