

Graham's Law of Diffusion

1. Dalton's law of partial pressure is not applied for

- 1) $N_2 + CO_2$ 2) $NO + O_2$ 3) $CO_2 + O_2$ 4) O_2, N_2

2. A vessel contains Helium and Methane in 4: 1 molar ratio at 20 bar pressure. Due to leakage, the mixture of gases starts effusion. So the composition of mixture effused in the initial stage

- 1) 8 : 1 2) 2 : 1 3) 1 : 1 4) 1 : 4

Hint: $\frac{r_1}{r_2} = \frac{P_1}{P_2} \sqrt{\frac{M_2}{M_1}}$

3. Consider two flasks connected by a stopcock. One flask has a volume of 250 ml and contains Neon gas at 650 torr and the other flask has a volume of 300 ml and contains $O_2(g)$ at 825 torr. If the stopcock is opened so that the two gases mix, calculate the partial pressure of Neon gas

- 1) 295 torr 2) 450 torr 3) 745 torr 4) 200 torr

Hint: P' of Neon = pXv of neon/total volume

4. The ratio of rate of diffusion of He and Methane gases at given temperature is

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

Hint: $\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$

5. The principle involved in the separation of Uranium isotopes is

- 1) Dalton's law 2) Graham's law 3) Charles's law 4) Boyle's law

6. 4gm of Helium diffuses through a porous membrane in certain time the mass of sulphur dioxide that diffuses through the same porous membrane in the same time under similar conditions is

- 1) 8gm 2) 16gm 3) 4gm 4) 2gm

Hint: $\frac{w_1}{w_2} = \sqrt{\frac{M_1}{M_2}}$

7. A vessel contains hydrogen and oxygen in the volume ratio 2: 1. Due to a hole in the vessel the gas is effusing out. The volume ratio of H_2 and O_2 that is effusing out initially is

- 1) 1 : 8 2) 4 : 1 3) 8 : 1 4) 5600 : 1

Hint: $\frac{r_1}{r_2} = \frac{P_1}{P_2} \sqrt{\frac{M_2}{M_1}}$, 'p' is proportional to 'n'

8. A vessel contains equal moles of Helium and sulphurdioxide. Due to a hole in the vessel half of the initial number of moles in the vessel effused out the molar ratio of helium and sulphurdioxide in the residual gas in the vessel is

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

Hint: $\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$, The molar ratio of residual gases is $R_2:R_1$

9. Vapour pressure of water at 60°C is 300 m.m. 1 litre of vessel contained carbon dioxide saturated with water vapour at 60°C at a total pressure of 760 torrs. The contents of the vessel are completely transferred in to a 2 lit vessel at the same temperature the partial pressure of oxygen, water vapour and the total pressure in the second vessel are respectively (in mm)

- 1) 230 : 150 : 380 2) 380 : 150 : 530
3) 80 : 300 : 380 4) 920 : 600 : 1520

15. The pressure of saturated water vapour at 25°C is 24.8 m.m. At 100°C the pressure of saturated water vapour will be
- 192.2 m.m. 2) 31.6 m.m. 3) 760 m.m. 4) 316 m.m.
16. Among the following gaseous elements, which will have greater rate of diffusion? [Z = atomic number]
- 1) Z = 7 2) Z = 8 3) Z = 9 4) Z = 10
17. Dalton's law of partial pressure is not applicable to
- 1) $CO + CO_2$ 2) $CO_2 + Cl_2$ 3) $N_2 + H_2$ 4) $CO + Cl_2$
18. 180ml of hydro carbon having the molecular weight 16 diffuses in 1.5 min. under similar conditions, the time taken by 120 ml of SO_2 to diffuse is
- 1) 2 min 2) 1.5 min 3) 1 min 4) 1.75 min
19. According to Graham's law at a given temperature the ratio of rate of diffusion $\frac{r_A}{r_B}$ of gases A and B is given by
1. $\left(\frac{P_A}{P_B}\right)\left(\frac{M_A}{M_B}\right)^{1/2}$ 2) $\left(\frac{P_A \times M_B}{P_B \times M_A}\right)^{1/2}$ 3) $\left(\frac{P_A}{P_B}\right)\left(\frac{M_B}{M_A}\right)^{1/2}$ 4) $\left(\frac{M_A}{M_B}\right)\left(\frac{P_B}{P_A}\right)^{1/2}$
20. Which one of the following gas has highest diffusion rate?
- 1) Fluorine (at. Wt = 19) 2) Neon (at. Wt = 20)
- 3) Chlorine (at. Wt = 35.5) 4) Oxygen (at. Wt = 16)
21. Helium diffuses twice as fast as another gas B. The gas B may be
- 1) Oxygen 2) Methane 3) Neon 4) SO_2
22. Which is lighter than dry air?
- 1) Moist air 2) SO_2 3) Cl_2 4) N_2
23. A gaseous mixture contains 56g of N_2 , 44g of CO_2 and 16g of CH_4 . If the total pressure of the mixture is 720 mm of Hg then the partial pressure of CH_4 is
- 1) 180 mm 2) 360 mm 3) 540 mm 4) 720 mm

