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India's Number 1 Education App

CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

STATES OF MATTER

LECTURE SHEET - EXERCISE - I (LEVEL - I MAIN)(STRAIGHT OBJECTIVE TYPES QUESTIONS)

1. Gases show ideal gas behaviour at

A. high pressure and high temperature

B. low pressure and high temperature

C. low pressure and low temperature

D. high pressure and low temperature

Answer: B

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2. A gas of volume 2000ml is kept in a vessel at a pressure of 10^3 pascals at a temperature of $27^\circ C$. If the pressure is increased to 10^5 pascals at the same temperature, the volume of the gas becomes

A. 1000ml

B. 20ml

C. 2ml

D. 200ml

Answer: B

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3. Which of the following indicates Charles' law mathematically (when n, P are constant)?

a) VT = constant $b) V_t = V_0\left(1 + \frac{t}{273}\right)$

c) $V_0 = V_t\left(1 + \frac{t}{273}\right)$ d) V/T = constant (when n, P are constant)

A. a,c

B. a, b

C. b, c

D. b, d

Answer: D

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4. The volume of a given mass of a gas is 100ml at $100\,^{\circ}C$. If pressure is kept constant at what temperature will the sample have the volume of 200ml?

A. $50\,^{\circ}C$

B. $473\,^{\circ}C$

C. $200^{\circ}C$

D. $400^{\circ}C$

Answer: B

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5. A gas cylinder withstands a pressure of 14.9 atm. Its pressure gauze indicates 12 atm at $27^{\circ}C$. If the building catches fire suddenly, at what temperature the cylinder explodes?

A. $21.7^{\circ}C$

B. $33.5^{\circ}C$

C. $372.5^{\circ}C$

D. $99.5^{\circ}C$

Answer: D

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6. Value of Rin SI units is

A. $8.315 \times 10^{-7} ergK^{-1} \text{mol}^{-1}$

B. $8.315 JK^{-1} \text{mole}^{-1}$

C. $0.0823 lit. Atm. K^{-1} \text{mole}^{-1}$

D. $2 calK^{-1} \text{mole}^{-1}$

Answer: B

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7. The value of the universal gas constant R depends upon the

A. Nature of the gas

B. Mass of the gas

C. Temperature of the gas

D. The units of measurement

Answer: D

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8. Assertion (A): 8 gm of CH_4 occupies 11.355 of volume at S.T.P.

Reason (R): 1 mole of any gas at S.T.P. ocupies 22.711 lit.

A. A & R are true, R explains A

B. A & R are true, R does not explain A

C. A is true R is false

D. A is false R is true

Answer: A

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9. The molar volume of an ideal gas at one atmosphere and $273^\circ C$ is

A. 22.4L

B. 44.8L

C. 11.2L

D. 5.61

Answer: B

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10. At $27^{\circ}C$, one mole of an ideal gas exerted a pressure of 0.821 atmospheres. What is its volume in litres ? $\left(R = 0.082\text{lit-atm/mol}^{-1}K^{-1}\right)$

A. 300

B. 30

C. 0.3

D. 3

Answer: B

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11. 'n' moles of an ideal gas at temperature 'T' occupy 'V' litres of volume, exerting a pressure of 'p' atmospheres. What is its concentration in mole lit^{-1} (R = gas constant)

A. $\frac{RT}{R}$

B. $\frac{P}{RT}$

C. $\frac{RT}{P}$

D. $\frac{R}{RT}$

Answer: B

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12. Two identical vessels are filled with 44g of Hydrogen and 44g of carbon dioxide at the same temperature. If the pressure of CO_2 is 2 atm, the pressure of Hydrogen is

A. 1 atm

B. 44 atm

C. 2 atm

D. 22 atm

Answer: B

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13. A gas occupies a volume of 300 cc at $27\ ^{\circ}C$ and 620 mm pressure. The volume of the gas at $47\ ^{\circ}C$ and 640 mm pressure is

A. 260cc

B. 310cc

C. 390cc

D. 450cc

Answer: B

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14. If the weight of 5.6 lit of a gas at NTP is 11g, the gas may be (at.wt of P = 31, N = 14,0 = 16 and Cl = 35.5)

A. PH_3

B. $COCl_2$

C. 390

D. 450

Answer: D

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15. 0.3 g of a gas has a volume of 112 ml at $0^\circ C$ and 2atm pressure. Its Molecular weight is

A. 60

B. 30

C. 44

D. 28

Answer: B

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16. The vapour density of a gas is 11.2. The volume occupied by 10g of the gas at STP is

A. 10 L

B. 1 L

C. 11.2 L

D. 5.6 L

Answer: A

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17. When the absolute temperature of a gas is doubled then the correct statements are

a) The V of a gas increases by 4 times at constant P

b) The P of a gas increases by 2 times at constant V

c) The V of a gas increases by 2 times at constant P

d) The P of a gas increases by 4 times at constant V

A. b, d

B. a, c

C. b, c

D. a, d

Answer: C

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18. If the pressure and absolute temperature of 4 litres of SO_2 gas are doubled, the volume of this gas would be

A. 1 litre

B. 4 litres

C. 2 litres

D. 8 litres

Answer: B

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19. One litre of a gas weights 28 at 300 K and latm pressure. If the pressure is made 0.75 atm, at what temperature will one litre of the same gas weigh lg

A. 600K

B. 800K

C. 900K

D. 450K

Answer: D

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20. 'X' moles of N_2 gas at S.T.P. conditions occupy a volume of 10 litres, then the volume of '2x' moles of CH_4 at $273^\circ C$ and 1.5 atm is

A. 20 lit

B. 26.6 lit

C. 5 lit

D. 16.6 lit

Answer: B

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21. The density of a gas is l gm/lit at STP. At 6 atm pressure and $546^{\circ} C$, ihe density of the same gas is

A. 2 g/lt

B. 1 g/lt

C. 0.5 g/lt

D. 0.25 g/lt

Answer: A

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22. Assertion (A): At 273K and 0.5 atms pressure, 1L of H_2 and 1L ofCO_2 contain same number of molecules.

Reason (R): Equal volumes of all gases contain equal number of molecules under the same conditions of temperature and pressure.

A. A & R are true, R explains A

B. A & R are true, R does not explain A

C. A is true R is false

D. A is false R is true

Answer: A

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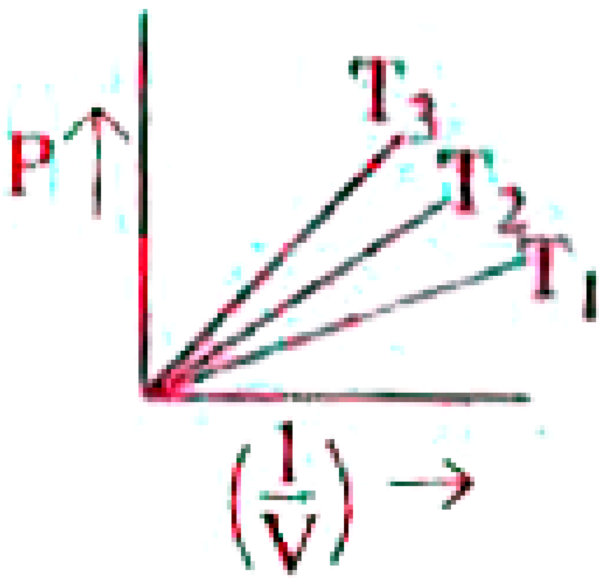
23. From the graph the correct order of temperatures is



A. $T_3 > T_2 > T_1$

B. $T_3 < T_2 < T_1$

C. $T_3 = T_2 = T_1$

D. $T_3 > T_2 < T_1$

Answer: A

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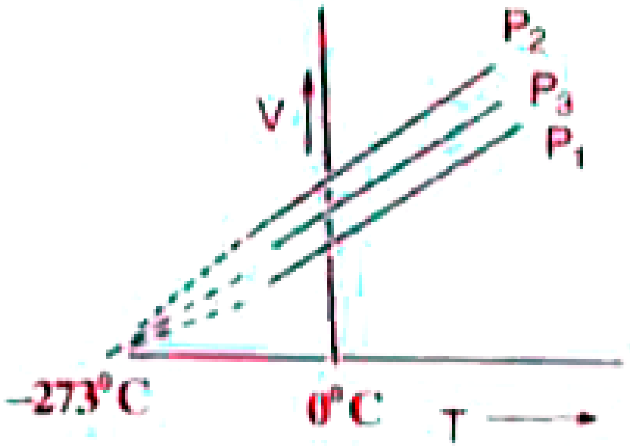
24. The volume-temperature graphs of a given mass of an ideal gas at constant pressures are shown below. What is the correct order of pressures?



A. $P_1 > P_3 > P_2$

B. $P_1 > P_2 > P_3$

C. $P_2 > P_3 > P_1$

D. $P_2 > P_1 > P_3$

Answer: A

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LECTURE SHEET - EXERCISE - I (LEVEL - II ADVANCED)(STRAIGHT OBJECTIVE TYPES QUESTIONS)

1. How much should the pressure be increased in order to decrease the volume of a gas by 5% at constant temperature

A. 25%

B. 10%

C. 4.26%

D. 5.26%

Answer: D

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2. A cubical vessel has a side with 'l' cm length contained a gas at a pressure of 'P'. When the side of the vessel is made l/2 cm, the pressure of the gas becomes

A. P

B. P/8

C. 2P

D. 8P

Answer: D

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3. Four one litre flasks are seperately filled with gases O_2, F_2, CH_4 and CO_2 under same conditions. The ratio of number of molecules in these flasks is

A. $2:2:4:3$

B. $1:1:1:1$

C. $1:2:3:4$

D. $2:2:3:4$

Answer: B

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4. N_2 gas is present in one litre flask at a pressure of 7.6×10^{-10}mm of Hg. The number of N_2 gas molecules in the flask at $0\,^{\circ}C$ are

A. 2.68×10^9

B. 2.68×10^{10}

C. 1.34×10^{28}

D. 2.68×10^{22}

Answer: B

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5. One mole of argon will have least density at

A. STP

B. $0^{\circ} C, 2atm$

C. $273^{\circ} C, 2atm$

D. $273^{\circ} C, 1atm$

Answer: D

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6. By taking two J-tubes at constant temperature what is the difference in the levels of mercury in two columns?

A. 1013.3 mm

B. 1140 mm

C. 253.3 mm

D. 760 mm

Answer: C

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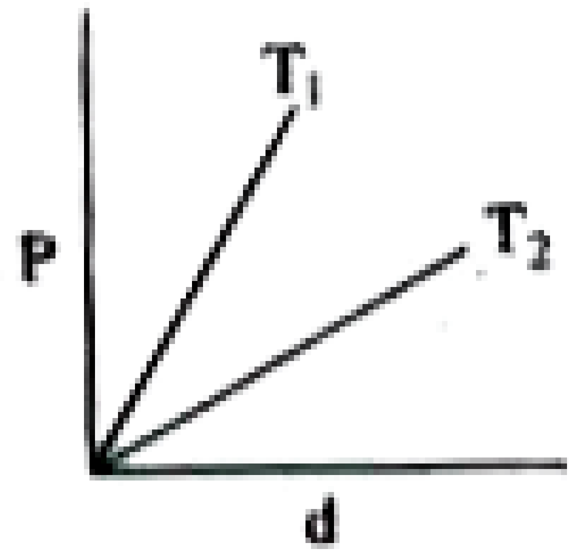
7. Diagram shows a graph between pressure and density for an ideal gas at two temperatures T_1 and T_2 which is correct



A. $T_1 > T_2$

B. $T = T_2$

C. $T_1 > T_2$

D. None

Answer: A

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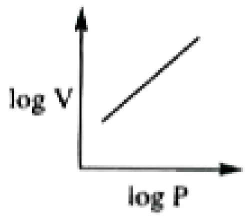
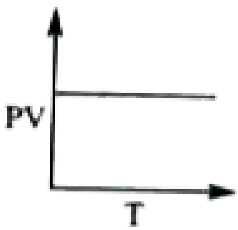
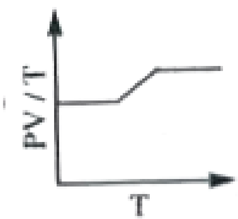
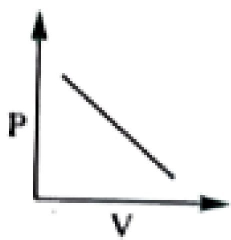
8. Which among the following indicates change in the chemical composition due to dissociation

A.


B.


C.


D.


Answer: C

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9. Balloons of 4L capacity are to be filled with Hydrogen at a pressure of 1 atm and 27°C from an 8L cylinder containing Hydrogen at 10 atm at the same temperature. The number of balloons that can be fdled is

A. 20

B. 18

C. 40

D. 38

Answer: B

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10. A 10 lt vessel contains He gas at 10 atm and TK .How many balloons of one litre capacity at 1 aTm and 2TK can be filled by using the gas present in the cylinder

A. 200

B. 190

C. 180

D. 170

Answer: C

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11. An open flaskh has Helium gas at 2 atm and $327^\circ C$. The flask is heated to $527^\circ C$ at the same pressure. The fraction of original gas remaining in the flask is

A. 3/4

B. 1/4

C. $1/2$

D. 2/5

Answer: A

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LECTURE SHEET - EXERCISE - I (LEVEL - II ADVANCED)(MORE THAN ONE CORRECT ANSWER TYPES QUESTIONS)

1. The following statements are correct

A. a plot of log V vs log P is linear at const T

B. a plot of log V vs log Tis linear at const P

C. a plot of log P vs 1/T is linear at const V

D. a plot of P vs 1/V is linear at const T

Answer: A::B::D

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2. A graph is ploted between log V and log T for two moles of gas at constant pressure of 0.0821 atm. [V and T are in litres and kelvin]. Then which of the following is/are correct

A. The graph is a straight line with slope + 1

B. The graph is a straight line with slope - 1

C. The intercept on Y-axis is 0.301

D. The intercept on Y-axis is

Answer: A::C

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3. Which of the following correctly represent the behaviour of an ideal gas

A. $PV_m \propto T$

B. $PM \propto dT$

C. $P \propto CT$

D. $PV_m \propto CT$

Answer: A::B::C

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4. Consider the quantity $\frac{MkT}{PV}$ of an ideal gas where M is the mass of the gas. It does not depends on the

A. Temperature of the gas

B. Volume of the gas

C. Pressure of the gas

D. Nature of the gas

Answer: A::B::C

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5. Boyle's law for a gas of constant mass, may be expressed as

A. $\left(\frac{dP}{dV}\right)_T = \frac{K}{V}$

B. $\left(\frac{dP}{dV}\right)_T = -\frac{K}{V^2}$

C. $\left(\frac{dP}{dV}\right)_T = \frac{K}{V}$

D. $V\alpha\frac{1}{P}$ at constant T

Answer: B::D

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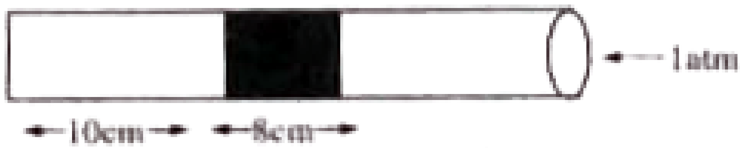
LECTURE SHEET - EXERCISE - I (LEVEL - II ADVANCED)(LINKED COMPREHENSION TYPES QUESTIONS)

1. A 10 cm column of air is trapped by a column of mercury, 8 cm long, in a capillary tube horizontally fixed as shown below, at 1 atm pressure. When the tube is held at certain angle θ° with open end up, the weight of Hg is borne partially by the gas. Vertical Height of Hg is a measure of additional pressure on gas.



The length of air column, when the tube is fixed vertically at the same temperature with open end up is .

A. $\frac{76 \times 84}{10} cm$

B. $\frac{76 \times 10}{84} cm$

C. $\frac{84 \times 10}{76} cm$

D. $\frac{76 \times 10}{84} cm$

Answer: B

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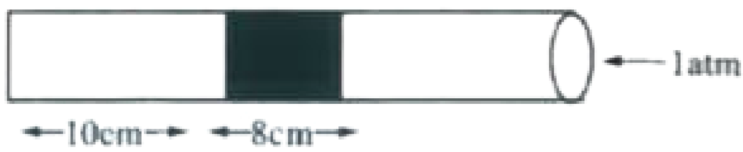
2. A 10 cm column of air is trapped by a column of mercury, 8 cm long, in a capillary tube horizantally fixed as shown below, at 1 atm pressure. When the tube is held at certain angle θ°, with open end up, the weight of Hg is borne partially by the gas. Vertical Height of Hg is a measure of additional pressure on gas:



The length of air coloumn.when the tube is fixed vertically with opend end down at same temperature is

A. $\frac{76 \times 68}{10}$

B. 0 cm

C. $\frac{76 \times 10}{84}$

D. $\frac{76 \times 10}{84}$

Answer: C

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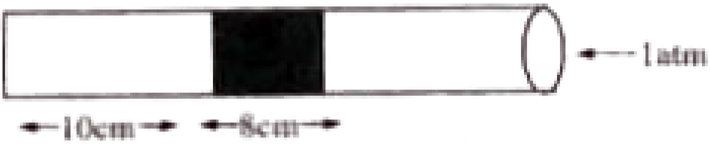
3. A 10 cm column of air is trapped by a column of mercury, 8 cm long, in a capillary tube horizontally fixed as shown below, at 1 atm pressure. When the tube is held at certain angle θ° with open end up, the weight of Hg is borne partially by the gas. Vertical Height of Hg is a measure of additional pressure on gas.



When the tube's held at 45° with the horizontal with open end up the length of air column is

A. $\dfrac{76 \times 10}{76 + \frac{8}{\sqrt{2}}} cm$

B. $\dfrac{76 \times \frac{8}{\sqrt{2}}}{76 + 10} cm$

C. $76 \times \dfrac{8}{\sqrt{2}}$

D. $10 \times \dfrac{8}{\sqrt{2}}$

Answer: A

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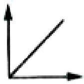
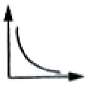
LECTURE SHEET - EXERCISE - I (LEVEL - II ADVANCED)(MATRIX MATCHING TYPE QUESTIONS)

1.

Column-I	Column-II
A) $\frac{1}{V^2}$ vs P for ideal gas at constant T and n.	P) 
B) V vs $\frac{1}{T}$ for ideal gas at constant P and n	Q) 
C) PT vs T^2 for ideal gas at constant V and n	R) 
D) V vs $\frac{1}{P^2}$ for ideal gas at constant T and n	S) 

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LECTURE SHEET - EXERCISE - I (LEVEL - II ADVANCED)(INTEGER TYPE QUESTIONS)

1. A gas occupies a volume of 2.5L at $9 \times 10^5 Nm^{-2}$. The additional pressure required to decrease the volume of the gas to 1.5L keeping the temperature constant is .... $\times 10^5 Nm^{-2}$?

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2. 4.0g of argon gas has pressure P and temperature TK in a vessel. On keeping the vessel at $50\,^{\circ}C$ higher, 0.8g of argon was given out to maintain the pressure at P. The original temperature was ____ $\times 10^2 K$.

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3. For a given mass of gas, if pressure is reduced to half and temperature is increased two times, then the volume of gas would become ___ times .

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LECTURE SHEET - EXERCISE - II (LEVEL - I MAIN)(STRAIGHT OBJECTIVE TYPES QUESTIONS)

1. Dalton's law of partial pressures is applicable to

A. $NO + O_2$

B. $H_2 + Cl_2$

C. $NH_3 + HCl$

D. $CO_2 + O_2$

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2. Combination that obeys Dalton's law

$A = CO \quad B = CI_2 \quad C = F_2 \quad D = Xe$

A. A, B

B. B,C

C. B, D

D. A, C

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3. In a ten litre vessel, the total pressure of a gaseous mixture containing H_2, N_2 and CO_2 is 9.8atm. The partial pressures of H_2 and N_2 are 3.7 and 4.2 atm respectively. Then the partial pressure of CO_2 is

A. 1.9atm

B. 0.19atm

C. 2.4atm

D. 0.019atm

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4. O_2 and He are taken in equal weights in a vessel. The pressure exerted by Helium in the mixture is

A. $\frac{1}{8^{th}}$ of total pressure

B. $\frac{1}{9^{th}}$ of total pressure

C. $\frac{2}{9^{th}}$ of total pressure

D. $\frac{8}{9^{th}}$ of total pressure

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5. The total pressure of a mixture of 8g of oxygen and 14g of nitrogen contained in a 11.2L vessel at 0°C is.

A. 0.5 atm

B. 1 atm

C. 1.5 atm

D. 2 atm

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6. A and B are ideal gases. The molecular weights of A and B are in the ratio of 1 : 4. The pressure of a gas mixture containing equal weights of A

and B is P atm. What is the partial pressure (in atm) of B in the mixture?

A. P/5

B. P/2

C. P/2

D. 3P/4

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7. A mixture contains 16 g of oxygen, 28 g of nitrogen and 8 g of CH_4. Total pressure of mixture is 740 mm. What is the partial pressure of nitrogen in mm?

A. 185 mm

B. 370 mm

C. 555 mm

D. 740 mm

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8. At 27° C, a closed vessel contains a mixture of equal weights of helium (mol. wt. = 4), methane (mol. wt. =16) and sulphur dioxide (mol. wt = 64). The pressure exerted by the mixture is 210 mm. If the partial pressures of helium, methane and sulphur dioxide are P_1, P_2 and P_3 respectively, which one of the following is correct ?

A. $P_3 > P_2 > P_1$

B. $P_1 > P_2 > P_3$

C. $P_1 > P_3 > P_2$

D. $P_2 > P_3 > P_1$

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9. In a gaseous mixture at 4 atm pressure, 25% of molecules are Nitrogen, 40% of molecules are carbon dioxide and the rest are oxygen. The partial pressure of oxygen in the mixture is

A. 1.40 atm

B. 1.6 atm

C. 1 atm

D. 0.9 atm

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10. 2gm of hydrogen is present in a closed vessel at S.T.P. If the same quantity of another gas 'X' when introduced into the vessel the pressure becomes 1.5 atm. The gas 'X' would be

A. CH_4

B. SO_2

C. He

D. O_2

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11. Mixing of two gases by diffusion is

A. Reversible

B. irreversible

C. Exothermic

D. endothermic

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12. For the diffusion of a gas at pressure P, the rate of diffusion is expressed by

A. $r \alpha \frac{P}{\sqrt{M}}$

B. $r = \frac{P}{M}$

C. $r \alpha \frac{M}{\sqrt{P}}$

D. $r = \frac{P}{\sqrt{M}}$

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13. A balloon filled with acetylene is kept in a vessel of hydrogen at the same temperature and pressure. If the balloon is punctured with a pin, it

A. collapses

B. bursts

C. nothing happens

D. becomes red

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14. Among the following, the applications of Graham's law are

a) In Marsh gas alarm b) In designing eudiometer

c) In separating uranium isotopes d) To measure volume of a gas by gas burette

A. a, c

B. b, d

C. c, d

D. b, d

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15. The rate of diffusion of Hydrogen is about

A. 1/2 that of He

B. Twice that of He

C. 1.414 times that of He

D. Four times that of He

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16. Which of the pairs of gases diffuse at a slower rate than CO_2?

A. H_2 and He

B. SO_2 and SO_3

C. N_2 and CO

D. N_2O and C_2H_8

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17. O_2 and He are taken in equal weights in a vessel. The pressure exerted by Helium in the mixture is

A. O_3

B. O_2

C. SO_2

D. SO_3

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18. At what temperature will the rate of diffusion of N_2 be 1.6 times the rate of diffusion of SO_2 at 27°C?

A. $336\,^{\circ}C$

B. $27\,^{\circ}C$

C. $50^\circ C$

D. $63^\circ C$

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19. Two samples of gases 'a' and 'b' are at the same temperature. The molecules of 'a' are travelling 4 times faster than molecules of 'b'. The ratio of M_a/M_b will be

A. $1/4$

B. $16/1$

C. $4/1$

D. $1/16$

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20. Assertion (A): Rate of diffusion of H_2 gas is the highest.

Reason (R) : Rate of diffusion of a gas is inversely proportional to molecular weight of the gas.

A. A & R are true, R explains A

B. A & R are true, R does not explain A

C. A is true R is false

D. A is false R is true

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21. $350cm^3$ of $CH4$ and $175cm^3$ of an unknown gas 'A' diffused in the same time under similar conditions. The molecular mass of gas A is

A. 32

B. 64

C. 30

D. 71

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22. A certain volume of Methane diffuses in 10 Sec through a porous partition. The time taken by an equal volume of oxygen to diffuse under the same condition is

A. 14.14 Sec.

B. 7.07 Sec.

C. 20 sec.

D. 5 Sec

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23. 0.5 mole each of $H_2SO_4$and CH_4 are kept in a container. A hole was made in the container. After 3 hours the order of partial pressures in the container will be:

A. $P_{SO_2} > P_{CH_4} > P_{H_2}$

B. $P_{CH_4} > P_{SO_2} > P_{H_2}$

C. $P_{H_2} > P_{SO_2} > P_{CH_4}$

D. $P_{H_2} > P_{CH_4} > P_{SO_2}$

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24. 50 ml of oxygen diffuses under certain conditions through a porous membrane. The volume of Hydrogen that diffuses in the same time under the same conditions is

A. 12.5 ml

B. 25ml

C. 100ml

D. 200ml

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LECTURE SHEET - EXERCISE - II (LEVEL - II ADVANCED)(STRAIGHT OBJECTIVE TYPES QUESTIONS)

1. In a mixture of N_2 and CO_2 gases, the partial pressure of CO_2 is 1.25 atm. The total pressure of the mixture is 5 atm. The mole fraction of N_2 in the mixture is

A. 0.82

B. 0.75

C. 0.80

D. 0.65

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2. Equal volumes of two jars contain HCI, NH_3 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

A. 1 atm

B. Equal to P

C. Becomes Zero

D. P+P = 2P

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3. When 2g of a gas A is introduced into an evacuated flask kept at 25°C, the pressure is found to be 1 atmosphere. If 3g of another gas is then added to the same flask, the total pressure becomes 1.5 atm. Assuming ideal behaviour, the ratio of their molecular weights $M_A : M_B$ is

A. $3:1$

B. $1:3$

C. $2:3$

D. $3:2$

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4. A vessel has N_2 gas saturated with water vapour at a total pressure of 1 atm. The partial pressure of water vapour is 0.3 atm. The contents of this vessel are completely transferred to another vessel having one third of the capacity of the original volume, at the same temperature. The total pressure of this system in the new vessel is

A. 3.0 atm

B. 1 atm

C. 3.33 atm

D. 2.4 atm

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5. The reaction between gaseous NH_3 and HBr produces a white solid NH_4Br. Suppose that NH_3 and HBr are introduced simultaneously into the opposite ends of an open tube of 1 metre length. Where would you expect the white solid to form?

A. At a distance of 34.45 cm from NH_3 end

B. At a distance of 68.5 cm from NH_3 end

C. At a distance of 44.45 cm from HBr end

D. At a distance of 45.45 cm from HBr end

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6. Two glass bulbs A and B are connected by very small tube having a stop cock. Bulb A has a volume of 100 ml and contained a gas while bulb B is empty and has a volume of 150 ml. On opening the stop cock, the pressure of the gas in bulb A will fall down to :

A. 80%

B. 60%

C. 0.4

D. 20%

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7. 10 lts of an air sample with relative humidity 0.6 is compressed to 5 litres at same temperature. What is the partial pressure of the water vapour in the compressed air, if the pressure of saturated water vapour at that temperature is 2.4 K Pa

A. 1.2 KPa

B. 2.4 Kpa

C. 3.6 kPa

D. 1.8 KPa

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8. Two containers A and B have the same volume. Container 'A' contains 5 mole oxygen gas. Container 'B' contains 3 moles He gas and 2 mole CH_4 gas. Both the containers are separately kept in vaccum at the same temperature. Both the containers have very small orifices of the same area through which the gases leak out. The rate of diffusion of O_2 is how many times the rate of diffusion of He and CH_4 mixture

A. $\sqrt{\frac{8.8}{32}}$

B. $\sqrt{\frac{7}{32}}$

C. $\frac{3}{2}\sqrt{\frac{8.8}{32}}$

D. $\sqrt{\frac{32}{8.8}}$

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LECTURE SHEET - EXERCISE - II (LEVEL - II ADVANCED)(MORE THAN ONE CORRECT ANSWER TYPES QUESTIONS)

1. Two vessels are connected by a valve of negligible volume. One container, A has 2.8 g N_2 at T_1K. The other container, B is completely evacuated. The container A is heated to T_1K, while container B is maintained at $\frac{T_2}{3}K$. Volume of A is half that of B. If the valve is opened, then

A. 6/70 moles of N_2 will be present in B

B. The weight ratio of N_2 in A and B vessels is 1:6

C. N_2 gas does not enter into B vessel

D. number of moles of N_2 released into B vessel is less than that in A vessel

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2. To measure the pressure exerted by a trapped gas A, an open ended mercury manometer is used. After sparking the gas A, it dissociates as, A(g) $\rightarrow$ B(g) + 3C(g). If the pressure of A decreases to 0.9 atm, then (assume temperature to be constant, 300K)

A. total pressure increased to 1.3 atm

B. total pressure increased by 0.3 atm

C. difference in mercury level is 228 mm

D. Total pressure increased by 0.3 cm of Hg

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3. Under identical conditions of pressure and temperature

A. $\frac{r_{H_2}}{r_{O_2}} = 4$

B. $\frac{r_{H_2}}{r_{CH_4}} = 2.83$

C. $\frac{r_{He}}{r_{CH_4}} = 2$

D. $\frac{r_{He}}{r_{SO_2}} = 4$

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LECTURE SHEET - EXERCISE - II (LEVEL - II ADVANCED)(MATRIX MATCHING TYPE QUESTIONS)

1.

Column-	Column-II
A) Boyle's law	P) $P_{obs} = P_{atm} + P_{water\ vapour}$
B) Avagadro's law	Q) $V_1 = n_1\left(\frac{V_2}{n_2}\right)$
C) Charles' law	R) $V_t = V_0\left(1 + \frac{t}{273}\right)$
D) Dalton's law	S) $V_1 = P_2\left(\frac{V_2}{P_1}\right)$

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LECTURE SHEET - EXERCISE - II (LEVEL - II ADVANCED)(INTEGER TYPE QUESTIONS)

1. In what ratio by mass carbon monoxide and nitrogen should be mixed so that partial pressure exerted by each gas is same ?

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2. 3.2g of oxygen (At.wt =16) and 0.2g of hydrogen (At.wt = 1) are placed in a 1.12 litre flask at $0^\circ C$. The total pressure of the gas mixture will be atm

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3. A vessel contains equal weights of He and CH_4 gases at 20 bar pressure. Due to the leakage, the gases in the vessel started effusing out. What is the volume ratio of He and CH_4 gases coming out initally

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4. Two gram of hydrogen diffuse from a container in 10 minutes. How many grams of oxygen would diffuse through the same container in the same time under similar conditions?

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LECTURE SHEET - EXERCISE - III (LEVEL - I MAIN)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. The kinetic gas equation is applicable when the gas is present in a

A. Cubic vessel

B. Spherical vessel

C. Vessel of any shape

D. Cylindrical vessel

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2. The correct statements regarding kinetic molecular theory are

a) The distance between the molecules is high compared to size of the gaseous molecules

b) The motion of the gaseous molecules are affected by gravitational force

c) The attractive forces between the gaseous molecules are very high.

d) The total K.E of a sample of gaseous molecules remains constant at a given temperature

A. b, d

B. b,c

C. a, d

D. c, d

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3. Which is wrong according to kinetic theory

A. Average K.E. of molecules is proportional to the absolute temperature

B. Collisions between molecules are perfectly elastic

C. Pressure is due to collisions between molecules

D. There are no attractive forces between the molecules of a gas

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4. When gas molecules collide on the walls of the vessel, the energy of the molecules changes into

A. Heat

B. Temperature

C. Light

D. None

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5. The Kinetic energy of a gas depends upon

a) nature of the gas

b) absolute temperature

c) molecular weight of the gas

d) number of moles of the gas

A. b, d

B. c, d

C. a, d

D. a, b

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6. Assertion (A): At a given temperature 1 mole of any gas has same kinetic energy.

Reason (R): Kinetic energy = (3/2)RT (for 1mole of gas).

A. A & R are true, R explains A

B. A & R are true, R does not explain A

C. A is true R is false

D. A is false R is true

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7. The ratio of kinetic energies of 2gm of $H_2$and 4gm of CH_4 at a given temperature is

A. $4:1$

B. $2:32$

C. $1:4$

D. $16:2$

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8. The kinetic energy of 1 mole of oxygen molecules in cal mol^{-1} at 27°C

A. 300

B. 600

C. 900

D. 800

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9. The kinetic energy of 'N' molecules of H_2 is 3J at -73°C. The kinetic energy of the same sample of H_2 at 127°C is

A. 12 J

B. 6J

C. 9J

D. 3J

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10. Which of the following indicates RMS velocity of a gas?

a) $\sqrt{\frac{2RT}{M}}$ b) $\sqrt{\frac{3P}{d}}$ c) $\sqrt{\frac{8RT}{\pi M}}$ d) $\sqrt{\frac{3RT}{M}}$

A. c, d

B. b, d

C. a, c

D. a, b

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11. Which of the following is incorrect?

A. RMS velocity depends upon molecular weight

B. RMS velocity depends upon temperature

C. RMS velocity depends upon density at a given temperature

D. The RMS velocity is used in deriving the kinetic gas equation

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12. When pressure is increased upon a gas at constant temperature

A. the R.M.S. velocity decreases

B. the R.M.S. velocity increases

C. the R.M.S. velocity remains the same

D. the average kinetic energy of the molecules increases

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13. Which of the following relations regarding molecular velocities are true ?

a) Most probable velocity $= 0.8166 \times$ RMS velocity

b) RMS velocity = $0.9213 \times$ Average velocity

c) Average velocily = $\sqrt{\frac{8RT}{\pi M}}$

d) $C_p > \bar{C} > C$

A. b,c

B. a,d

C. c, d

D. a,c

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14. The root mean square velocity of a gas is doubled when the temperature is

A. reduced to one-half

B. reduced to one-fourth

C. increase four times

D. increased two times

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15. Assertion (A): H_2 and O_2 have same R.M.S. velocity at the same temperature.

Reason ® : R.M.S. velocity of a gas molecules is directly proportional to square root its 'T'.

A. A & R are true, R explains A

B. A & R are true, R does not explain A

C. A is true R is false

D. A is false R is true

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16. At the same temperature carbon monoxide molecules have the same most probable velocity as the molecules of

A. Nitrogen dioxide

B. Nitrogen

C. Nitrous Oxide

D. Oxygen

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17. R.M.S velocity of ethane molecules when one mole of ethane is present in 10 lt vessel at 10 atm is

A. 10^2 cm/sec

B. 10^3 cm/sec

C. 10^4 cm/sec

D. 10^5 cm/sec

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18. R.M.S velecity of helium at S.T.Pis x cm/sec. R.M.S velocity of helium at 273 k and 4 atm is

A. 4x cm/sec

B. 3x cm/sec

C. 2x cm/sec

D. x cm/sec

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19. RMS velocity of a gas at a given temperature is how much factor higher than its most probable velocity

A. $\frac{3}{2}$

B. $\frac{\sqrt{3}}{2}$

C. $\sqrt{\frac{3}{2}}$

D. $2/3$

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20. The most probable velocity of the molecules of a gas is 1 km/sec. The R.M.S velocity of the molecules is

A. 1.128 km/sec

B. 1.224 km/sec

C. 1.5 km/sec

D. 1.086 km/sec

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21. If two gases of molecular weights M_A and M_B at temperature T_A and T_B are taken such that, $T_A M_B = T_B M_A$, then which property has the same magnitude for both the gases.

A. density

B. pressure

C. KE per mol

D. u_{rms}

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LECTURE SHEET - EXERCISE - III (LEVEL - II ADVANCED)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. At what temperature the most probable velocity of O_2 gas is equal to the RMS velocity of O_3 at 't'°C?

A. $(273 + t)\sqrt{\frac{3}{2}}K$

B. $(273 + t)\sqrt{\frac{2}{3}}K$

C. $(273 + t)K$

D. $\frac{3}{2}(273 + t)K$

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2. What is the RMS speed of a moist particle of mass 10^{-12} g at 27°C according to kinetic molecular theory?

A. 0.35 cm/sec

B. 0.45 cm/sec

C. 0.6 cm/sec

D. 0.7 cm/sec

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3. The rate of effusion of two gases 'a' and 'b' under identical conditions of temperature and pressure are in the ratio of 2:1. What is the ratio of rms velocity of their molecules if T_a and T_b are in the ratio of 2:1

A. $2:1$

B. $\sqrt{2}$:1

C. $2\sqrt{2}:1$

D. $1:\sqrt{2}$

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4. Incorrect statement among the following is

A. Larger the size of molecule, smaller is the mean free path

B. Greater the number of molecules per unit volume, smaller is the mean free path

C. Larger the temperature, larger is the mean free path

D. Larger the pressure, larger is the mean free path

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

A. decreases with the rise in temperature

B. increases with the rise in temperature

C. decreases intially and thereafter increases

D. unpredictable.

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6. The closest distance between the centres oi iwo molecules of a gas taking part in collision is called

A. molecular diameter

B. collision diameter

C. both (a) and (b)

D. none of these

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LECTURE SHEET - EXERCISE - III (LEVEL - II ADVANCED)(MORE THAN ONE CORRECT ANSWER TYPE QUESTIONS)

1. If an inert gas expands at constant pressure by providing heat

A. The temperature increases

B. The intermolecular attractive forces decrease

C. The kinetic energy of molecules decrease

D. The number of molecules per unit volume increases

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2. According to kinetic theory of gases, for a diatomic molecule, which is not correct

A. the pressure exerted by the gas is proportional to the mean speed of the molecule

B. the pressure exerted by the gas is proportional to the mean square speed of the molecule

C. the root mean square speed of the molecule is inversly proportional to the square root of temperature

D. the mean transational kinetic energy of the molecule is proportional to the absolute temperature

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3. Which one of the following is true about the effect of increase in temperature on the distribution of molecular speeds in a gas?

A. the area under the distribution curve remains the same as that under lower temperature

B. the distribution becomes broader

C. the fraction of the molecules with most probable speed increases

D. the most probable speed of the molecules increases

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4. For a mixture of I mole He and 1 mole Ne, select the correct statements(s)

A. Molecules of the two gases strike the wall of the container with same frequency

B. Molecules of the helium strike the wall more frequently

C. $u_{av_{He}} > u_{av_{He}}$

D. $P_{He} > P_{ne}$

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5. There are equal volumes of N_2 and CO_2 gases at $25\,^\circ C$ and 1 atm. Then indicate the correct statements among the following

A. The rms velocity remains the same for N_2 and CO_2 gases

B. The average translational K.E per molecule is the same for N_2 and CO_2

C. The density of N_2 is less than that of CO_2

D. The total translational K.E of both N_2 and CO_2 is the same

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6. If the u_{rms} of an ideal gas in a closed container is doubled, then which of the following statement correctly explains how the change is accomplished?

