PRE-MEDICAL

PHYSICAL CHEMISTRY

ENTHUSIAST | LEADER | ACHIEVER

EXERCISE

Behaviour of Gases

ENGLISH MEDIUM

EXERCISE-I (Conceptual Questions) — Build Up Your Understanding

GRAHAM'S LAW OF DIFFUSION

1. Which pair of the gaseous species diffuse through a small jet with the same rate of diffusion at same P and T :
(1) NO, CO (2) NO, CO_2
(3) NH_3,PH_3 (4) NO, C_2H_6
IG0001

2. 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) 4.0 (4) 8.0
IG0002

3. 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
IG0003

4. Gas A having molecular weight 4 diffuses thrice as fast as the gas B at a given T. The molecular weight of gas B is :
(1) 36 (2) 12 (3) 18 (4) 24
IG0004

5. Four rubber tubes are respectively filled with H_2, O_2, N_2 and CO_2. The tube which will be deflated first is :
(1) H_2 filled tube (2) O_2 filled tube
(3) N_2 filled tube (4) CO_2 filled tube
IG0005

6. 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
IG0006

7. Rate of diffusion of hydrogen is :
(1) Half of He (2) 1.4 times of He
(3) Double than He (4) four times of He
IG0007

8. 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
IG0008

9. If the vapour densities of methane & oxygen are in the ratio 1 : 2, the ratio of rate of diffusion of O_2 & CH_4 is respectively
(1) 1 : 2 (2) 1 : 1.414
(3) 2 : 1 (4) 1.414 : 1
IG0009

10. 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
IG0010

11. The relative rate of diffusion of a gas (Mol wt. = 98) as compared to hydrogen will be :
(1) 1/7 (2) 1/5 (3) 1/4 (4) 1
IG0011

12. The relative rate of diffusion of a gas (molecular weight = 128) as compared to oxygen is
(1) 2 times (2) 1/4 times
(3) 1/8 times (4) 1/2 times
IG0012

13. Since the atomic weights of carbon, nitrogen and oxygen are 12, 14 and 16 respectively, among the following pairs of gases, the pair that will diffuse at the same rate is :
(1) Carbon dioxide and nitrous oxide
(2) Carbon dioxide and nitrogen dioxide
(3) Carbon dioxide and carbon monoxide
(4) Carbon dioxide and nitric oxide
IG0013

14. A bottle of dry ammonia and a bottle of dry hydrogen chloride connected through a long tube are opened simultaneously at both ends, the white ammonium chloride ring first formed will be :
(1) at the centre of the tube
(2) near the hydrogen chloride bottle
(3) near the ammonia bottle
(4) throughout the length of the tube
IG0014

15. 50 ml of a gas A diffuses through a membrane in the same time as for the diffusion of 40 ml of a gas B under identical pressure and temperature conditions. If the Molecular weight of A = 64, that of B would be :
(1) 100 (2) 250 (3) 200 (4) 80
IG0015

16. If rate of diffusion of A is 5 times that of B. What will be the ratio of density of A and B :
(1) 1/25 (2) 1/5 (3) 25 (4) 5
IG0016

17. 50 ml of hydrogen diffuses through a small hole from vessel in 20 minutes time. Time taken for 40 ml of oxygen to diffuse out under similar conditions will be :
(1) 12 min. (2) 64 min
(3) 8 min (4) 32 min
IG0017

18. 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
IG0018

19. The rate of diffusion of a gas having molecular weight just double of nitrogen gas is 56 ml per sec the rate of diffusion of nitrogen gas will be :
(1) 79.19 ml/sec (2) 112 ml/sec
(3) 56 ml/sec (4) 90 ml/sec
IG0019

20. Under identical conditions of temperature and pressure, the ratio of the rates of effision of O_2 and CO_2 gases is given by :
(1) $\frac{\text{rate of effusion of oxygen}}{\text{rate of effusion of } CO_2} = 0.87$
(2) $\frac{\text{rate of effusion of oxygen}}{\text{rate of effusion of } CO_2} = 1.17$
(3) $\frac{\text{rate of effusion of oxygen}}{\text{rate of effusion of } CO_2} = 8.7$
(4) $\frac{\text{rate of effusion of oxygen}}{\text{rate of effusion of } CO_2} = 0.117$
IG0021