24. 0.5 gm of H_2 gas diffused through a porous pot in 10 minutes. Under the same conditions how many grams of oxygen will diffuse through the same pot?
- 1) 0.125 gm 2) 1 gm 3) 2 gm 4) 4 gm
25. 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) $2 : \sqrt{2} : 1$ 4) $1 : 2 : \sqrt{2}$
- 26) 50ml of gas 'A' diffuses through a membrane in the same times as 40ml of a gas 'B' under identical pressure temperature conditions. If the molecular weight of 'A' is 64, then molecular weight of 'B' would be
- 1) 100 2) 250 3) 200 4) 80
27. x ml of H_2 gas effuses through a hole in a container in 5 seconds. The time taken for the effusion of the same volume of the gas specified below under identical conditions
- 1) 10 seconds, He 2) 20 seconds, O_2
4) 25 seconds, CO 4) 55 seconds, CO_2
28. 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 lighter gas is this mixture is
- 1) 0.55 atm 2) 0.11 atm 3) 1 atm 4) 0.11 atm
29. 2lit of SO_2 gas at 760 mm of Hg transferred to 10 lit flask containing oxygen at a particular temperature. The partial pressure of SO_2 in the flask is
- 1) 63.33 mm of Hg 2) 152 mm of Hg 3) 760 mm of Hg 4) 1330 mm of Hg
30. 2 gm of Helium diffuses from a porous membrane in 4 minutes. How many grams of CH_4 would diffuse through the same membrane in same time under similar conditions
- 1) 8 gm 2) 4 gm 3) 16 gm 4) 2 gm

31. At what temperature will the rate of diffusion of N_2 be 1.6 times the rate of diffusion of SO_2 at $27^\circ C$?

- 1) $336^\circ C$ 2) $27^\circ C$ 3) $63^\circ C$ 4) $50^\circ C$

Hint:
$$\frac{r_1}{r_2} = \sqrt{\frac{T_1}{M_1} \times \frac{M_2}{T_2}}$$

32. In a gaseous mixture at 5 atmospheric pressure, 30% of molecules of CO_2 , 40% of molecules of N_2 and the rest oxygen. The partial pressure of oxygen in the mixture is

- 1) 11.5 atmosphere 2) 2 atmosphere 3) 1.4 atmosphere 4) 1.6 atmosphere

33. Equal volumes of two jars contain Ammonia and Hydrochloric gases respectively at constant temperature and pressure P. when one of the jars is inverted over another jar so that they mix up, the pressure in either of the jars is

- 1) Equal to P 2) $P + P = 2P$ 3) $P/2$ 4) Becomes Zero

Hint: Both combine to form solid Ammonium chloride

34. The pair of gases which possess same rate of diffusion

- 1) CO_2, N_2 2) C_2H_6, N_2 3) CH_4, O_2 4) CO, N_2

35. Dalton's law of partial pressures is applicable to a mixture of

- 1) $NH_3 + HCl$ 2) $CH_4 + F_2$ 3) $CO + Cl_2$ 4) $CO_2 + N_2$

36. Equal weights of CH_4 and O_2 are present in a vessel. So their partial pressures are in the ratio

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

Hint: $P_1:P_2=n_1:n_2$

37. Which of the following is not an application of Graham's law?

- 1) Separation of isotopes of Uranium 2) Working of marsh gas alarm
3) Steam distillation 4) Separation of a gaseous mixture

38. Which among the following is true?

- 1) CO_2 diffuses 1.5 times faster than SO_2
- 2) CH_4 diffuses 2 times faster than O_2
- 3) He diffuses 2 times faster than CH_4
- 4) H_2 diffuses 2 times faster than He

39. Atmolysis is based upon

- 1) Dalton's law
- 2) Charles's law
- 3) Graham's law
- 4) Boyle's law

40. Dry NH_3 and HCl gas are introduced from either side of glass tube of length 100 cm. The white fumes are formed nearly at ___ length from NH_3 end

- 1) 40 cm
- 2) 50 cm
- 3) 60 cm
- 4) 80 cm

41. Molecular weights of 2 gases are in the ratio 36: 49. Then the ratio of diffusion of their rates will be

- 1) 6: 7
- 2) 7: 6
- 3) 18: 24.5
- 4) 24.5: 18

42. A vessel contains oxygen and hydrogen in the molecular ratio of 2: 1 at a pressure of 30 atm. If a small leak is developed in the vessel, the composition of the gas mixture that effuses out initially ($\text{O}_2:\text{H}_2$)

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

43. If 20 ml of SO_2 diffuses in 25 sec under certain conditions the volume of He that will be diffused in same time under same conditions is

- 1) 160 ml
- 2) 100 ml
- 3) 80 ml
- 4) 40 ml

KEY

1)2 2)1 3)1 4)1 5)2 6)2 7)3 8)2 9)3 10)1

11)3 12)2 13)3 14)3 15)3 16)4 17)4 18)1 19)3 20)2

21)2 22)4 23)1 24)3 25)1 26)1 27)2 28)3 29)2 30)2

31)3 32)1 33)4 34)4 35)4 36)1 37)3 38)3 39)3 40)3

41)2 42)3 43)3

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