A. The temperature is doubled

B. The pressure is quadrupled at constant volume

C. The temperature is quadrupled

D. The pressure is quadrupled at constant temperature

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7. Mean free path decreases if

A. H_2 is replaced by He

B. He is replaced by H_2

C. He is replaced by O_2

D. O_2 is replaced by CO_2

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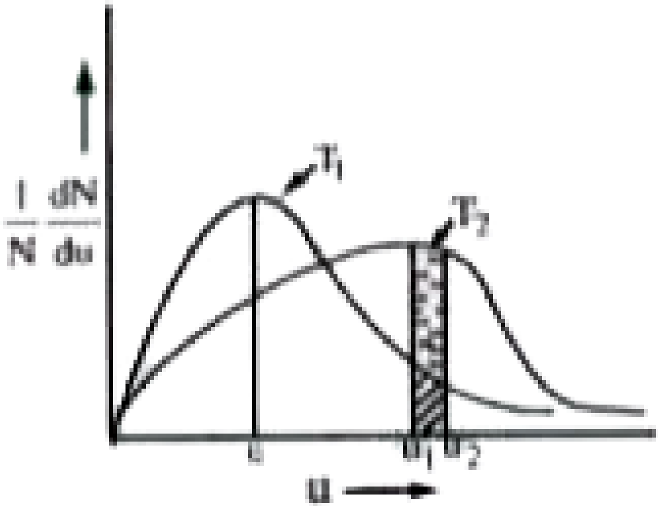
LECTURE SHEET - EXERCISE - III (LEVEL - II ADVANCED)(LINKED COMPREHENSION TYPE QUESTIONS)

1. According to Maxwell distribution, the area under the curve is equal to the total number of molecules in collision. On increasing temperature, fraction of molecules having speed equal to u_{mp} .(most probable speed) decreases. The speed distribution also depends on the mass of the molecules along with the temperature. In general, the distribution depends upon the value of $\frac{M}{T}$ (where M is molar mass and Tis temperature in kelvin).



Relationship between T_1 and T_2 is given as

A. $T_1 = T_2$

B. $T_1 > T_2$

C. $T_2 > T_1$

D. can't be determined

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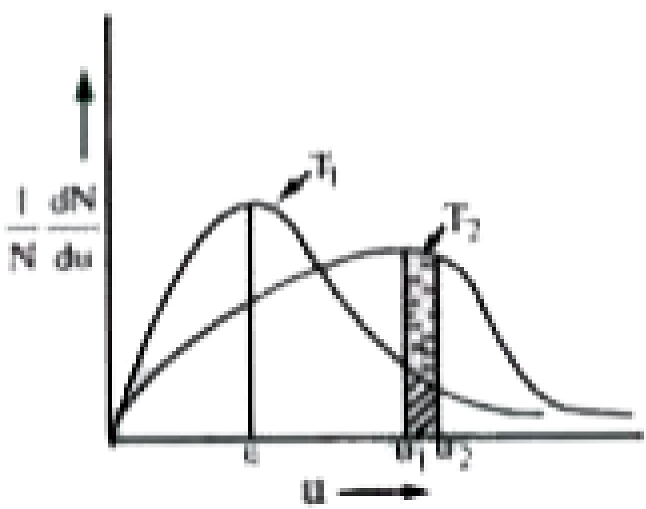
2. According to Maxwell distribution, the area under the curve is equal to the total number of molecules in collision. On increasing temperature, fraction of molecules having speed equal to u_{mp} .(most probable speed) decreases. The speed distribution also depends on the mass of the molecules along with the temperature. In general, the distribution depends upon the value of $\frac{M}{T}$ (where M is molar mass and Tis temperature in kelvin).



On increasing the temperature, number of molecules having speed between u_1 and u_2

A. increases

B. decreases

C. remains constant

D. can't be determined

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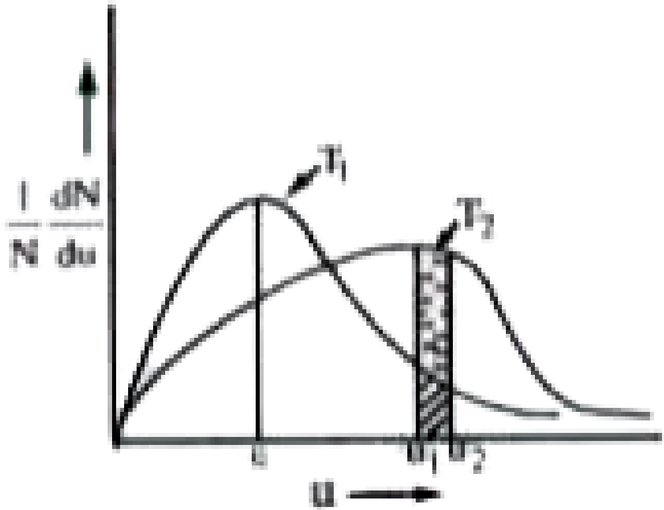
3. According to Maxwell distribution, the area under the curve is equal to the total number of molecules in collision. On increasing temperature, fraction of molecules having speed equal to u_{mp} .(most probable speed) decreases. The speed distribution also depends on the mass of the molecules along with the temperature. In general, the distribution depends upon the value of $\frac{M}{T}$ (where M is molar mass and Tis temperature in kelvin).



If at T_1K is u, then value of u_{rms} at T_2 is

A. $3\sqrt{\frac{T_2}{T_1}}u$

B. $\sqrt{\frac{3T_2}{2T_1}}u$

C. $\sqrt{\frac{T_2}{T_1}}u$

D. $2\sqrt{\frac{T_2}{T_1}}u$

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4. The root mean square speed of an ideal gas is given by : $u_{\text{rms}} = \sqrt{\frac{3RT}{M}}$

Thus we conclude that u_{rms} speed of the ideal gas molecules is proportional to square root of the temperature and inversely proportional to the square root of the molar mass. The translational kinetic energy per mole can also be given as $\frac{1}{2}Mu_{rms}^2$. The mean free path (λ) is the average of distances travelled by molecules in between two successive collisions whereas collision frequency (C.F.) is expressed as number of collisions taking place in unit time. The two terms λ and C.F. are related by : $C.F = \left(\frac{u_{\text{rms}}}{\lambda}\right)$

A jar contains He and H, in the molar ratio 1 : 5. The ratio of mean translational kinetic energy at the same temperature is

A. $1:5$

B. $5:1$

C. $2:1$

D. $1:1$

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Which of the following relation is correct for an ideal gas regarding its pressure (P) and translational kinetic energy per unit volume (E) ?

A. $P = \frac{2}{3}E$

B. $P = \frac{3}{2}E$

C. $P = \frac{1}{2}E$

D. $P = 2E$

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6. The root mean square speed of an ideal gas is given by : $u_{\text{rms}} = \sqrt{\frac{3RT}{M}}$

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If n represents number of moles, n0 is number of molecules per unit volume, k is Boltzmann constant, R is molar gas constant, T is absolute temperature and NA is Avogadro's number then which of the following relations is wrong ?

A. $P = m_0 kT$

B. $P = n_0 RT$

C. $P = \dfrac{nKN_A T}{V}$

D. $n_0 = N_A \times \dfrac{n}{V}$

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LECTURE SHEET - EXERCISE - III (LEVEL - II ADVANCED)(MATRIX MATCHING TYPE QUESTIONS)

1.

Column-I	Column-II
A) If temperature of given gas is increased	P) Average speed of gas molecules
B) If the pressure of the given gas increased at constant temperature	Q) Root mean square speed of gas will increase
C) If the density of a given gas is lowered at constant temperature	R) Most probable speed of gas mole increase
D) If the volume of a given gas is increased at constant temperature	S) Speed of gas molecules will not

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LECTURE SHEET - EXERCISE - III (LEVEL - II ADVANCED)(INTEGER TYPE QUESTIONS)

1. The K.E of N molecules of O_2 is x Joules at -123°C. Another sample of O_2 at 27°C has a KE of 2x Joules. The latter sample contains______N molecules of O_2.

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2. At 27°C, the average speed of N_2 molecules is xms4. At 927°, the speed will be______ xms^{-1}

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3. The mass of molecule A is twice the mass of molecule B. The rms speed of A is twice the rms speed of B. If two samples of A and B contain same number of molecules, what will be the ratio of pressures of two samples in separate containers of equal volume.______

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4. Collision diameter is least in case of $(1)H_2, (2)He : (3)CO_2 : (4)N_2$ Indicate with the number in brackets.

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LECTURE SHEET - EXERCISE - IV (LEVEL - I MAIN)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. The deviation from the ideal gas behaviour of a gas can be expressed as

A. $Z = \frac{P}{VRT}$

B. $Z = \frac{PV}{nRT}$

C. $Z = \frac{nRT}{PV}$

D. $Z = \frac{VR}{PT}$

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LECTURE SHEET - EXERCISE - IV (LEVEL - II ADVANCED)(MORE THAN ONE CORRECT ANSWER TYPE QUESTIONS)

1. 2 moles of Xenon is present in a one litre vessel. For Xenon gas $a = 4.19 lt^2$. atm. mol^{-2}, b = 0.05 lt/mol. The volume of free space available for random motion of molecules is

A. 900 c. c

B. 100 c.c

C. 950 c.c

D. 50c.c

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2. Which of the following are the characteristics of a real gas

A. The molecules attract cach other

B. It shows deviations from the ideal gas law

C. It obeys the gas law at low temperature and high pressure

D. The mass of molecules is negligible

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3. Which of the following gases deviate from ideal behaviour to a greater extent

A. H_2

B. NH_3

C. He

D. SO_2

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4. A gas obeys $P(V - b) = RT$. Then which of the following are correct

A. Isochoric curves have the slope = R/V-b

B. Isobaric curves have the slope =R/P with intercept = b

C. For the gas compressibility factor = 1+ Pb/RT

D. Attractive forces predominate repulsive forces

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5. Select the correct statements

A. At high pressure real gases are less compressible in comparison to ideal gas

B. H_2 and He are more compressible than ideal gases at all pressures

C. Except H_2 and He, the compressibility factor is less than unity for all gases at low pressure

D. The compressibility factor of real gases is independent of temperature

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6. When a sample of a gas is compressed at constant temperature from 15 atm to 60 atm, its volume changes from $76cm^3$ to $20.5cm^3$. Which of the following are possible.

A. The gas shows non-ideal behaviour

B. The gas dimerizes

C. The gas is adsorbed onto the vessel walls

D. The gas molecules have repulsions to each other

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7. Which of the following are correct

A. For hydrongen gas Z gt 1, at room temperature and pressure

B. The real gas behaves as ideal gas at Boyle's temperature

C. For Vander waal's gas $T_C = \frac{8a}{27Rb}$

D. At low pressure, for a Vander waal's gas, $Z = 1 + \frac{Pb}{RT}$

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8. Vander Waal's constants for three different gases are given:

Gas	a	b
X	3.0	0.025
Y	10.0	0.030
Z	6.0	0.035

Which is correct?

A. maximum critical temperature - Y

B. most ideal behaviour - X

C. maximum molecular volume - Z

D. minimum molecular volume - X

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9. Which of the following statements is/are correct about the coefficient B in the virial equation of state $PV_m = RT\left(1 = \frac{B}{V_m} + \frac{C}{V_m^2} + \dots .\right)$

A. It is independent of temperature

B. It is equal to zero at Boyle temperature

C. It has dimensions of molar volume

D. It is dependent on pressure

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LECTURE SHEET - EXERCISE - IV (LEVEL - II ADVANCED)(LINKED COMPREHENSION TYPE QUESTIONS)

1. Gases tend to behave non-ideally at low temperatures and high pressures. The deviation from ideal behaviour can be explained by considering two types of corrections. They are volume correction and pressure correction.

Select incorrect statement(s) :

A. Volume correction is due to finite size of molecules and pressure correction is due to force of attraction between molecules.

B. At high temperatures, molecules have greater kinetic energy, and attractive forces are smaller and he behaviour of gases is close to the ideal gas behaviour

C. Volume correction is also called covolume or excluded volume and is four times the volume of spherical molecules present in one mole of the gas

D. At very low pressure, force of attraction is effective and pressure correction needs further resolution.

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2. Gases tend to behave non-ideally at low temperatures and high pressures. The deviation from ideal behaviour can be explained by considering two types of corrections. They are volume correction and pressure correction.

Following represents equation of state for a mules of real gas $\left[P+\frac{n^2a}{V^2}\right][V-nb]=nRT$.Select incorrect statement for a real gas

A. Constant 'a' is a measure of force of attraction among gas molecules

B. a is expressed in atm L^2mol^{-2} b is expressed in $Lmol^{-1}$

C. At high pressure, compression factor is $\left(1+\frac{Pb}{RT}\right)$

D. $\frac{n^2a}{V^2}$ is also called internal volume

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3. Gases tend to behave non-ideally at low temperatures and high pressures. The deviation from ideal behaviour can be explained by considering two types of corrections. They are volume correction and pressure correction.

Which assumption of kinetic theory is not followed when a real gas shows non-ideal behaviour ?

A. Gas molecules move at random with no attractive forces between them

B. The velocity of gas molecules is dependent on temperature

C. Amount of space occupied by a gas is much greater than that by actual gas molecules

D. During collisions with the walls of the container or with another molecules, energy is conserved

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4. Ideal gas equation is represented as $PV = nRT$. Gases present in the universe were found ideal n the Boyle's temperature range only. The compressibility factor for an ideal gas, $Z = \frac{PV}{nRT}$. The main cause to show deviations were due to wrong assumptions made bout forces of attractions (which becomes significant at high pressure). olume occupied by molecules V, in PV = nRT, is supposed to be volume of as or, the volume of container in which gas is placed by assuming that aseous molecules do not have appreciable volume. Actual volume of the as is that volume in which each molecule of a gas can move freely. If olume occupied by gaseous molecule is not negligible, then the term V hould be replaced by the ideal volume which is available for free motion of ach molecule of gas.

Similarly for n moles of gas $V_{\text{actual}} = V - nb$

The excluded volume can be calculated by considering bimolecular collisions. The excluded volume is the volume occupied by the sphere of 2r for each pair of molecule.

Thus, excluded volume for one pair of molecules = $\frac{4}{3}\pi(2r)^3 = \frac{4 \times 8\pi r^3}{3}$

The excluded volume for 1 molecule $= \frac{2}{3} \times 8\pi r^3 = 4 \times \left(\frac{4}{3}\pi r^3\right) = 4V$

The excluded volume for N molecules $= 4NV = b$(where N is Avogadro's

No.) The compressibility factor for N_2 at -$50\,^\circ C$ and 800 atm pressure is 1.95. Number of moles of N_2 required to fill a balloon of 100 L capacity is :

A. 99.9%, 99%

B. 0.082%, 0.82%

C. 99%, 90%

D. 11%, 10%

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5. Ideal gas equation is represented as $PV = nRT$. Gases present in the universe were found ideal n the Boyle's temperature range only. The compressibility factor for an ideal gas, $Z = \frac{PV}{nRT}$. The main cause to show deviations were due to wrong assumptions made bout forces of attractions (which becomes significant at high pressure). olume occupied by molecules V, in PV = nRT, is supposed to be volume of as or, the volume of container in which gas is placed by assuming that aseous molecules do not have appreciable volume. Actual volume of the as is that volume in which each molecule of a gas can move freely. If olume occupied by gaseous molecule is not negligible, then the term V hould be replaced by the ideal volume which is available for free motion of ach molecule of gas.

Similarly for n moles of gas $V_{\text{actual}} = V - nb$

The excluded volume can be calculated by considering bimolecular collisions. The excluded volume is the volume occupied by the sphere of 2r for each pair of molecule.

Thus, excluded volume for one pair of molecules = $\frac{4}{3}\pi(2r)^3 = \frac{4 \times 8\pi r^3}{3}$

The excluded volume for 1 molecule $= \frac{2}{3} \times 8\pi r^3 = 4 \times \left(\frac{4}{3}\pi r^3\right) = 4V$

The excluded volume for N molecules $= 4NV = b$(where N is Avogadro's No.) The compressibility factor for N_2 at $-50\,^\circ C$ and 800 atm pressure is 1.95. Number of moles of N_2 required to fill a balloon of 100 L capacity is :

A. 2.244×10^3

B. 2.244×10^2

C. 2.244

D. 22.44

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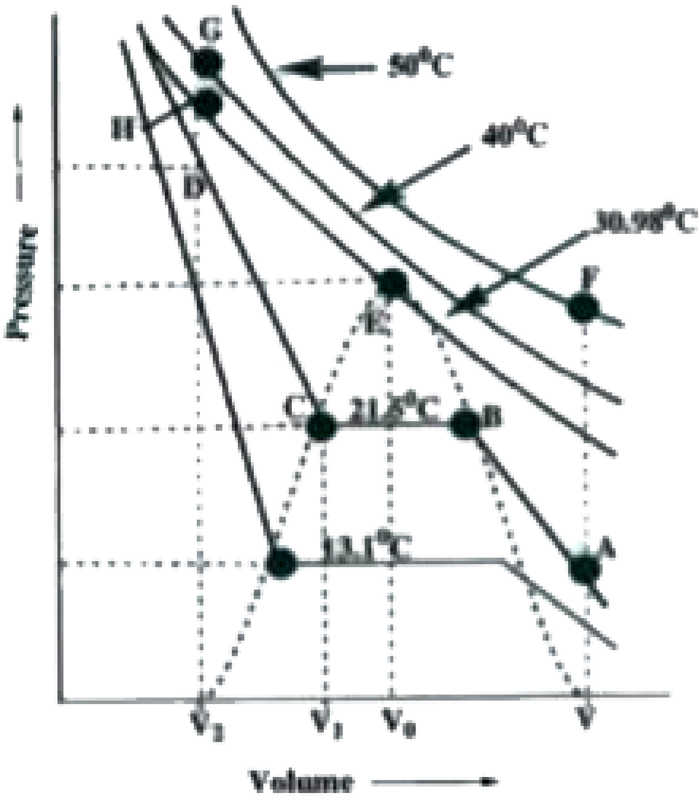
6. Study the following isotherms of carbondioxide at various temperature and answer the following questions based on that:



Choose the temperature above which CO_2 cannot be liquified whatsoever applied pressure is

A. 290K

B. 294.5 K

C. 302K

D. 304 K

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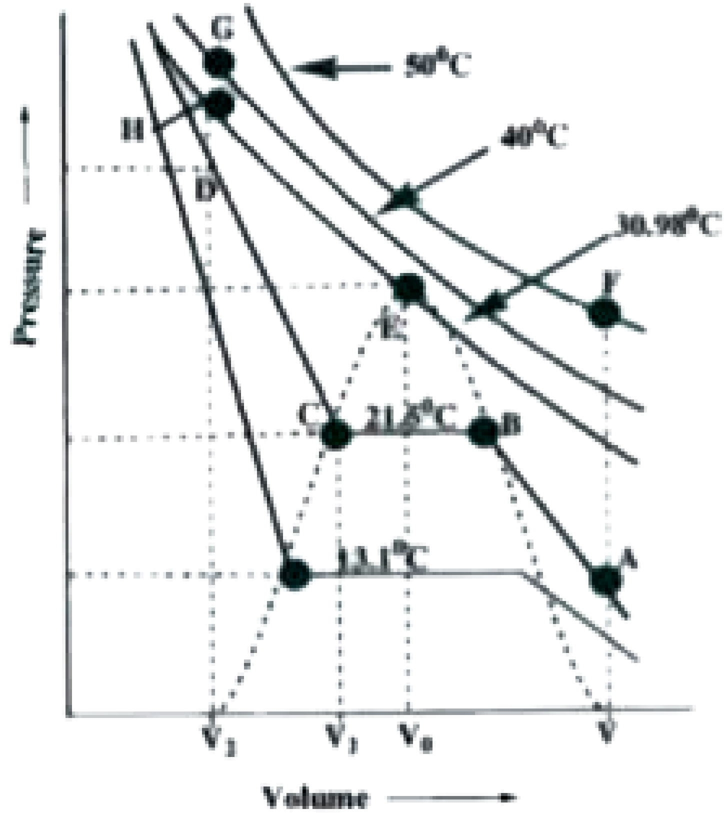
7. Study the following isotherms of carbondioxide at various temperature and answer the following questions based on that:



At 21.5°C decrease in volume(B-C) doesn't result into increase in pressure

because

A. The compression causes increase in solidification

B. At point B only all gases convert into solid

C. The compression causes further increase in condensation

D. Carbon dioxide is real gas

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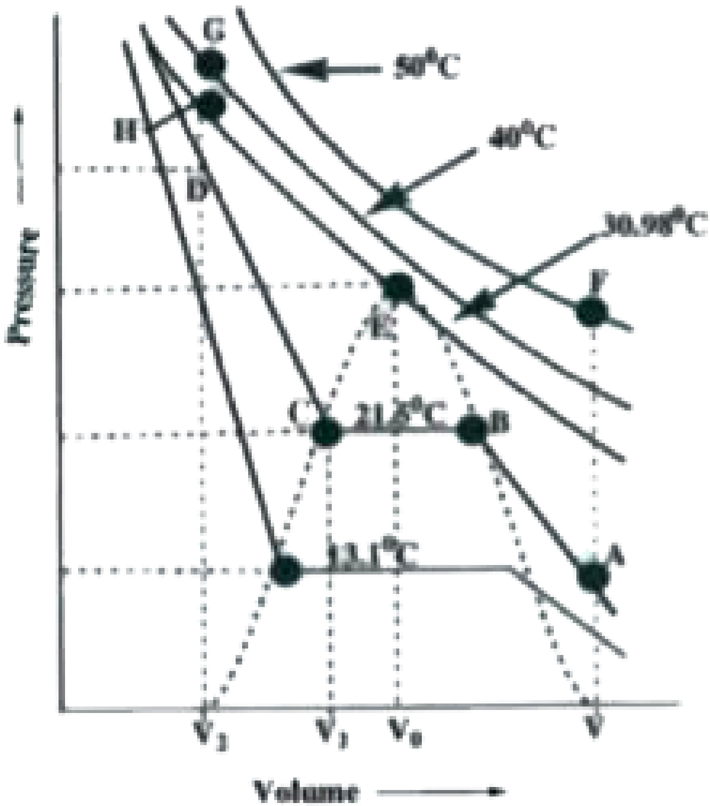
8. Study the following isotherms of carbondioxide at various temperature and answer the following questions based on that:



Carbondioxide present at F can be liquified

A. At critical volume by compression

B. At critical pressure by compression

C. By compression at any temperature

D. By compression and lowering the temperature

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LECTURE SHEET - EXERCISE - IV (LEVEL - II ADVANCED)(MATRIX MATCHING TYPE QUESTIONS)

1.

Column-I	Column-II
A) Hydrogen gas (P = 200 atm, T = 273K)	P) Compressibility factor $\neq 1$
B) Hydrogen gas $(P \approx 0, T = 273K)$	Q) Attractive forces are dominant
C)$CO_2(P = 1atm, T = 273K)$	R)$PV = nRT$
D) Real gas with very large molar volume	S)$P(V - nb) = nRT$

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2. Match the compression factor under different condition (in List-I) with its value (in List-II)

List-I	List-II
A) Compression factor (Z) for ideal gas	P) $\frac{3}{8}$
B) Z for real gas at low P	Q) $(1+Pb/RT)$
C) Z for real gas at high P	R) 1
D) Z for critical state	S) $(1-a/RTV)$

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3.

Column-I	Column-II
A) Atm L mol^{-1}	P) a/Rb
B) $\sqrt{\frac{2RT}{M}}$	Q) a/b
C) Boyle temperature	R) V_m
D) Volume of one mole	S) u_{MP}

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LECTURE SHEET - EXERCISE - IV (LEVEL - II ADVANCED)(INTEGER TYPE QUESTIONS)

1. Excluded volume for free random motion of gas molecules is how many times the actual volume of gas molecules

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2. Inversion temperature of a gas is how many times the Boyle's temperature?

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3. What is the value of $\sqrt[3]{\dfrac{a}{P_c b^2}}$?

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4. The volume to be excluded due to only two molecules of a gas in collision with a fixed point of impact is $\dfrac{0.09}{N_A}$ litre (NA = Avogadro number).

If the value of 'a' is $3.6 atm L^2 mol^{-2}$ then the value of Boyle's temperature is, $10^x K$. What is the value of 'x'? $\left(R = 0.08 Latm K^{-1} m^{-1}\right)$

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LECTURE SHEET - EXERCISE - V (LEVEL - I MAIN)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. F_2 is gas but I_2 is solid, because

A. Larger london forces are present in I_2 when compared to F_2

B. Lesser number of london forces are present in I_2 when compared to F_2

C. F_2 and I_2 has same extent of london forces

D. I_2 has low bond dissociation energy

View Text Solution

2. Among the following molecules , london or disperision forces are strongest in

A. n-hexane

B. n-pentane

C. isopentane

D. neopentane

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3. Non polar compounds can also solidify because of

A. Van der Waals forces

B. Dipole - dipole interaction

C. Ionic bonds

D. Hydrogen bonds

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4. Which forces of attraction are responsible for liquification of hydrogen chloride

A. coulombic forces

B. dipole forces

C. hydrogen bonding

D. vander Waal's forces

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5. The inter molecular forces present in inert gases are

A. Ion-ion

B. Ion-dipole

C. Dipole - dipole

D. Dispersion

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6. Regarding dipole - dipole attractions the incorrect statement is

A. Dipole - dipole attractions are more if the molecules have high dipole moment values.

B. In liquid HBr, dipole - dipole attractions are present.

C. Dipole - Dipole interaction energy between stationary polar molecules $\propto r^{-3}$

D. Dipole - dipole interaction energy between rotating molecules $\propto r^{6}$

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7. In ion-dipole forces, the magnitude of the interaction energy (E)

A. $E = \dfrac{Z^2\mu}{r^2}$

B. $E = \dfrac{Z\mu}{r}$

C. $E = \dfrac{Z\mu^2}{r^2}$

D. $E = \dfrac{Z\mu}{r^2}$

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8. Hydration of different ions is an example of

A. Ion - dipole interaction

B. Dipole - dipole interaction

C. Dipole-induced dipole

D. Dispersion

View Text Solution

9. If thermal energy predominates over intermolecular forces, then the substance changes from __to__

A. gas to liquid

B. liquid to solid

C. gas to solid

D. liquid to gas

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10. A liquid is in equilibrium with its vapours at its boiling point. On the average, the molecules in the two phases have euqal :

A. Potential energy

B. Kinetic energy

C. Total energy

D. 1, 2 and 3

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11. A relation between vapour pressure and temperture is known as

A. Ideal gas equation

B. Boltzmam equation

C. Clausious equation

D. Clausius - Clapeyron equation

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12. Find incorrect match

A. Unit of surface energy $= J - m^{-2}$

B. Unit of surface tension $= N - m^{-1}$

C. Molecules on the surface of liquid = less energy.

D. Minimum surface area of a liquid = Lowest energy state

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13. The surface tension of water at 20°C is 72.75 dyne cm^{-1}. Its value in SI system is

A. $7.275 Nm^{-1}$

B. $0.7275 Nm^{-1}$

C. $0.07275 Nm^{-1}$

D. None of the above

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14. A manifestation of surface tension is :

A. Rise of liquid in a capillary tube

B. Spherical shape of liquid drops

C. Upward movement of water in soils

D. All the above

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15. On heating a liquid, its surface tension

A. Increases

B. Decreases

C. Remains same

D. Is reduced to zero

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16. Generally liquid drops assume spherical shape because

A. A sphere has maximum surface area

B. A sphere has minimum surface area

C. Sphere is symmetrical in shape

D. Sphere is heavy

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17. Laminar flow of a liquid means

A. Regular gradation of velocity for layers in passing from one layer to the next layer of a liquid

B. Showing constancy in the velocity of layers of a liquid

C. Increase in the velocity of layers from surface to bottom of a liquid

D. All

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18. Find incorrect statement

A. Due to viscosity, velocity of flow of water at the surface is more than that at the bottom in a river.

B. Due to vislosity, velocity of flow of water at the surface is less than that at the bottom in a river

C. Velocity gradient = du/dx

D. Viscosity coefficient is related to absolute temperature as

$\eta = Ae^{E/KT}$

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19. In SI system, the units of coefficient of viscosity, η are

A. $Kgs^{-1}m^{-2}$

B. $Kgm^{-1}s^{-1}$

C. $Kgcm^{-1}s^{-1}$

D. $gm^{-1}s^{-1}$

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20. Poise stands for

A. $1 \text{dynes cm sec}^{-2}$

B. $1 \text{dyne sec cm}^{-2}$

C. $10^{18} e.s.u - cm$

D. 10^{-7} erg sec.

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21. The viscosity of four liquids P, Q, R and S are 85, 11.4, 18 and 12.3 respectively, then which flows slowly

A. P

B. Q

C. R

D. S

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22. With rise in temperature of a liquid, the viscosity

A. Increases

B. Decreases

C. Remains constant

D. May increase or decrease

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23. The thickness of window panes of old buildings is more at the bottom than at the top, which is due to

A. Surface tension of glass

B. Viscosity of glass

C. Expansion of solid as a given temperature

D. Expansion of liquid at a given temperature

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24. Among the following compounds viscosity is highest for

A. Methanol

B. Propane-1,2,3 triol

C. Ethyleneglycol

D. Ethanol

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PRACTICE SHEET (EXERCISE -I) (LEVEL -I MAINS)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. When the pressure of 2 litres of O_2 gas is doubled and its temperature is also doubled from 300K to 600K, the final volume of the gas is

A. 4 lit

B. 20 lit

C. 40 lit

D. 2 lit

Answer: D

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2. A pre-weighed vessel was filled with oxygen at NTP and weighed. It was then evacuated, filled with SO_2 at the same temperature and pressure and again weighed. The weight of oxygen will be

A. The same as that of SO_2

B. One-half that of SO_2

C. Twice that of SO_2

D. One-fourth that of SO_2

Answer: B

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3. 4 grams of an ideal gas occupies 5.6035 litres of volume at 546 K and 2 atm, pressure. What is its molecular weight ?

A. 4

B. 16

C. 32

D. 64

Answer: B

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4. The density of a gas is 2.5g/L at $127^\circ C$ and 1 atm. The molecular weight of the gas is

A. 82.1

B. 41.05

C. 56

D. 28

Answer: A

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5. The density of a gas at 27ºC and 1 atm is d. Pressure remaining constant at what temperature its density becomes 0.75 d

A. $36^\circ C$

B. $127^\circ C$

C. $30^\circ C$

D. $54^{\circ}C$

Answer: B

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6. If one mole of a gas A (mol.wt-40) occupies a volume of 201itres, under the same conditions of temperature and pressure the volume occupied by 2 moles of gas B (mol.wt=80) is

A. 80 L

B. 60 L

C. 50 L

D. 40 L

Answer: A

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7. 112ml. of oxygen at STP is subjected to liquefication. The mass of liquid oxygen obtained is

A. 0.64 g

B. 0.16 g

C. 0.32 g

D. 0.96 g

Answer: D

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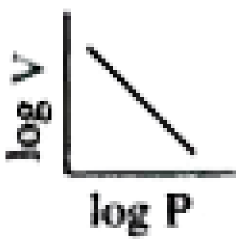
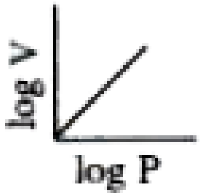
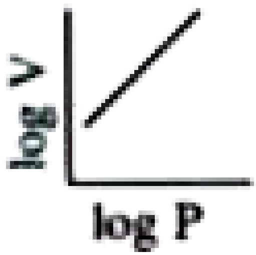
8. The Boyle's law can be expressed graphically as



A.



B.



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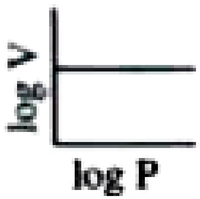

D.

Answer: B

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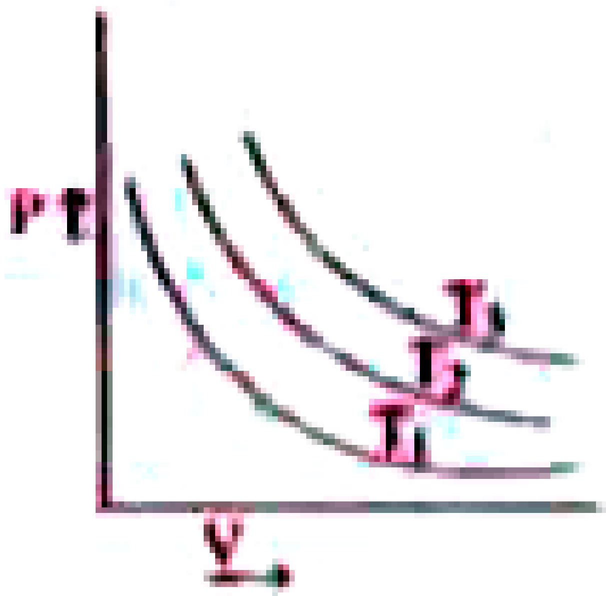
9. From the graph the correct order of temperature is



A. $T_1 < T_2 < T_3$

B. $T_1 = T_2 = T_3$

C. $T_1 > T_2 > T_3$

D. $T_1 < T_2 > T_3$

Answer: A

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PRACTICE SHEET (EXERCISE -I) (LEVEL -II ADVANCED)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. The molecular weights of two ideal gases A and B are respectively 100 and 200. One gram of A occupies V litres of volume at STP. What is the volume (in litres) occupied by one gram of B at STP ?

A. V/2

B. V

C. 4 V

D. 2V

Answer: A

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2. For 8g of helium gas (assume ideal behaviour), what is the slope of the straight line in PV VS T graph

A. 1 lt. atm. K^{-1}

B. 0.0821 lt. atm. K^{-1}

C. 0.1642 lt. atm .K^{-1}

D. 2 lt. atm . K^{-1}

Answer: C

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3. A 2.24 litre cylinder of oxygen at NTP 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:

A. 0.025

B. 0.05

C. 0.075

D. 0.09

Answer: A

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4. Density of neon will be highest at

A. STP

B. $0\,^{\circ}C, 2atm$

C. $273\,^{\circ}C, 1atm$

D. $273\,^{\circ}C, 2atm$

Answer: B

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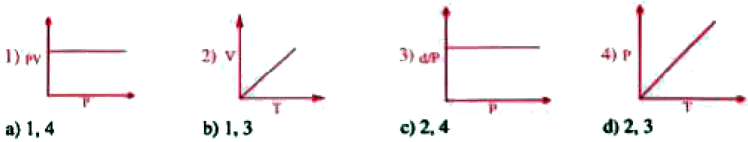
5. Which of the following indicates the isotherms?



A. 1,4

B. 1,3

C. 2,4

D. 2,3

Answer: B

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6. A glass bulb is connected to an open limb manometre. The level of mercury in both limbs of the manometer was same. The bulb was heated to $57^{\circ}C$. If the room temperature and the atmospheric pressure were $27^{\circ}C$ and 750mm, the difference of levels in the two limbs now will be

A. 2. 5 cm

B. 5.0 cm

C. 7.5 cm

D. 10.0 cm

Answer: B

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7. A sea diver at depth of 45m exhales a bubble of air that is 1.0 cm in radius. Assuming the ideal behaviour, find out radius of this bubble as it breaks at the surface of water?

A. 1.75 cm

B. 1.50 cm

C. 1.25 cm

D. 0.75 cm

Answer: A

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8. A steel cylinder of 8 litres capacity contain hydrogen gas at 12atm pressure. At the same temperature how many cycle tubes of 4 litres capacity at 2 atm can be filled up with this gas.

A. 12

B. 48

C. 5

D. 10

Answer: D

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9. An open vessel at $27^{\circ}C$ is heated until three-fourths mass of the air in it has been expelled. Neglecting the expansion of the vessel, the temperature to which the vessel has been heated is

A. $927^{\circ}C$

B. $108\ ^{\circ}C$

C. $1000\ ^{\circ}C$

D. $477\ ^{\circ}C$

Answer: A

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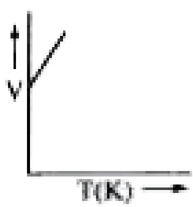
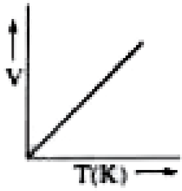
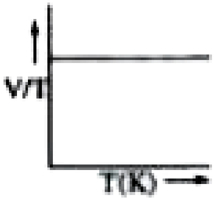
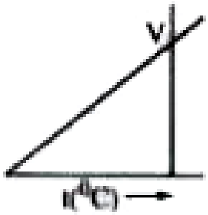
PRACTICE SHEET (EXERCISE -I) (LEVEL -II ADVANCED)(MORE THAN ONE CORRECT ANSWER TYPE QUESTIONS)

1. Which of the following shows correct relation between volume and temperature at constant pressure for a given amount of gas

A. 

B. 

C. 

D. 

Answer: B::C::D

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2. According to Charle's law, for a gas of constant mass

A. $\left(\frac{dV}{dt}\right)_P = K$

B. $\left(\frac{dV}{dT}\right)_P = -K$

C. $\left(\frac{dV}{dT}\right)_P = -\frac{K}{T}$

D. $V \propto T$ (at const P, const mass)

Answer: A::D

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3. For one mole of an ideal gas, if P = $\frac{P_0}{1+\left(\frac{V}{V_0}\right)^2}$, where P_0 and V_0 are constants. Which of the following are true?

A. $P = P_0/2 \text{when } V = V_0$

B. $V = 2V_0$ when $P = P_0$

C. $T = P_0V_0/2R$ when $V = V_0$

D. $R = \frac{P}{TV_0}$ when $P = P_0$

Answer: A::C

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4. Which of the following are correct

A. gases with equal P,T and $M_1 > M_2$, then $d_1 > d_2$

B. gases with equal P,V,T and $M_1 > M_2$, then $N_1 = N_2$ (no. of molecules)

C. gases with equal P, V and $N_1 > N_2$ then $T_1 < T_2$

D. gases with equal T, N and $P_1 > P_2$, then $V_1 > V_2$

Answer: A::B::C

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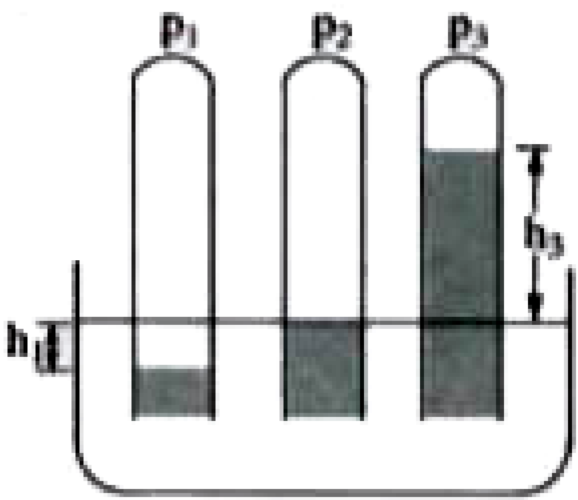
PRACTICE SHEET (EXERCISE -I) (LEVEL -II ADVANCED)(LINKED COMPREHENSION TYPE QUESTIONS)

1. Consider gases confined by a liquid, as shown below. Density of the liquid = $d.\,gmL^{-1}h_1$ and h_3 in mm and p_1, p_2 and p_3 in mm Hg.



Barometric pressure is equal to

A. p_1

B. p_2

C. p_3

D. $p_1 + p_2 = p_3$

Answer: B

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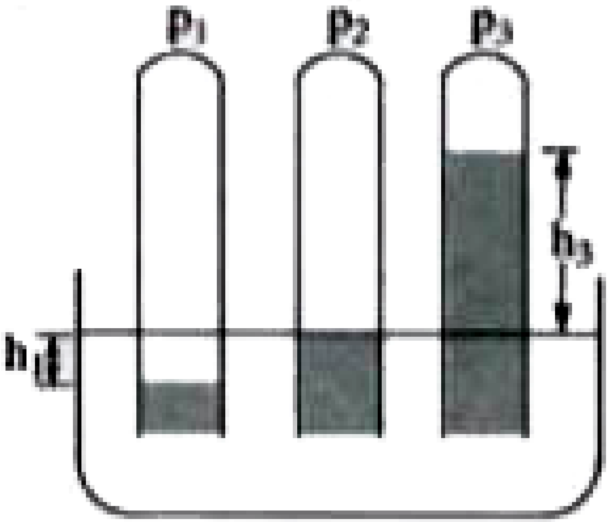
2. Consider gases confined by a liquid, as shown below. Density of the liquid = $d.\ gmL^{-1} h_1$ and h_3 in mm and p_1, p_2 and p_3 in mm Hg.