DEVIATION FROM IDEAL GAS BEHAVIOUR

21. When does a real gas show behaviour same as ideal gas:
(1) At low temperature and low pressure
(2) At high temperature and high pressure
(3) At low temperature and high pressure
(4) At high temperature and low pressure
IG0022

22. In van der Waal's equation, the constant 'b' is a measure of :
(1) intermolecular repulsions
(2) intermolecular attraction
(3) volume occupied by the molecules
(4) intermolecular collisions per unit volume
RG0023

23. Pressure of real gas is less than the pressure of ideal gas because :
(1) No. of collisions increases
(2) Definite shape of molecule
(3) K.E. of molecule increases
(4) Inter molecular forces
IG0025

24. Which gas can be easily liquefied ?
given 'a' for NH_3 = 4.17, CO_2 = 3.59, SO_2= 6.71, Cl_2 = 6.49
(1) NH_3 (2) Cl_2
(3) SO_2 (4) CO_2
RG0026

25. At relatively high pressure, van der waals' equation reduces to :
(1) PV = RT (2) $PV = RT + \frac{a}{V}$
(3) PV = RT + Pb (4) $PV = RT - \frac{a}{V^2}$
RG0027

26. 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
RG0028

27. The compressibility factor of an ideal gas is :
(1) 0 (2) 1 (3) 2 (4) 4
IG0029

28. The compressibility of a gas is less than unity at STP therefore :
(1) $V_m > 22.4$ L (2) $V_m < 22.4$ L
(3) $V_m = 22.4$ L (4) $V_m = 44.8$ L
RG0030

29. The values of van der Waal's constant 'a' for the gases O_2, N_2, NH_3 and CH_4 are 1.360, 1.390, 4.170 and 2.253 L^2 atm mol^{-2} respectively. The gas which can most easily be liquefied is :
(1) O_2 (2) N_2 (3) NH_3 (4) CH_4
RG0031

30. Which of the following is not correct for real gases ?

(1) No force of attraction between the molecules of a gas.

(2) Volume of the moelecules of a gas is negligible in comparison to the space occupied by the gas.

(3) Do not follow PV = nRT.

(4) Both (1) & (2)

RG0054

31. The Boyle temperature or Boyle point is :

(1) The temperature at which ideal gas obeys real gas laws

(2) The temperature at which a real gas obeys ideal gas laws over an appreciable range of pressure

(3) It does not depend on nature of gas

(4) The temperature at which gases have no deviation

IG0055

EXERCISE-I (Conceptual Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**4**	**1**	**4**	**1**	**1**	**1**	**2**	**1**	**2**	**2**	**1**	**4**	**1**	**2**	**1**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**1**	**2**	**2**	**1**	**2**	**4**	**3**	**4**	**3**	**3**	**3**	**2**	**2**	**3**	**4**
Que.	31														
Ans.	**2**														

EXERCISE-II (Previous Year Questions) AIPMT/NEET

AIPMT Pre.-2011

1. Two gases A and B having the same volume diffuse through a porous partition in 20 and 10 seconds respectively. The molecular mass of A is 49u. Molecular mass of B will be :-

(1) 50.00 u (2) 12.25 u

(3) 6.50 u (4) 25.00 u

IG0032

AIPMT Pre. - 2012

2. 50 mL each of gas A and of gas B takes 150 and 200 seconds respectively for effusing through a pin hole under the similar condition. If molecular mass of gas B is 36, the molecular mass of gas A will be:

(1) 20.25 (2) 64 (3) 96 (4) 128

IG0033

AIPMT Main - 2012

3. A certain gas takes three times as long to effuse out as helium. Its molecular mass will be :

(1) 64 u (2) 9 u (3) 27 u (4) 36 u

IG0034

NEET-UG 2013

4. Maximum deviation from ideal gas is expected from :

(1) $NH_3(g)$ (2) $H_2(g)$ (3) $N_2(g)$ (4) $CH_4(g)$

IG0035

NEET(UG) 2018

5. Given van der Waal's constant for NH_3, H_2, O_2 and CO_2 are 4.17, 0.244, 1.36 and 3.59, L^2 atm mol^{-2} respectively which one of the following gases is most easily liquefied?