In terms of barometric pressure $\left(P_{atm}\right)$is

A. $p_{atm} + 0.1h_1d$

B. p_{atm} - $0.1h_1d$

C. $p_{atm} + h_1d$

D. p_{atm} - h_1d

Answer: A

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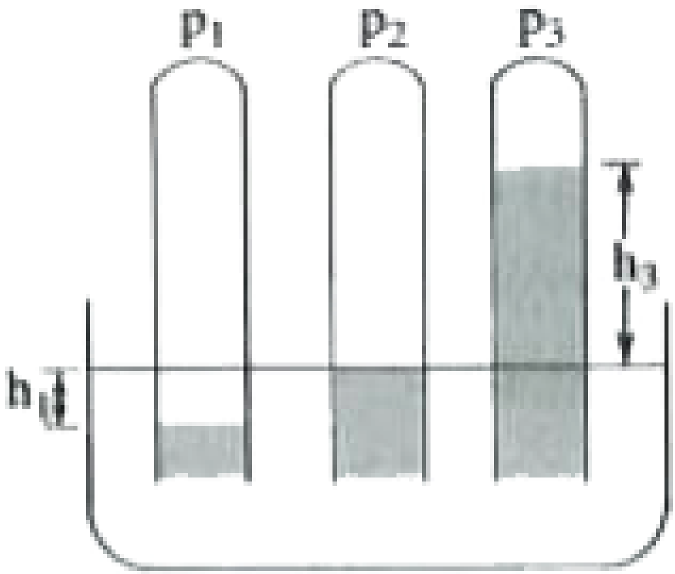
3. Consider gases confined by a liquid, as shown below.

Density of the liquid = $d.\ \mathrm{gmL}^{-1}$

h_1 and h_3 in mm and p_1, p_2 and p_3 in mm Hg.



Select correct relation for pressure p_3

A. $p_3 = p_{\text{atm}} + 0.1h_3d$

B. $p_3 = p_{atm} - 0.1h_3d$

C. $p_3 = p_{atm} - h_3d$

D. $p_3 = p_{atm} + h_3d$

Answer: B

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PRACTICE SHEET (EXERCISE -I) (LEVEL -II ADVANCED)(MATRIX MATCHING TYPE QUESTIONS)

1.

Column-	Column-II
A) Boyle's law	P) $P_{obs} = P_{atm} + P_{water\ vapour}$
B) Avagadro's law	Q) $V_1 = n_1\left(\frac{V_2}{n_2}\right)$
C) Charles' law	R) $V_t = V_0\left(1 + \frac{t}{273}\right)$
D) Dalton's law	S) $V_1 = P_2\left(\frac{V_2}{P_1}\right)$

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PRACTICE SHEET (EXERCISE -I) (LEVEL -II ADVANCED)(INTEGER TYPE QUESTIONS)

1. Temperature at the foot of a mountain is $30^\circ C$ and pressure is 760mm whereas at the top of the mountain these are $0^\circ C$ and 710mm. Ratio of the densities of the air at the foot and the top of the mountain is ____(approx)

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2. An LPG cylinder contains 15kg of butane gas at 27°C and 10 atmospheric pressure. It was leaking and its pressure fell down to 8 atmospheric pressure after one day. The gas leaked is_______kg.

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3. Two flasks of equal volumes have been joined by a narrow tube of negligible volume. Initially both the flasks are 300 K and totally 9 mole of gas is present. One of the flasks is then placed in a thermostat at 600K. How many moles of gas is present in hot bulb.

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PRACTICE SHEET (EXERCISE -II) (LEVEL -I MAIN)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. To which of the following gas mixture, Dalton's Law of partial pressures is not applicable ?

A. CO, CO_2

B. HCl, NH_3

C. O_2, N_2

D. CO_2, N_2

Answer: B

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2. Which of the following indicates the mathematical expression for Dalion's law of partial pressures

a) Partical pressure = $\frac{\text{The component gas volume}}{\text{Total pressure}} \times \text{Total volume}$

b) Partial pressure = mole fraction of component gas $\times$ Total pressure

c) Partial pressure = Partial volume $\times$ Total pressure

d) Partial pressure = No. of moles of component gas $\times$ Total pressure

A. a,d

B. b,c

C. c,d

D. a,b,c

Answer: D

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3. A five litre flask contains 3.5gm of $N_2 3gofH_2$ and $8g$ of O_2 at $27\,^{\circ}C$. The total pressure exerted by the mixture of these gases is

A. 92.4 atm

B. 0.924 atm

C. 9.24 atm

D. 924 atm

Answer: C

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4. A sample of water gas contains 42% by volume of carbon monoxide. If the total pressure is 760 mm. the partial pressure of carbon monoxide is

A. 380 mm

B. 319.2 mm

C. 38 mm

D. 360 mm

Answer: B

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5. The total pressure of a mixture of 6.4 grams of oxygen and 5.6 grams of nitrogen present in a 2 lit vessel is 1200mm. What is the partial pressure of nitrogen in mm?

A. 1200

B. 600

C. 900

D. 200

Answer: B

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6. A gaseous mixture containing 0.35g of N_2 and 5600 ml of O_2 at STP is kept in a 5 litres flask at 300K. The total pressure of the gaseous mixture is

A. 1.293 atm

B. 1.2315 atm

C. 12.315 atm

D. 0.616 atm

Answer: A

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7. According to Graham's law at a given temp, the ratio of diffusion r_A / r_B, of gases A and B is given by

A. $\left(\frac{P_A}{P_B}\right)\left(\frac{M_A}{M_B}\right)^{\frac{1}{2}}$

B. $\left(\frac{M_A}{M_B}\right)\left(\frac{P_A}{P_B}\right)^{\frac{1}{2}}$

C. $\left(\frac{P_A}{P_B}\right)\left(\frac{M_B}{M_A}\right)^{\frac{1}{2}}$

D. $\left(\frac{M_A}{M_B}\right)\left(\frac{P_B}{P_A}\right)^{\frac{1}{2}}$

Answer: C

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8. Under the same conditions the rates of diffusion of two gases are in the ratio 1:4. The ratio of their vapour densities is

A. $2:1$

B. $1:2$

C. $16:1$

D. $1:16$

Answer: C

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9. Ammonia gas diffuses twice as fast as gas X. The gas 'X'is

A. SO_2

B. C_4H_{10}

C. C_5H_8

D. Cl_2

Answer: C

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10. Pick out the pair of gases with the same rate of diffusion

A. CO, NO

B. N_2O, CO

C. N_2O, CO_2

D. CO_2, NO_2

Answer: C

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11. The four tyres of a motor car are filled with CO_2, He, H_2 and O_2 respectively. The order in which they are to be reinflated is

A. CO_2, O_2, He, H_2

B. H_2, He, O_2, CO_2

C. H_2, He, CO_2, O_2

D. H_2, O_2, He, CO_2

Answer: B

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12. If the molecules of SO_2 effuse a distance of 150cm in a certain period of time, the distance travelled by the molecules of CH_4 effusing in the same time is

A. $300cm$

B. $600cm$

C. $37.5cm$

D. $75cm$

Answer: A

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13. 180ml of hydrocarbon having a molecular weight 16 diffuses in 1.5 min. Under similar conditions time taken by 120ml of So, to diffuse is

A. 2 min

B. 1.5 min

C. 1 min

D. 75 min

Answer: A

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14. 2 grams of Helium diffuses from a porous plate in 4min. How many grams of CH_4 would diffuse through the same plate in same time under similar conditions?

A. 4 g

B. 16 g

C. 8 g

D. 2 g

Answer: A

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15. Assertion (A) : Poisonous gases can be diluted by the process of diffusion

Reason (R) : Ansil's alarm works on the principle of Graham's law

A. A & R are true, R explains A

B. A & R are true, R does not explain A

C. A is true R is false

D. A is false R is true

Answer: B

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PRACTICE SHEET (EXERCISE -II) (LEVEL -II ADVANCED)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. A sample of air contains Nitrogen, Oxygen and saturated with water vapour under a total pressure of 640 mm. If the vapour pressure of water at that temperature is 40 mm and the molecular ratio of $N_2 : O_2$ is 3:1, the partial pressure of Nitrogen in the sample is

A. 480 mm

B. 600 mm

C. 450 mm

D. 160 mm

Answer: C

Watch Video Solution

2. A gaseous mixture of three gases A, B and C has a pressure of 10atm. The total number of moles of all the gases is 10. The partial pressure of A and B are 3 and I am respectively. If C has a molecular weight of 2, what is the weight of C in grams present in the mixture?

A. 6

B. 3

C. 12

D. 8

Answer: C

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3. At 298K 10 litres of N, at 0.96 alm is added to 32 litres of an evacuvated polythene bag, Subsequently enough O_2 is pumped into the bag at 298K. Now if the total pressure is 0.990 atm, partial pressure of O_2

A. 0.69 atm

B. 0.32 atm

C. 0.495 atm

D. 0.5 atm

Answer: A

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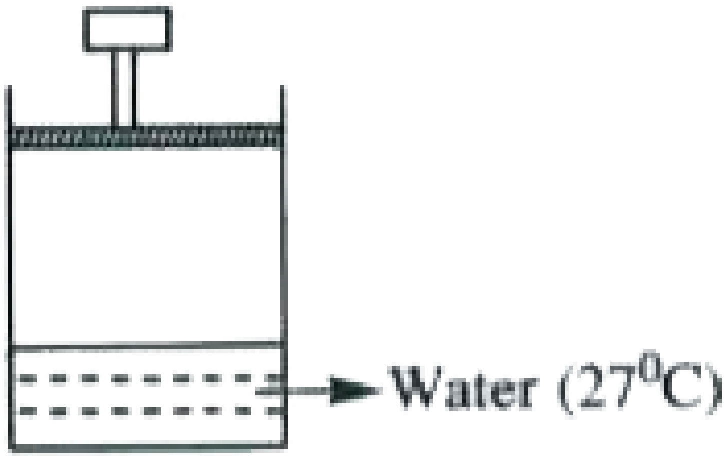
4. The piston shown in the figure is moved downwards such that the vapour volume is decreased by 246.3cc. How many grams of H_2O is condensed? (Assume aqueous tension at 27°C is 360 mm Hg).



A. 1.8 gram

B. 0.09 gram

C. 0.9 gram

D. 0.18 gram

Answer: B

Watch Video Solution

5. Among the following gaseous elements with atomic numbers, which will have greater rate of diffusion?

A. Z = 7

B. Z = 8

C. Z = 10

D. Z = 17

Answer: C

Watch Video Solution

6. Two gases A and B present separately in two vessels X and Y at the same temperature and pressure with molecular weights M and 2M respectively are effused out. The orifice in vessel X is circular while that in Y is a square. If the radius of the circular orifice is equal to that the length of the square orifice, the ratio of rates of effusion of gas A to that of gas B is

A. $\pi\sqrt{2}$

B. $\sqrt{\frac{\pi}{2}}$

C. 2π

D. $\sqrt{\frac{2}{\pi}}$

Answer: A

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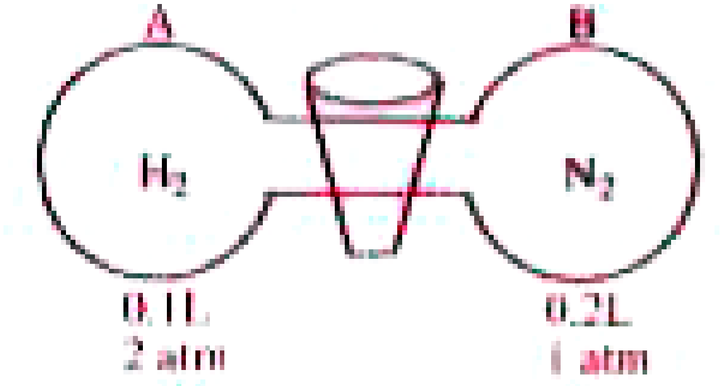

7.

Total pressure observed after opening the stopcock is [neglecting the volume of the tube connecting the two bulbs]

A. 1.33 atm

B. 3 atm

C. 0.3 atm

D. 0.75 atm

Answer: A

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PRACTICE SHEET (EXERCISE -II) (LEVEL -II ADVANCED)(MORE THAN ONE CORRECT ANSWER TYPE QUESTIONS)

1. Which pairs can not explain Dalton's law ?

A. H_2, O_2

B. H_2, F_2

C. NH_3, HCl

D. NO, O_2

Answer: B::C::D

Watch Video Solution

2. Two containers, X and Y at 300K and 350K with water vapour pressures 22 mm and 40 mm respectively are connected, initially closed with a valve. If the valves opened,

A. the final pressure in each container is 31 mm

B. the final pressure in each container is 40 mm

C. Mass of $H_2O(l)$ in X increases

D. Mass of $H_2O(l)$ in Y decreases

Answer: C::D

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3. Which of the following gases have same rate of diffusion at constant P and T ?

A. C_2H_6

B. C_2H_4

C. N_2

D. CO

Answer: B::C::D

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PRACTICE SHEET (EXERCISE -II) (LEVEL -II ADVANCED)(LINKED COMPREHENSION TYPE QUESTIONS)

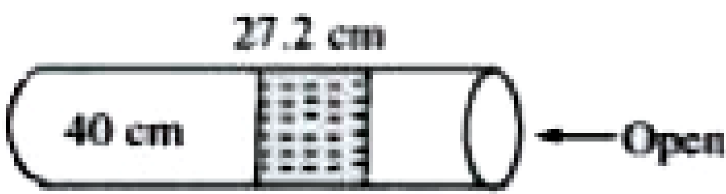
1. Gases best follow the facts given below

A) An ideal gas obeys the mathematical relation PV=nRT

B) Rates of diffusion of two gases are in the reciprocal ratio of square roots of their molecular weight

C) Total pressure of a mixture of non reacting gases is given by the algebric sum of their partial pressure

An ideal gas is captured in a glass tube of uniform arca of cross section by a water column at a given temperature as shown



If the tube is held vertical, by what length the water column descends down?

(Density of mercury=13.6gm/cc) $\left(P_{atm} = 76 cm of Hg\right)$

A. 2.2 cm

B. 3.2 cm

C. 1.03 cm

D. 4.07 cm

Answer: C

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2. Gases best follow the facts given below

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B) Rates of diffusion of two gases are in the reciprocal ratio of square roots of their molecular weight

C) Total pressure of a mixture of non reacting gases is given by the algebric sum of their partial pressure

What is the mass of water vapour in $1m^3$ of air with 0.4 relative humidity at 300K? (Aqueous tension at 300K = 3.6 K Pa)

A. 0.5

B. 0.2

C. 0.4

D. 0.6

Answer: D

Watch Video Solution

3. Gases best follow the facts given below

A) An ideal gas obeys the mathematical relation PV=nRT

B) Rates of diffusion of two gases are in the reciprocal ratio of square roots of their molecular weight

C) Total pressure of a mixture of non reacting gases is given by the algebric sum of their partial pressure

What is the mass of water vapour in $1m^3$ of air with 0.4 relative humidity at 300K? (Aqueous tension at 300K = 3.6 K Pa)

A. 22.12 gm

B. 10.53 gm

C. 4.68 gm

D. 2.86 gm

Answer: B

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PRACTICE SHEET (EXERCISE -II) (LEVEL -II ADVANCED)(INTEGER TYPE QUESTIONS)

1. How many of the following gaseous mixtures do not obey Dalton's law of partical pressures :

$H_2 + Cl_2, NH_3 + HBr, N_2 + O_2,$

$CO + Cl_2, NO + O_2, N_2 + Cl_2, Xe + O_2$

Watch Video Solution

2. Pressure of Ig of an ideal gas A at $27^{\circ}C$ is found to be 2 bar. When 2g of another ideal gas B is introduced in the same flask at same temperature, the pressure becomes 3 bar, then M_B = ____ M_A

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3. At 25°C vapour pressure of water is 23 mm of Hg. If partial pressure of water vapour in air at 25°C is 18.4 mm of Hg, the percentage relative humidity in air is how many multiple of ten?

Watch Video Solution

4. The ratio of the rates of diffusion of helium and methane under identical condition of pressure and temperature will be _____

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PRACTICE SHEET (EXERCISE -III) (LEVEL -I MAIN)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. Which of the following statements is not a postulate of kinetic molecular theory of gases?

A. K.E. is dependent on temperature

B. K.E. is dependent on pressure

C. The molecular collisions are perfectly elastic collisions

D. The pressure of the gas is due to collisions of gas molecules on the walls of the vessel

Answer: B

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2. The absolute temperature of a gas

A. is a measure of the number of molecules in the gas

B. is a measure of the volume of the gas

C. indicates the nature of the gas

D. is a measure of the average kinetic energy of the molecules

Answer: D

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3. Which of the following is valid at absolute zero?

A. kinetic energy of the gas becomes zero but the molecular motion does not become zero

B. kinetic energy of the gas becomes zero and molecular motion also becomes zero

C. kinetic energy of the gas decreases but does not become zero

D. kinetic energy of the gas decreases but total energy increases

Answer: B

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4. Which of the following indicates Kinetic gas equation ?

a) $PV = \frac{3M}{C^2}$ b) $PV = \frac{1}{3}mnC^2$ c) $P = \frac{1}{3}dC^3$ d) $KE = \frac{3}{2}RT$

A. a,c

B. b,d

C. a,b

D. b,c

Answer: D

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5. Boltzmann constant represents the gas constant per

A. mole

B. Avogadro number of molecules

C. any number of molecules

D. molecule

Answer: D

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6. The average K.E. of one mole of an ideal gas in calories is equal to

A. 3 times of its absolute temp

B. 2 times of its absolute temp

C. 4 times of its absolute temp

D. 2/3 times of its absolute temp

Answer: A

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7. SO_2 , molecule is twice as heavy as O_2 molecule. Hence at 25°C the ratio of the average kinetic energies of Sulphur dioxide and oxygen is

A. $1:1$

B. $2:1$

C. $1:2$

D. $4:1$

Answer: A

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8. The temperature at which Methane molecules have the same average Kinetic energy as that of oxygen molecules at 27°C is

A. $327^\circ C$

B. $27^\circ C$

C. $927^\circ C$

D. $627\ ^{\circ}C$

Answer: B

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9. The RMS 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?

A. $\frac{m_2}{u_1} = \frac{m_2}{u_2}$

B. $m_1u_1 = m_2u_2$

C. $\frac{m_1}{u_1} = \frac{m_2}{u_2}$

D. $m_1u_1^2 = m_2u_2^2$

Answer: D

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10. At a given temperature the ratio of RMS and average velocities is

A. $1.086 : 1$

B. $1 : 1.086$

C. $2 : 1.086$

D. $1.086 : 2$

Answer: A

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11. The RMS velocity of an ideal gas at 300K is 12240 cm/see, then its most probable velocity in cm/sec at the same temperature is

A. 10000

B. 11280

C. 1000

D. 12200

Answer: A

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12. Molecules having the least RMS velocity at constant temperature are

A. CO_2

B. SO_2

C. ClO_2

D. NO_2

Answer: C

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13. When the temperature of a gas is raised from $27^{\circ}C$ to $927^{\circ}C$, its RMS velocity

A. gets halved

B. gets doubled

C. remains same

D. becomes $\sqrt{\frac{927}{27}}$ times

Answer: B

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

A. $\sqrt{\frac{3}{5}}$

B. $\sqrt{\frac{1}{4}}$

C. $\sqrt{\frac{4}{3}}$

D. $\sqrt{\frac{2}{3}}$

Answer: D

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15. At what temperature the velocity of O_2 molecules will have the same velocity as SO_2 at 47ºC?

A. $113\,^\circ C$

B. $160\,^\circ C$

C. $-113\,^\circ C$

D. $-160\,^\circ C$

Answer: C

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16. If $C_p, \bar{C}$ and C of CO_2 gas are equal at T_1, T_2 and T_3 temperatures then

A. $T_1 < T_2 < T_3$

B. $T_1 > T_2 > T_3$

C. $T_3 > T_1 > T_2$

D. $T_1 = T_2 = T_3$

Answer: B

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17.

List -I	List - II
A) $\sqrt{\frac{U_1^2 + U_2^2 + \dots . + U_n^2}{n}}$	1) Average velocity
B) $\frac{U_1 + U_2 + U_3 + \dots . + U_n}{n}$	2) at absolute zero kelvin
C) $\sqrt{2P/d}$	3) RMS velocity of gas molecules
	4) Most probable velocity of gas molecules

The correct match is

A. A-1, B-2, C- 1

B. A-2, B-3, C- 1

C. A-3, B-1, C-4

D. A-4: B-1, C-3

Answer: C

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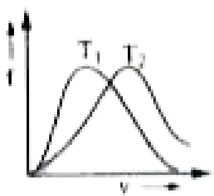
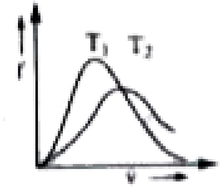
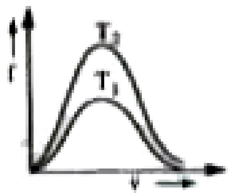
PRACTICE SHEET (EXERCISE -III) (LEVEL -II ADVANCED)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. Which of the following diagaram correctly represents the Boltzmann distribution of molecular speeds at two temperatures T_1 and T_2 where $T_2 > T_1$? (Proportion of molecules = f, molecular speed = v)

A. 

B. 

C. 

D. 

Answer: B

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2. The rms speed of N_2 molecules in a gas is u. If the temperature is doubled and the nitrogen molecules dissociate into nitrogen atoms, the rms speed becomes :

A. $u/2$

B. $2u$

C. $4u$

D. $14u$

Answer: B

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3. At constant volume, for a fixed number of moles of a gas, the pressure of the gas increases with a rise in temperature, due to

A. increases in average molecular speed

B. decreased number of collisions amongst molecules

C. increase in molecular attractions

D. decrease in mean free path

Answer: A

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4. The mean free path of a gas molecule is the distance

A. between the two opposite walls of the container

B. which the molecule travel in one second

C. through which a molecule moves between two consecutive collisions

D. Which the molecule travel in one second

Answer: C

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5. If the mean free path is ' λ' at one atm pressure then its value at 5 atm pressure is

A. 5λ

B. $\frac{2}{5}\lambda$

C. $\frac{\lambda}{5}$

D. unpredictable.

Answer: C

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6. In which one of the following cases mean free path increases

A. Helium molecules in a container are replaced by oxygen molecules

B. Oxygen molecules in a container replaced by CO_2 molecules

C. N_2 molecules in a container are replaced by Helium molecules

D. Helium molecules in a container are replaced by nitrogen molecules

Answer: C

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7. The number of collisions depends on

A) mean free path

B) pressure

C) temperature

A. A, C

B. A,B

C. B,C

D. A, B, C

Answer: D

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8. At $127\,^{\circ}C$, for helium if time of flight is 0.1 nanosec, the mean free path of helium (in A) is

A. 15.8

B. 158

C. 1580

D. 158000

Answer: C

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PRACTICE SHEET (EXERCISE -III) (LEVEL -II ADVANCED)(MORE THAN ONE CORRECT ANSWER TYPE QUESTIONS)

1. Consider a collision between oxygen molecule and hydrogen molecule in a mixture of oxygen and hydrogen kept at room temperature. Which of the following are possible

A. The kinetic energies of both the molecules increase

B. The kinetic energies of both the molecules decrease

C. The kinetic energy of the oxygen molecule increases and that of the hydrogen molecule decreases

D. The kinetic energy of the hydrogen molecule increases and that of the oxygen molecule decreases

Answer: C::D

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2. Select incorrect statements

A. $\frac{PV}{T} = K$, the value of K is independent of amount of gas

B. The value of R depends on temperature, volume and number of gaseous molecules

C. R is also known as Boltzmann's constant

D. The average K.E of molecules depends only on temperature

Answer: A::B::C

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3. On increasing temperature, which of the following statement is correct?

A. area under $\frac{dN}{N}$ vs V curve at different temperatures are different

B. fraction of the molecules having speed equal to decreases

C. more molecules possess speeds nearer to most probable speed

D. the distribution of speeds depends only on the value of molar mass of the gas

Answer: B::C

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4. Correct statement(s) about molecular velocities is/are

A. With increase in the temperature fraction of molecules with most probable velocity decreases.

B. With increase in the temperature, RMS velocity of gas molecules increases

C. The correct order of fraction of molecules with different types of velocities is $C_p > \bar{C} > C$

D. The correct velocity order of various types of velocitics is $C > \bar{C} > C_p$

Answer: A::B::C::D

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5. Which processes will increase the number of molecules, to have an energy greater than a particular value

A. increasing the temperature

B. introducing more of the same gas at the same temperature

C. compressing the gas at constant temperature

D. decreasing the temperature

Answer: A::B

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6. For two gases A and B with molecular weights M_A and M_B, it is observed that at a certain temperature T, the mean velocity of A is equal to the root mean square velocity of B. Thus the mean velocity of A can be made equal to the mean velocity of B if

A. A is increased to a temperature $T_2 = \frac{3\pi}{8}T$

B. A is lowered to a temperature $T_2 = \frac{8T}{3\pi}$

C. B is increased to a temperature $T_2 = \frac{3\pi T}{8}$

D. B is lowered to a temperature $T_2 = \frac{8T}{3\pi}$

Answer: B::C

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7. A 5 L flask containing 1.0g of hydrogen is heated from 300K to 600K. Which of the following statements are correct

A. The pressure of the gas increases

B. The rate of collision increases

C. The energy of the gaseous molecules increases

D. The number of the moles of the gas increases

Answer: A::B::C

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8. Among the following cases, in which case mean free path increases

A. With increasing altitude

B. with increasing temperature

C. When O_2 is replaced by CO_2 molecules

D. When density of gas increased

Answer: A::B

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PRACTICE SHEET (EXERCISE -III) (LEVEL -II ADVANCED)(LINKED COMPREHENSION TYPE QUESTIONS)

1. On the basis of the postulates of kinetic theory of gases, it is possible to derive the mathematical expression, commonly known as kinetic gas equation. $PV = \frac{1}{3}mnu^3$?

where, P= Pressure of the gas, V a volume of the gas, m=Mass of a molecule, n = Number of molecules present in the given amount of a gas and u = root mean square speed

For one mole of gas, PV = RT and $n = N_A$

$$\frac{1}{3}mN_a u^2 = RT \text{ or } \frac{2}{3}\frac{.1}{2}mN_A u^2 = N_A$$

$$\left[\frac{1}{2}mN_A u^2 = KE\text{per mole}\right], \frac{2}{3}K.E. = RT \Rightarrow K.E. \frac{3}{2}RT$$

Average kinetic energy per mol does not depend on the nature of the gas but depends only on temperature. This, when two gases are mixed at the same temperature, there will be no rise or decrease in temperature unless both react chemically.

Average kinetic energy per molecule = $\frac{\text{Average K.E. per mole}}{N} = \frac{3}{2}\frac{RT}{N} \Rightarrow \frac{3}{2}kT$

where k is the Boltzmann constant

In deriving the kinetic gas equation, the use of the root mean square speed of the molecules is done, hecause it is

A. average speed of the molecules

B. the most probable speed of the molecules

C. root of average speed of the molecules

D. The most accurate form of speed

Answer: D

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2. On the basis of the postulates of kinetic theory of gases, it is possible to derive the mathematical expression, commonly known as kinetic gas equation. $PV = \frac{1}{3}mnu^3$?

where, P= Pressure of the gas, V a volume of the gas, m=Mass of a molecule, n = Number of molecules present in the given amount of a gas and u = root mean square speed

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Average kinetic energy per mol does not depend on the nature of the gas but depends only on temperature. This, when two gases are mixed at the same temperature, there will be no rise or decrease in temperature unless both react chemically.

Average kinetic energy per molecule =

$$\frac{\text{Average K.E. per mole}}{N} = \frac{3}{2}\frac{RT}{N} \Rightarrow \frac{3}{2}kT$$

where k is the Boltzmann constant

Which of the following expressions correctly represents the relationship between the average molar kinetic energies of CO and N_2 molecules at the same temperature ?

A. $K.E.(CO) = KE.\left(N_2\right)$

B. $K.E.(CO) > KE.\left(N_2\right)$

C. $K.E.(CO) < KE.\left(N_2\right)$

D. cannot be predicated

Answer: A

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3. On the basis of the postulates of kinetic theory of gases, it is possible to derive the mathematical expression, commonly known as kinetic gas equation. $PV = \frac{1}{3}mnu^3$?

where, P= Pressure of the gas, V a volume of the gas, m=Mass of a molecule, n = Number of molecules present in the given amount of a gas

and u = root mean square speed

For one mole of gas, PV = RT and $n = N_A$

$$\frac{1}{3}mN_a u^2 = RT \text{ or } \frac{2}{3}\frac{.1}{2}mN_A u^2 = N_A$$

$$\left[\frac{1}{2}mN_A u^2 = KE\text{per mole}\right], \frac{2}{3}K.E. = RT \Rightarrow K.E. \frac{3}{2}RT$$

Average kinetic energy per mol does not depend on the nature of the gas but depends only on temperature. This, when two gases are mixed at the same temperature, there will be no rise or decrease in temperature unless both react chemically.

Average kinetic energy per molecule =

$$\frac{\text{Average K.E. per mole}}{N} = \frac{3}{2}\frac{RT}{N} \Rightarrow \frac{3}{2}kT$$

where k is the Boltzmann constant

The average kinetic energy (in joule) of the molecules in 8g methane at $27\& \circ C$ is.

A. $62.14 \times 10^{-22} J$

B. $72.68 \times 10^{-21} J$

C. $68.2 \times 10^{-21} J$

D. $62.14 \times 10^{-20} J$

Answer: A

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PRACTICE SHEET (EXERCISE -III) (LEVEL -II ADVANCED)(MATRIX MATCHING TYPE QUESTIONS)

1. Match the term (in Column-I) with its expression (in Column-II) :

Column-I	Column-II
A) RMS velocity	P) $\sqrt{8RT/\pi M}$
B) Average velocity	Q) $\frac{1}{3}\frac{mNu^2}{V}$
C) Most probable velocity	R) $\sqrt{3RT/M}$
D) Pressure by N molecules of gases	S) $\sqrt{2RT/M}$

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PRACTICE SHEET (EXERCISE -III) (LEVEL -II ADVANCED)(INTEGER TYPE QUESTIONS)

1. Kinetic energy of 0.30 moles of He gas in a container of maximum capacity of 4 litres at 5 atmosphere, must be (R = 0.0821 atm litre mole $^{-1}K^{-1}$)______ $\times 10^{1}$ atm.lit

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2. The RMS velocity of nitrogen gas molecules is 'V cm/sec at a certain temperature. When the temperature is doubled, the molecules dissociated into individual atoms. Now the RMS velocity of nitrogen atoms is x V cm/sec. What is the value of 'x'?

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3. Two flasks A and B have equal volumes. A is maintained at 300 K and B at 600 K. while A contains H_2 gas, B has an equal mass of CH_4 gas. Assuming ideal behaviour for the both gases find the ratio of $\left(u_{av}\right)_A : \left(u_{av}\right)_B$.

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PRACTICE SHEET (EXERCISE -IV) (LEVEL -I MAINS)(STRAIGTH OBJECTIVE TYPE QUESTIONS)

1. The compressibility factor of an ideal gas is

A. 1.0

B. 1.5

C. 2

D. Infinity

Answer: A

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2. The most ideal gas among real gases is

A. Hydrogen

B. Helium

C. Carbon dioxide

D. Nitrogen

Answer: B

Watch Video Solution

3. A real gas deviates most from ideal behaviour at

A. High temperature and Low pressure

B. High pressure and Low temperature

C. High pressure and High temperature

D. Low pressure and Low temperature

Answer: B

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4. If V is the observed molar volume of real gas and V_{id} is the molar volume of an ideal gas then Z is

A. VV_{id}

B. $\frac{V}{V_{id}}$

C. $\frac{V_{id}}{V}$

D. $\frac{V^2}{V_{id}}$

Answer: B

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5. At low pressure Vander Waal's equation for 3 moles of a real gas will have its simplified from

A. $\frac{PV}{RT - (3a/V)} = 3$

B. $\frac{PV}{RT + Rb} = 3$

C. $\frac{PV}{RT - 3Pb} = 1$

D. $\frac{PV}{RT - (9/V)} = 3$

Answer: A

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6. Volume of a molecule is related to Vander Waal's constant 'b' and Avagadro Number 'N_0' by the equation :

A. $V = \frac{b}{N_0}$

B. $V = 4bN_0$

C. $V = \frac{4b}{N_0}$

D. $V = \frac{b}{4N_0}$

Answer: D

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7. The value of Vander Waal's constant a' is maximum for

A. Helium

B. Nitrogen

C. Methane

D. Ammonia

Answer: D

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8. NH_3 gas is liquified more easily than N_2 . Hence :

A. Vander Waal's constant a and b of $NH_3 >$ that of N_2

B. Vander Waal's constant a and b of $NH_3 <$ that of N_2

C. $a(NH_3) > a(N_2)$ but $b(NH_3) < b(N_2)$

D. $a(NH_3) < a(N_2)$ but $b(NH_3) > (N_2)$

Answer: C

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9. Assertion (A): Compressibility factor for hydrogen varies with pressure with positive slope at all pressures

Reason (R): Even at low pressures, repulsive forces dominate in hydrogen gas.

A. A & R are true, R explains A

B. A & R are true, R does not explain A

C. A is true R is false

D. A is false R is true

Answer: A

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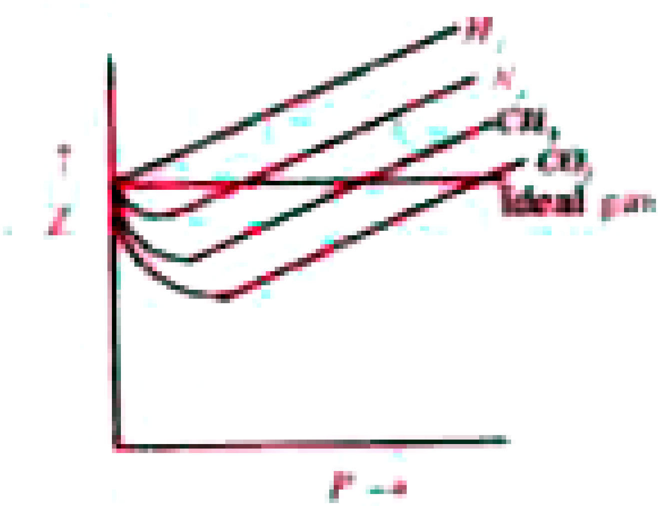
10. Compressibility factor $\left(Z = \frac{PV}{nRT}\right)$ is plotted against pressure. What is the order of liquefiability of the gas,



A. $H_2 < N_2 < CH_4 < CO_2$

B. $CO_2 < CH_4 < N_2 < CH_2$

C. $H_2 < CH_4 < N_2 < CO_2$

D. $CH_4 < H_2 < N_2 < CO_2$

Answer: A

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11. Boyle's temperature of various gases are given below:

Gas	A_1	A_2	A_3	A_4
$T_B(K)$	117	23	498	406

Which can be liquefied most easily

A. A

B. A_2

C. A_3

D. A_4

Answer: C

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12. A gas can be liquefied by

A. Cooling

B. Compressing

C. Both 1 and 2

D. None of these

Answer: C

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13. A gas can be liquefied by pressure alone when its temperature is

A. Higher than its critical temperature

B. Lower than its critical temperature

C. Equal to its critical temperature

D. Equal to its Boyle's temperature

Answer: B

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14. A gas can be liquefied if :

A. forces of attraction are low under ordinary conditions

B. forces of attraction are high under ordinary conditions

C. forces of attraction are zero under ordinary conditions

D. forces of attraction either high or low under ordinary conditions

Answer: D

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

A. Below critical temperature

B. Above critical temperature

C. Above absolute zero

D. Below absolute zero

Answer: B

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16. The correct formula for reduced pressure and reduced volume are

A. $P. P_C, V. V_C$

B. $\frac{P}{P_C}, \frac{V}{V_C}$

C. $\frac{P_C}{P}, \frac{V_C}{V}$

D. P_C, V_C

Answer: B

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17. Among the following which can be liqufied easily ('a' values given in bracket in L^2. atm mol^{-2})

A. $He(0.034)$

B. $Xe(4.19)$

C. $NH_3(4.17)$

D. $CO_2(3.59)$

Answer: B

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18. Under critical states for one mole of a gas, compressibility factor is

A. $\frac{3}{8}$

B. $\frac{8}{3}$

C. 1

D. $\frac{1}{4}$

Answer: A

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19. The cooling caused by the expansion of a compressed gas below its inversion temperature without doing external work is called

A. Joule Thomson effect

B. Aciabatic demagnetisation

C. Tyndall effect

D. Compton effect

Answer: A

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20. When an ideal gas undergoes unrestricted expansion

A. cooling occurs because the molecules lie above inversion temp.

B. no cooling occurs as no attractive interactions exist antong molecules

C. cooling occurs as molecules collide with each other among molecules

D. cooling does not occur as these do work equal to loss in kinetic energy.

Answer: B

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PRACTICE SHEET (EXERCISE -IV) (LEVEL -II ADVANCED)(STRAIGTH OBJECTIVE TYPE QUESTIONS)

1. For helium vander Waals parameter bis 0.024 lit/mol. The diameter of helium is nearly

A. $1.7A^{\circ}$

B. $2.7A^{\circ}$

C. $3.7A^{\circ}$

D. $4.0A^{\circ}$

Answer: B

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2. 2 moles of gas contained in a four litre flask exerts a pressure of II atm at $27^{\circ}C$. If vander Waals parameter bis 0.05 l/mol, the value of 'a' (in atm $\mathrm{lt}^2\mathrm{mol}^{-2}$) is

A. 6.46

B. 3.23

C. 2.0

D. 1.23

Answer: A

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3. What is the compressibility facto (Z) for 0.02 mole of a van der Waal's gas at pressure of 0.1 atm. Assume the size of gas molecules is neligible.

Given : RT = 20 L. atm mol^{-1} and α = 1000 atm $L^2 mol^{-2}$

A. 2

B. 1

C. 0.02

D. 0.5

Answer: D

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4. If volume occupied by CO_2 molecules is negligible, then the pressure exerted by one mole of CO_2 gas in terms of temperature (T), assuming V to be single valued, is

A. $P = \frac{RT}{4a}$

B. $P = \frac{RT}{4(a - b)}$

C. $P = \dfrac{R^2T^2}{4a}$

D. $\dfrac{R^2T^2}{4ab}$

Answer: C

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5. The. van der Waal's equation of law of corresponding states for 1 mole of gas is :

A. $\left(\pi + \dfrac{3}{\phi^2}\right)(3\phi - 1) = 8\theta$

B. $\left(\pi + \dfrac{3}{\phi}\right)(3\phi - 1) = 8\theta$

C. $\left(\pi + \dfrac{3}{\phi}\right)(3\phi + 1) = 8R\theta$

D. $\left(\pi + \dfrac{3}{\phi}\right)(3\phi - 1) = 8R\theta$

Answer: A

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PRACTICE SHEET (EXERCISE -IV) (LEVEL -II ADVANCED)(MATRIX MATCHING TYPE QUESTIONS)

1.

Column-I	Column-II
A) Low pressure	P) $Z = 1$
B) High pressure	Q) $Z \neq 1$
C) Very high temperature	R) $Pb < \frac{a}{V}$
D) Very low pressure	S) $Pb > \frac{a}{V}$

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2.

Column-I (Gas)	Column-II (Order of T_B Boyle Temp) (1.= min, 5 = max)
A) He	P) 3
B) CH_4	Q) 5
C) H_2	R) 1
D) N_2	S) 4
E) NH_3	T) 2

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3. Match Column-I with List-II and select the correct answers:

Column-I	Column-II
A) Critical temperature	P) $\frac{a}{ab}$
B) Boyle temperature	Q) $\frac{2a}{Rb}$
C) Inversion temperature	R) $\frac{T}{T_c}$
D) Reduced temperature	S) $\frac{8a}{27Rb}$

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4. The vander waals constants a and b of a real gas are $3.6L^2 atmmol^{-2}$ and $0.05Lmol^{-1}$respectively. If 200g of gas (molecular mass 40) is placed in 10L vessel at 300K,

Column-I	Column-II
A) Pressure correction (atm)	P) 0.25
B) Free space for the molecules to move about(L)	Q) 0.0125
C) Actual volume of the gas molecules per mole (L)	R) 0.9
D) Effective volume occupied by total gas molecules (L)	S) 9.75

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PRACTICE SHEET (EXERCISE -IV) (LEVEL -II ADVANCED)(INTEGER TYPE QUESTIONS)

1. Among the following gases, for how many gases, the compressibility factor is greater than unity at any pressure. $H_2, He, SO_2, CO_2, CH_4, N_2, C_2H_6O_2$

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2. Real gases exert less pressure when compared with ideal gases due to the attraction between the gas molecules. Reduction in pressure of real gases $\propto$ $(\text{Concentration of gas})^n$. What is the value of n ?

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3. What is the value of: $\dfrac{27RbT_c}{a}$?

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4. How many properties of gases increases with increasing the temperature, Viscosity, mean free path, collision frequency, rate of diffusion, R.M.S velocity, density at constant pressure, molar volume at constant pressure, molar concentration at constant pressure, vander Waals parameter a.

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PRACTICE SHEET (EXERCISE -V) (LEVEL -I MAIN)(STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. In between which of the following molecules London force exist

a) CO_2, CO_2 b) HCI, HCI c) HCI, C_6H_6

A. Only a

B. Only a and c

C. Only a and b

D. a, b, and c

Answer: D

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2. The intermolecular force of attraction present between NH_3 and C_6H_6 are

A. Dipole - Dipole

B. Ion - dipole

C. Dipole - induced dipole

D. Dispersion

Answer: C

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3. The term Vander Waals forces refers to

A) Dipole -- dipole interaction B) Dipole - induced dipole

C) Dispersion forces

A. A,C

B. B,C

C. A, B

D. A,B,C

Answer: D

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4. Inter molecular forces in solid hydrogen are

A. Covalent forces

B. Vander Waals forces

C. Hydrogen bond

D. dipole - dipole bond

Answer: B

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5. The approximate energy required to break A+B~ type ionic crystal into its ions is in the range of

A. 10 to 100 kJ/mole

B. 50 to 150 kJ/mole

C. 500 to 1000 kJ/mole

D. 2 to 50 kJ/mole

Answer: C

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6. When sodium metal is dropped in liquid NH_3 it forms Na^+ and gets ammoniated. Which of the following forces are responsible for the formation of ammoniated sodium ion.

A. Ion-induced dipole

B. Dipole - dipole

C. Ion - dipole

D. Dipole-induced dipole

Answer: C

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7. The melting point of four substances are given in bracket, then the attraction forces in a solid is more in case of

A. Ice (273K)

B. NaF (1270 K)

C. Phosphorous (317K)

D. Naphthalein (353 K)

Answer: B

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8. At room temperature among the following intermolecular forces are strongest in

A. H_O

B. H_2S

C. H_2Se

D. H_2Te

Answer: A

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9. The unit of surface tension is

A. Dynes cm^2

B. Ergs/cm

C. Joules m^{-1}

D. $N.\ m^{-1}$

Answer: D

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10. The internal resistance to flow in liquid is called

A. Fluidity

B. Specific resistance

C. Viscosity

D. Surface tension

Answer: C

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11. Liquids show viscosity which is due to

X) Creation of friction between the layers of the fluid.

Y) Inter molecular attraction forces of the liquid.

Z) Inter molecular repulsion forces of the liquid.

A. Y,Z

B. X, Y

C. X,Z

D. X, Y, Z

Answer: B

Watch Video Solution

12. The graph of viscosity coefficient (T|) and absolute temperature (T) is

____

A. Straight line passing through origin

B. Straight line parallel to temperature axis

C. Straight line with (+) ve slope

D. Exponential graph

Answer: D

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13. Which has the maximum viscosity ?

A. Water

B. Glycol

C. Acetone

D. Ethanol

Answer: B

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14. Sharp glass edges are heated for making them smooth (polishing of glass) which is due to its

A. Viscocity

B. Surface tension

C. Fluidity

D. Expansion nature of glass

Answer: B

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15. Viscosity of ethanol is 12.0 millipoise. Viscosity of ethanol in S.I system is equal to

A. 1.2

B. 1.2×10^{-3}

C. 1.2×10^{-2}

D. 1.2×10^{-1}

Answer: B

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ADDITIONAL PRACTICE EXERCISE (LEVEL - I MAIN) (STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. The ratio of the kinetic energies of equal number of moles of H_2 and He at the same temperature is

A. $1:2$

B. $2:1$

C. $1:1$

D. $4:1$

Answer: C

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2. The RMS velocity of a gas at 0°C is 2m/s. The RMS velocity of the same gas at 819°C

A. 1 m/s

B. 4 m/s

C. 8 m/s

D. 16 m/s

Answer: B

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3. The Ne atom has 10 times the mass of H_2. Which of the following statements is true?

I) At $25^\circ C$ the both have the same kinetic energy

II) Ten moles of H_2 would have the same volume as 1 mole of Ne at same temperature and pressure

III) One mole of Ne exerts the same pressure as one mole of H_2 at STP.

IV) AH_2 molecule travels 10 times faster than Ne atom at same temperature.

V) At STP, one litre of Ne has 10 times the density of 1 litre of H_2

A. II, IV, V

B. I, III, V

C. I, II, III

D. I, II

Answer: B

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4. Which of the following is NOT a postulate of the kinetic molecular theory of gases ?

A. The molecules possess a volume that is negligibly samll compared o the container

B. The pressue and volume of a gas are inversely related

C. Gases consist of discrete particles that are in constant chaotic motion

D. The average kinetic energy of the molecules is directly proportional to the temperature.

Answer: B

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5. Consider three one-litre flasks labeled A, B and C filled with the gases NO, NO_2 and N_2O respectively, each at 1 atm and 273 K. In which flask do the molecules have the highest average kinetic energy?

A. Flask C

B. All are the same

C. Flask A

D. None

Answer: B

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6. Two flasks A and B have equal volumes. A is maintained at 300 K and B at 600 K, while A contains H_2 gas, B has an equal mass of CO_2 gas. Find the ratio of total K.E. of gases in flask A to that of B.

A. $1:2$

B. $11:1$

C. $33:2$

D. $55:7$

Answer: B

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7. In two vessels of 1 litre each at the same temperature lg of H_2 and 1 g of CH_4 are taken, for these :

A. V_{rms} values will be same

B. Kinetic energy per mol will be same

C. Total kinetic energy will same

D. Pressure will be same

Answer: B

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

A. 3.5 cm/s

B. (27/2) cm/s

C. 54 cm's

D. (54/2) cm/s

Answer: D

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9. What is r.m.s speed of O_2 molecule if its kinetic energy is 2 k cal mol^{-1}?

A. 7.24×10 2 m/sec

B. 3.5×10^2 m/sec

C. 1.8×10^1 m/sec

D. $3.5x10^1$ m/sec

Answer: A

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10. If the ratio of molar masses of two gases A and B is 1 : 4. What is the ratio of the average speeds ?

A. 2

B. 4

C. 1

D. 4

Answer: A

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11. Inversion temperature (Ti=2aRb) is defined as the temperature above which if gas is expanded adiabatically it gets warm up but if temperature of gas is lower than Ti then it will cool down. What will happen to gas if it is adiabatically expanded at 50∘C if its Boyle's temperature is 20∘C

A. Heating

B. Cooling

C. Constant

D. None

Answer: A

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II)(LECTURE SHEET ADVANCED) (STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. A balloon of diameter 21 meter weight 100 kg. Calculate its pay-load, if it is filled with He at 1.0 atm and 27°C. Density fair is 1.2 kgm^{-3} (Given : R = 0.0821 L atm $K^{-1}mol^{-1}$)

A. 4952.42 kg

B. 4932.42 kg

C. 493.242 kg

D. none of these

Answer: B

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2. Let u_{av}, u_{rms} and u_{mp} are average, root means square and most probable speed the molcules in an ideal monoatomic gas at absolute temperature T. The mass of molecule is m, then :

A. none of the moelcules can have a speed greater than $\sqrt{2}u_{rms}$

B. none of the molecules can have a speed less than $\sqrt{2}u_{mp}$.

C. $u_{av} < u_{rms} < u_{mp}$

D. the average kinetic energy of molecule is $\frac{3}{4}mu_{mp}^2$

Answer: D

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II)(LECTURE SHEET ADVANCED) (MORE THAN ONE CORRECT ANSWER TYPE QUESTIONS)

1. Among the following which gases are heavier then air

A. Dry O_2

B. moisto O_2

C. dry N_2

D. moistN_2

Answer: A::B

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2. RMS velocity of a gas does not vary with______at a given temperature.

A. pressure

B. volume

C. density

D. shape of the container

Answer: A::B::C::D

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3. Average kinetic energy of a gas does not depend on______at a given temperature

A. pressure

B. volume

C. nature of gas

D. density

Answer: A::B::C::D

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4. Transitional kinetic energy of a gas molecule______

A. is constant at constant temperature

B. depends on quantity of gas

C. does not change with volume at a given temp.

D. is same for all gases at a given temperature

Answer: A::B::C::D

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5. The correct statement regarding various types of molecular speeds are

A. increasing temperature increases the fraction of molecules having U_{mps}

B. Increasing temperature increases U_{mps}

C. In a sample of gas at a given temperature, molecules with extremely low and high speeds are less

D. At the same temperature lighter gaseous having narrow distribution of molecular speeds than heavier gaseous

Answer: B::C

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6. Which of the following statement(s) is/are true?

A. The ratio of rms speed to average speed is independent of temperature

B. Average kinetic energy is independent of the change in temperature

C. The difference between rms and most probable speed increases on increase in temperature

D. The rms speed is higher for He than for H_2 at a given temperature

Answer: A::C

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II)(LECTURE SHEET ADVANCED) (LINKED COMPREHENSION TYPE QUESTIONS)

1. Inside a spherical glass flask 'A' of radius 1 meter containg 300gm of H2, there was another rubber balloon B containing some N2. Inside the balloon B, another rubber balloon 'C containing some O_2 is present. At 27°C it was found that the balloon B had a radius of 60cm and balloon 'C had a radius of 30cm

Calculate the moles of nitrogen in the balloon B

A. 4.123 atm

B. 3.123 atm

C. 2.123 atm

D. 1.123 atm

Answer: D

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2. Inside a spherical glass flask 'A' of radius 1 meter containg 300gm of H2, there was another rubber balloon B containing some N2. Inside the balloon B, another rubber balloon 'C containing some O_2 is present. At 27°C it was found that the balloon B had a radius of 60cm and balloon 'C had a radius of 30cm

Calculate the moles of nitrogen in the balloon B

A. 16.14

B. 1.614

C. 3.614

D. 36.14

Answer: D

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3. 1 g of methane diffused in 20 sec. under certain conditions. Under the same conditions $\sqrt{20}g$ of a hydrocarbon (A) diffused in 40 sec. A 10 mg of sample of (A) took up 8.40 ml of H_2 gas measured at 0°C and 760 mm pressure:

The number of n. bonds present in the compound A is/are

A. 2

B. 1

C. 3

D. 4

Answer: C

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4. If one of the open chain isomer of (A) on ozonolysis gives only formaldehyde & glyoxal, then its monocyclic isomer on ozonolysis gives

A. only glyoxal

B. only methyl glyoxal

C. formaldehyde & glyoxal

D. glyoxal & methyl glyoxal

Answer: B

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5. 1 g of methane diffused in 20 sec. under certain conditions. Under the same conditions $\sqrt{20g}$ of a hydrocarbon (A) diffused in 40 sec. A 10 mg of sample of (A) took up 8.40 ml of H_2 gas measured at 0°C and 760 mm pressure:

Identify the incorrect statement.

A. One of the isomers of (A) exhibits geometrical isomerism

B. One of the isomers of (A) gives white precipitate with Tollen's reagent

C. One of the isomers of (A) is asymmetric

D. One of the isomers on ozonolysis gives only acetone

Answer: D

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II)(PRACTICE SHEET ADVANCED) (STRAIGHT OBJECTIVE TYPE QUESTIONS)

1. A mixture of hydrogen and helium is prepared such that the number of collisions on the wall per unit time by molecules of each gas is same. Which gas has higher concentration?

A. helium

B. hydrogen

C. both have same concentration

D. can't be determined

Answer: A

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2. Calculate the volume occupied by 16 grm O_2 at 300 K and 8.31 MPa if $\frac{P_cV_c}{RT_c} = \frac{3}{8}$ and $\frac{P_tV_t}{T_t} = 2.21$ (Given : R = 8.314 Mpa/K-mol)

A. 125.31 mL

B. 124.41 mL

C. 248.62 mL

D. none of these

Answer: B

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3. Which is/are correct for real gases?

A. $Lt_{P \to 0}\left(PV_m\right)$ = constant at constant high temperature

B. $Lt_{V_m \to 0}\left(PV_m\right)$= constant at constant low temperature

C. As the temperature is reduced, the pressure decreases

D. A point is reached where theoretically, the volume become zero

Answer: A

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4. At Boyle temperature,

A. the effects of the repulsive and atractive intermolecular forces just cancelled each other

B. the repulsive intermolecular forces are greater than the attractive intermolecular forces

C. the repulsive intermolecular forces are less than the attractive intermolecular forces

D. $b - \frac{a}{RT} > 0$

Answer: A

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II)(PRACTICE SHEET ADVANCED) (MORE THAN ONE CORRECT ANSWER TYPE QUESTIONS)

1. Which of the following statements is/are correct with respect to behaviour of real gas.

A. For every vander Waal gas at critical condition, attractive force will be dominant.

B. The liquid and gaseous state can be distinguished only if the temperature is below the gas's critical temperature,

C. At very high pressures, real gases occupy greater volume as compared to ideal gas having samo moles at same temperature and exerting same pressure.

D. For a real gas the 'y' intercept of $\frac{PV_m}{T}$ vs curve where 'P' represents pressure (in atm), V_m represents molar volume and 'T' represents temperature in kelvin is equal to 0.0821 atm-litre/mol Kelvin.

Answer: A::B::C::D

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2. The correct statement amongst the following is:

A. For every gas there exists a characteristic temperature above which it cannot be liquefied no matter however high is the pressure applied called critical temperature of the gas.

B. For every gas there exists a characteristic temperature at which its compressibility factor is equal to unity for some range of pressure.

C. Amongst He, N_2, O_2 and CO_2, CO_2 has the lowest value of "a" and He has the lowest value "b" where a and bare vander walls constants of the gas.

D. The extent of departure of Z (compressibility factor) from unity is the measure of the extent of deviation from ideal behavior.

Answer: A::B::D

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3. The internal pressure loss of one mole of vander Waal gas over an ideal gas is not equal to

A. zero

B. b^2

C. $\frac{a}{V^2}$

D. $b - \frac{a}{RT}$

Answer: A::B::D

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4. Which are true ?

A. A gas can be liquified above its T_C

B. A gas behaves as a vapour below its T_C

C. A gas with higher T_C is more liquifiable

D. All gases possess same V_C

Answer: B::C

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5. Select incorrect statements(s)

A. At very low pressure real gases show minimum deviation from ideal behaviour

B. The compressibility factor for an ideal gas is zero.

C. At Boyle temperature eal gas behave as ideal gas in high pressure region

D. Real gas show maximum deviation at high pressure and low temperature

Answer: B::C

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6. The density of air 380K and 722 mm of Hg is lg/cm^3. If air is cooled to 100K and 1 atm the final density is :

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PROBLEMS

1. Convert 0.5 atmospheres pressure into mm of mercury.

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2. A balloon is filled with one mole of helium at $0^{\circ}C$ and 1 bar pressure. It will burst if pressure is decreased to 0.2 bar. What is the maximum volume of balloon?

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3. At what temperature the volume of 28 grams of N_2 will be 1L exerting a pressure of 1 atm?

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4. Certain mass of oxygen exerts a pressure of 'P' atm in a vessel of volume 'V' at $25^{\circ}C$. In the same vessel what be the pressure of gas at 25 K ?

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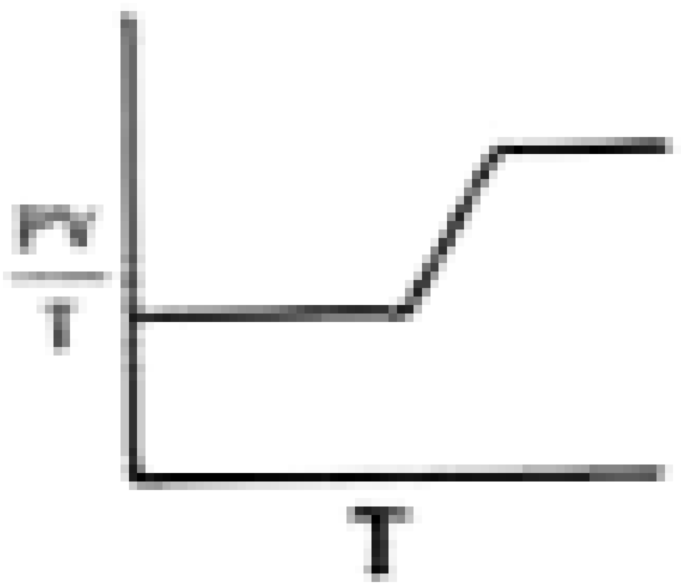

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Watch Video Solution

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Watch Video Solution

64. Acetaldehyde is polar and benzene is non-polar. But benzene boils at higher temperature. Why?

Watch Video Solution

65. Why sulphuric acid is much viscous than hydrochloric acid?

Watch Video Solution

66. Convert 0.5 atmospheres pressure into mm of mercury.

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67. A balloon is filled with one mole of helium at $0\,^{\circ}C$ and 1 bar pressure. It will burst if pressure is decreased to 0.2 bar. What is the maximum volume of balloon?

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68. At what temperature the volume of 28 grams of N_2 will be 1L exerting a pressure of 1 atm?

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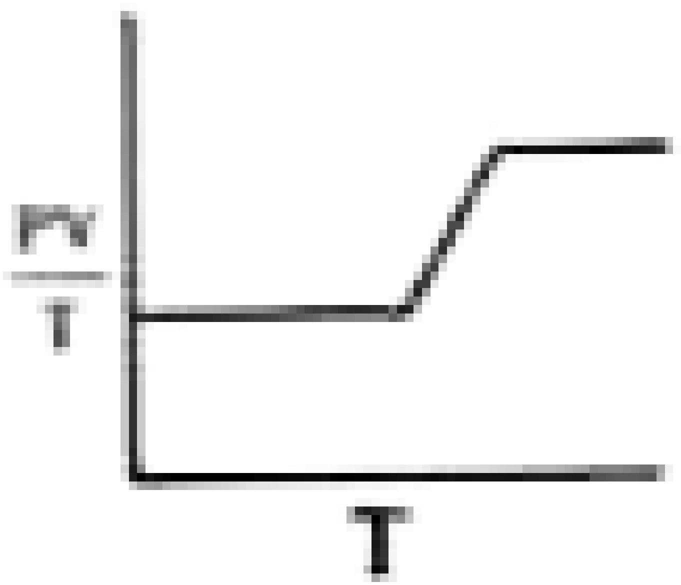

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SUBJECTIVE EXERCISE - 1 (SHORT ANSWER QUESTIONS)

1. State and explain Gay-Lussac's law of combining volumes.

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2. State and explain Boyle's law.

Watch Video Solution

3. Derive the value of molar gas constant from gram molar volume.

Watch Video Solution

4. Mention the four measurable parameters of a gas and write the units.

Watch Video Solution

5. State and explain Charle's law.

Watch Video Solution

6. State and explain Avogadro.s law.

Watch Video Solution

7. Derive ideal gas equation.

Watch Video Solution

8. Write the values and units of Universal gas constant.

Watch Video Solution

9. The absolute temperature of a gas

Watch Video Solution

10. State and explain Graham's law of Diffusion.

Watch Video Solution

11. State Dalton's law of partial pressures.

Watch Video Solution

12. Write any four applications of diffusion and effusion.

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13. How is the pressure of gas calculated when it is collected over water, using Dalton's law of partial pressure?

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SUBJECTIVE EXERCISE - 1 (VERY SHORT ANSWER QUESTIONS)

1. If the value of gas constant is 82.1, give its units.

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2. Find the volume of 3g of H_2 at STP.

Watch Video Solution

3. What are the characteristic properties of gases?

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4. Write equation of state. Why is it so called?

Watch Video Solution

5. Draw two graphs showing the ideal gas equation.

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6. What are isotherms and isobars?

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7. What is the value of the gas constant, if pressure is expressed in netwtons m^{-2} and volume is expressed in dm^3?

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8. What are standard temperature and pressure conditions? What is the volume of one mole of an ideal gas under these conditions?

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9. Which of the gases diffuses faster among N_2, O_2 and CH_4? Why?

Watch Video Solution

10. How many times methane diffuses faster than sulphur dioxide?

Watch Video Solution

11. State and explain Dalton's law of partial pressures.Derive the relation between partial pressure and total pressure.

Watch Video Solution

12. Define the terms, diffusion and effusion.

Watch Video Solution

13. How does volume of a given mass of gas change, when its pressure is reduced to half and absolute temperature is increased by four times ?

Watch Video Solution

14. Why is gas constant (R) called universal gas constant? What is Boltzmann constant ?

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15. What is an ideal gas?

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SUBJECTIVE EXERCISE - 1 (NUMERICALS)

1. Calculate the volume occupied by 25g. of carbon dioxide at 303K and 0.974 atm. Pressure

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2. Find the density of methane at 298K and 72cm of Hg pressure

Watch Video Solution

3. A gas cylinder withstands a pressure of 14.9 atm. Its pressure gauze indicates 12 atm at $27^{\circ}C$. If the building catches fire suddenly, at what temperature the cylinder explodes?

Watch Video Solution

4. Calculate the pressure of 11g of CO_2 at $40\ ^\circ C$ in a 3 litre flask.

Watch Video Solution

5. Calculate the volume of 14 g of nitrogen gas at$27\ ^\circ C$ and 600mm, of Hg pressure.

Watch Video Solution

6. 0.5 litres of an ideal gas is present at a pressure.

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7. Calculate the density of carbon dioxide at 97° C and 760 mm of Hg of pressure.

Watch Video Solution

8. A five litre flask contains 3.5gm of $N_2 3gofH_2$ and $8g$ of O_2 at $27\,^\circ C$. The total pressure exerted by the mixture of these gases is

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9. Find the mass of 7×10^{20} molecules of H_2gas.

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10. The volume of a given mass of gas is $0.6 dm^3$. If its pressure is increased by 3 times and absolute temperature is increased by 5 times, what would be its new volume?

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11. Find the volume of 8g of oxygen gas at $27^\circ C$ and 1 atmosphere prressure. If the volume of each molecule is $3.4 \times 10^{-24} cc$ calculate the vacant space in the gas.

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12. Find the mass of $450cm^3$ of N_2 gas at $32^\circ C$ and 750mm of Hg pressure.

Watch Video Solution

13. 2.5gms. of a gas is present in 750ml. flask at $32^\circ C$ and 770mm, of Hg pressure. Calculate the molecular mass of the gas.

Watch Video Solution

14. A flask contains 1.2 inoles of methane gas at $25^\circ C$ and 74.6mm pressure. If 4gm of the same gas is sent into the flask, what would be its pressure ?

Watch Video Solution

15. A 15 dm^3 cylinder contains hydroen gas at 5 atm at $27^\circ C$, How many balloons of capacity of 1.5 dm^3 at 1 atm and $27^\circ C$ can be filled using the gas available from the given cylinder ?

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16. 3.2g of a gas occupies 550 cc of volume at $22^\circ C$ and 770 mm of Hg pressure. Find the molecular mass of the gas.

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17. Ammonia gas diffuses through a fine hole at the rate $0.5 lit \min^{-1}$. Under the same conditions find the rate of diffusion of chlorine gas.

Watch Video Solution

18. If oxygen diffuses at a rate of $6cm^3, \sec^{-1}$ through a fine hole, find the rate of diffusion of carbon dioxide gas under the same conditions.

Watch Video Solution

19. Find the relative rates of diffusion of CO_2 and Cl_2 gases.

Watch Video Solution

20. Two gases have densities 0.388g/cc and 0.097gm/cc. If the second gas has the rate of diffusion 5cc/sec, find the rate of duffusion of the first gas.

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21. 100cc of CO_2 gas is diffused in 25 seconds through a porous membrane. How much time does the same volume fo sulphur dioxide take to diffuse ?

Watch Video Solution

22. Certain volume of oxygen gas undergoes effusion in 15 min. Under similar conditions, what is the time required for the effusion of same volume of chlorine gas?

Watch Video Solution

23. If 150cc of CO effused in 25 seconds, what volume of methane would effuse in the same time?

Watch Video Solution

24. A porous tube containing a mixture of H_2 and O_2 is placed in a flask. After the diffusion for 25 seconds into the flask, what would be the composition of the gases in the flask?

Watch Video Solution

25. 240cc of SO_2 gas diffused through a porous membrane in 20 minutes. Under similar conditions, 720 cc of another gas diffused in 30 minutes. Find the molecular mass of the gas.

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26. Carbon dioxide and another gas 'X' have their rates of diffusion as 0.299 cc s^{-1} and 0.271 cc s^{-1} respectively. Find the vapour density of the gas 'X' if the vapour density of carbon dioxide is 22.

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27. $350cm^3$ of oxygen and $275cm^3$ of another gas 'A' diffused in same time under similar conditions. Find the molecualr mass of the gas 'A'.

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28. If $500cm^3$ of hydrogen diffused in 16 minutes through a fine hole, how much time does the same volume of ozone $\left(O_3\right)$ take for diffusion?

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29. Hydrogen chrolide gas is sent into a 100 metre tube from one end 'A and ammonia gas from the other end 'B', under similar conditions. At what distant from 'A' will be the two gases meet.

Watch Video Solution

30. Find the partial pressures of each gas in a mixture containing 4.4 gms. of CO_2 and 5.6 gms of N_2 present at a pressure of 1.5atm. at a given temperature.)

Watch Video Solution

31. A flask contains 1gm, of H_2 , 2gms. of Ne and 1.6 gms. of O_2 at a pressure of 2 atmoshperes at $27^{\circ} C$. Calculate the partial pressures of each gas and the volume of the flask.

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32. A 3 lit flask contains 3g of nitrogen and 6.4g of oxygen at $30^{\circ} C$. Calculate the following for the mixture :

(a) partial pressure of oxygen and

(b) total pressure of the gaseous mixture.

Watch Video Solution

33. Aqueous tension at $25^{\circ} C$ is given as 23.8 mm, If 1.5 L of nitrogen gas is collected over water at $25^{\circ} C$ and 735 mm Hg, find the mass of dry gas collected in the experiment.

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34. A vessel contains a mixture of equal masses of helium and oxygen at a pressure of 600 torr. Calculate the partial pressures of components in the mixture.

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35. At $25^{\circ} C, 500 cm^3$ flask contains hydrogen at a pressure of 120 mm of Hg and a $250 cm^3$ flask contains oxgyen at a pressure of 300 mm of Hg at the same temperature. If the two gases are transferred into a one litre flask at the same temperature, find the pressure of the mixture.

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36. A 3 litre flask contains 2.2 gms of CO_2 and some mass of oxgyen. If the pressure of the mixture is 1.2 atm at $27^{\circ} C$, Calculate the partial pressure and the mass of oxygen.

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37. A vessel contains helium and methane in 4:1 mole ratio at 20 bar pressure. Find the ratio of initial rates of effusion through a small aperture.

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38. A neon dioxide mixture contains 70.6 g dioxygen and 167.5 g neon. If pressure of the mixture of gases in the cylinder is 25 bar. What is the partial pressure of dioxygen and neon in the mixture?

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39. At $25\ ^\circ C, 500cm^3$ flask contains hydrogen at a pressure of 120 mm of Hg and a $250cm^3$ flask contains oxgyen at a pressure of 300 mm of Hg at the same temperature. If the two gases are transferred into a one litre flask at the same temperature, find the pressure of the mixture.

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SUBJECTIVE EXERCISE - 2 (SHORT ANSWER QUESTIONS)

1. Write the postulates of kinetic Molecular Theory of Gases.

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2. Deduce Boyle's law from kinetic gas equation.

Watch Video Solution

3. Deduce Charle's kaw from kinetic gas equation.

Watch Video Solution

4. Derive Avogadro's law from kinetic gas equation.

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5. Deduce Dalton's from kinetic gas equation.

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6. Deduce Graham's law from kinetic gas equation.

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7. Derive Gay-Lussac's law from kinetic gas equation.

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8. Derive an expression for kinetic energy of gas molecules.

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9. Calculate the kinetic energy of a chlorine molecule at room temperature.

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10. A vessel contains equal masses of helium and oxygen at $35^{\circ} C$. What is the ratio of kinetic energies of the components?

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11. What is the effet of temperature on the distribution of molecular velocities?

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12. Define RMS, mean and most probable velocities. Write the ratio of these velocities for a given gas.

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13. How are ratio of molecular velocities related to molecular weight and temperature of gases?

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14. Write on the distribution of molecular velocities.

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15. What are different types of molecular velocities? Give their inter-relationship.

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Watch Video Solution

16. Derive the expressions for RMS velocity from kinetic gas equation.

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17. Explain the Maxwell - Boltzmann distribution curves of molecular velocities.

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SUBJECTIVE EXERCISE - 2 (VERY SHORT ANSWER QUESTIONS)

1. How is pressure of gas created ?

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2. What is Boltzman's constant? Give its value.

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3. Find the kinetic energy of 2 moles of an ideal gas in calories at $27^{\circ} C$

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4. Write the factors on which the kinetic energy of gas depends upon?

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5. Calculate the kinetic energy per mole of carbondioxide at $27^{\circ} C$

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6. Calculate the average and total kinetic energy of 0.5 mole of an ideal gas at $0^{\circ} C$

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7. What is most probable velocity?

Watch Video Solution

8. With what factors RMS velocity is multiplied to give average and most probable velocities of gas molecules ?

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9. Give the ratio of molecular velocities.

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10. Give a mathematical relation of RMS velocities of two different gases at a given temperature.

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11. Why RMS speed is taken in the derivation of kinetic gas equation?

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12. Why does the velocity of gas molecules increase with increase in temperature?

Watch Video Solution

13. Give the fomulae to calculate average velocity of gas molecules.

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SUBJECTIVE EXERCISE - 2 (NUMERICALS)

1. Two vessels of equal volume contain O_2 and CO_2 gases separately at the same temperature and pressure. Then, which gas contains (a) more number of molecules ? (b) more number of atoms? (c) more kinetic energy ? (d) high RMS velocity ?

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2. Find the average velocity, RMS velocity and most probable velocity of oxygen molecules at $30^{\circ} C$

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3. If RMS velocity of carbon dioxide is $4.4 \times 10^4 cms^{-1}$ at given temperature, find the RMS velocity of ethane at the same temperature

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4. Calculate RMS velocity of 1.5L of ethane at 750mm of Hg.

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5. If gas has a RMS velocity $5.2 \times 10^4 cms^{-1}$, find the average and most probable velocities of the gas

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6. The average velocity of gas is $2.9 \times 10^4 cms^{-1}$.Calculate the RMS and most probable velocities of the gas.

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7. A gas has density $1.52 gL^{-1}$ at 1.5atm. Calculate its RMS velocity.

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8. Four molecules have the velocities $3 \times 10 cms^{-1}, 4 \times 10^4 cms^{-1}, 2 \times 104 cms^{-1}$ and $5 \times 10^4 cms^{-1}$.. Find the RMS velocity of the molecules.

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9. Calculate RMS velocity of ozone at $20\,^{\circ}C$ and 82cm. of Hg pressure.

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10. Cars pass a point travelling at $45.0(5), 47.0(7) 50.0(9), 53.0(4)$ and $57.0(1) kmh^{-1}$. The numbers in brackets give the number of cars with respective velocities. Calculate the RMS velocity and average velocity.

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11. Air is cooled from $25^{\circ}C$ to $0^{\circ}C$. Calculate the decrease in rms speed of the molecules.

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12. Calculate kinetic energy of 5 moles of Nitrogen at $27^{\circ}C$.

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13. Calculate the ratio of kinetic energies of 3g of hydrogen and 4g of oxygen at an given temperature.

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SUBJECTIVE EXERCISE - 3 (SHORT ANSWER QUESTIONS)

1. Write a note on the intermolecular forces.

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2. Explain ion-dipole attraction with example.

Watch Video Solution

3. Explain induced dipole-dipole attractions.Give examples.

Watch Video Solution

4. Why experimental isothermal of real gases resemble the perfect-gas isotherms at high temperature and low pressure?

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5. Explain the deviation of real gas from perfect gas using compression factor of values?

Watch Video Solution

6. Explain the viscoty of liquids?

Watch Video Solution

7. Explain the isotherms of carbondioxide.

Watch Video Solution

8. Derive and expalin van der Waals equation.

Watch Video Solution

9. What are bulk properties? Explain them with example.

Watch Video Solution

10. Explain the surface tension preperty of liquids with suitable examples.

Watch Video Solution

11. Write four differences between ideal gas and real gas.

Watch Video Solution

12. Write the real gas equation. What do the correction constants .a. and .b. signify ?

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13. Using the compression factor explain the behaviour of real gases.

Watch Video Solution

14. Explain the liquefication of gases.

Watch Video Solution

15. Derive the correction factor for pressure exerted by a real gas.

Watch Video Solution

16. Write the expressions for critical constants interms of van der Waals constants, for correction in pressure and in volume.

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SUBJECTIVE EXERCISE - 3 (VERY SHORT ANSWER QUESTIONS)

1. What are dispersion forces ?

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2. Write a note of dipole-dipole attractions.

Watch Video Solution

3. How hydrogen bond influences attractions between molecules.

Watch Video Solution

4. Discuss the cage like structure of ice.

Watch Video Solution

5. When does a real gas behave like an ideal gas?

Watch Video Solution

6. What is Boyle's temperature?

Watch Video Solution

7. What are the reasons for deviations from ideal gas behaviour ?

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8. Compressibility factor of a gas is less than unity at STP. Predict its molar volume.

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9. Define compression factor. What is its value for a perfect-gas?

Watch Video Solution

10. Explain the different terms in van der Waals equation.

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11. Why were hydrogen like gases considered as permenant gases in the begining?

Watch Video Solution

12. What is Joule-Thomson effect? How does it help in the liquefication of gases?

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13. Define critical pressure and critical volume

Watch Video Solution

14. Define critical temperature. What is the critical temperature of the CO_2 gas?

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SUBJECTIVE EXERCISE - 3 (NUMERICALS)

1. Volume correction constant 'b' for argon gas is $3.22 \times 10^{-5} m^3$ per mol. Calculate the diameter of argon molecule.

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2. Find the temperature at which one mole of SO_3 will occupy 10 lit at 5 atm. (correction constants 'a' = $6.71 atm L^2 mol^{-2}$ and $'b' = 0.0504 L mol^{-1}$

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3. The compression factor for one mole of real gas at $0^{\circ}C$ and 100 atm is 0.5. Calculate the van der Waals' constant 'a', if 'b' is zero.

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4. What would be the SI unit for the quantity pV^2T^2/n?

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OBJECTIVE EXERCISE - 1 (INTRODUCTION)

1. When a solid containing $10N^{\circ}$ molecules is allowed to melt, then

A. Only one molecule of a solid melts

B. each individual molecule of a solid melts

C. bulk of the solid melts

D. No molecules melt

Answer: C

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2. (A) : Molar volume of ideal gas at latest STP conditions is 22.711 lit

(R): Latest STP conditions are 273.15 K and 1 bar

A. Both A and R are correct and R is the correct explanation of A

B. Both A and R are correct but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: A

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3. The pressure exerted by a mass of 'x' mg resting on the area of 1.00 cm^2 is 1.00 Pa, then 'x' is

A. 10.300

B. 10.308

C. 1030

D. 10.2

Answer: D

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4. A $1.00m^2$ column of air extending from the earth's surface through the upper atmosphere has a mass of about x producing an atmospheric pressure. Then 'x' is

A. 10,300 kg

B. 10,300 gm

C. 1030 gm

D. 1030 mg

Answer: A

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OBJECTIVE EXERCISE - 1 (GAS LAWS)

1. Gases show ideal gas behaviour at

A. high pressure and high temperature

B. low pressure and high temperature

C. low pressure and low temperature

D. high pressure and low temperature

Answer: B

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2. The value of the universal gas constant R depends upon the

A. Nature of the gas

B. Mass of the gas

C. Temperature of the gas

D. The units of measurement

Answer: D

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3. The SI unit of pressure is pascal and it is equal to the pressure exerted by

A. a mass of 10.2 gram on $1.00 cm^2$ area

B. a mass of 1.02 gram on $1.00 cm^2$ area

C. a mass of 1.02 mg on $1.00 cm^2$ area

D. a mass of 10.2 mg on $1.00 cm^2$area

Answer: D

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4. What is the value of gas constant R in $Jmol^{-1}K^{-1}$?

A. 82.1

B. 8.314×10^{7}

C. 8.314

D. $0.08219.$

Answer: C

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5. 'n' moles of an ideal gas at temperature ‘T’ occupy ‘V’ litres of volume, exerting a pressure of ‘p’ atmospheres. What is its concentration in mole lit^{-1} (R = gas constant)

A. $\frac{RT}{R}$

B. $\frac{P}{RT}$

C. $\frac{RT}{P}$

D. $\frac{R}{RT}$

Answer: B

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6. According to Avogadro law the correct statements are

a) Volume of gas is proportional to the no. of moles at constant T and P

b) The pressure of a gas is directly proportional to temp. of the gas under all conditions

c) Equal volumes of different gases under similar conditions consist of equal no. of molecules

d) Equal volumes of different gases under same conditions have equal no. of atoms

A. b, c

B. a, c

C. d, b

D. c, d

Answer: B

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7. Which of the following changes cannot increase the volume of a gas by 4 times

A. T is doubled, P is decreased to half

B. P is kept constant, T is increased by 4 times

C. 'T' is halved, P is decreased to half

D. 'T' is kept constant, P is decreased to 1/4 th

Answer: C

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8. Value of R in SI units is

A. $8.315 \times 10^7 \text{erg} K^{-1}\ \text{mole}^{-1}$

B. $8.3153 JK^{-1} \text{mole}^{-1}$

C. $0.0823 \text{lit.Atm.K}^{-1} \text{mole}^{-1}$

D. $2 cal K^{-1} \text{mole}^{-1}$

Answer: B

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9. The gas constant R represents work done

A. per molecule

B. per degree absolute

C. per degree per mole

D. per mole

Answer: C

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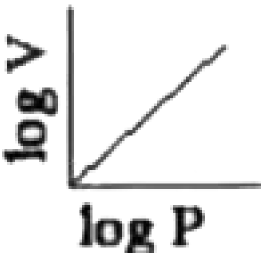
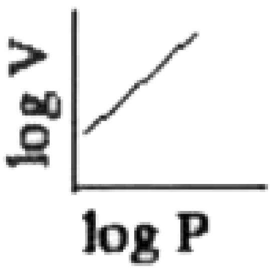
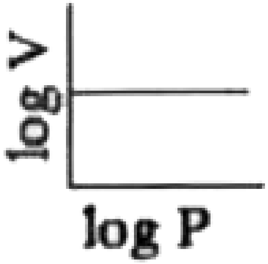
10. The Boyle's law can be expressed graphically as

A. 