(1) NH_3 (2) H_2 (3) O_2 (4) CO_2

RG0039

6. The correction factor 'a' to the ideal gas equation corresponds to

(1) density of the gas molecules

(2) volume of the gas molecules

(3) electric field present between the gas molecules

(4) forces of attraction between the gas molecules

IG0040

NEET(UG) 2019

7. A gas at 350 K and 15 bar has molar volume 20 percent smaller than that for an ideal gas under the same conditions. The **correct** option about the gas and its compressibility factor (Z) is :

(1) Z > 1 and attractive forces are dominant

(2) Z > 1 and repulsive forces are dominant

(3) Z < 1 and attractive forces are dominant

(4) Z < 1 and repulsive forces are dominant

RG0056

NEET(UG) (Odisha) 2019

8. The volume occupied by 1.8 g of water vapour at 374 °C and 1 bar pressure will be :-

[Use R = 0.083 bar L $K^{-1}mol^{-1}$]

(1) 96.66 L (2) 55.87 L

(3) 3.10 L (4) 5.37 L

IG0057

9. In water saturated air, the mole fraction of water vapour is 0.02. If the total pressure of the saturated air is 1.2 atm, the partial pressure of dry air is :-

(1) 1.18 atm (2) 1.76 atm

(3) 1.176 atm (4) 0.98 atm

IG0058

NEET (UG) 2020

10. A mixture of N_2 and Ar gases in a cylinder contains 7g of N_2 and 8g of Ar. If the total pressure of the mixture of gases in the cylinder is 27 bar, the partial pressure of N_2 is:

[Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]

(1) 18 bar (2) 9 bar

(3) 12 bar (4) 15 bar

IG0067

NEET (UG) 2020 (Covid-19)

11. The minimum pressure required to compress 600 dm^3 of a gas at 1 bar to 150 dm^3 at 40°C is

(1) 4.0 bar (2) 0.2 bar

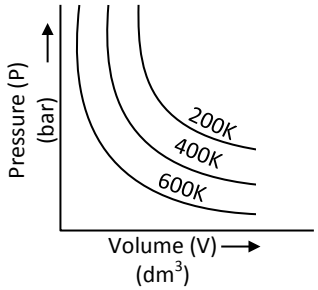
(3) 1.0 bar (4) 2.5 bar

IG0068

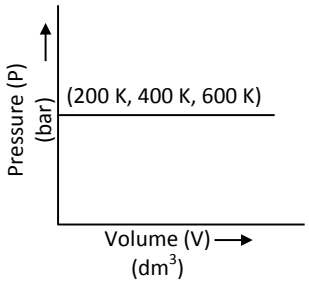
NEET (UG) 2021

12. Choose the correct option for graphical representation of Boyle's law, which shows a graph of pressure vs. volume of a gas at different temperatures:

(1)



(2)



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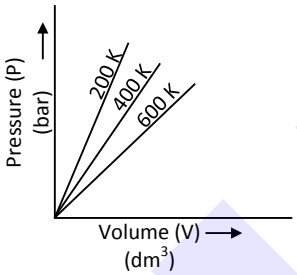
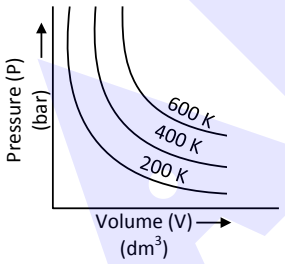


(4)



IG0069

13. Choose the correct option for the total pressure (in atm.) in a mixture of 4g O_2 and 2g H_2 confined in a total volume of one litre at 0°C is:
[Given R = 0.082 L atm $mol^{-1}K^{-1}$, T=273K]

(1) 2.518 (2) 2.602

(3) 25.18 (4) 26.02

IG0070

NEET (UG) 2022

14. A 10.0 L flask contains 64 g of oxygen at 27°C. (Assume O_2 gas is behaving ideally). The pressure inside the flask in bar is
(Given R = 0.0831 L bar K^{-1} mol^{-1})

(1) 498.6 (2) 49.8

(3) 4.9 (4) 2.5

IG0071

NEET (UG) 2022 (OVERSEAS)

15. At 300 K, 250 mL of gas A at 1 bar pressure is mixed with 500 mL of gas B at 2 bar pressure in a 1.0 L flask. Gas A does not react with gas B. The final pressure of the mixture is :

(1) 2.15 bar (2) 2.50 bar

(3) 1.25 bar (4) 1.00 bar

IG0072

16. Which of the following is not correct about postulates of kinetic molecular theory of gases?

(1) Volume of the gas is due to the large number of molecules of the gas.