B. 

C. 

D. 

Answer: b

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11. When the pressure on a gas is decreased to 1/4 and the absolute temperature is increased four-fold the volume of the gas

A. Increases by 16 times

B. decreases to 1/16

C. Increases by 8 times

D. remains the same

Answer: A

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12. The temperature of a gas is increased by 1 aC. Then from the following statements pickout the correct one

1) The volume increases by 1/273 of its volume at 0°C at constant pressure

2) The pressure increases by 1/273 of its pressure at 0°C at constant volume

3) The volume decreases by 1/273 of its volume at 0°C

4) The pressure is doubled to its pressure at 0°C

A. a, c

B. c, d

C. a, b

D. b, c

Answer: C

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13. Which of the following are correct statements

a) 760 torr is equal to 1 atmosphere

b) 10^6dynes/cm^2 is called 1 Bar

c) 10^5Newtons/m^2 is pascal

d) 1 atmosphere is $1.013 \times 10^5 \text{dynes/m}^2$

A. a, c

B. a, b

C. a, d

D. c, d

Answer: B

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14. 1 mole of any gas

a) Occupies 22.4 lit at STP

b) Contains 3.05×10^{22} molecules

c) Contains 6.023×10^{23} molecules

d) Contain same number of molecules as in 22 gm of CO_2

A. b, d

B. a,c

C. b, c

D. a, d

Answer: B

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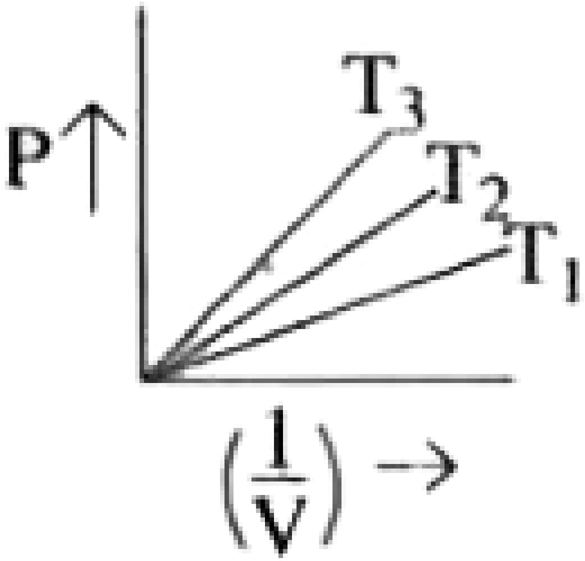
15. From the graph the correct order of temperatures is



A. $T_3 > T_2 > T_1$

B. $T_3 < T_2 < T_1$

C. $T_3 = T_2 = T_1$

D. $T_3 > T_2 < T_1$

Answer: A

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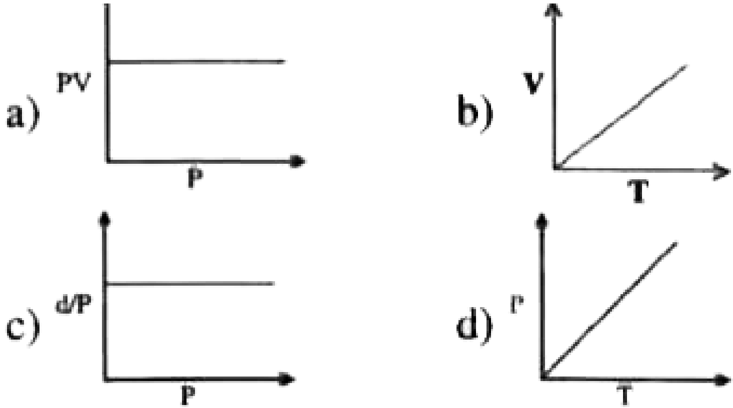
16. Which of the following indicates the isotherm?



A. a, d

B. a, c

C. b, d

D. b, c

Answer: B

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17. Which of the following indicates Charles' law mathematically (when n, P are constant)?

a) VT = constant $b)V_t = V_0\left(1 + \frac{t}{273}\right)$

c)$V_0 = V_t\left(1 + \frac{t}{273}\right)$ d) V/T = constant (when n, P are constant)

A. a, c

B. a, b

C. b, c

D. b, d

Answer: D

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18. At absolute zero which of the following statements about an ideal gas are correct ?

a) The motion of gaseous molecules ceases

b) The volume of gas increases by 273 times

c) The K.E of gas molecules increases ab normally

d) The volume of a gas becomes zero

A. b, d

B. b, c

C. c, d

D. a, d

Answer: D

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19. The density of CO_2 gas at $27^{\circ}C$ and 1 atm pressure is ___ (gram/lit)

A. 1.78

B. 1.52

C. 1.96

D. 1.20

Answer: A

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20. Which of the following indicates correct R (Gas constant) values in different units ?

a) $1.987 \text{cals mole}^{-1} K^{-1}$

b) $8.314 \times 10^7 J \text{mole}^{-1} K^{-1}$

c)$0.0821 \text{lit-atm mole}^{-1} K^{-1}$

d) $82.1 \text{lit. mole}^{-1} K^{-1}$

A. a, b

B. b, c

C. a, c

D. d, c

Answer: C

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21. When the absolute temperature of a gas is doubled then the correct statements are

a) The V of a gas increases by 4 times at constant P

b) The P of a gas increases by 2 times at constant V

c) The V of a gas increases by 2 times at constant P

d) The P of a gas increases by 4 times at constant V

A. b, d

B. a, c

C. b, c

D. a, d

Answer: C

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22. Match the following

A) Movement of gas molecules	1) Unaffected by gravity
B) Gas with least rate diffusion	2) Diffusion
C) Gas with highest rate of diffusion	3)H_2
D) Spontaneous mixing of gases	4)He
	5) UF

The correct match is .

A. $\begin{array}{cccc} A & B & C & D \\ 5 & 3 & 4 & 2 \end{array}$

B. $\begin{array}{cccc} A & B & C & D \\ 1 & 2 & 3 & 4 \end{array}$

C. $\begin{array}{cccc} A & B & C & D \\ 1 & 5 & 3 & 2 \end{array}$

D. $\begin{array}{cccc} A & B & C & D \\ 5 & 3 & 2 & 1 \end{array}$

Answer: C

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23.

Column-	Column-II
A) Boyle's law	P) $P_{obs} = P_{atm} + P_{\text{water vapour}}$
B) Avagadro's law	Q) $V_1 = n_1\left(\frac{V_2}{n_2}\right)$
C) Charles' law	R) $V_t = V_0\left(1 + \frac{t}{273}\right)$
D) Dalton's law	S) $V_1 = P_2\left(\frac{V_2}{P_1}\right)$

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24.

LIST - 1	LIST - 2
$(A) R = 8.314 \text{J.Kelvin-mol}^{-1}$	(1) STP conditoins
$(B) V = 22.711 lit$	(2) SI unit
$(C) P = 1\text{bar}, T = 273.15K$	(3) CGS unit
$(D) R = 0.8314 \times 10^8 \text{ergs.kelvin}^{-1} mol^{-1}$	(4) Gram molecular weight
	(5) Gram molar volume at S.T.P

The correct match is

A. $\begin{matrix} A & B & C & D \\ 5 & 4 & 3 & 1 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 4 & 3 & 2 & 1 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 3 & 5 & 2 & 4 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 2 & 5 & 1 & 3 \end{matrix}$

Answer: D

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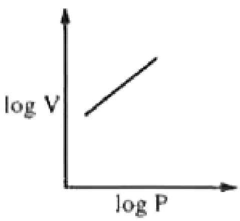
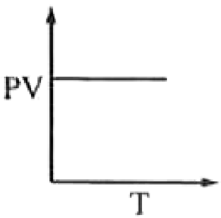
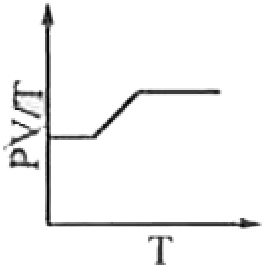
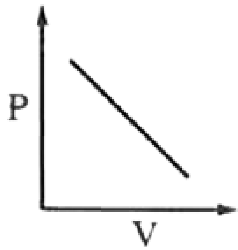
25. Which among the following indicates change in the chemical composition due to dissociation

A. 

B. 

C. 

D. 

Answer: C

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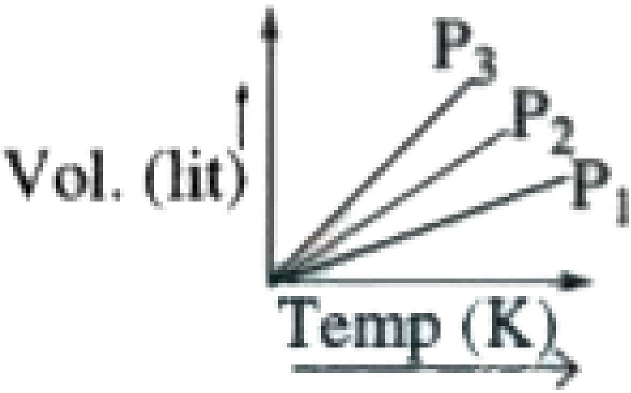
26. From the graph the order of pressure of a gas is



A. $P_1 > P_2 > P_3$

B. $P_1 < P_2 < P_3$

C. $P_1 = P_2 = P_3$

D. $P_1 < P_2 > P_3$

Answer: A

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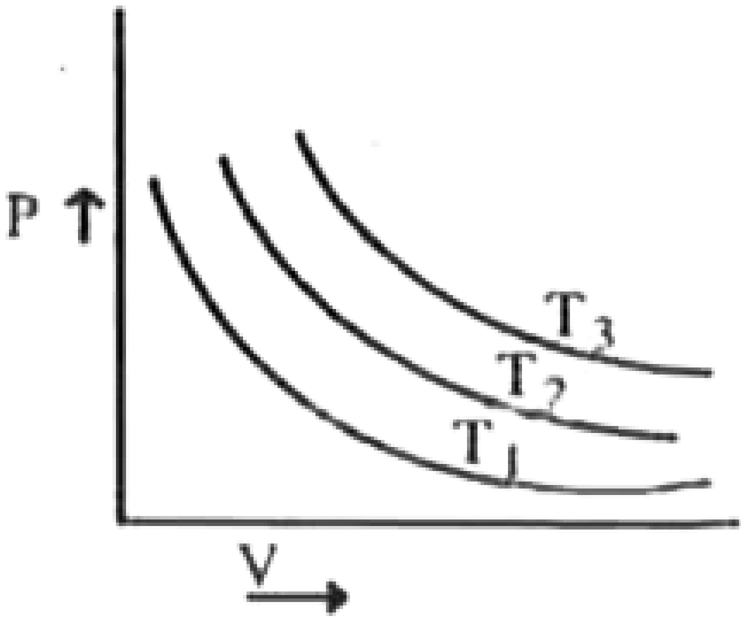
27. From the graph the correct order of temperature is



A. $T_1 < T_2 < T_3$

B. $T_1 = T_2 = T_3$

C. $T_1 > T_2 > T_3$

D. $T_1 < T_2 > T_3$

Answer: A

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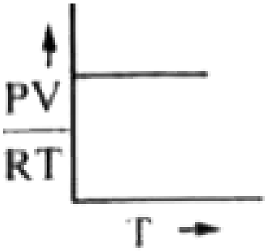
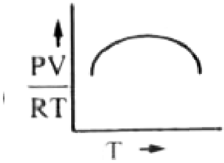
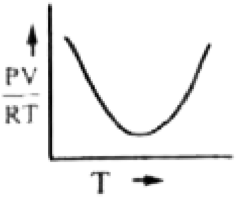
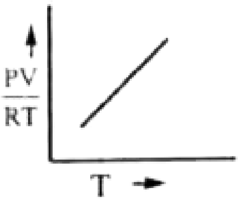
28. For an ideal gas the graph between PV/RT and T is

A. 

B. 

C. 

D. 

Answer: A

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29. One mole of argon will have least density at

A. STP

B. $0^{\circ} C$, 2 atm

C. 273°, 2 atm

D. $273^{\circ} C$, 1 atm

Answer: D

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30. What are the conditions under which the relation between 'V' and 'n' are plotted ?

A. At constant P

B. At constant P, V

C. At constant T, V

D. At constant P, T

Answer: D

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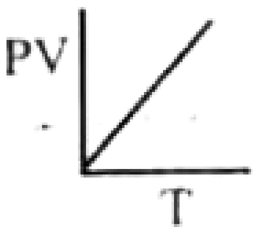
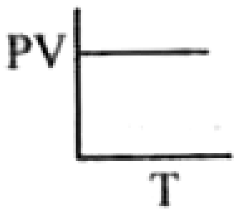
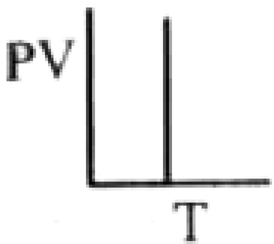
31. Which of the following shows ideal gas behaviour



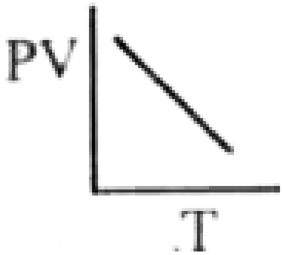
A.



B.



C.

D. 

Answer: A

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32. When universal gas constant (R) is divided by Avogadro number(N), then the value R/N is equivalent to

A. Rydberg's constant

B. Boltzmann's constant

C. Planck's constant

D. Vanderewall's constant

Answer: B

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33. (A): Volume to temperature ratio is constant for a fixed amount of gas at constant pressure.

(R) : At constant pressure the volume of a given mass of a gas increases or decreases by 1/273 times of its volume at $0^\circ C$, for every $1^\circ C$ change in temp.

A. Both A and R are correct and R is the correct explanation of A.

B. Both A and R are correct but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true

Answer: A

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34. Value of gas constant (R) is

A. 0.082 lit atm

B. $0.987 cal mol^{-1} K^{-1}$

C. $0.83 erg mol^{-1} K^{-1}$

D. $8.3 J mol^{-1} K^{-1}$

Answer: D

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35. At constant volume, for a fixed number of moles of a gas, the pressure of the gas increases with a rise in temperature, due to

A. increases in average molecular speed

B. decreased number of collisions amongest molecules

C. increase in molecular attractions

D. decrease in mean free path

Answer: A

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36. Density of neon will be highest at

A. STP

B. $0^{\circ} C$, 2atm

C. $273^{\circ} C$, 1 atm

D. $273^{\circ} C, 2atm$

Answer: B

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37. Temperature of a gas is tK. What would be the temperature at which volume and pressure, both will reduced to half of the initial values

A. t/2

B. t/4

C. t/3

D. t/8

Answer: B

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OBJECTIVE EXERCISE - 1 (GRAHAM.S LAW)

1. (A): Gas with lower molecular weight will effuse or diffuse faster than the gas with higher molecular weight.

(R) : Kinetic energy of any gas is independent of temperature.

A. Both A and R are correct and R is the correct explanation of A.

B. Both A and R are correct but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: C

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2. According to Graham's law at a given temp, the ratio of diffusion r_A/r_B, of gases A and B is given by

A. $\left(\frac{P_A}{P_B}\right)\left(\frac{M_A}{M_B}\right)^{\frac{1}{2}}$

B. $\left(\frac{M_A}{M_B}\right)\left(\frac{P_A}{P_B}\right)^{\frac{1}{2}}$

C. $\left(\frac{P_A}{P_B}\right)\left(\frac{M_B}{M_A}\right)^{\frac{1}{2}}$

D. $\left(\frac{M_A}{M_B}\right)\left(\frac{P_B}{P_A}\right)^{\frac{1}{2}}$

Answer: C

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3. Which of the pairs of gases diffuse at a slower rate than CO_2?

A. $H_2\&He$

B. $SO_2 \& SO_3$

C. N_2 and CO

D. N_2O and C_3H_8

Answer: B

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4. Ammonia gas diffuses twice as fast as gas X. The gas 'X'is

A. SO_2

B. C_4H_{10}

C. C_5H_8

D. Cl_2

Answer: C

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5. The four tyres of a motor car are filled with CO_2, He, H_2 and O_2 respectively. The order in which they are to be reinflated is

A. CO_2, O_2, He, H_2

B. H_2, He, O_2, CO_2

C. H_2, He, CO_2, O_2

D. H_2, O_2, He, CO_2

Answer: B

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6. A balloon filled with acetylene is kept in a vessel of hydrogen at the same temperature and pressure. If the balloon is punctured with a pin, it

A. collapses

B. bursts

C. nothing happens

D. becomes red

Answer: B

Watch Video Solution

7. The rate of diffusion of methane is twice that of the following gas under the same conditions

A. O_3

B. O_2

C. SO_2

D. SO_3

Answer: C

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8. Among the following gaseous elements with atomic numbers, which will have greater rate of diffusion?

A. Z=7

B. Z = 8

C. Z = 10

D. Z = 17

Answer: C

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9. The rate of diffusion of a gas at constant temperature and pressure is

a) Directly proportional to its density

b) Directly proportional to square root of its molecular wt

c) Inversely proportional to its square root of its vapour density

d) Directly proportional to its RMS velocity

A. c, d

B. a, b

C. b, d

D. b, c

Answer: A

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10. Among the following, the applications of Graham's law are

a) In Marsh gas alarm b) In designing eudiometer

c) In separating uranium isotopes d) To measure volume of a gas by gas burette

A. a, c

B. b, d

C. c, d

D. b, d

Answer: A

Watch Video Solution

11. Match the following.

LIST - 1	LIST - 2
(A) Effusion	(1)$r\alpha 1/\sqrt{d}$
(B) Velocity of gas molecules	(2) Collision of molecules on the walls
(C) Pressure of the gas	(3) Vector quatity
	(4) Scalar quantity

A. A-4, B-2, C-3

B. A-1, B-3, C-2

C. A-1, B-2, C-4

D. A-1, B-4, C-3

Answer: B

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12. Pick out the pair of gases with the same rate of diffusion

A. CO, NO

B. N_2O, CO

C. N_2O, CO

D. CO_2, NO_2

Answer: C

Watch Video Solution

13. For the diffusion of a gas at pressure P, the rate of diffusion is expressed by

A. $r\alpha\frac{P}{\sqrt{M}}$

B. $r = \frac{P}{M}$

C. $r\alpha\frac{M}{\sqrt{P}}$

D. $r = \frac{P}{\sqrt{M}}$

Answer: A

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14. A gas diffuses four times as quickly as oxygen. The molecular weight of the gas is

A. 2

B. 4

C. 8

D. 16

Answer: A

Watch Video Solution

15. Mixing of two gases by diffusion is

A. Reversible

B. irreversible

C. Exothermic

D. endothermic

Answer: B

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16. Dalton's law of partial pressures is applicable to

A. $NO + O_2$

B. $H_2 + Cl_2$

C. $NH_3 + HCI$

D. $CO_2 + O_2$

Answer: D

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17. Equal volumes of two jars contain HCI, NH_3 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

A. 1 atm

B. Equal to P

C. Becomes Zero

D. P + P = 2P

Answer: C

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18. Which of the following indicates the mathematical expression for Dalion's law of partial pressures

a) Partical pressure = $\frac{\text{The component gas volume}}{\text{Total pressure}} \times \text{Total volume}$

b) Partial pressure = mole fraction of component gas $\times$ Total pressure

c) Partial pressure = Partial volume $\times$ Total pressure

d) Partial pressure = No. of moles of component gas $\times$ Total pressure

A. a, d

B. b, c

C. c, d

D. a, b, c

Answer: D

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19. Combination that obeys Dalton's law

$A = CO \quad B = CI_2 \quad C = F_2 \quad D = Xe$

A. A, B

B. B,C

C. B, D

D. A, C

Answer: B

Watch Video Solution

20. To which of the following gas mixture, Dalton's Law of partial pressures is not applicable ?

A. CO, CO_2

B. HCI, NH_3

C. O_2, N_2

D. CO_2, N_2

Answer: D

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21. O_2 and He are taken in equal weights in a vessel. The pressure exerted by Helium in the mixture is

A. 1/8 th of total pressure

B. 1/9th of total pressure

C. 2/9 th of total pressure

D. 8/9th of total pressure

Answer: B

Watch Video Solution

OBJECTIVE EXERCISE - 1 (KINETIC THEORY OF GASES)

1. Which is wrong according to Kinetic theory?

A. The average K.E. of the molecules is directly proportional to the absolute temperature.

B. All the molecules in a gas have the same K.E.

C. Collisions between molecules are perfectly elastic

D. Pressure is due to the impact of the molecules on the walls of the container

Answer: A

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2. (A): Pressure of the gas increases with the decrease in volume at constant temperature

(R): Number of molecules per unit volume increases with decrease in volume consequently number of collisions on the wall increases

A. Both A and R are correct and R is the correct explanation of A.

B. Both A and R are correct but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: B

Watch Video Solution

3. An ideal gas cannot be liquified because

A. collisions are elastic

B. of the absence of attractive forces

C. gravity has no effect on the molecules

D. the average K.E. is not proportional to the absolute temperature.

Answer: B

Watch Video Solution

4. The most ideal gas among real gases is

A. Hydrogen

B. Helium

C. Carbon dioxide

D. Nitrogen

Answer: C

Watch Video Solution

5. Which is wrong according to Kinetic theory?

A. Average K.E. of molecules is proportional to the absolute temperature

B. Collisions between molecules are perfectly elastic

C. Pressure is due to collisions between molecules

D. There are no attractive forces between the molecules of a gas

Answer: D

Watch Video Solution

6. The gas which can not be liquified is

A. H_2

B. He

C. Ar

D. Ideal gas

Answer: B

Watch Video Solution

7. The ratio of kinetic energies of 2gm of $H_2$and 4gm of CH_4 at a given temperature is

A. $1:4$

B. $4:1$

C. $1:2$

D. $2:1$

Answer: D

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8. When gas molecules collide on the walls of the vessel, the energy of the molecules changes into

A. Heat

B. Temperature

C. Light

D. None

Answer: D

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9. The absolute temperature of a gas

A. is a measure of the number of molecules in the gas

B. is a measure of the volume of the gas

C. indicates the nature of the gas

D. is a measure of the average kinetic energy of the molecules

Answer: D

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10. The kinetic energy of n moles of an ideal gas is given by the expression

A. $\frac{3}{2}RT$

B. $\frac{3}{2}nRT$

C. $\frac{2}{3}\ RT$

D. $\frac{2}{3}RT$

Answer: B

Watch Video Solution

11. Boltzmann constant represents the gas constant per

A. mole

B. an Avogadro number of molecules

C. any number of molecules

D. molecule

Answer: D

Watch Video Solution

12. The ratio of kinetic energies of 2gm of $H_2$and 4gm of CH_4 at a given temperature is

A. $4:1$

B. $2:32$

C. $1:4$

D. $16:2$

Answer: A

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13. The average K.E. of one mole of an ideal gas in calories is equal to

A. 3 times of its absolute temp

B. 2 times of its absolute temp

C. 4 times of its absolute temp

D. 2/3 times of its absolute temp

Answer: A

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14. The correct statements regarding kinetic molecular theory are

a) The distance between the molecules is high compared to size of the gaseous molecules

b) The motion of the gaseous molecules are affected by gravitational force

c) The attractive forces between the gaseous molecules are very high.

d) The total K.E of a sample of gaseous molecules remains constant at a given temperature

A. b, d

B. b, c

C. a, d

D. c, d

Answer: C

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15. Which of the following indicates Kinetic gas equation ?

a) $PV = \frac{3M}{C^2}$ b) $PV = \frac{1}{3}mnC^2$ c) $P = \frac{1}{3}dC^3$ d) $KE = \frac{3}{2}RT$

A. $PV = \frac{3M}{C^2}$

B. $PV = \frac{1}{3}mnC^2$

C. $P = \frac{1}{3}dC^2$

D. $KE = \frac{3}{2}RT$

Answer: D

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16. The Kinetic energy of a gas depends upon

a) nature of the gas

b) absolute temperature

c) molecular weight of the gas

d) number of moles of the gas

A. b, d

B. c, d

C. a, d

D. a, b

Answer: A

Watch Video Solution

17. Which of the following is independent of temperature of a gas

A. Density

B. Rate of diffusion

C. Vapour density

D. R.M.S velocity

Answer: C

Watch Video Solution

18. When two molecules of an ideal gas collide

A. heat is liberated

B. no heat is liberated

C. heat is absorbed

D. there is a decrease in the total K.E.

Answer: B

Watch Video Solution

OBJECTIVE EXERCISE - 1 (TYPES OF VELOCITIES)

1. Which of the following molecules have the highest mean speed at the same temperature

A. CO_2

B. SO_2

C. CIO_2

D. NO_2

Answer: A

Watch Video Solution

2. Molecules having the least RMS velocity at constant temperature are

A. CO_2

B. SO_2

C. CIO_2

D. NO_2

Answer: C

Watch Video Solution

3. When pressure is increased upon a gas at constant temperature

A. the R.M.S. velocity decreases

B. the R.M.S. velocity increases

C. the R.M.S. velocity remains the same

D. the average kinetic energy of the molecules increases

Answer: C

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4. The most probable velocity of the molecules is given by (m is mass of a molecule)

A. $\sqrt{\frac{3KT}{m}}$

B. $\sqrt{\frac{8KT}{m}}$

C. $\sqrt{\frac{2KT}{m}}$

D. $\sqrt{\frac{2KT}{\pi m}}$

Answer: B

Watch Video Solution

5. Which of the following is incorrect?

A. RMS velocity depends upon molecular weight

B. RMS velocity depends upon temperature

C. RMS velocity depends upon density at a given temperature

D. The RMS velocity is used in deriving the kinetic gas equation

Answer: C

Watch Video Solution

6. The gas which is easy to liquefy is

A. H_2

B. He

C. CO_2

D. NH_3

Answer: D

Watch Video Solution

7. The RMS 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?

A. $\frac{m_2}{u_1} = \frac{m_2}{u_2}$

B. $\frac{m_1}{u_1} = \frac{m_2}{u_2}$

C. $m_1 u_1 = m_2 u_2$

D. $m_1 u_1^2 = m_2 u_2^2$

Answer: D

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8. Which of the following relations regarding molecular velocities are true ?

a) Most probable velocity $= 0.8166 \times$ RMS velocity

b) RMS velocity = $0.9213 \times$ Average velocity

c) Average velocily = $\sqrt{\frac{8RT}{\pi M}}$

d) $C_p > \bar{C} > C$

A. b, c

B. a, d

C. c, d

D. a, c

Answer: D

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9. At STP the order of root mean square velocity of molecules of H_2, N_2, O_2 and HBr is

A. $N_2 > HBr > O_2 > H_2$

B. $H_2 > N_2 > O_2 > HBr$

C. $HBr > H_2 > O_2 > N_2$

D. $H_2 > O_2 > HBr > N_2$

Answer: B

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10. Match the following.

LIST - 1	LIST - 2
(A) Average velcoity	(1) $\frac{3}{2}nRT$
(B) Most probable velocity	(2) $\sqrt{\frac{8RT}{\pi M}}$
(C) Kinetic energy of a gas	(3) $\sqrt{\frac{2RT}{M}}$
(D) Kinetic energy of a gas molecule	(4) $\sqrt{\frac{3RT}{M}}$
(E) RMS velocity	

A. E - 1, C - 3, B-2, A - 4

B. E - 3, D - 4, B-2, A - 1

C. B - 3, A -2, E-4, C - 1

D. D - 3, E - 4, A - 2, B - 1

Answer: C

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11.

LIST - 1	LIST - 2
$(A) 0.0821$ lit. atm $mol^{-1}k^{-1}$	(1) Density of mercury
$(B) 1.38 \times 10^{-23}$ joule k^{-1} molecule^{-1}	(2) Planck's constant
$(C) 13.6 gcm^{-3}$	(3) Gram molar volume
$(D) 22400 ml$ of gas	(4) Gas constant
(5) Boltzmann constant	

The correct match is

A. A-5, B - 4, C - 3, D-2

B. A - 4, B - 3, C -5, D-1

C. A - 4, B - 3, C - 4, D-2

D. A - 4, B - 5, C - 1, D-3

Answer: D

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12.

List -I	List - II
A) $\sqrt{\frac{U_1^2+U_2^2+\dots.+U_n^2}{n}}$	1) Average velocity
B) $\frac{U_1+U_2+U_3+\dots.+U_n}{n}$	2) at absolute zero kelvin
C) $\sqrt{2P/d}$	3) RMS velocity of gas molecules
	4) Most probable velocity of gas molecules

The correct match is

A. A-1, B-2, C- 1

B. A-2, B-3, C-1

C. A-3, B-1, C-4

D. A-4, B-1, C-3

Answer: C

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13. The root mean square velocity of a gas is doubled when the temperature is

A. reduced to one-half

B. reduced to one -fourth

C. increased four times

D. increased two times

Answer: C

Watch Video Solution

14. Which of the following indicates RMS velocity of a gas?

a) $\sqrt{\frac{2RT}{M}}$ b) $\sqrt{\frac{3P}{d}}$ c) $\sqrt{\frac{8RT}{\pi M}}$ d) $\sqrt{\frac{3RT}{M}}$

A. c,d

B. b,d

C. a,c

D. a,b

Answer: B

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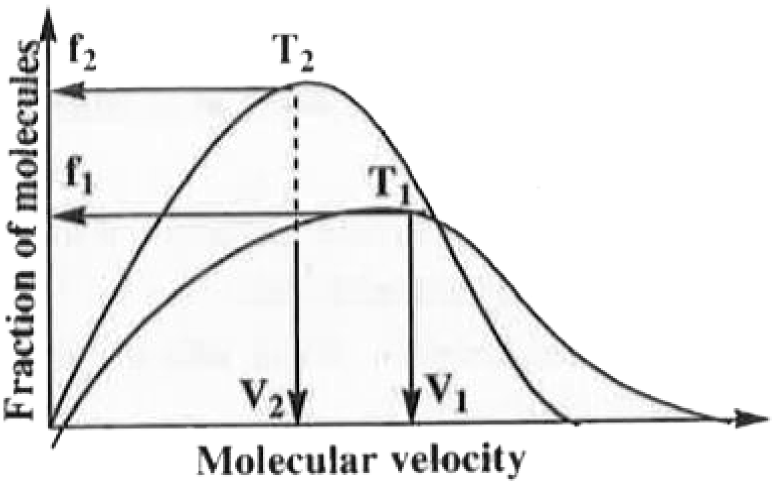
15. Plot of Maxwell's distribution of velocities is given below :



Which of the following is correct about this plot?

A. $f_1 > f_2$

B. $V_1 < V_2$

C. $T_1 < T_2$

D. $T_1 > T_2$

Answer: D

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16. The most probable speed of O_2 molecules at T(K) is

A. $\sqrt{\frac{RT}{4\pi}}$

B. $\sqrt{\frac{RT}{16\pi}}$

C. $\sqrt{\frac{RT}{16}}$

D. $\sqrt{\frac{3RT}{32}}$

Answer: C

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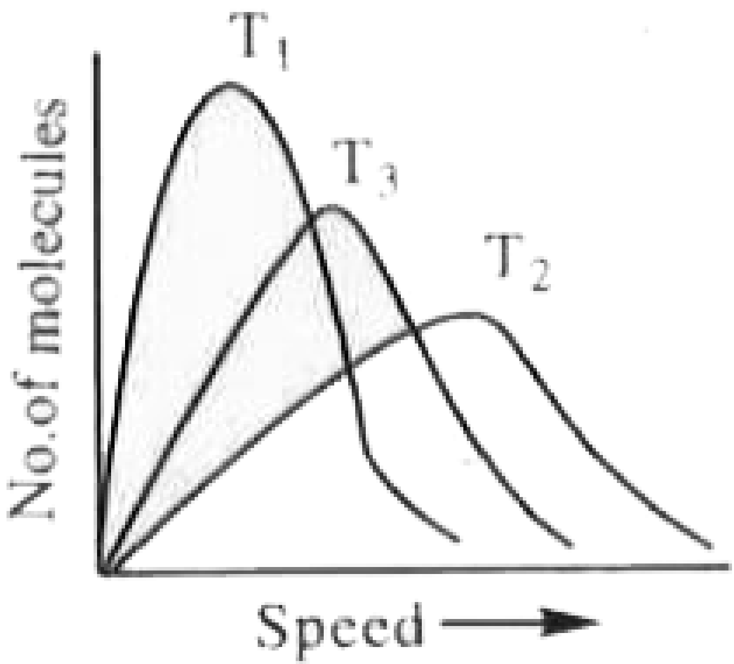
17. The given figure shows the Maxwell distribution of molecular speeds of a gas at three different temperatures T_1, T_2 and T_3. The correct order of temperatures is:



A. $T_1 > T_2 > T_3$

B. $T_1 > T_3 > T_2$

C. $T_3 > T_2 > T_1$

D. $T_2 > T_3 > T_1$

Answer: D

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OBJECTIVE EXERCISE - 1 (VAN DER WAAL EQUATIONS)

1. A real gas deviates most from ideal behaviour at

A. High temperature and Low pressure

B. High pressure and Low temperature

C. High pressure and High temperature

D. Low pressure and Low temperature

Answer: B

Watch Video Solution

2. When an ideal gas undergoes undestrained expansion, no cooling occurs because the molecules

A. Are above the inversion temperature

B. Exert no attractive force on the other

C. Do work equal to the loss in KE

D. Collide without loss of energy

Answer: B

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3.

Gas	O_2	N_2	NH_3	CH_4
a	1.360	1.390	4.170	2.253

The table indicates the value of vander Waal's constant a in L^2 atm mol 2.

The gas which can most easily be liquefied is ?

A. O_2

B. N_2

C. NH_3

D. CH_4

Answer: C

Watch Video Solution

4. Which of the following are correct statements ?

A. Van der Waal constant a is a measure of attractive force

B. Van der Waal constant b is also called co-volume or excluded volume

C. b is expressed in $Lmol^{-1}$

D. all of the above

Answer: D

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5. Compressibility factor for H2 behaving as real gas is

A. 1

B. $\left(1 - \frac{a}{RTV}\right)$

C. $\left(1 + \frac{Pb}{RT}\right)$

D. $\frac{RTV}{(1 - a)}$

Answer: C

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6. If V is the observed molar volume of real gas and V_{id} is the molar volume of an ideal gas then Z is

A. VV_{id}

B. $\frac{V}{V_{id}}$

C. $\frac{V_{id}}{V}$

D. $\frac{V^2}{V_{id}}$

Answer: B

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7. Volume of a molecule is related to Vander Waal's constant 'b' and Avagadro Number 'N_0' by the equation :

A. $V = \frac{b}{N_0}$

B. $V = 4bN0$

C. $V = \frac{4b}{N_0}$

D. $V = \frac{b}{4N_0}$

Answer: D

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8. Consider following statements :

(A): The gas whose critical temperature is above room temperature can be liquified by applying sufficient pressure to the gas.

(B): The gas whose critical temperature is below room temperature can be liquified by the temperature below T_c.

Select correct statement

A. A

B. B

C. both

D. none

Answer: C

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9. The deviation from the ideal gas behaviour of a gas can be expressed as

A. $Z = \frac{P}{VRT}$

B. $Z = \frac{PV}{nRT}$

C. $Z = \frac{nRT}{PV}$

D. $Z = \frac{VR}{PT}$

Answer: B

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10. In Vander Waal's equation of state of the gas law, the constant 'b' is a measure of

A. Intermoleculer repulsions

B. Intermolecular collisions per unit volume

C. Volume occupied by the molecules

D. Intermolecular attraction

Answer: C

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11. NH_3 gas is liquified more easily than N_2 . Hence :

A. Van der Waals constant a and b of $NH_3 > t\hat{o}f$N_2`

B. Van der Waals constant a and b of NH_3 lt that of N_2

C. $a(NH_3) > a(N_2)$ but $b(NH_3) < b(N_2)$

D. $a(NH_3) < a(N_2)$ but $b(NH_3) > b(N_2)$

Answer: C

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12. Under critical states for one mole of a gas, compressibility factor is

A. $\frac{3}{8}$

B. $\frac{8}{3}$

C. 1

D. $\frac{1}{4}$

Answer: A

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13. Vander Waal's equation for one mole of CO_2 gas at low pressure will be

A. $\left(P + \frac{a}{V^2}\right)V = RT$

B. $P(V - b) = RT - \frac{a}{V^2}$

C. $P = \frac{RT}{V - b}$

D. $P\left(\frac{RT}{V - b} - \frac{a}{V^2}\right)$

Answer: A

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14. The compressibility factor of an ideal gas is

A. 1.0

B. 1.5

C. 2

D. Infinity

Answer: A

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OBJECTIVE EXERCISE - 1 (LIQIFICATION OF GASES AND CRITICAL CONSTANTS)

1. The critical temperature of a substance is defined as :

A. The temperature above which the substance decomposses

B. The temperature above which a substance can exist only as a gas

C. melting point of the substance

D. boiling point of the substance

Answer: B

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2. When an ideal gas undergoes unrestricted expansion

A. cooling occurs because the molecules lie above inversion temp.

B. no cooling occurs as an attractive interactions exist among molecules

C. cooling occurs as molecules collide with each other among molecules

D. cooling does not occur as these do work equal to loss in kinetic energy.

Answer: B

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3. A gas X causes heating effect when allowed to expand. This is because

A. The gas is a noble gas

B. The inversion temperature of the gas is very low

C. The gas is ideal gas

D. The boiling point of the gas is very low

Answer: B

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4. A gas can be liquefied by pressure alone when its temperature is

A. Higher than its critical temperature

B. Lower than its critical temperature

C. Equal to its critical temperature

D. None

Answer: B

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5. Which set of conditions represents easiest way to liquefy a gas ?

A. Low temperature and high pressure

B. High temperature and low temperature

C. Low temperature and low pressure

D. High temperature and high pressure

Answer: A

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

A. Below critical temperature

B. Above critical temperature

C. Above absolute zero

D. Below absolute zero

Answer: B

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7. The relationship between P_c, V_c and T_c is

A. $P_cV_c = RT$

B. $P_cV_c = 3RT_c$

C. $P_cV_c = \frac{3}{5}RT_c$

D. $P_cV_c = \frac{3}{8}RT_c$

Answer: D

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8. The cooling caused by the expansion of a compressed gas below its inversion temperature without doing external work is called

A. Joule Thomson effect

B. Adiabatic demagnetisation

C. Tyndall effect

D. Compton effect

Answer: A

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9. (A): A gas behaves as an ideal gas at high temperature and low pressure.

(R): Helium behaves as an ideal gas under all conditions.

A. Both A and R are correct and R is the correct explanation of A.

B. Both A and R are correct but R is not the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

Answer: C

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10. NH_3 can be liquefied at ordinary temperature without the application of pressure. But O_2 cannot, because

A. its critical temp. is very high

B. its critical temp. Is low

C. its critical temp. is moderate

D. its critical tempereture is higher than that of ammonia.

Answer: B

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11. A gas can be liquefied by

A. Cooling

B. Compressing

C. Both

D. None

Answer: C

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12. The gas that is heated up during Joule Thomson effect at ordinary temperture is

A. O_2

B. CO_2

C. H_2

D. SO_2

Answer: C

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13. A,B,C and D are four different gases with critical temperature 304.1,154.3,405.5 and 126.0K respectively. While cooling the gas which gets liquified first is

A. B

B. A

C. D

D. C

Answer: D

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OBJECTIVE EXERCISE - 1 (SURFACE TENSION)

1. A manifestation of surface tension is :

A. Rise of liquid a capillary tube

B. Spherical shape of liquid drops

C. Upward movement of water in soils

D. All the above

Answer: D

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2. The unit of surface tension is

A. Dynes cm^{-2}

B. Ergs/cm

C. Joules m^{-1}

D. N.m^{-1}

Answer: D

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3. Generally liquid drops assume spherical shape because

A. A sphere has maximum surface area

B. A sphere has minimum surface area

C. Sphere is symmetrical in shape

D. None of these

Answer: B

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4. The surface tension of water at 20ºC is 72.75 dyne cm^{-1} . Its value in SI system is

A. $2.275Nm^{-1}$

B. $0.7275Nm^{-1}$

C. $0.07275Nm^{-1}$

D. None of the above

Answer: C

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5. Example of surface active substance

A) Cholesterol , B) Alcohol , (C) Soap

A. Cholesterol

B. Alcohol

C. Soap

D. All

Answer: D

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6. On heating a liquid, its surface tension

A. Increases

B. Decreases

C. Remains same

D. Is reduced to zero

Answer: B

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7. Water drops stick to a glass surface due to

A. Cohesion

B. Adhesion

C. Flocculation

D. None of these

Answer: B

Watch Video Solution

8. Find incorrect match

A. Unit of surface energy = $J - m^{-2}$

B. Unit of surface tension $(T) = N - m^{-1}$

C. Molecules on the surface of liquid = less energy

D. Minimum surface arca of a liquid = Lowest energy state

Answer: C

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9. Sharp glass edges are heated for making them smooth (polishing of glass) which is due to its

A. Viscocity

B. Surface tension

C. Fluidity

D. Expansion nature of glass

Answer: B

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10. When mercury is dropped over a glass surface the globules are spherical which is due to its

A. Viscosity

B. Surface tension

C. Fluidity

D. Metallic nature

Answer: B

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11. (A): A drop of liquid acquires spherical shape.

(R): Acquiring spherical shape by a liquid drop is give to its capillary action.

A. Both A and R are correct and R is the correct explanation of A.

B. Both A and R are correct but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: C

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12. (A): Oil rises into the wick of an oil lamp.

(R): The rise of oil into the wick is due to the surface tension.

A. Both A and R are correct and R is the correct explanation of A.

B. Both A and R are correct but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: B

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OBJECTIVE EXERCISE - 1 (VISCOSITY)

1. The unit of viscosity is

A. Poise

B. Millipoise

C. Centipoise

D. All these

Answer: D

Watch Video Solution

2. The viscosity of four liquids P, Q, R and S are 85, 11.4, 18 and 12.3 respectively, then which flows slowly

A. P

B. Q

C. R

D. S

Answer: A

Watch Video Solution

3. The thickness of window panes of old buildings is more at the bottom than at the top, which is due to

A. Surface tension of glass

B. Viscosity of glass

C. Expansion of solid at a given temperature

D. Expansion of liquid at a given temperature

Answer: B

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4. The graph of viscosity coefficient (T|) and absolute temperature (T) is _______

A. Straight line passing through origin

B. Straight line parallel to temperature axis

C. Straight line with (+)ve slope

D. Rectangular hyperbola

Answer: D

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5. The internal resistance to flow in liquid is called

A. Fluidity

B. Specific resistance

C. Viscosity

D. Surface tension

Answer: C

Watch Video Solution

6. Which has the maximum viscosity ?

A. Water

B. Glycol

C. Acetone

D. Ethanol

Answer: B

Watch Video Solution

7. Poise stands for

A. 1 dynes cm sec^{-2}

B. 1 dyne sec cm^{-2}

C. 10^{18} e.s.u.cm^{-2}

D. 10^{-7} erg sec

Answer: B

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8. With the increasing molecular weight of a liquid, the viscosity

A. Decreases

B. Increases

C. No effect

D. All are wrong

Answer: B

Watch Video Solution

9. The presence of ionic salts in a liquid

A. Decreases the viscosity of the liquid

B. Increases the viscosity of the liquid

C. Does not effect the viscosity of the liquid

D. None of the above is correct Intermolecular forces

Answer: B

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OBJECTIVE EXERCISE - 1 (INTERMOLECULAR FORCES)

1. The inter molecular forces present in inert gases are

A. Ion – ion

B. Ion - dipole

C. Dipole - dipole

D. Dispersion

Answer: D

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2. The intermolecular force of attraction present between NH_3 and C_6H_6 are

A. Dipole - Dipole

B. Ion - Dipole

C. Dipole - Induced dipole

D. Dispersion

Answer: C

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3. Inter molecular forces in solid hydrogen are

A. Covalent forces

B. van der Waals forces

C. Hydrogen bond

D. All the above

Answer: B

Watch Video Solution

4. Hydration of different ions is an example of

A. Ion - Dipole interaction

B. Dipole - Dipole interaction

C. Dipole - Induced dipole

D. Dispersion

Answer: A

Watch Video Solution

5. The melting point of four substances are given in bracket, then the attraction forces in a solid is more in case of

A. Ice (273 K)

B. NaF (1270 K)

C. Phosphorus (317 K)

D. Naphthalein (353 K)

Answer: B

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6. If thermal energy predominates over intermolecular forces, then the substance changes from __to__

A. gas to liquid

B. liquid to solid

C. gas to solid

D. liquid to gas

Answer: D

Watch Video Solution

7. F_2, is gas but I_2 is solid, because

A. Larger London forces are present in I_2 when compared with F_2

B. Lesser number of London forces are present in I_2 when compared with F_2

C. F_2 and I_2 have same extent of London forces.

D. I_2 has low bond dissociation energy

Answer: A

Watch Video Solution

8. Which one of the following is the wrong statement about the liquid?

A. It has intermolecular force of attraction

B. Evapoation of liquids increases with the decrease of surface area

C. It resembles a gas near the critical tempeature

D. It is in an intermediate state between gaseous and solid state

Answer: B

Watch Video Solution

9. The pair of boiling point and compound ar given as,

C_6H_6	CH_3OH	$C_6H_5NO_2$	$C_6H_5NH_2$
$80\,^{\circ}C$	$65\,^{\circ}C$	$212\,^{\circ}C$	$184\,^{\circ}C$
I	II	III	IV

Which will show lowest vapour pressure at room temperature

A. C_6H_6

B. CH_3OH

C. $C_6H_5NO_2$

D. $C_6H_5NH_2$

Answer: B

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10. A liquid can exist only,

A. Between triple point and critical point.

B. At any temperature above melting point.

C. Between melting point and critical point.

D. Between boiling and melting points.

Answer: D

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OBJECTIVE EXERCISE - 2 (GAS LAWS)

1. A gas of volume 2000ml is kept in a vessel at a pressure of 10^3 pascals at a temperature of $27^\circ C$. If the pressure is increased to 10^5 pascals at the same temperature, the volume of the gas becomes

A. 1000ml

B. 20ml

C. 2ml

D. 200ml

Answer: B

Watch Video Solution

2. At a constant temperature a gas is initially at 2 atm pressure. To compress it to 1/8th of its initial volume, pressure to be applied is

A. 4atm

B. 12 atm

C. 12atm

D. 16atm

Answer: D

Watch Video Solution

3. The volume of a given mass of a gas is 100ml at $100^{\circ}C$. If pressure is kept constant at what temperature will the sample have the volume of 200ml?

A. $50^{\circ}C$

B. $473^{\circ}C$

C. $200^{\circ}C$

D. $400^{\circ}C$

Answer: B

Watch Video Solution

4. At what temperature, the volume of 'V' of a certain mass of gas at $37\,^\circ C$ will be doubled, keeping the pressure constant?

A. $327\,^\circ C$

B. $347\,^\circ C$

C. $527\,^\circ C$

D. $54\,^\circ C$

Answer: B

Watch Video Solution

5. One litre of a gas weights 28 at 300 K and latm pressure. If the pressure is made 0.75 atm, at what temperature will one litre of the same gas weigh lg

A. 600K

B. 800K

C. 900K

D. 450K

Answer: D

Watch Video Solution

6. The total pressure of a mixture of 8g of oxygen and 14g of nitrogen contained in a 11.2L vessel at 0°C is.

A. 0.5 atm

B. 1 atm

C. 1.5 atm

D. 2 atm

Answer: C

Watch Video Solution

7. The density of a gas is 2.5g/L at $127\,^{\circ}C$ and 1 atm. The molecular weight of the gas is

A. 82.1

B. 41.05

C. 56

D. 28

Answer: A

Watch Video Solution

8. The molar volume of an ideal gas at one atmosphere and $273\,^{\circ}C$ is

A. 22.4L

B. 44.8L

C. 11.2 L

D. 5.6 L

Answer: B

Watch Video Solution

9. The density of a gas is 2g/L at 1 atm and $27^{\circ} C$. The density of the same gas at 2 atm and $127^{\circ} C$ is

A. 3g/L

B. 1.33g/L

C. 2 g/L

D. 1g/L

Answer: A

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10. How much should the pressure be increased in order to decrease the volume of a gas by 5% at constant temperature

A. 25%

B. 10%

C. 4.26%

D. 5.26%

Answer: D

Watch Video Solution

11. 16gm of oxygen and 3gm of hydrogen are present in a vessel at $0^{\circ}C$ and 760mm of Hg pressure. Volume of the vessel is

A. 22.4 L

B. 44.8 L

C. 11.2 L

D. 5.6 L

Answer: B

Watch Video Solution

12. If the pressure and absolute temperature of 4 litres of SO_2 gas are doubled, the volume of this gas would be

A. 1 litre

B. 4 litres

C. 2 litres

D. 8 litres

Answer: B

Watch Video Solution

13. For a given mass of gas, if pressure is reduced to half and temperature is increased two times, then the volume of gas would become ___ times .

A. V/4

B. 4V

C. 2V

D. 6V

Answer: B

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14. When the pressure of 2 litres of O_2 gas is doubled and its temperature is also doubled from 300K to 600K, the final volume of the gas is

A. 4 lit

B. 20 lit

C. 40 lit

D. 2 lit

Answer: D

Watch Video Solution

15. If one mole of a gas A (mol.wt-40) occupies a volume of 201itres, under the same conditions of temperature and pressure the volume occupied by 2 moles of gas B (mol.wt=80) is

A. 80 L

B. 60 L

C. 50 L

D. 40 L

Answer: D

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16. Four one litre flasks are seperately filled with gases O_2, F_2, CH_4 and CO_2 under same conditions. The ratio of number of molecules in these flasks is

A. $2:2:4:3$

B. $1:1:1:1$

C. $1:2:3:4$

D. $2:2:3:4$

Answer: B

Watch Video Solution

17. The weight of one litre of a gas at latm pressure and 300K is 4g. At what temperature the weight of the gas is 4g when the pressure is made 0.5 atm and volume is 1 litre?

A. 200K

B. 150K

C. 600K

D. 1200K

Answer: B

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18. The Molecular weight of a gas is 40. At 400K if 120 g of this gas has a volume of 20 litres, the pressure of the gas in atm is

A. 4.92

B. 5.02

C. 49.6

D. 0.546

Answer: A

Watch Video Solution

19. At 127°C and latm pressure, a mixture of a gas contains 0.3 mole of N_2, 0.2 mole of O_2 The volume of the mixture is

A. 15 lit

B. 22.4lit

C. 18.2lit

D. 16.4lit

Answer: D

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20. 'X' moles of N_2 gas at S.T.P. conditions occupy a volume of 10 litres, then the volume of '2x' moles of CH_4 at $273\,^\circ C$ and 1.5 atm is

A. 20 lit

B. 26.6 lit

C. 5 lit

D. 16.6 lit

Answer: B

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21. A gaseous mixture containing 0.35g of N_2 and 5600 ml of O_2 at STP is kept in a 5 litres flask at 300K. The total pressure of the gaseous mixture is

A. 1.293atm

B. 1.2315 atm

C. 12.315 atm

D. 0.616atm

Answer: A

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22. Balloons of 4L capacity are to be filled with Hydrogen at a pressure of 1 atm and $27\ ^{\circ}C$ from an 8L cylinder containing Hydrogen at 10 atm at the same temperature. The number of balloons that can be filled is

A. 20

B. 18

C. 40

D. 38

Answer: B

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23. A steel cylinder of 8 litres capacity contain hydrogen gas at 12atm pressure. At the same temperature how many cycle tubes of 4 litres capacity at 2 atm can be filled up with this gas.

A. 12

B. 48

C. 5

D. 10

Answer: D

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24. An open vessel at $27^{\circ} C$ is heated until three-fourths mass of the air in it has been expelled. Neglecting the expansion of the vessel, the temperature to which the vessel has been heated is

A. $927^{\circ} C$

B. $108^{\circ} C$

C. $1000^{\circ} C$

D. $477^{\circ} C$

Answer: A

Watch Video Solution

25. An open flaskh has Helium gas at 2 atm and $327^{\circ} C$. The flask is heated to $527^{\circ} C$ at the same pressure. The fraction of original gas remaining in the flask is

A. 3/4

B. 1/4

C. 1/2

D. $2/5$

Answer: A

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26. A gas cylinder withstands a pressure of 14.9 atm. Its pressure gauze indicates 12 atm at $27^{\circ} C$. If the building catches fire suddenly, at what temperature the cylinder explodes?

A. $9.95 ^{\circ} C$

B. $0.995 ^{\circ} C$

C. $1.990 ^{\circ} C$

D. $99.5 ^{\circ} C$

Answer: D

Watch Video Solution

27. When 2g of a gas A is introduced into an evacuated flask kept at 25°C, the pressure is found to be 1 atmosphere. If 3g of another gas is then added to the same flask, the total pressure becomes 1.5 atm. Assuming ideal behaviour, the ratio of their molecular weights $M_A : M_B$ is

A. $3:1$

B. $1:3$

C. $2:3$

D. $3:2$

Answer: B

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28. The vapour density of a gas is 11.2. The volume occupied by 10g of the gas at STP is

A. 10 L

B. 1 L

C. 11.2 L

D. 5.6 L

Answer: A

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29. 112ml. of oxygen at STP is subjected to liquefication. The mass of liquid oxygen obtained is

A. 0.64 g

B. 0.16g

C. 0.32g

D. 0.96g

Answer: B

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30. "m" is the mass of a molecule, "k" is the Boltzmann constant, P is the pressure and T is the absolute temperature. The density of the gas is given by

A. $\frac{kT}{pm}$

B. $\frac{PT}{km}$

C. $\frac{pm}{kT}$

D. $\frac{pK}{Tm}$

Answer: C

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31. The density of a gas at 27ºC and 1 atm is d. Pressure remaining constant at what temperature its density becomes 0.75 d

A. $36^{\circ} C$

B. $127^{\circ} C$

C. $30^{\circ} C$

D. $54^{\circ} C$

Answer: B

Watch Video Solution

32. A glass tube of volume 112ml. containing a gas is partially evacuated till the pressure in it drops to 3.8×10^{-5} torr at $0^{\circ} C$. The number of molecules of the gas remaining in the tube is

A. 3×10^{17}

B. 1.5×10^{14}

C. 4.5×10^{18}

D. Name of the gas is required

Answer: B

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33. 35ml of dry H_2 gas were collected at $6^{\circ} C$ and 758 mm pressure. What is the volume in ml of H_2 at STP?

A. 32

B. 24.6

C. 34.16

D. 30.16

Answer: C

Watch Video Solution

34. At T kelvin and a pressure of a P atm, certain gas is present in a vessel. If the vessel is divided into two equal compartments by a partition, the pressure in each compartment is equal to

A. 4P atm

B. P atm

C. P/4 atm

D. 2 P atm

Answer: B

Watch Video Solution

35. A sample of gas has a volume of 0.2 lit measured at 1 atm pressure and $0\,^{\circ}C$. At the same pressure, but at $273\,^{\circ}C$, its volume will become

A. 0.1 lit

B. 0.4 lit

C. 0.8 lit

D. 0.6 lit

Answer: B

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36. If the weight of 5.6 lit of a gas at NTP is 11g, the gas may be (at.wt of P = 31, N = 14,0 = 16 and Cl = 35.5)

A. PH_3

B. $COCI_2$

C. NO

D. N_2O

Answer: D

Watch Video Solution

37. The volume of 10 moles of an ideal gas at $27^\circ C$ and latm pressure is 1 lit. What is the volume of 20 moles of same gas at same pressure and temperature?

A. 2 lit

B. 4 lit

C. 1 lit

D. 8 lit

Answer: A

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38. At $27\,^{\circ}C$, one mole of an ideal gas exerted a pressure of 0.821 atmospheres. What is its volume in litres ? $\left(R = 0.082\text{lit-atm/mol}^{-1}K^{-1}\right)$

A. 300

B. 30

C. 0.3

D. 3

Answer: B

Watch Video Solution

39. A sample of gas has a volume of 0.2 lit measured at 1 atm pressure and $0\,^{\circ}C$. At the same pressure, but at $273\,^{\circ}C$, its volume will become

A. 0.1 lit

B. 0.4 lit

C. 27.8 lit

D. 5.6 lit

Answer: B

Watch Video Solution

OBJECTIVE EXERCISE - 2 (GRAHAM.S LAW)

1. Under the same conditions the rates of diffusion of two gases are in the ratio 1:4. The ratio of their vapour densities is

A. $2:1$

B. $1:2$

C. $16:1$

D. $1:16$

Answer: C

Watch Video Solution

2. The rate of diffusion of methane at given temperature is twice that of gas 'X'. The Molecular weight of 'X' is

A. 32

B. 16

C. 8

D. 64

Answer: D

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3. 2 grams of Helium diffuses from a porous plate in 4min. How many grams of CH_4 would diffuse through the same plate in same time under similar conditions?

A. 4g

B. 16g

C. 8g

D. 2g

Answer: A

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4. $350cm^3$ of $CH4$ and $175cm^3$ of an unknown gas 'A' diffused in the same time under similar conditions. The molecular mass of gas A is

A. 32

B. 64

C. 30

D. 71

Answer: B

Watch Video Solution

5. At what temperature will the rate of diffusion of N_2 be 1.6 times the rate of diffusion of SO_2 at 27°C?

A. $336\,^\circ C$

B. $300K$

C. $50\,^\circ C$

D. $63\,^\circ C$

Answer: D

Watch Video Solution

6. 50 ml of oxygen diffuses under certain conditions through a porous membrane. The volume of Hydrogen that diffuses in the same time under the same conditions is

A. 12.5 ml

B. 25ml

C. 100ml

D. 200ml

Answer: D

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7. A certain volume of Methane diffuses in 10 Sec through a porous partition. The time taken by an equal volume of oxygen to diffuse under the same condition is

A. 14.14 sec.

B. 7.07 sec.

C. 20 sec.

D. 5 sec.

Answer: A

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8. A pre-weighed vessel was filled with oxygen at NTP and weighed. It was then evacuated, filled with SO_2 at the same temperature and pressure and again weighed. The weight of oxygen will be

A. The same as that of SO_2

B. 1/2 that of SO_2

C. Twice that of SO_2

D. 1/4 that of SO_2

Answer: B

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9. The reaction between gaseous NH_3 and HBr produces a white solid NH_4Br. Suppose that NH_3 and HBr are introduced simultaneously into the opposite ends of an open tube of 1 metre length. Where would you expect the white solid to form?s

A. At a distance of 34.45 cm from NH_3 end

B. At a distance of 68.5 cm from NH_3 end

C. At a distance of 44.45 cm from HBr end

D. At a distance of 45.45 cm from HBr end

Answer: B

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10. 180ml of hydrocarbon having a molecular weight 16 diffuses in 1.5 min. Under similar conditions time taken by 120ml of So, to diffuse is

A. 2 min

B. 1.5 min

C. 1 min

D. 1.75 min

Answer: A

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11. CH_4 diffuses two times faster than a gas X. The number of molecules present in 32 g of gas X is (N is Avogadro number)

A. N

B. $\frac{N}{2}$

C. $\frac{N}{4}$

D. $\frac{N}{16}$

Answer: B

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12. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape ?

A. 1/8

B. 1/4

C. 3/8

D. 1/2

Answer: A

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OBJECTIVE EXERCISE - 2 (DALTON.S LAW)

1. A sample of air contains Nitrogen, Oxygen and saturated with water vapour under a total pressure of 640 mm. If the vapour pressure of water at that temperature is 40 mm and the molecular ratio of $N_2 : O_2$ is 3:1, the partial pressure of Nitrogen in the sample is

A. 480 mm.

B. 600 mm

C. 450 mm.

D. 160 mm

Answer: C

Watch Video Solution

2. A sample of water gas contains 42% by volume of carbon monoxide. If the total pressure is 760 mm. the partial pressure of carbon monoxide is

A. 380 mm

B. 319.2 mm

C. 38 mm

D. 360 mm

Answer: B

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3. In a ten litre vessel, the total pressure of a gaseous mixture containing H_2, N_2 and CO_2 is 9.8atm. The partial pressures of H_2 and N_2 are 3.7 and 4.2 atm respectively. Then the partial pressure of CO_2 is

A. 1.9atm

B. 0.19atm

C. 2.4atm

D. 0.019atm

Answer: A

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4. A mixture contains 16g of oxygen, 28g of nitrogen and 8g of methane. Total pressure of the mixture is 740mm. What is the partial pressure of nitrogen in mm? (E-1999)

A. 185

B. 370

C. 555

D. 740

Answer: B

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5. Equal weights of methane and oxygen are mixed in an empty container at 250C. The fraction of the total pressure exerted by oxygen is

A. $1/2$

B. $2/3$

C. 1/4

D. 1/3

Answer: D

Watch Video Solution

6. When 2g of a gas A is introduced into an evacuated flask kept at 25°C, the pressure is found to be 1 atmosphere. If 3g of another gas is then added to the same flask, the total pressure becomes 1.5 atm. Assuming ideal behaviour, the ratio of their molecular weights $M_A : M_B$ is

A. $1:3$

B. $3:1$

C. $2:3$

D. $3:2$

Answer: A

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OBJECTIVE EXERCISE - 2 (KINETIC THEORY)

1. The velocity of a gas molecule present in a cubic vessel in a particular direction is 100 cm/sec. The side of that cubic vessel is 10 cm. The time taken for one collision in a given particular direction on one face is

A. 0.2 sec

B. 5 sec

C. 0.5 sec

D. 50 sec

Answer: A

Watch Video Solution

2. In a cubic vessel of side length 5 cm, a Helium molecule moving with a velocity 10^5 cm/sec in X-direction then rate of change in momentum in X-direction is (in g cm/sec)

A. 2.56×10^{-14}

B. 1.66×10^{-14}

C. 10^{10}

D. 10^{-4}

Answer: B

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3. The kinetic energy of 'N' molecules of H_2 is 3J at -73°C. The kinetic energy of the same sample of H_2 at 127°C is

A. 12 J

B. 6J

C. 9 J

D. 3 J

Answer: B

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4. SO_2 , molecule is twice as heavy as O_2 molecule. Hence at 25°C the ratio of the average kinetic energies of Sulphur dioxide and oxygen is

A. $1:1$

B. $2:1$

C. $1:2$

D. $4:1$

Answer: A

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5. The ratio of the kinetic energies of equal number of moles of H_2 and He at the same temperature is

A. $1:2$

B. $2:1$

C. $1:1$

D. $4:1$

Answer: C

Watch Video Solution

6. The temperature at which Methane molecules have the same average Kinetic energy as that of oxygen molecules at 27°C is

A. $327\,^\circ C$

B. $27\,^\circ C$

C. $927\,^\circ C$

D. $627\,^\circ C$

Answer: B

Watch Video Solution

7. The kinetic energy of 1 mole of oxygen molecules in cal mol^{-1} at 27°C

A. 300

B. 600

C. 900

D. 800

Answer: C

Watch Video Solution

8. The ratio of kinetic energies of 2gm of $H_2$and 4gm of CH_4 at a given temperature is

A. $1:4$

B. $4:1$

C. $2:1$

D. $8:1$

Answer: B

Watch Video Solution

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

A. X/N

B. NX

C. 2NX

D. NX/2

Answer: D

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10. The velocity of a gas molecule present in a cubic vessel in X-direction is 1000 cm / sec. The side of that cubic vessel is 10 cm. The number of bombardments made by the molecule on one face in X-direction in one second is

A. 200

B. 400

C. 25

D. 50

Answer: D

Watch Video Solution

11. If the kinetic energy of sa particle is reduced to half .Eebroglie wave length becomes.

A. 2 times

B. $\frac{1}{\sqrt{2}}$ times

C. 4 times

D. $\sqrt{2}$ times

Answer: D

Watch Video Solution

12. Which one of the following is the kinetic energy of a gaseous mixture containg 3 g of hydrogen and 80 g of oxygen at temperature T(K) ?

A. 3RT

B. 6RT

C. 4RT

D. 8RT

Answer: B

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13. If the kinetic energy in j, of CH_4 (molar mass $= 16 gmol^{-1}$) at T (K) is X, the kinetic energy in j , of O_2 (molar mass = 32 g mol^{-1}) at the same temperature is

A. X

B. $2X$

C. X^2

D. $\frac{X}{2}$

Answer: A

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14. Which of the following statement is true

A. The pressure of a fixed amount of an ideal gas is propotional to its temperature on

B. Frequency of collisions increases in proportion to the square root of temperature

C. The value of van der Waals constant 'a' is smaller for ammonia than for nitrogen

D. If a gas is expanded at constant temperature, the kinetic energy of the molecule decrease TS Engg-2017

Answer: B

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OBJECTIVE EXERCISE - 2 (TYPES OF VELOCITIES)

1. The average speed at T_1K and most probable speed at T_2K of CO_2 gas is 9×10^4 cm/sec. The values of T_1 and T_2 are

A. 2143K, 1694K

B. 2126K, 1726K

C. 1684 K, 2143K

D. 1684K, 3368K

Answer: C

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2. The RMS velocity of an ideal gas at 300K is 12240 cm/see, then its most probable velocity in cm/sec at the same temperature is

A. 10000

B. 11280

C. 1000

D. 12240

Answer: A

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3. The RMS velocity of a gas at $0^{\circ}C$ is 2m/s. The RMS velocity of the same gas at $819^{\circ}C$

A. 1 m/s

B. 4 m/s

C. 8 m/s

D. 16 m/s

Answer: B

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4. The ratio of rates of diffusion of gases X and Y is 1 : 5 and that of Y and Z is 1 : 6. Then ratio of rates of diffusion Z and X is

A. $1:30$

B. $1:6$

C. $30:1$

D. $6:1$

Answer: C

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

A. $\sqrt{\frac{3}{5}}$

B. $\sqrt{\frac{1}{4}}$

C. $\sqrt{\frac{4}{3}}$

D. $\sqrt{\frac{2}{3}}$

Answer: D

Watch Video Solution

6. At what temperature the most probable velocity of O_2 gas is equal to the RMS velocity of O_2 at 't' $^\circ C$?

A. $(273 + t)sqry\left(\frac{3}{2}K\right)$

B. $(273 + t)sqry\left(\frac{2}{3}K\right)$

C. $(273 + t)K$

D. $\frac{3}{2}(273 + t)K$

Answer: C

Watch Video Solution

7. What is the RMS speed of a moist particle of mass 10^{-12} g at 27ºC according to kinetic molecular theory?

A. 0.35 cm/sec

B. 0.45 cm/sec

C. 0.6 cm/sec

D. 0.7 cm/sec

Answer: A

Watch Video Solution

8. The temperature at which the average speed of oxygen molecules is double that of the same molecules at $0^\circ C$ is

A. 546 K

B. 1092 K

C. 277 K

D. $1911^\circ C$

Answer: B

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9. At the same temperature carbon monoxide molecules have the same most probable velocity as the molecules of

A. Nitrogen dioxide

B. Nitrogen

C. Nitrous Oxide

D. Oxygen

Answer: B

Watch Video Solution

10. The most probable velocity of the molecules of a gas is 1 km/sec. The R.M.S velocity of the molecules is

A. 1.128 km/sec

B. 1.224 km/sec

C. 1.5 km/sec

D. 1.086 km/sec

Answer: B

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OBJECTIVE EXERCISE - 2 (VISCOSITY)

1. Which one of the following equations represents the variation of viscosity coefficient (q) with temperature (T)?

A. $(\eta) = Ae^{-E/RT}$

B. $(\eta) = Ae^{E/RT}$

C. $(\eta) = Ae^{-E/kT}$

D. $(\eta) = Ae^{E/T}$

Answer: A

Watch Video Solution

2. In SI system, the units of coefficient of viscosity, η are

A. $Kgs^{-1}m^{-2}$

B. $Kgm^{-1}s^{-1}$

C. $Kgcm^{-1}s^{-1}$

D. $gm^{-1}s^{-1}$

Answer: B

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OBJECTIVE EXERCISE - 2 (INTERMOLECULAR FORCES)

1. Non polar compounds can also solidify because of

A. Van der Waals forces

B. Dipole - dipole interaction

C. Ionic bonds

D. Hydrogen bonds

Answer: A

Watch Video Solution

2. The interactions that are results of temporary dipoles induced in the ordinarily non polar molecules are

A. Dispersion forces

B. Dipole – Dipole

C. Dipole induced dipole

D. Hydrogen bonding

Answer: A

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3. The molecular interaction responsible for hydrogen bonding in HF.

A. ion-induced dipole

B. dipole-dipole

C. ion-dipole

D. dipole-induced dipole

Answer: B

Watch Video Solution

4. Match the following :

	List I		List II
(A)	Viscosity	(I)	Critical temperature
(B)	Ideal gas behaviour	(II)	Isobar
(C)	Liquefaction of gases	(III)	Compressibility factor
(D)	Charles'law	(V)	Kinetin
		(T)	$kgm^{-1}s^{-1}$

The correct answer is

A. $\begin{matrix} A & B & C & D \\ IV & II & I & II \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ V & III & I & II \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ V & III & II & I \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ IV & III & II & I \end{matrix}$

Answer: B

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5. Lower carboxylic acids are soluble in water due to

A. Formation of hydrogen bonds with water

B. Due to London forces

C. Water is non electrolyte

D. Van der Waals interaction with water molecules

Answer: C

Watch Video Solution

PRACTICE EXERCISE

1. At the same temperature and pressure, the ratio of the masses having equal volumes of NH_3 and H_2S gas is

A. $1:1$

B. $2:1$

C. $4:3$

D. $1:2$

Answer: D

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2. 4 g. of methane at 380 torr and $273^{\circ}C$ occupies a volume of

A. 5.6 L

B. 11.2 L

C. 16.8 L

D. 22.4 L

Answer: D

Watch Video Solution

3. The mass of oxygen that a 11.2L vessel can hold at 380 torr and $0^{\circ} C$ is

A. 4g

B. 8 g

C. 16 g

D. 32 g

Answer: B

Watch Video Solution

4. 16 g. of oxygen occupies a volume of 22.4L at 1 atm and

A. $0^{\circ} C$

B. $30^{\circ} C$

C. $273^{\circ} C$

D. $273K$

Answer: C

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5. 6g of hydrogen at 1.5 atm and $273^{\circ} C$ occupies a volume of

A. 44.8L

B. 89.6L

C. 67.2L

D. 11.2L

Answer: B

Watch Video Solution

6. Density of neon will be highest at

A. STP

B. $0^{\circ}C$ 2 atm

C. $273^{\circ}C$, 1 atm

D. $273^{\circ}C$, 2 atm

Answer: B

Watch Video Solution

7. The density of nitrogen under standard conditions is

A. 2.5g/L

B. 1.25g/L

C. 0.625g/L

D. 3.75g/L

Answer: B

Watch Video Solution

8. For 11.2L of an ideal gas at STP the value of PV is

A. 0.25 RT

B. RT

C. 0.5 RT

D. 0.75 RT

Answer: C

Watch Video Solution

9. A sample of an ideal gas has a volume of 0.5 litres at $27^\circ C$ and 750mm pressure. The number of moles of gas are

A. 0.02

B. 0.2

C. 2

D. 0.002

Answer: A

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10. The weight of 350 ml of a diatomic gas is 1 gram at $0^\circ C$ and 2 atm. pressure. The weight of one atom in grams is

A. $\frac{32}{N}$

B. $\frac{16}{N} \times \frac{1}{2}$

C. 2.66×10^{-23}

D. 5.33×10^{-23}

Answer: C

Watch Video Solution

11. The density of oxygen at 2atm. and $27^{\circ}C$ is

A. 0.13g/l

B. 0.65g/l

C. 2.6 g/l

D. 1.3 g/l

Answer: C

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12. At 273K, 2 moles of a gas is present in 22.4 lit vessel. The pressure of the gas is

A. 1 atm

B. 2 atm

C. 4 atm

D. 3 atm

Answer: B

Watch Video Solution

13. The density of a gas at STP is 2g/l. Its molecular weight is

A. 22.4

B. 56

C. 44.8

D. 30

Answer: C

Watch Video Solution

14. The mass of 2.46lit of CH4 at 1.5atm and $27^{\circ}C$ is

A. 1.6g

B. 2.4g

C. 22.4

D. 3.0g

Answer: B

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15. 44.8 litres of H_2 and 67.2 litres of $O_2$are mixed at STP. The weight of the mixture is

A. 112g

B. 22.4g

C. 100g

D. 44.8g

Answer: C

Watch Video Solution

16. What weight of N_2 is present in a 22.4 lit flask at $273\,^\circ C$ and 380mm?

A. 8g

B. 11g

C. 79

D. 14g

Answer: C

Watch Video Solution

17. What is the mole percentage of O_2 in a mixture of 7g of N_2 and 8g of O_2?

A. 25%

B. 72%

C. 50%

D. 40%

Answer: C

Watch Video Solution

18. An open vessel at $27^{\circ} C$ is heated until three-fourths mass of the air in it has been expelled. Neglecting the expansion of the vessel, the temperature to which the vessel has been heated is

A. 750K

B. 1200K

C. 400K

D. 900K

Answer: B

Watch Video Solution

19. Oxygen is present in a flask of 1.12L capacity at a pressure of 7.6×10^{-10} mm of Hg at $0\,^{\circ}C$. The number of oxygen molecules in the flask is

A. 1.5×10^{10}

B. 3×10^{12}

C. 3×10^{10}

D. 6×10^{12}

Answer: C

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20. The volume occupied by 8.8 gm of CO_2 at $31.1\ ^\circ C$ and 1 bar pressure $\left(R = 0.083\text{bar. lt K}^{-1} mol^{-1}\right)$ is

A. 4 L

B. 50 L

C. 5.05 L

D. 0.505 L

Answer: C

Watch Video Solution

21. At standard pressure and temperature conditions the density of a gas in $g.\ lit^{-1}$, whose molecular weight is 45

A. 2

B. 22.4

C. 11. 2

D. 1000

Answer: A

Watch Video Solution

22. The volume of 2.8g of carbon monoxide at $27^{\circ}C$ and 0.821 atm pressure is

$\left(R = 0.0821\text{lit-atm}mol^{-1}K^{-1}\right)$

A. 1.5 lit

B. 0.3 lit

C. 3 lit

D. 30lit

Answer: C

Watch Video Solution

23. 7.5 g of a gas occupies 5.6 litres as STP. The gas is

A. CO_2

B. CH_4

C. NO

D. SO_2

Answer: C

Watch Video Solution

24. What is the density (in g lit^{-1}) of CO_2, at 400 K and exerting a pressure of 0.0821 atm

$\left(R = 0.0821 \text{lit atm mol}^{-1} k^{-1}\right)$

A. 0.01

B. 0.11

C. 2.5

D. 44

Answer: B

Watch Video Solution

25. The volume of a gas measured at $27^\circ C$ and 1 atm pressure is 10 litres. To reduce the volume to 5 litres at 1 atm pressure, the temperature required is

A. 75K

B. 150 K

C. 225 K

D. 300 K

Answer: B

Watch Video Solution

26. The density of a gas 'S' at 2 atm and $27^{\circ}C$ is 1.3 gm / lit. Then the gas 'S' may be

A. CH_4

B. O_2

C. SO_2

D. CO_2

Answer: A

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27. The weight of 112 ml of oxygen at STP, on liquifaction would be

A. 0.32g

B. 0.64g

C. 0.16g

D. 0.96g

Answer: C

Watch Video Solution

28. A bulb of unknown volume 'V' Contains an ideal gas at 2 atm pressure. It was connected to another evacuated bulb of volume 0.5 litre through a stopcock. When the stopcock was opened the pressure in each bulb became 0.5 atm. Then V is

A. 17 ml

B. 1.7 litres

C. 0.17 litres

D. 0.34 litres

Answer: C

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29. 200 ml of O_2 gas maintained at 700mm pressure and 250ml of N_2 gas maintained at 720mm pressure are put together in one litre flask. If the temperature is kept constant, the final pressure of the mixture in mm is

A. 450

B. 320

C. 632

D. 316

Answer: B

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30. The rate of diffusion of methane at given temperature is twice that of gas 'X'. The Molecular weight of 'X' is

A. 32

B. 16

C. 8

D. 64

Answer: D

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31. Two gram of hydrogen diffuse from a container in 10 minutes. How many grams of oxygen would diffuse through the same container in the same time under similar conditions?

A. 0.5g

B. 4g

C. 6g

D. 8g

Answer: D

Watch Video Solution

32. 300ml of O_2 diffused though a porous pot in 50 Sec. How long will it take for 500ml of CO_2 to diffuse under similar conditions.