(2) Average kinetic energy of molecules is directly proportional to the absolute temperature of the gas.

(3) The molecules move randomly with different speeds in different directions.

(4) Pressure of the gas is due to the collision of molecules against the walls of the container.

IG0073

Re-NEET (UG) 2022

17. Four gas cylinders containing He, N_2, CO_2 and NH_3 gases separately are gradually cooled from a temperature of 500 K. Which gas will liquify first? (Given T_C in K – He : 5.3, N_2 : 126, CO_2 : 304.1 and NH_3 : 405.5)

(1) He (2) N_2

(3) CO_2 (4) NH_3

RG0074

18. A vessel contains 3.2 g of dioxygen gas at STP (273.15 K and 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes one third of the original pressure. The volume of new vessel in L is :

(Given - molar volume at STP is 22.4 L)

(1) 6.72 (2) 2.24 (3) 22.4 (4) 67.2

IG0075

EXERCISE-II (Previous Year Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**2**	**1**	**4**	**1**	**1**	**4**	**3**	**4**	**3**	**4**	**1**	**4**	**3**	**3**	**3**
Que.	16	17	18												
Ans.	**1**	**4**	**1**												

EXERCISE-III (Analytical Questions) — Master Your Understanding

1. When r, P and M represent rate of diffusion, pressure and molecular mass, respectively, then the ratio of the rates of diffusion (r_A/r_B) of two gases A and B, is given as :-

(1) $(P_A/P_B)^{1/2}\,(M_A/M_B)$ (2) $(P_A/P_B)\,(M_B/M_A)^{1/2}$

(3) $(P_A/P_B)^{1/2}\,(M_B/M_A)$ (4) $(P_A/P_B)\,(M_A/M_B)^{1/2}$

IG0043

2. The compressibility factor for a real gas at high pressure is :-

(1) $1-\frac{pb}{RT}$ (2) $1+\frac{RT}{pb}$

(3) 1 (4) $1+\frac{pb}{RT}$

RG0044

3. If Z is a compressibility factor, van der Waal's equation **at low** pressure can be written as :

(1) $Z = 1-\frac{Pb}{RT}$ (2) $Z = 1+\frac{Pb}{RT}$

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

RG0045

4. Under which of the following conditions, a gas deviates most from the ideal behaviour ?

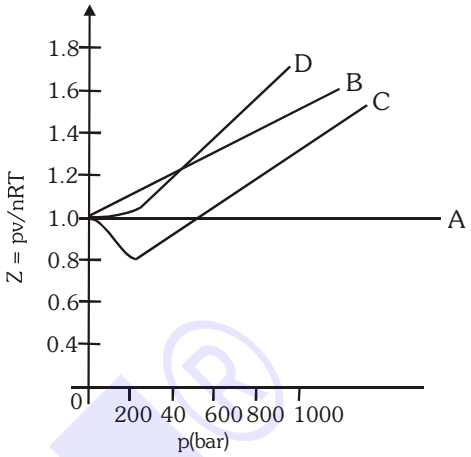
(a) Very low pressure (b) High pressure

(c) Low temperature (d) High temperature

(1) a, d (2) b, c (3) a, c (4) b, d

RG0059

5. Which curve in the graph always show compressibility factor greater than 1 ?



(1) A gas (2) B gas

(3) C & D gases (4) D gas

RG0060

6.

Gases	H_2	N_2	NH_3	CO_2
Critical temperature	33.2 K	126 K	405.5 K	304.1 K

From the above data what would be the decreasing order of liquefaction of these gases ?

(1) NH_3, CO_2, N_2, H_2 (2) CO_2, NH_3, H_2, N_2

(3) NH_3, N_2, H_2, CO_2 (4) H_2, N_2, CO_2, NH_3

RG0061

7. Vander Waals constant 'a' is -

(1) Measure of magnitude of inter molecular forces within the gas.

(2) Independent of temperature and pressure.

(3) Having unit = L^2 atm mol^{-2}

(4) All are correct

RG0062

EXERCISE-III (Analytical Questions) — ANSWER KEY

Que.	1	2	3	4	5	6	7
Ans.	**2**	**4**	**4**	**2**	**2**	**1**	**4**