A. 97.72 seconds

B. 5.117 sec

C. 26.18 sec

D. 9.772 sec

Answer: A

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33. 100ml of O_2 diffuses in 100 minutes, under similar conditions one litre of H_2 diffuses in

A. 100min

B. 250min

C. 500min

D. 750min

Answer: B

Watch Video Solution

34. Among the following gaseous elements with atomic numbers, which will have greater rate of diffusion?

A. Z = 7

B. Z = 8

C. Z = 10

D. Z = 17

Answer: C

Watch Video Solution

35. A cylinder contains 6.023×10^{23} molecules of hydrogen and $5 \times 6.023 \times 10^{22}$ molecules of oxygen. The partial pressure of oxygen is

A. 6/5 of the total pressure

B. 2.5 of the total pressure

C. 1/3 of the total pressure

D. 3/5 of the total pressure

Answer: C

Watch Video Solution

36. A vessel contains methane and oxygen in the mass ratio 2:1. The fraction of the partial pressure of oxygen in the total pressure is

A. 415

B. 175

C. 1/2

D. 1/4

Answer: B

Watch Video Solution

37. A gaseous mixture contains 160 grams of neon and 64 grams of oxygen in 82.1 litre vessel at $27^{\circ} C$, then the partical pressure of Neon may be - atm

A. 2.4

B. 0.6

C. 1.5

D. 3

Answer: A

Watch Video Solution

38. A vessel contains a mixture of equal weights of oxygen and SO_2 at a pressure of 600mm of Hg. The partial pressure of oxygen in mm is

A. 200

B. 300

C. 400

D. 100

Answer: C

Watch Video Solution

39. According to kinetic molecular theory the Kinetic energy value of one mole of gas is

A. 1.5RT Cal

B. 1.5RT ergs

C. 1.5RT

D. 1.5RT Joules

Answer: C

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40. The average kinetic energy of a gas molecule is given by

A. 3/2 RT

B. 3/2 KT

C. 2/3 RT

D. 2/3 KT

Answer: B

Watch Video Solution

41. The ratio of the kinetic energies of equal number of moles of H_2 and He at the same temperature is

A. $1:1$

B. $2:1$

C. $1:2$

D. $4:1$

Answer: B

Watch Video Solution

42. The minimum temperature at which CO_2 gas at 73 atm appears first as liquid

A. $5^\circ C$

B. $25^\circ C$

C. $31^\circ C$

D. $81^{\circ} C$

Answer: C

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43. The temperature at which oxygen molecules have the same mean velocity as that of Helium atoms at $0^{\circ} C$ is

A. $2184^{\circ} C$

B. $2184 K$

C. $546 K$

D. $1092 K$

Answer: B

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44. The temperature at which Helium atoms have the same R.M.S. velocity as that of Methane at $927^{\circ}C$ is

A. 1200 K

B. $300^{\circ}C$

C. $27^{\circ}C$

D. 600 K

Answer: C

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45. The mean speed of Helium atoms is 4 times that of the molecules of a gas x at the same temperature. The molecular weight of x is

A. 4

B. 16

C. 32

D. 64

Answer: D

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46. If RMS velocity of CH_4 at $27\,^\circ C$ is $0.2 ms^{-1}$ the RMS velocity at $927\,^\circ C$

A. $4 ms^{-1}$

B. $0.8 ms^{-1}$

C. $0.4 ms^{-1}$

D. $0.6 ms^{-1}$

Answer: C

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47. The rate of diffusion of Hydrogen is about

A. 1/2 that of He

B. Twice that of He

C. 1.414 times that of He

D. Four times that of He

Answer: C

Watch Video Solution

48. The ratio of the R.M.S. Velocities of Hydrogen and Oxygen molecules at the same temperature is

A. $4:1$

B. $1:4$

C. $8:1$

D. $1:8$

Answer: A

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49. One poise in $kgms^{-1}$ is numerically equal to

A. 10^2

B. 10

C. 10^{-1}

D. 10^{-2}

Answer: C

Watch Video Solution

50. The standard boiling point of water is

A. 371.8 K

B. 372.6 K

C. 373.0 K

D. 373.4 K

Answer: B

Watch Video Solution

51. Which of the following has maximum density ?

A. O_2 at $25^\circ C$ and 1 atm

B. O_2 at $0^\circ C$ and 2 atm

C. O_2 at $273^\circ C$ and 1 atm

D. O_2 at $0^\circ C$ and 1 atm

Answer: B

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52. The pressure exerted by the gas is directly proportional to

A. Root mean square speed

B. Average speed

C. Mean square speed

D. All of these

Answer: C

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53. The boiling point of water in pressure cooker is

A. $100^{\circ} C$

B. $> 100^{\circ} C$

C. $< 100^{\circ} C$

D. $25^{\circ} C$

Answer: B

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54. The density of gas is $3.8gL^{-1}$ at STP. The density at $27^{\circ}C$ and 700mm Hg pressure will be

A. $3.185gL^{-1}$

B. $3.185gml^{-1}$

C. $3.185kgL^{-1}$

D. $3.185kgml^{-1}$

Answer: A

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Example

1. Iodine is more soluble in water in the presence of potassium iodide. Why ?

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Watch Video Solution

2. Intermolecular forces are much stronger in ammonia than in methane. Comment

Watch Video Solution

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11. Molecular mass of liquid ammonia is les than that of liquid hydrogen chloride. But hydrogen chloride is more volatile. Why ?

Watch Video Solution

12. Rate of evaporisation increases with increase in 3 surface area, but not vapour pressure. Why?

Watch Video Solution

13. Mercury has almost no vapour pressure. Why?

Watch Video Solution

14. Why sulphuric acid is much viscous than hydrochloric acid?

Watch Video Solution

15. A gas cylinder can withstand a pressure of 15 bar. The pressure gauze indicates 12 bar at $27^{\circ} C$. IF the building catches fire suddenly. At what temperature will the cylinder explode ?

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16. On a ship sailing in Indian ocean where the temperture is $26.1^{\circ} C$, a ballon is filled with 20.18L of air. What will be the volume of the ballon when the ship reaches Pacific ocean, where temperature is $23.4^{\circ}C$?

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17. Certain amount of a gas at $25^{\circ}C$ and 76cm Hg occupies volume of 12.0L. What will be the pressure at a height where temperature is $10^{\circ}C$ and volume is 12.8L?

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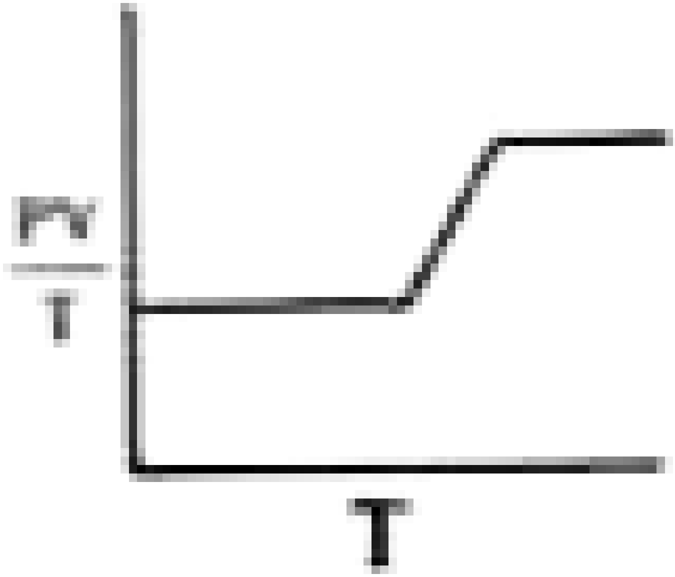
18. What information is derived by the shape of the graph given for a fixed mass of gas?



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19. Calculate the pressure exerted by one gram of helium present in a 5 L vessel at room temperature?

Watch Video Solution

20. A synthetic mixture of nitrogen and Argon has a density of $1.4 gL^{-1}$ at $0^{\circ}C$. Calculate the average molecular weight. Find out the volume percentage of nitrogen in the mixture.

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21. How many grams of Chlorine can exert 1200 torr at room temperature in a vessel of 1.5 L capacity?

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22. 0.1g of carbon dioxide occupies a volume of 320cc at certain conditions. Under similar conditions 0.2g of 3 dioxide of element 'X' occupies 440cc. Calculate the atomic weight of 'X'.

Watch Video Solution

23. A 10L cylinder has helium at 8 atm and $32^\circ C$. How many balloons of 2L each at 2atm and $32^\circ C$ can be filled with the gas available from the cylinder.

Watch Video Solution

24. One hundred Litre of a vessel contains 14g of carbondioxide at $27^{\circ}C$. What is the density ?

Watch Video Solution

25. An open steel vessel has an ideal gas at $27^{\circ}C$. What fraction of the gas is escaped if the vessel and its contents are heated to $127^{\circ}C$? (neglect the expansion of steel)

Watch Video Solution

26. A vessel of irregular shape has a volume 'V'. It is first evacuated and coupled with a vessel of 4L capacity at $35^{\circ}C$ and 10 atm pressure. If the final pressure in both the vessels is 3atm, calculate the volume V.

Watch Video Solution

27. A vertical hollow cylinder of height 1.52 m is fitted with a movable piston of negligible mass and thickness. The lower half portion of the cylinder contains an ideal gas and the upper half is filled with mercury. The cylinder is initially at 300 K. When the temperature is raised, half of the mercury comes out of the cylinder. Find this temperature, assuming the thermal ·expansion of mercury to be negligible.

Watch Video Solution

28. Elements with atomic numbers 7, 8, 9 and 10 are gases. Under similar conditions, which gas has highest rate of diffusion? Why?

Watch Video Solution

29. 720cc of methane diffused through a porous membrane in 30min. Under identical conditions 240cc of gas 'X'diffused in 20 min. Calculate the molecular weight of 'X'.

Watch Video Solution

Watch Video Solution

30. Helium diffuses 4 times faster than an unknown gas under similar conditions. Find the vapour density of unknown gas.

Watch Video Solution

31. A 100 meter hollow tube of uniform thickness has two open ends X and Y. Ammonia gas is sent into the tube from end X and hydrogen chloride from end Y, simultaneously. At what distance from end 'X', the gases first meet to form a smoke ring?

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32. One litre of hydrogen effused in 8min through a 8 fine aperture. What is the time required for the same volume of ozone to effuse under similar conditions?

Watch Video Solution

33. A two litre flask contains a mixture of 16g of oxygen, 7g of nitrogen and 2g of hydrogen at $20^{\circ} C$. Report the total pressure and partial pressures.

Watch Video Solution

34. 400cc of N_2 at 600mm and 500cc of O_2 at 300mm are quantitatively transferred in to an empty vessel of X 2 L capacity. Calculate the pressure of the mixture and partial pressures.

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35. If $10^{-4} dm^3$ of water is introduced into a 1.0 dm^3. Flask at 300 K, calculate the number of moles of water is in vapour phase when equililbrium is established ? (V.P. of H_2O at 300 K is 3170 Pa)

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36. 100cc of gas is collected over water at $15^{\circ}C$ and 750torr. If the gas occupies 91.9 mL in dry state at STP, find the aqueous tension at STP.

Watch Video Solution

37. A vessel contains helium and methane in 4:1 mole ratio at 20 bar pressure. Find the ratio of initial rates of effusion through a small aperture.

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38. The density of a gaseous mixture O_2 and N_2 is 1.4 g/L at S.T.P. Find out the partial pressure of O_2 in the mixture.

View Text Solution

39. At one litre vessel contains oxygen gas saturated with water vapour at 760 torr and $25^{\circ}C$. At constant temperature, if the gaseous mixture transferred into 500 ml vessel, find out the total pressure in the new vessel. (aqueous tension at $25^{\circ}C$ = 23.8 torr)

Watch Video Solution

40. Why the pressure of certain mass of gas in a given vessel increases upon heating ?

Watch Video Solution

41. What is the pressure exerted by 10^{23} gas molecules, each molecule of mass 10^{-23}g, present in a container of volume one L and RMS speed of $1000ms^{-1}$?

Watch Video Solution

42. How many joules of translational kinetic energy is associated with 4 grams of methane at $27^{\circ} C$?

Watch Video Solution

43. At what temperature the kinetic energy of a gas molecule is one-half of its value at $30^{\circ} C$?

Watch Video Solution

44. 7 grams of nitrogen is present at $127^{\circ} C$ and 16 grams of oxygen at $27^{\circ} C$. Calculate (a) ratio of kinetic energy and (b) ratio of average kinetic energy of nitrogen and oxygen.

Watch Video Solution

45. For nitrogen a = 1.4 $L^{2}atm$, mol^(-2), $b = 0.04L$mol^(-1)`. Find out the diameter of nitrogen molecule.

View Text Solution

46. What is incompressible nature of a gas molecules ? How is it shown ?

View Text Solution

47. Helium and hydrogen show exceptional behavour in deviation from ideal gas nature. Why ?

Watch Video Solution

48. Van der Waals constant 'b' for helium is $2.93 \times 10^{-5} m^3 mol^{-1}$. Calculate actual volume of helium atom. What is the radius of helium atom?

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49. Deduce the Van der Waals equation for real gases at (a) low presssure and (b) high pressure.

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50. Critical temperatures of ammonia and carbondioxide are respectively 405.5 and 304.1K. Cooling from 450K, which gas can be liquify first? Why?

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51. For a real gas 'X'the Boyle point is $240^{\circ} C$. If the van der Waals constant 'b'is $0.08 dm^3 mol^{-1}$, calculate the value of constant 'a'for 'X'.

Watch Video Solution

52. The values of critical presssure, critical volume and critical temperature for hydrogen gas are 12.97 bar, 0.065 L mol^{-1} and 33.2 K.

Calculate the compressibility factor.

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53. The ratio of rates of diffusion of two gases x and y under similar conditions is 2:1. What will be the ratio of their average speeds if gas X is at $-23^{\circ}C$ and gas y is at $273^{\circ}C$?

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54. At what temperature hydrogen has the same RMS velocity as that of oxygen at room temperature?

Watch Video Solution

55. Calculate the RMS velocity and most probable velocity of carbondioxide at $27^{\circ}C$.

Watch Video Solution

56. One litre glass bubl contains 2×10^{21} molecules of nitrogen at a pressure of $7.57 \times 10^{-3} N. m^{-2}$. Find out the RMS velocity of nitrogen.

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57. A gas X,Y, at $35\,^\circ C$ has RMS speed $12ms^{-1}$. On heating the gas twice to the original absolute temperature, the dimer totally dissociated to give monomer. What is the RMS speed of XY_2 molecules at the given elevated temperature?

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58. Density of a gas at one atm pressure is $1.43 \times 10^{-2} gcc^{-1}$. Calculate the RMS velocity of the gas.

Watch Video Solution

59. Compare the mean free path of hydrogen with that of oxygen molecules under the same conditions.

Watch Video Solution

60. Calculate the ratio of average velocity of helium atoms at $27^{\circ} C$ and methane molecules at $127^{\circ} C$.

Watch Video Solution

61. Iodine is more soluble in water in the presence of potassium iodide. Why ?

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74. Why sulphuric acid is much viscous than hydrochloric acid?

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75. A gas cylinder can withstand a pressure of 15 bar. The pressure gauze indicates 12 bar at $27^{\circ}C$. IF the building catches fire suddenly. At what temperature will the cylinder explode ?

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76. On a ship sailing in Indian ocean where the temperture is $26.1^{\circ}C$, a ballon is filled with 20.18L of air. What will be the volume of the ballon when the ship reaches Pacific ocean, where temperature is $23.4^{\circ}C$?

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77. Certain amount of a gas at $25^{\circ}C$ and 76cm Hg occupies volume of 12.0L. What will be the pressure at a height where temperature is $10^{\circ}C$ and volume is 12.8L?

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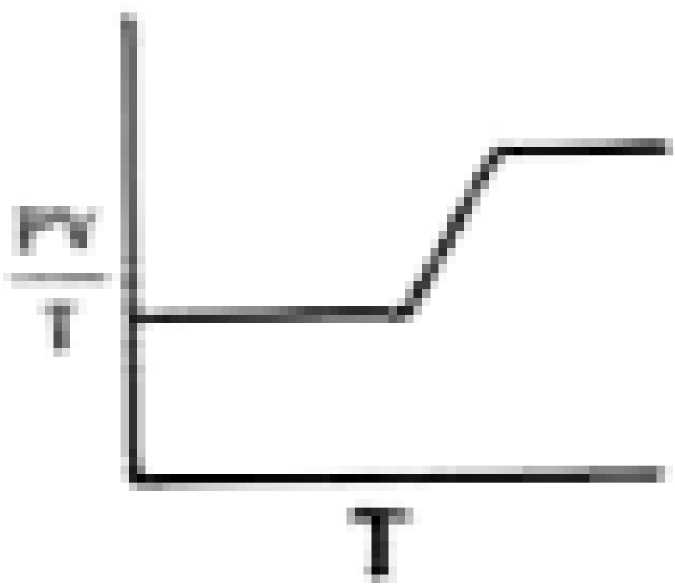
78. What information is derived by the shape of the graph given for a fixed mass of gas?



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79. Calculate the pressure exerted by one gram of helium present in a 5 L vessel at room temperature?

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80. A synthetic mixture of nitrogen and Argon has a density of $1.4gL^{-1}$ at $0^{\circ}C$. Calculate the average molecular weight. Find out the volume percentage of nitrogen in the mixture.

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81. How many grams of Chlorine can exert 1200 torr at room temperature in a vessel of 1.5 L capacity?

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82. 0.1g of carbon dioxide occupies a volume of 320cc at certain conditions. Under similar conditions 0.2g of 3 dioxide of element 'X' occupies 440cc. Calculate the atomic weight of 'X'.

Watch Video Solution

83. A 10L cylinder has helium at 8 atm and $32\,^{\circ}C$. How many balloons of 2L each at 2atm and $32\,^{\circ}C$ can be filled with the gas available from the cylinder.

Watch Video Solution

84. One hundred Litre of a vessel contains 14g of carbondioxide at $27\,^{\circ}C$. What is the density ?

Watch Video Solution

85. An open steel vessel has an ideal gas at $27\,^{\circ}C$. What fraction of the gas is escaped if the vessel and its contents are heated to $127\,^{\circ}C$? (neglect the expansion of steel)

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86. A vessel of irregular shape has a volume 'V'. It is first evacuated and coupled with a vessel of 4L capacity at $35^\circ C$ and 10 atm pressure. If the final pressure in both the vessels is 3atm, calculate the volume V.

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87. A vertical hollow cylinder of height 1.52 m is fitted with a movable piston of negligible mass and thickness. The lower half portion of the cylinder contains an ideal gas and the upper half is filled with mercury. The cylinder is initially at 300 K. When the temperature is raised, half of the mercury comes out of the cylinder. Find this temperature, assuming the thermal ·expansion of mercury to be negligible.

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88. Elements with atomic numbers 7, 8, 9 and 10 are gases. Under similar conditions, which gas has highest rate of diffusion? Why?

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89. 720cc of methane diffused through a porous membrane in 30min. Under identical conditions 240cc of gas 'X'diffused in 20 min. Calculate the molecular weight of 'X'.

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90. Helium diffuses 4 times faster than an unknown gas under similar conditions. Find the vapour density of unknown gas.

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91. A 100 meter hollow tube of uniform thickness has two open ends X and Y. Ammonia gas is sent into the tube from end X and hydrogen chloride from end Y, simultaneously. At what distance from end 'X', the gases first meet to form a smoke ring?

Watch Video Solution

92. One litre of hydrogen effused in 8min through a 8 fine aperture. What is the time required for the same volume of ozone to effuse under similar conditions?

Watch Video Solution

93. A two litre flask contains a mixture of 16g of oxygen, 7g of nitrogen and 2g of hydrogen at $20^{\circ}C$. Report the total pressure and partial pressures.

Watch Video Solution

94. 400cc of N_2 at 600mm and 500cc of O_2 at 300mm are quantitatively transferred in to an empty vessel of X 2 L capacity. Calculate the pressure of the mixture and partial pressures.

Watch Video Solution

95. If $10^{-4} dm^3$ of water is introduced into a 1.0 dm^3. Flask at 300 K, calculate the number of moles of water is in vapour phase when equililbrium is established ? (V.P. of H_2O at 300 K is 3170 Pa)

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96. 100cc of gas is collected over water at $15^\circ C$ and 750torr. If the gas occupies 91.9 mL in dry state at STP, find the aqueous tension at STP.

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97. A vessel contains helium and methane in 4:1 mole ratio at 20 bar pressure. Find the ratio of initial rates of effusion through a small aperture.

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98. The density of a gaseous mixture O_2 and N_2 is 1.4 g/L at S.T.P. Find out the partial pressure of O_2 in the mixture.

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99. At one litre vessel contains oxygen gas saturated with water vapour at 760 torr and $25^\circ C$. At constant temperature, if the gaseous mixture transferred into 500 ml vessel, find out the total pressure in the new vessel. (aqueous tension at $25^\circ C$ = 23.8 torr)

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100. Why the pressure of certain mass of gas in a given vessel increases upon heating ?

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101. What is the pressure exerted by 10^{23} gas molecules, each molecule of mass 10^{-23}g, present in a container of volume one L and RMS speed of $1000 ms^{-1}$?

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102. How many joules of translational kinetic energy is associated with 4 grams of methane at $27^{\circ}C$?

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103. At what temperature the kinetic energy of a gas molecule is one-half of its value at $30^{\circ}C$?

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104. 7 grams of nitrogen is present at $127^\circ C$ and 16 grams of oxygen at $27^\circ C$. Calculate (a) ratio of kinetic energy and (b) ratio of average kinetic energy of nitrogen and oxygen.

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105. For nitrogen a = 1.4 $L^2 atm$, mol^(-2), $b = 0.04L$mol^(-1)`. Find out the diameter of nitrogen molecule.

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106. What is incompressible nature of a gas molecules ? How is it shown ?

Watch Video Solution

107. Helium and hydrogen show exceptional behavour in deviation from ideal gas nature. Why ?

Watch Video Solution

108. Van der Waals constant 'b' for helium is $2.93 \times 10^{-5} m^3 mol^{-1}$. Calculate actual volume of helium atom. What is the radius of helium atom?

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109. Deduce the Van der Waals equation for real gases at (a) low presssure and (b) high pressure.

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110. Critical temperatures of ammonia and carbondioxide are respectively 405.5 and 304.1K. Cooling from 450K, which gas can be liquify first? Why?

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111. For a real gas 'X'the Boyle point is $240^{\circ}C$. If the van der Waals constant 'b'is $0.08 dm^3 mol^{-1}$, calculate the value of constant 'a'for 'X'.

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112. The values of critical presssure, critical volume and critical temperature for hydrogen gas are 12.97 bar, 0.065 L mol^{-1} and 33.2 K. Calculate the compressibility factor.

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113. The ratio of rates of diffusion of two gases x and y under similar conditions is 2:1. What will be the ratio of their average speeds if gas X is at $-23^{\circ}C$ and gas y is at $273^{\circ}C$?

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114. At what temperature hydrogen has the same RMS velocity as that of oxygen at room temperature?

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115. Calculate the RMS velocity and most probable velocity of carbondioxide at $27^\circ C$.

Watch Video Solution

116. One litre glass bubl contains 2×10^{21} molecules of nitrogen at a pressure of $7.57 \times 10^{-3} N. m^{-2}$. Find out the RMS velocity of nitrogen.

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117. A gas X,Y, at $35^\circ C$ has RMS speed $12ms^{-1}$. On heating the gas twice to the original absolute temperature, the dimer totally dissociated to give monomer. What is the RMS speed of XY_2 molecules at the given elevated temperature?

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118. Density of a gas at one atm pressure is $1.43 \times 10^{-2} gcc^{-1}$. Calculate the RMS velocity of the gas.

Watch Video Solution

119. Compare the mean free path of hydrogen with that of oxygen molecules under the same conditions.

Watch Video Solution

120. Calculate the ratio of average velocity of helium atoms at $27\,^{\circ}C$ and methane molecules at $127\,^{\circ}C$.

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EXERCISE -2.1.1

1. Write and compare any four characteristics of three states of matter.

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2. What are dispersion forces ?

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3. Write a note on dipole-dipole attractions.

Watch Video Solution

4. How does hydrogen bond influence attractions between molecules.

Watch Video Solution

5. Mention four important porperties of crystalline solids.

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EXERCISE -2.1.2

1. Discuss the terms :

(a) evaporation and (b) condensation.

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2. What is rate of evaporation ? Mention the factors influencing the rate.

Watch Video Solution

3. Discuss the concept of vapour pressure.

Watch Video Solution

4. Write a note on the boiling point of a liquid.

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5. How does intermolecular forces influence the following ?

(a) vapour pressure and

(b) boiling point.

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EXERCISE -2.1.3

1. Mention the four mesaurable parameters of a gas and write the units.

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2. State and explain Boyle's law.

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3. State and explain Charle's law.

Watch Video Solution

4. State and explain Avogadro.s law.

Watch Video Solution

Watch Video Solution

5. What are isotherms and isobars ?

Watch Video Solution

6. Derive ideal gas equation.

Watch Video Solution

7. Write the values and units of Universal gas constant.

Watch Video Solution

8. What is the volume occupiedby 1.4 g of nitrogen aat 600 mm Hg and $27^{\circ} C$?

Watch Video Solution

9. Report the density in mol L^{-1} of nitrous oxide at $97^{\circ} C$ and one atm.

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10. 1.6 g of a gas occupies 275 cc at $22^{\circ} C$ and 77 cm Hg. Calculate its molecular weight.

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11. 4.4 grams of carbondioxide present in a vessel at certain temperature exerts a pressure of 1000 kPa. Keeping the temperature constant if the gas is evacuated to have a rediual pressure of 0.01 kPa,how many molecules are left in the vessel ?

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12. The volume of a given mass of gas is $0.6dm^3$. If its pressure is increased by 3 times and absolute temperature is increased by 5 times, what would be its new volume?

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13. How many moles of ideal gas are present in a flask of volume $3dm^3$ at $25^\circ C$ and 770 mm. Hg ?

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14. Calculate the volume at STP, if certain mass, of gas occupies 0.5 L at $30^\circ C$ and 700 torr.

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15. One gram of hydrogen gas is present in a vessel of 11.2 L capacity at $546\,^{\circ}C$. What is the pressure exerted by the hydrogen gas present in the vessel ?

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16. A 15 dm^3 cylinder contains hydroen gas at 5 atm at $27\,^{\circ}C$, How many balloons of capacity of 1.5 dm^3 at 1 atm and $27\,^{\circ}C$ can be filled using the gas available from the given cylinder ?

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EXERCISE -2.1.4

1. Define the terms, diffusion and effusion.

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2. State and explain Graham's law of Diffusion.

Watch Video Solution

3. Sate Dalton'law of partial pressures.

Watch Video Solution

4. What is aqueous tension ? How is it dependent on temperature ?

Watch Video Solution

5. Write any four applications of diffusion and effusion.

Watch Video Solution

6. $350 cm^3$ of oxygen and $275 cm^3$ of another gas 'A' diffused in same time under similar conditions. Find the molecualr mass of the gas 'A'.

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7. Rate of diffusion of carbon dioxide is 2.9 cc s^{-1} and another unknown gas is 2.71 cc s^{-1}. Calculate the vapour density of unknown gas.

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8. How many times faster carbon dioxide can effuse compared to chlorine under similar conditions of temperature and pressure ?

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9. The rate of diffusion of oxygen is 12 $cm^3 s^{-1}$.Under similar conditions, what is the rate of diffusionof carbondioxide ?

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10. Two gases have densities 0.388 g L^{-1} and 0.097 g L^{-1}. What is the rate of diffusion of the first gas, if the second gas diffuses at the rate 10 cc s^{-1} under similar conditions ?

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11. At 30° C and 1.5 atm a gaseous mixture contains 4.4 g of carbondioxide and 5.6 g of nitrogen. What is the ratio of the partial pressures of carbon-dioxide and nitrogen ?

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12. A 3 lit flask contains 3g of nitrogen and 6.4g of oxygen at $30^{\circ} C$. Calculate the following for the mixture :

(a) partial pressure of oxygen and

(b) total pressure of the gaseous mixture.

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14. One litre flask contains air, water vapour and a small amount of liquid water at $50^{\circ} C$ and 200 torr. If this flask is connected to another one litre evacuated flask, what will be the final pressure in each flask ? Given that the aqueous tension at $50^{\circ} C$ si 92 torr

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EXERCISE -2.1.5

1. Write the postulates of kinetic molecular theory of gases .

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2. Derive the kinetic gas equation.

Watch Video Solution

3. Derive the gas laws from the kinetic gas equation.

Watch Video Solution

4. How is pressure of gas created ?

Watch Video Solution

5. What is Boltzman's constant? Give its value.

Watch Video Solution

6. Derive an expression for kinetic energy of gas molecules.

Watch Video Solution

7. Find the kinetic energy of 2 moles of an ideal gas in calories at $27^{\circ} C$

Watch Video Solution

8. Calculate the kinetic energy per mole of carbondioxide at $27^{\circ} C$

Watch Video Solution

9. Calculate the average and total kinetic energy of 0.5 mole of an ideal gas at $0^{\circ}C$

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EXERCISE -2.1.6

1. What are the reasons for deviations from ideal gas behaviour ?

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2. When does a real gas behave like an ideal gas?

Watch Video Solution

3. Write four differences between ideal gas and real gas.

Watch Video Solution

4. What is Boyle temperature ? Write its dependence on 'a' and 'b' .

Watch Video Solution

5. What are the general conditions for liquification of a gas?

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6. Write the real gas equation. What do the correction constants .a. and .b. signify ?

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EXERCISE -2.1.7

1. Write on the distribution of molecular velocities.

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2. What are different types of molecular velocities? Give their inter-relationship.

Watch Video Solution

3. Derive the expressions for RMS velocity from kinetic gas equation.

Watch Video Solution

4. Why does the velocity of gas molecules increase with increase in temperature ?

Watch Video Solution

5. Draw the Maxwell- Boltzmann distribution curves of molecular velocities.

Watch Video Solution

6. Calculate the RMS, average and most probable velocity of SO_2 at $27^\circ C$.

Watch Video Solution

7. What is the average velocity of oxygen gas molecules at $30\ ^{\circ}C$?

Watch Video Solution

8. At certain temperature RMS velocity of ethane molecules is 5.33×10^{4} cm s^{-1}. Find the RMS velocity of carbondioxide at the same temperature.

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9. IF the mean velocity of molecules of a gas is 4.79×10^{4} cm s^{-1}, find the most probable velocity of the molecules under similar conditions.

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10. Four molecules have the velocities $3 \times 10 cms^{-1}, 4 \times 10^{4} cms^{-1}, 2 \times 104 cms^{-1}$ and $5 \times 10^{4} cms^{-1}$.. Find the RMS velocity of the molecules.

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11. What is the ratio of most probable velocities of hydrogen molecules at 50 K and oxygen molecules at 800 K ?

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12. Calculate RMS velocity of 1.5 lit of ethane at 750 torr.

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13. A gas has density $1.52gL^{-1}$ at 1.5atm. Calculate its RMS velocity.

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14. Calculate RMS velocity of ozone at $20^{\circ}C$ and 82cm. of Hg pressure.

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QUESTIONS FOR DESCRIPTIVE ANSWERS

1. Write a critical account of intermolecular forces versus thermal energy ?

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2. Mention different factors influencing boiling point of a liquid.

Watch Video Solution

3. Show graphically the influence of temperature on vapour pressure of a liquid.

Watch Video Solution

4. Intermolecular forces play important role in vapour pressure as well as boiling point. Explain.

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5. Mercury is the least volatile liquid. Explain.

Watch Video Solution

6. Honey is more viscous, but ethanol is less viscuss. Why ?

Watch Video Solution

7. Discuss application of surface tension.

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8. If the pressure of wet gas is reduced to half, its volume is not doubled.

Why ?

Watch Video Solution

9. Write equation of state. Why so it so called ?

Watch Video Solution

10. Derive the value of molar gas constant from gram molar volume.

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11. At STP, the volume of hydrogen is $22.72 L mol^{-1}$. Calculate the volume occupied by 10 gram of the same gas under similar conditions .

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12. 0.11 g of colourless oxide is nitrogen occupies56 cc at $273^{\circ} C$ and 2 atm. Name the gas.

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13. The stop cock connecting two bulbs of 5 L and 10 L containing an ideal at 18 atm and 12 atm respectively, is opened. If the temperature remains the same, calculate the final pressure.

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14. Molar mass of a gas is 34 g mol^{-1}. Calculate its density at 190 torr and $127^{\circ}C$.

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15. Calculate the weight percentage of nitrogen retained in the vessel. When it is allowed to escape when pressure, volume and temperature change from 3 atm, 165 L and $220^{\circ}C$ to 0.7 atm, 100 L and $110^{\circ}C$.

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16. The density of phosphorus vapour at $310^{\circ}C$ and 775 torr is 2.67 g dm^{-3}. What is the molecular formula ?

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17. Calculate the ratio of rates of diffusion of $^{235}UF_6$ and $^{238}UF_6$. In the gaseous state, under similar conditions.

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18. An open flaskh has Helium gas at 2 atm and $327^\circ C$. The flask is heated to $527^\circ C$ at the same pressure. The fraction of original gas remaining in the flask is

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19. One mole of nitrogen gas at 0.8 atm takes 38 sec to diffuse, while one mole of a xenon fluoride at 1.6 atm takes 57 sec to diffuse. What is the formula of xenon fluoride ?

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20. IF the volume of each molecule is 3.4×10^{-24} cc, calculate the vacant space of 8 g of oxygen gas at $27^{\circ} C$ and one atmosphere pressure.

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21. A 3 litre flask contains 2.2 gms of CO_2 and some mass of oxgyen. If the pressure of the mixture is 1.2 atm at $27^{\circ} C$, Calculate the partial pressure and the mass of oxygen.

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22. A container of just 10cc has 2.69×10^{20} gas molecules at $0^{\circ} C$. What is the pressure exerted?

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23. One L ammonia diffuses through a fine hole in 32.5 sec. How much time will 0.6 L of nitrogen takes to diffuse under similar conditions ?

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24. An evacuated glass vessel weight 50 g when empty and 148 g when filled with a liquid of density 0.98 g $\wedge(-1)$ and 50.5 g when filled with an ideal gas at $27^{\circ} C$ and 1 atm. Determine the molecular weight of the ideal gas.

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25. A vessel contains a mixture of equal masses of helium and oxygen at a pressure of 600 torr. Calculate the partial pressures of components in the mixture.

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26. A gaseous mixture of oxygen and helium is found to have a density of 0.518 gL^{-1} at 720 mm Hg and room temperature. Calculate the weight percentage of oxygen in the mixture.

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42. The density of phosphorus vapour at $310^{\circ}C$ and 775 torr is 2.67 g dm^{-3}. What is the molecular formula ?

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43. Calculate the ratio of rates of diffusion of $^{235}UF_6$ and $^{238}UF_6$. In the gaseous state, under similar conditions.

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44. Certain amount of N_2O_4 is taken in a closed vessel at 1 atm and $27\,^{\circ}C$. Heating to $327\,^{\circ}C$, 20%of the gaseous substance decomposes to give its monomer. Calculate the final pressure in the vessel. What is vapour density of gaseous mixture at $327\,^{\circ}C$?

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45. One mole of nitrogen gas at 0.8 atm takes 38 sec to diffuse, while one mole of a xenon fluoride at 1.6 atm takes 57 sec to diffuse. What is the formula of xenon fluoride ?

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46. IF the volume of each molecule is 3.4×10^{-24} cc, calculate the vacant space of 8 g of oxygen gas at $27\,^{\circ}C$ and one atmosphere pressure.

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47. A 3 litre flask contains 2.2 gms of CO_2 and some mass of oxgyen. If the pressure of the mixture is 1.2 atm at $27^\circ C$, Calculate the partial pressure and the mass of oxygen.

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48. A container of just 10cc has 2.69×10^{20} gas molecules at $0^\circ C$. What is the pressure exerted?

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49. One L ammonia diffuses through a fine hole in 32.5 sec. How much time will 0.6 L of nitrogen takes to diffuse under similar conditions ?

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50. An evacuated glass vessel weight 50 g when empty and 148 g when filled with a liquid of density 0.98 g $\wedge(-1)$ and 50.5 g when filled with an ideal gas at $27^{\circ}C$ and 1 atm. Determine the molecular weight of the ideal gas.

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51. A vessel contains a mixture of equal masses of helium and oxygen at a pressure of 600 torr. Calculate the partial pressures of components in the mixture.

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52. A gaseous mixture of oxygen and helium is found to have a density of 0.518 gL^{-1} at 720 mm Hg and room temperature. Calculate the weight percentage of oxygen in the mixture.

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SUBJECTIVE EXERCISE -1 (SHORT ANSWER QUESTIONS)

1. State and explain Gay-Lussac's law of combining volumes.

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2. State and explain Boyle's law.

Watch Video Solution

3. Derive the value of molar gas constant from gram molar volume.

Watch Video Solution

4. Mention the four mesaurable parameters of a gas and write the units.

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5. State and explain Charle's law.

Watch Video Solution

6. State and explain Avogadro.s law.

Watch Video Solution

7. Derive ideal gas equation.

Watch Video Solution

8. Write the values and units of Universal gas constant.

Watch Video Solution

9. The absolute temperature of a gas

Watch Video Solution

10. State and explain Graham's law of Diffusion.

Watch Video Solution

11. State Dalton's law of partial pressures.

Watch Video Solution

12. Write any four applications of diffusion and effusion.

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13. How is the pressure of gas calculated when it is collected over water, using Dalton's law of partial pressure?

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SUBJECTIVE EXERCISE -1 (VERY SHORT ANSWER QUESTIONS)

1. If the value of gas constant is 82.1, give its units.

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2. Find the volume of 3g of H_2 at STP.

Watch Video Solution

3. What are the characteristic properties of gases?

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4. Write equation of state. Why so it so called ?

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5. Draw two graphs showing the ideal gas equation.

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6. What are isotherms and isobars ?

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7. What is the value of the gas constant, if pressure is expressed in netwtons m^{-2}-and volume is expressed in dm^3?

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8. What are standard temperature and pressure conditions? What is the volume of one mole of an ideal gas under these conditions?

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9. Which of the gases diffuses faster among N_2, O_2 and CH_4? Why?

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10. How many times methane diffuses faster than sulphur dioxide?

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11. Give the relation between the partial pressure of a gas and its mole fraction.

Watch Video Solution

12. Define the terms, diffusion and effusion.

Watch Video Solution

13. How does volume of a given mass of gas change, when its pressure is reduced to half and absolute temperature is increased hy four times ?

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14. Why is gas constant (R) called universal gas constant? What is Boltzmann constant ?

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15. What is an ideal gas?

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SUBJECTIVE EXERCISE -1 (NUMERICALS)

1. Calculate the volume occupied by 25g. of carbon dioxide at 303K and 0.974 atm. Pressure

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2. Find the density of methane at 298K and 72cm of Hg pressure

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3. A gas cylinder can withstand a pressure of 14.9 bar at 27°C. The pressure gauze indicates 12 bar. If the building catches fire suddenly, at what temperature the cylinder expodes?

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4. Calculate the pressure of 11g of CO_2 at $40^{\circ}C$ in a 3 litre flask.

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5. Calculate the volume of 14 g of nitrogen gas at $27^{\circ}C$ and 600mm, of Hg pressure.

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6. 0.5 litres of an ideal gas is present at a pressure of 700 mm of Hg and 30° C. Find its volume at standard temperature and pressure.

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7. Calculate the density of carbon dioxide at 97° C and 760 mm of Hg of pressure.

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8. A five litre flask contains 3.5gm of $N_2 3gof H_2$ and $8g$ of O_2 at $27^\circ C$. The total pressure exerted by the mixture of these gases is

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9. Find the mass of 7×10^{20} molecules of H_2gas.

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10. The volume of a given mass of gas is $0.6dm^3$. If its pressure is increased by 3 times and absolute temperature is increased by 5 times, what would be its new volume?

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11. Find the volume of 8g of oxygen gas at $27^\circ C$ and 1 atmosphere prressure. If the volume of each molecule is $3.4 \times 10^{-24} cc$ calculate the vacant space in the gas.

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12. Find the mass of $450 cm^3$ of N_2 gas at $32^\circ C$ and 750mm of Hg pressure.

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13. 2.5gms. of a gas is present in 750ml. flask at $32^\circ C$ and 770mm, of Hg pressure. Calculate the molecular mass of the gas.

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14. A flask contains 1.2 inoles of methane gas at $25^\circ C$ and 74.6mm pressure. If 4gm of the same gas is sent into the flask, what would be its pressure ?

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15. A 15 dm^3 cylinder contains hydroen gas at 5 atm at $27^\circ C$, How many balloons of capacity of 1.5 dm^3 at 1 atm and $27^\circ C$ can be filled using the gas available from the given cylinder ?

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16. 3.2g of a gas occupies 550 cc of volume at $22^\circ C$ and 770 mm of Hg pressure. Find the molecular mass of the gas.

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17. Ammonia gas diffuses through a fine hole at the rate $0.5 lit \min^{-1}$. Under the same conditions find the rate of diffusion of chlorine gas.

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18. If oxygen diffuses at a rate of $6cm^3$, $\sec^{-1}$ through a fine hole, find the rate of diffusion of carbon dioxide gas under the same conditions.

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19. Find the relative rates of diffusion of CO_2 and Cl_2 gases.

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20. Two gases have densities 0.388g/cc and 0.097gm/cc. If the second gas has the rate of diffusion 5cc/sec, find the rate of duffusion of the first gas.

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21. 100cc of CO_2 gas is diffused in 25 seconds through a porous membrane. How much time does the same volume fo sulphur dioxide take to diffuse ?

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22. Certain volume of oxygen gas undergoes effusion in 15 min. Under similar conditions, what is the time required for the effusion of same volume of chlorine gas?

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23. If 150cc of CO effused in 25 seconds, what volume of methane would effuse in the same time?

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24. A porous tube containing a mixture of H_2 and O_2 is placed in a flask. After the diffusion for 25 seconds into the flask, what would be the composition of the gases in the flask?

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25. 240cc of SO_2 gas diffused through a porous membrane in 20 minutes. Under similar conditions, 720 cc of another gas diffused in 30 minutes. Find the molecular mass of the gas.

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26. Carbon dioxide and another gas 'X' have their rates of diffusion as 0.299 cc s^{-1} and 0.271 cc s^{-1} respectively. Find the vapour density of the gas 'X' if the vapour density of carbon dioxide is 22.

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27. $350cm^3$ of oxygen and $275cm^3$ of another gas 'A' diffused in same time under similar conditions. Find the molecualr mass of the gas 'A'.

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28. If $500 cm^3$ of hydrogen diffused in 16 minutes through a fine hole, how much time does the same volume of ozone $\left(O_3\right)$ take for diffusion?

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29. Hydrogen chrolide gas is sent into a 100 metre tube from one end 'A and ammonia gas from the other end 'B', under similar conditions. At what distant from 'A' will be the two gases meet.

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30. Find the partial pressures of each gas in a mixture containing 4.4 gms. of CO_2 and 5.6 gms of N_2 present at a pressure of 1.5atm. at a given temperature.)

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31. A flask contains 1gm, of H_2 , 2gms. of Ne and 1.6 gms. of O_2 at a pressure of 2 atmoshperes at $27^\circ C$. Calculate the partial pressures of each gas and the volume of the flask.

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32. A 3 lit flask contains 3g of nitrogen and 6.4g of oxygen at $30^\circ C$. Calculate the following for the mixture :

(a) partial pressure of oxygen and

(b) total pressure of the gaseous mixture.

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33. A 3 lit flask contains 3g of nitrogen and 6.4g of oxygen at $30^\circ C$. Calculate the following for the mixture :

(a) partial pressure of oxygen and

(b) total pressure of the gaseous mixture.

Watch Video Solution

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34. Aqueous tension at $25^{\circ}C$ is given as 23.8 mm, If 1.5 L of nitrogen gas is collected over water at $25^{\circ}C$ and 735 mm Hg, find the mass of dry gas collected in the experiment.

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35. A vessel contains a mixture of equal weights of methane and sulphur dioxide al pressure of 600 mm. Find the partial pressures of each of these gases in the mixture.

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36. At $25^{\circ}C, 500cm^3$ flask contains hydrogen at a pressure of 120 mm of Hg and a $250cm^3$ flask contains oxgyen at a pressure of 300 mm of Hg at the same temperature. If the two gases are transferred into a one litre flask at the same temperature, find the pressure of the mixture.

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37. A 3 litre flask contains 2.2 gms of CO_2 and some mass of oxgyen. If the pressure of the mixture is 1.2 atm at $27^\circ C$, Calculate the partial pressure and the mass of oxygen.

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38. A vessel contains helium and methane in 4:1 molar ratio at 20 bar pressure. Due to leakage, the mixture of gases starts effusion. Find the composition of the mixture in the initial stage. (Hint: According to Graham's law of effusion, the rate of effusion of a gas in the mixture $r \propto$ Partial pressure $\sqrt{\frac{1}{\text{molecular mass}}}$

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SUBJECTIVE EXERCISE -2 (SHORT ANSWER QUESTIONS)

1. Write the postulates of kinetic molecular theory of gases .

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2. Deduce Boyle's law from kinetic gas equation.

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3. Deduce Charle's kaw from kinetic gas equation.

Watch Video Solution

4. Derive Avogadro's law from kinetic gas equation.

Watch Video Solution

5. Deduce Dalton's from kinetic gas equation.

Watch Video Solution

6. Deduce Graham's law from kinetic gas equation.

Watch Video Solution

7. Deduce Graham's law from kinetic gas equation.

Watch Video Solution

8. Deduce an expression for kinetic energy from kinetic gas equation

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9. Calculate the kinetic energy of a chlorine molecule at room temperature.

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10. A vessel contains equal masses of helium and oxygen at $35^\circ C$. What is the ratio of kinetic energies of the components?

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11. What is the effet of temperature on the distribution of molecular velocities?

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12. Define RMS, mean and most probable velocities. Write the ratio of these velocities for a given gas.

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13. How are ratio of molecular velocities related to molecular weight and temperature of gases?

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14. Write on the distribution of molecular velocities.

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15. What are different types of molecular velocities? Give their inter-relationship.

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16. Derive the expressions for RMS velocity from kinetic gas equation.

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17. Explain the Maxwell - Boltzmann distribution curves of molecular velocities.

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SUBJECTIVE EXERCISE -2 (VERY SHORT ANSWER QUESTIONS)

1. How is producer gas prepared ?

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2. What is Boltzman's constant? Give its value.

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3. Find the kinetic energy of 2 moles of an ideal gas in calories at $27^{\circ} C$

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4. Write the factors on which the kinetic energy of gas depends upon?

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5. Calculate the kinetic energy per mole of carbondioxide at $27^\circ C$

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6. Calculate the average and total kinetic energy of 0.5 mole of an ideal gas at $0^\circ C$

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7. What is most probable velocity?

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8. With what factors RMS velocity is multiplied to give average and most probable velocities of gas molecules ?

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9. Give the ratio of molecular velocities.

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10. Give a mathematical relation of RMS velocities of two different gases at a given temperature.

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11. Why RMS speed is taken in the derivation of kinetic gas equation?

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12. Why does the velocity of gas molecules increase with increase in temperature ?

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13. Give the fomulae to calculate average velocity of gas molecules.

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SUBJECTIVE EXERCISE -2 (NUMERICALS)

1. Two vessels of equal volume contain O_2 and CO_2 gases separately at the same temperature and pressure. Then, which gas contains more number of molecules ?

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2. Two vessels of equal volume contain O_2 and CO_2 gases separately at the same temperature and pressure. Then, which gas contains more number of atoms?

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3. Two vessels of equal volume contain O_2 and CO_2 gases separately at the same temperature and pressure. Then, which gas contains (a) more number of molecules ? (b) more number of atoms? (c) more kinetic energy ? (d) high RMS velocity ?

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4. Two vessels of equal volume contain O_2 and CO_2 gases separately at the same temperature and pressure. Then, which gas contains (a) more number of molecules ? (b) more number of atoms? (c) more kinetic energy ? (d) high RMS velocity ?

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5. Find the average velocity, RMS velocity and most probable velocity of oxygen molecules at $30 ^\circ C$

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6. If RMS velocity of carbon dioxide is $4.4 \times 10^4 cms^{-1}$ at given temperature, find the RMS velocity of ethane at the same temperature

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7. Calculate RMS velocity of 1.5 lit of ethane at 750 torr.

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8. If gas has a RMS velocity $5.2 \times 10^4 cms^{-1}$, find the average and most probable velocities of the gas

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9. The average velocity of gas is $2.9 \times 10^4 cms^{-1}$.Calculate the RMS and most probable velocities of the gas.

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10. A gas has density $1.52gL^{-1}$ at 1.5atm. Calculate its RMS velocity.

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11. Four molecules have the velocities $3 \times 10cms^{-1}, 4 \times 10^4cms^{-1}, 2 \times 104cms^{-1}$ and $5 \times 10^4cms^{-1}$.. Find the RMS velocity of the molecules.

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12. Calculate RMS velocity of ozone at $20\ ^\circ C$ and 82cm. of Hg pressure.

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13. Cars pass a point travelling at $45.0(5), 47.0(7)50.0(9), 53.0(4)$ and $57.0(1)kmh^{-1}$. The numbers in brackets give the number of cars with respective velocities. Calculate the RMS velocity and average velocity.

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14. Air is cooled from $25^\circ C$ to $0^\circ C$. Calculate the decrease in rms speed of the molecules.

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SUBJECTIVE EXERCISE -3 (SHORT ANSWER QUESTIONS)

1. Write notes on Intermolecular forces

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2. Explain ion-dipole attraction with example.

Watch Video Solution

3. Explain induced dipole-dipole attractions. Give examples.

Watch Video Solution

4. Why experimental isothermal of real gases resemble the perfect-gas isotherms at high temperature and low pressure?

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5. Explain the deviation of real gas behaviour from perfect-gas using compression factor of values?

Watch Video Solution

6. Derive and expalin van der Waals equation of state

Watch Video Solution

7. Write notes on the following properties of liquids

a) Vapour pressure (b) Surface tension (c) Viscosity.

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8. Write four differences between ideal gas and real gas.

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9. Write the real gas equation. What do the correction constants .a. and .b. signify ?

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10. Using the compression factor explain the behaviour of real gases.

Watch Video Solution

11. Explain the liquefication of gases.

Watch Video Solution

12. Show with the help of graphs, the deviation of gases from ideal gas behaviour.

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13. Derive the correction factor for pressure exerted by a real gas.

Watch Video Solution

14. Derive the correction constant for volume of a real gas.

Watch Video Solution

15. Write the expressions for critical constants interms of van der Waals constants, for correction in pressure and in volume.

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16. Comment on the influence of thermal energy on intermolecular forces

Watch Video Solution

17. Discuss the factors influencing vapour pressure of a liquid,

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18. What viscosity ? Write the factors influencing viscosity

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SUBJECTIVE EXERCISE -3 (VERY SHORT ANSWER QUESTIONS)

1. What are dispersion forces ?

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2. Write a note on dipole-dipole attractions.

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3. How does hydrogen bond influence attractions between molecules.

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4. Discuss the cage like structure of ice

Watch Video Solution

5. When does a real gas behave like an ideal gas?

Watch Video Solution

6. What is Boyle's temperature?

Watch Video Solution

7. A real gas deviates most from ideal behaviour at

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8. Compressibility factor of a gas is less than unity at STP. Then predict the molar volume of the gas.

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9. Define compression factor. What is its value for a perfect-gas?

Watch Video Solution

10. Explain the different terms in van der Waals equation.

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11. Define critical temperature. Why were hydrogen like gases considered as permenant gases in the begining?

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12. What is Joule-Thomson effect? How does it help in the liquefication of gases?

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13. Define critical pressure and critical volume

Watch Video Solution

14. What is critical temperature? Give its value for CO_2.

Watch Video Solution

15. Explain the factors influencing rate of reaction.

Watch Video Solution

16. Define vapour pressure of a liquid.

Watch Video Solution

17. Define boiling point of a liquid.

Watch Video Solution

18. What is surface tension ? Write its units.

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OBJECTIVE EXERCISE -1

1. Number of measurable parameters of a gas is

A. 1

B. 2

C. 3

D. 4

Answer: D

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2. Matter that has neither shape nor volume is

A. Gas

B. Liquid

C. Solid

D. All

Answer: A

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3. The pressure exerted by a mass of 'x' mg resting on the area of 1.00 cm^2 is 1.00 Pa, then 'x' is

A. 10.3

B. 10.308

C. 1030

D. 10.2

Answer: D

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4. A $1.00m^2$ column of air extending from the earth's surface through the upper atmosphere has a mass of about x producing an atmospheric pressure. Then 'x' is

A. 10.300 KG

B. 10,300 gm

C. 1030 gm

D. 1030 mg

Answer: A

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5. Gases show ideal gas behaviour at

A. high pressure and high temperature

B. low pressure and high temperature

C. low pressure and low temperature

D. high pressure and low temperature

Answer: B

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6. The value of the universal gas constant R depends upon the

A. Nature of the gas

B. Mass of the gas

C. Temperature of the gas

D. The units of measurement

Answer: D

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7. The SI unit of pressure is pascal and it is equal to the pressure exerted by

A. a mass of 10.2 gram on 1.00 cm^2 area

B. a mass of 1.02 gram on 1.00 cm^2 area

C. a mass of 1.02 mg on 1.00 cm^2 area

D. a mass of 10.2 mg on 1.00 cm^2 area

Answer: D

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8. What is the value of gas constant R in $Jmol^{-1}K^{-1}$?

A. 82.1

B. 8.314×10^7

C. 8.314

D. 0.0821

Answer: C

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9. (A) : The gas molecular collisions are perfectly elastic .(R) : Transfer of energy takes place among the colliding gas molecules .

A. Both A and R are true and R in the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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10. Which of the following changes cannot increase the volume of a gas by 4 times

A. T is doubled, P is decreased to half

B. P is kept constant, T is increased by 4 times

C. 'T' is halved, P is decreased to half

D. 'T' is kept constant, P is decreased to 1/4 th

Answer: C

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11. According to Avogadro law the correct statements are

a) Volume of gas is proportional to the no. of moles at constant T and P

b) The pressure of a gas is directly proportional to temp. of the gas under all conditions

c) Equal volumes of different gases under similar conditions consist of equal no. of molecules

d) Equal volumes of different gases under same conditions have equal no. of atoms

A. b,c

B. a,c

C. d,b

D. c,d

Answer: B

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12. Value of R in SI units is

A. $8.315 \times 10^{7} ergK^{-1}$ mole^{-1}

B. $8.315 JK^{-1}$mole^{-1}

C. 0.0823 lit .Atm K^(-1) $mo \leq ^{-1}$

D. 2 cal K^{-1}mole^{-1}

Answer: B

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13. The gas constant R represents work done

A. per molecule

B. per degree absolute

C. per degree per mole

D. per mole

Answer: C

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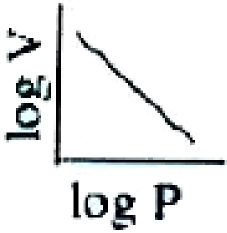
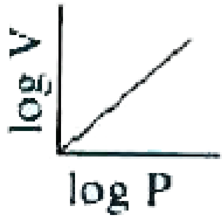
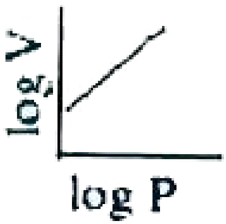
14. The Boyle's law can be expressed graphically as



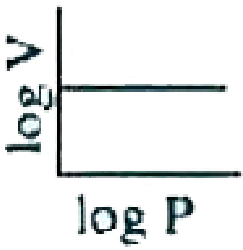
A.



B.



C.



D.

Answer: A

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15. When the pressure on a gas is decreased to 1/4 and the absolute temperature is increased four-fold the volume of the gas

A. Increases by 16 times

B. decreases to 1/16

C. Increases by 8 times

D. remains the same

Answer: A

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16. Which of the following are correct statements

a) 760 torr is equal to 1 atmosphere

b) 10^6dynes/cm^2 is called 1 Bar

c) 10^5Newtons/m^2 is pascal

d) 1 atmosphere is $1.013 \times 10^5 \text{dynes/m}^2$

A. a,c

B. a,b

C. a,d

D. c,d

Answer: B

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17. The temperature of a gas is increased by 1 aC. Then from the following statements pickout the correct one

1) The volume increases by 1/273 of its volume at 0°C at constant pressure

2) The pressure increases by 1/273 of its pressure at 0°C at constant volume

3) The volume decreases by 1/273 of its volume at 0°C

4) The pressure is doubled to its pressure at 0°C

A. a,c

B. c,d

C. a,b

D. b,c

Answer: C

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18. 1 mole of any gas

a) Occupies 22.4 lit at STP

b) Contains 3.05×10^{22} molecules

c) Contains 6.023×10^{23} molecules

d) Contain same number of molecules as in 22 gm of CO_2

A. b,d

B. a,c

C. b,c

D. a,d

Answer: B

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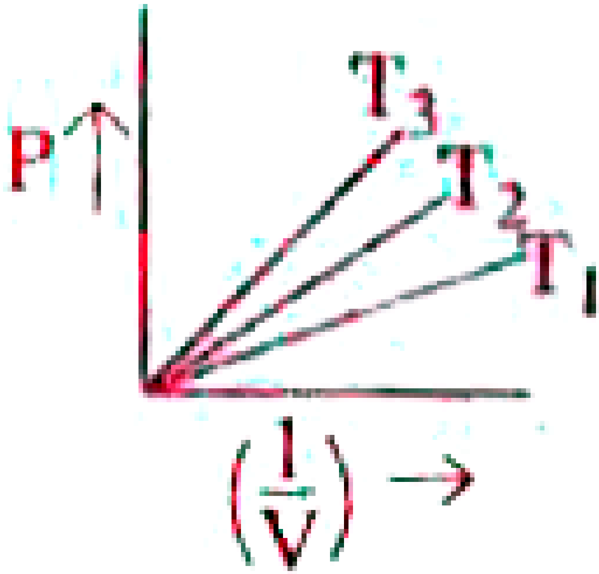
19. From the graph the correct order of temperatures is



A. $T_3 > T_2 > T_1$

B. $T_3 < T_2 < T_1$

C. $T_3 = T_2 = T_1$

D. $T_3 > T_2 < T_1$

Answer: A

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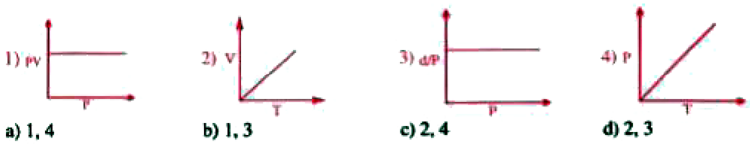
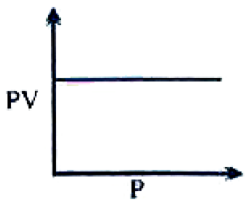
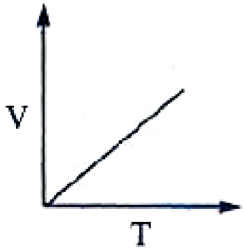
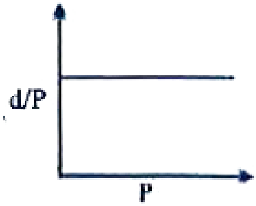
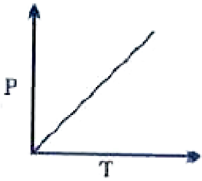
20. Which of the following indicates the isotherms?



A. 

B. 

C. 

D. 

Answer: B

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21. Which of the following indicates Charles' law mathematically (when n, P are constant)?

a) VT = constant $\quad b)\ V_t = V_0\left(1 + \frac{t}{273}\right)$

c) $V_0 = V_t\left(1 + \frac{t}{273}\right)$ $\quad$ d) V/T = constant (when n, P are constant)

A. a,c

B. a,b

C. b,c

D. b,d

Answer: D

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22. At absolute zero which of the following statements about an ideal gas are correct ?

a) The motion of gaseous molecules ceases

b) The volume of gas increases by 273 times

c) The K.E of gas molecules increases ab normally

d) The volume of a gas becomes zero

A. b,d

B. b,c

C. c,d

D. a,d

Answer: D

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23. The density of CO_2 gas at $27^{\circ}C$ and 1 atm pressure is ___ (gram/lit)

A. 1.78

B. 1.52

C. 1.96

D. 1.20

Answer: A

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24. Which of the following indicates correct R (Gas constant) values in different units ?

a) $1.987 \text{cals mole}^{-1} K^{-1}$

b) $8.314 \times 10^7 J mole^{-1} K^{-1}$

c)0.0821lit-atm $mole^{-1} K^{-1}$

d) 82.1lit. $mole^{-1} K^{-1}$

A. a,b

B. b,c

C. a,c

D. d,c

Answer: C

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25. When the absolute temperature of a gas is doubled then the correct statements are

a) The V of a gas increases by 4 times at constant P

b) The P of a gas increases by 2 times at constant V

c) The V of a gas increases by 2 times at constant P

d) The P of a gas increases by 4 times at constant V

A. b,d

B. a,c

C. b,c

D. a,d

Answer: C

Watch Video Solution

26. Match the following

A) Movement of gas molecules	1) Unaffected by gravity
B) Gas with least rate diffusion	2) Diffusion
C) Gas with highest rate of diffusion	3) H_2
D) Spontaneous mixing of gases	4) He
	5) UF_6

The correct match is

A. $\begin{array}{cccc} A & B & C & D \\ 5 & 3 & 4 & 2 \end{array}$

B. $\begin{array}{cccc} A & B & C & D \\ 1 & 2 & 3 & 4 \end{array}$

C. $\begin{array}{cccc} A & B & C & D \\ 1 & 5 & 3 & 2 \end{array}$

D. $\begin{array}{cccc} A & B & C & D \\ 5 & 3 & 2 & 1 \end{array}$

Answer: C

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27.

LIST - 1	LIST - 2
A) Boyle's law	1) $P_{obs} = P_{atm} + P_{water\ vapour}$
B) Avagadro law	2) $V_1 = n_1\left(\frac{V_2}{n_2}\right)$
C) Charles' law	3) $V_t = V_0\left(1 + \frac{t}{273}\right)$
D) Dalton's law	4) $V_1 = P_2\left(\frac{V_2}{P_1}\right)$

A. $\begin{array}{cccc} A & B & C & D \\ 1 & 2 & 3 & 4 \end{array}$

B. $\begin{matrix} A & B & C & D \\ 2 & 3 & 4 & 1 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 4 & 3 & 2 & 1 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 4 & 2 & 3 & 1 \end{matrix}$

Answer: D

Watch Video Solution

28. Match the following columns

LIST - 1	LIST - 2
A) R = 8.314 J.Kelvin^{-1}mol^{-1}	1) STP conditoins
B) V = 22.711 lit	2) SI unit
C) P = 1 bar ; T = 273.15 K	3) CGS unit
D) R = 0.8314 x 10^8 ergs.kelvin^{-1}mol^{-1}	4) Gram molecular weight
	5) Gram molar volume at S.T.P

A. $\begin{matrix} A & B & C & D \\ 5 & 4 & 3 & 1 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 4 & 3 & 2 & 1 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 3 & 5 & 2 & 4 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 2 & 5 & 1 & 3 \end{matrix}$

Answer: D

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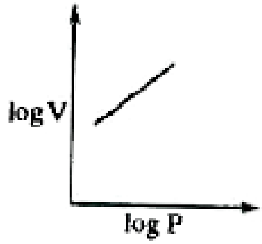
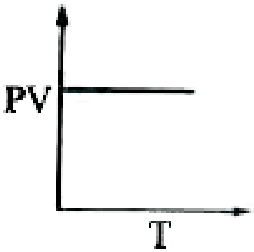
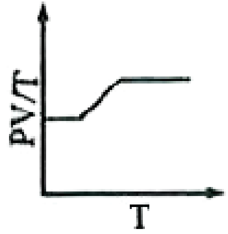
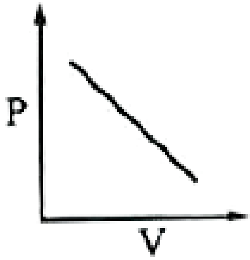
29. Which among the following indicates change in the chemical composition due to dissociation

A. 

B. 

C. 

D. 

Answer: C

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30. For an ideal gas, number of moles per lit in terms of pressure (P), gas constant (R) and temperature (T) is

A. PT/R

B. PTR

C. P/RT

D. RT/P

Answer: C

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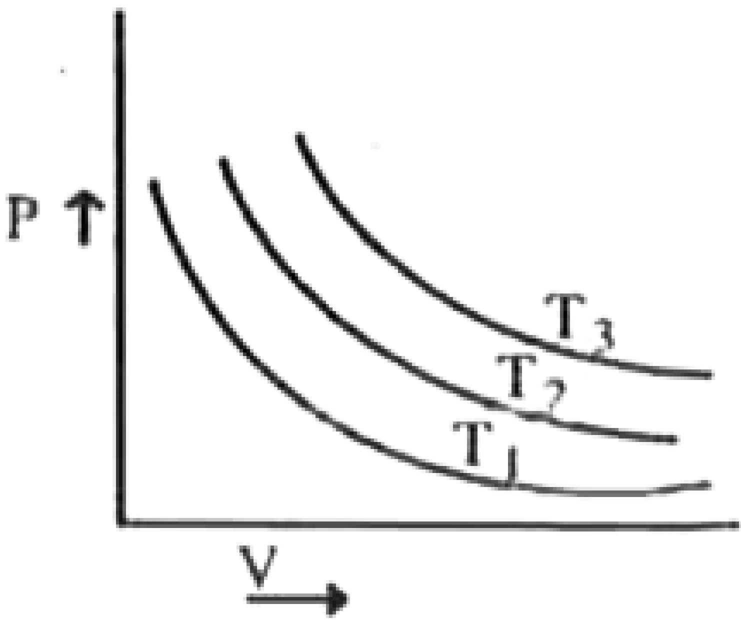
31. From the graph the correct order of temperature is



A. $T_1 < T_2 < T_3$

B. $T_1 = T_2 = T_3$

C. $T_1 > T_2 > T_3$

D. $T_1 < T_2 > T_3$

Answer: A

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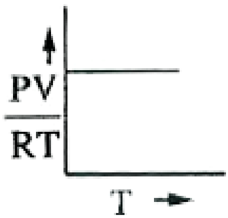
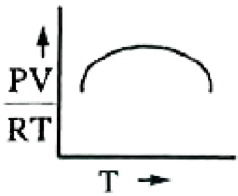
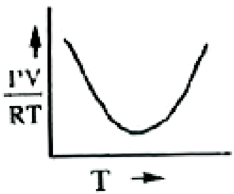
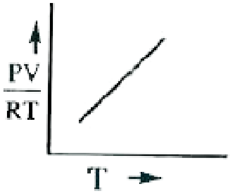
32. For an ideal gas the graph between PV/RT and T is

A. 

B. 

C. 

D. 

Answer: A

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33. One mole of argon will have least density at

A. STP

B. `0^@ C 2 atm

C. $273^{\circ}C, 2atm$

D. $273^{\circ}C, 1atm$

Answer: D

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34. What are the conditions under which the relation between 'V' and 'n' are plotted ?

A. At constant P

B. At constant P, V

C. At constant T, V

D. At constant P, T

Answer: D

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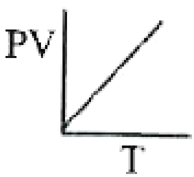
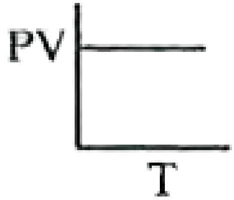
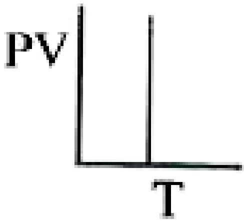
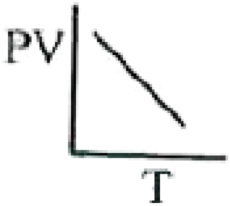
35. Which of the following shows ideal gas behaviour

A. 

B. 

C. 

D. 

Answer: A

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36. When universal gas constant (R) is divided by Avogadro number(N), then the value R/N is equivalent to

A. Rydberg's constant

B. Boltzmann's constant

C. Planck's constant

D. Vanderewall's constant

Answer: B

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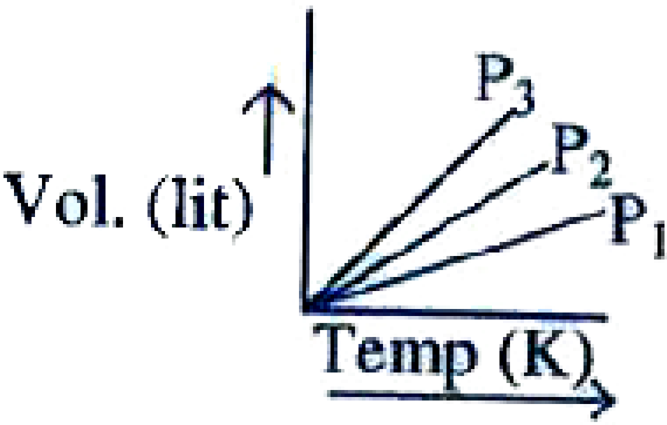
37. From the graph the order of pressure of a gas is



A. $P_1 > P_2 > P_3$

B. $P_1 < P_2 < P_3$

C. $P_1 = P_2 = P_3$

D. $P < P_2 > P_3$

Answer: A

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38. Value of gas constant (R) is

A. 0.082 lit atm

B. $0.987 cal mol^{-1} K^{-1}$

C. $0.83 erg mol^{-1} K^{-1}$

D. $8.3 J Mol^{-1} K^{-1}$

Answer: D

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39. Kinetic energy of molecules is least in

A. Gases

B. Solids

C. Liquids

D. Solutions

Answer: B

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40. The molar volume of CO_2 is maximum at

A. NTP

B. $0^{\circ}C$ and $2.0 atm$

C. $127^{\circ}C$ and $1 atm$

D. $8.3 J mol^{-1} K^{-1}$

Answer: A

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41. 15 g of ethane at 380 torr and $273^\circ C$ occupy a volume of

A. 11.2 L

B. 44.8 L

C. 33.6 L

D. 22.4 L

Answer: B

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42. The value of the universal gas constant R depends upon the

A. the nature of the gas

B. conditions of temperature

C. the units of measurement

D. none of the above

Answer: C

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43. At constant volume, for a fixed number of moles of a gas, the pressure of the gas increases with a rise in temperature, due to

A. increases in average molecular speed

B. decreased number of collisions amongest molecules

C. increase in molecular attractions

D. decrease in mean free path

Answer: A

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44. Density of neon will be highest at

A. STP

B. $0\,^{\circ}C$, 2 atm

C. $273\,^{\circ}C, 1atm$

D. $273\,^{\circ}C, 2atm$

Answer: B

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45. Mixing of two gases by diffusion is

A. Reversible

B. irreversible

C. Exothermic

D. endothermic

Answer: B

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46. The rate of diffusion of Hydrogen is about

A. 1/2 that of He

B. Twice that of He

C. 1.414 times that of He

D. Four times that of He

Answer: C

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47. According to Graham's law at a given temp, the ratio of diffusion r_A/r_B, of gases A and B is given by

A. $\left(\frac{P_A}{P_B}\right)\left(\frac{M_A}{M_B}\right)^{\frac{1}{2}}$

B. $\left(\frac{M_A}{M_B}\right)\left(\frac{P_A}{P_B}\right)^{1/2}$

C. $\left(\frac{P_A}{P_B}\right)\left(\frac{M_B}{M_A}\right)^{1/2}$

D. $\left(\frac{M_A}{M_B}\right)\left(\frac{P_B}{P_A}\right)^{\frac{1}{2}}$

Answer: C

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48. Which of the pairs of gases diffuse at a slower rate than CO_2?

A. $H_2 \& He$

B. $SO_2 \& SO_3$

C. N_2 and CO

D. N_2O and C_3H_8

Answer: B

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49. Ammonia gas diffuses twice as fast as gas X. The gas 'X'is

A. SO_2

B. C_4H_{10}

C. C_5H_8

D. Cl_2

Answer: C

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50. The four tyres of a motor car are filled with CO_2, He, H_2 and O_2 respectively. The order in which they are to be reinflated is

A. CO_2, O_2, He, H_2

B. H_2, He, O_2, CO_2

C. H_2, He, CO_2, O_2

D. H_2, O_2, He, CO_2

Answer: B

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51. The rate of diffusion of a gas is

A. directly proportional to its density

B. directly proportional to its molecular mass

C. directly proportional to the square root of its molecular mass

D. inversely proportional to the square root of its molecular mass

Answer: D

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52. The increasing order of effusion among the gases H_2O_2, NH_3 and CO_2 is

A. H_2, CO_2, NH_3, O_2

B. H_2, NH_3, O_2, CO_2

C. H_2, O_2, NH_3, CO_2

D. CO_2, O_2, NH_3, H_2

Answer: D

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53. Among the following gaseous elements with atomic numbers, which will have greater rate of diffusion?

A. Z = 7

B. Z = 8

C. Z = 9

D. Z=10

Answer: D

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54. The rate of diffusion of methane at given temperature is twice that of unknown gas. The gas is

A. C_2H_6

B. CO_2

C. C_3H_4

D. SO_2

Answer: D

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55. A balloon filled with acetylene is kept in a vessel of hydrogen at the same temperature and pressure. If the balloon is punctured with a pin, it

A. collapses

B. bursts

C. nothing happens

D. becomes red

Answer: B

Watch Video Solution

56. The rate of diffusion of methane is twice that of the following gas under the same conditions

A. O_3

B. O_2

C. SO_2

D. SO_3

Answer: C

Watch Video Solution

57. Among the following gaseous elements with atomic numbers, which will have greater rate of diffusion?

A. Z = 7

B. Z = 8

C. Z = 10

D. Z = 17

Answer: C

Watch Video Solution

58. The rate of diffusion of a gas at constant temperature and pressure is

a) Directly proportional to its density

b) Directly proportional to square root of its molecular wt

c) Inversely proportional to its square root of its vapour density

d) Directly proportional to its RMS velocity

A. c,d

B. a,b

C. b,d

D. b,c

Answer: A

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59. Among the following, the applications of Graham's law are

a) In Marsh gas alarm b) In designing eudiometer

c) In separating uranium isotopes d) To measure volume of a gas by gas burette

A. a,c

B. b,d

C. c,d

D. b,d

Answer: A

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60. Match the following.

LIST - 1	LIST - 2
A) Effusion	1) $r \alpha 1/\sqrt{d}$
B) Velocity of gas molecules	2) Collision of molecules on the walls
C) Pressure of the gas	3) Vector quatity
	4) Scalar quantity

A. A-4, B-2, C-3

B. A-1, B-3, C-2

C. A-1, B-2, C-4

D. A-1, B-4, C-3

Answer: B

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61. Pick out the pair of gases with the same rate of diffusion

A. CO, NO

B. N_2O, CO

C. N_2O, CO_2

D. CO_2, NO_2

Answer: C

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62. For the diffusion of a gas at pressure P, the rate of diffusion is expressed by

A. $r\alpha \frac{P}{\sqrt{P}}$

B. $r = \frac{P}{M}$

C. $r\alpha = \frac{M}{\sqrt{P}}$

D. $r = \frac{P}{\sqrt{M}}$

Answer: A

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63. A gas diffuses four times as quickly as oxygen. The molecular weight of the gas is

A. 2

B. 4

C. 8

D. 16

Answer: A

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64. The decreasing order of rates of diffusion of $H_2, N_2, O_2, \text{ and } CO_2,$ is

A. $H_2 > N_2 > CO_2 > O_2$

B. $H_2 > N_2 > O_2 > CO_2$

C. $CO_2 > O_2 > N_2 > H_2$

D. $H_2 > O_2 > N_2 > CO_2$

Answer: B

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65. 12L of SO_2 gas diffused through a porous membrane in 20 minutes. Under same conditions 36L of X gas diffused in 30 minutes. The molar mass of the gas 'X' in g mol^{-1} is :

A. 64

B. 32

C. 16

D. 8

Answer: C

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66. Dalton's law of partial pressures is applicable to

A. $NO + O_2$

B. $H_2 + Cl_2$

C. $NH_3 + HCl$

D. $CO_2 + O_2$

Answer: D

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67. Which of the following indicates the mathematical expression for Dalion's law of partial pressures

a) Partical pressure = $\frac{\text{The component gas volume}}{\text{Total pressure}} \times \text{Total volume}$

b) Partial pressure = mole fraction of component gas $\times$ Total pressure

c) Partial pressure = Partial volume $\times$ Total pressure

d) Partial pressure = No. of moles of component gas $\times$ Total pressure

A. a,d

B. b,c

C. c,d

D. a,b,c

Answer: D

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68. Combination that obeys Dalton's law

$A = CO \quad B = CI_2 \quad C = F_2 \quad D = Xe$

A. A,B

B. B,C

C. B,D

D. A,C

Answer: C

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69. A vessel contains a mixture of equal weights of oxygen and SO_2 at a pressure of 600mm of Hg. The partial pressure of oxygen in mm is

A. 150

B. 450

C. 300

D. 600

Answer: C

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70. A vessel contains methane and oxygen in the mass ratio 2:1. The fraction of the partial pressure of oxygen in the total pressure is

A. $1/3$

B. $2/3$

C. $1/4$

D. $1/2$

Answer: B

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71. The measurement of the pressure of dry gas collected over water is based upon

A. Gay Lussac's law

B. Charle's law

C. Boyle's law

D. Dalton's law

Answer: D

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72. Aqueous tension of water depends on

A. the amount of water taken

B. the temperature only

C. both amount of water and temperature

D. neither temperature nor amount of water

Answer: B

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73. O_2 and He are taken in equal weights in a vessel. The pressure exerted by Helium in the mixture is

A. 1/8 th of total pressure

B. 1/9th of total pressure

C. 2/9 th of total pressure

D. 8/9th of total pressure

Answer: D

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74. Equal volumes of two jars contain HCI, NH_3 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

A. 1 atm

B. Equal to P

C. Becomes Zero

D. P+P = 2P

Answer: C

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75. The wrong statement in the case of an ideal gas is

A. It cannot be converted into a liquid

B. There are no attractive forces between molecules

C. All molecules of the gas move with the same speed

D. At a given temperature PV is proportional to the amount of the gas

Answer: C

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76. An ideal gas cannot be liquified because

A. collisions are elastic

B. of the absence of attractive forces

C. gravity has no effect on the molecules

D. the average K.E. is not proportional to the absolute temperature.

Answer: B

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77. The most ideal gas among real gases is

A. Hydrogen

B. Helium

C. Carbon dioxide

D. Nitrogen

Answer: B

Watch Video Solution

78. Which is wrong according to kinetic theory

A. Average K.E. of molecules is proportional to the absolute temperature

B. Collisions between molecules are perfectly elastic

C. Pressure is due to collisions between molecules

D. There are no attractive forces between the molecules of a gas

Answer: C

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79. The gas which can not be liquified is

A. H_2

B. He

C. Ar

D. Ideal gas

Answer: D

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80. The ratio of kinetic energies of lg of H_2 and 2g of CH_4 at the same temperature will be

A. $1:4$

B. $4:1$

C. $1:2$

D. $2:1$

Answer: B

View Text Solution

81. When gas molecules collide on the walls of the vessel, the energy of the molecules changes into

A. Heat

B. Temperature

C. Light

D. None

Answer: D

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82. The absolute temperature of a gas

A. is a measure of the number of molecules in the gas

B. is a measure of the volume of the gas

C. indicates the nature of the gas

D. is a measure of the average kinetic energy of the molecules

Answer: D

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83. The kinetic energy of n moles of an ideal gas is given by the expression

A. $\frac{3}{2}RT$

B. $\frac{3}{2}nRT$

C. $\frac{2}{3}RT$

D. $\frac{2}{3}nRT$

Answer: B

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84. Boltzmann constant represents the gas constant per

A. mole

B. an Avogadro number of molecules

C. any number of molecules

D. molecule

Answer: D

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85. The ratio of kinetic energies of 2gm of $H_2$and 4gm of CH_4 at a given temperature is

A. $4:1$

B. $2:32$

C. $1:4$

D. $16:2$

Answer: A

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86. The kinetic energy of n moles of an ideal gas is given by the expression

A. pressure of gas

B. volume of gas

C. absolute temperature of gas

D. nature of gas

Answer: C

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87. The average K.E. of one mole of an ideal gas in calories is equal to

A. 3 times of its absolute temp

B. 2 times of its absolute temp

C. 4 times of its absolute temp

D. 2/3 times of its absolute temp

Answer: A

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88. The melting point of four substances are given in bracket, then the attraction forces in a solid is more in case of

A. Ice (273 K)

B. NaF (1270 K)

C. Phosphorus (317 K)

D. Naphthalein (353 K)

Answer: B

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89. If thermal energy predominates over intermolecular forces, then the substance changes from........to........

A. gas to liquid

B. liquid to solid

C. gas to solid

D. liquid to gas

Answer: D

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90. Hydration of different ions is an example of

A. Ion - Dipole interaction

B. Dipole - Dipole interaction

C. Dipole - Induced dipole

D. Dispersion

Answer: A

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91. The inter molecular forces present in inert gases are

A. Ion-ion

B. Ion - dipole

C. Dipole - dipole

D. Dispersion

Answer: D

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92. The term van der Waals forces refers to

A. Dipole - Dipole interaction

B. Dipole - Induced dipole

C. Dispersion forces

D. All the above

Answer: D

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93. Dipole-dipole forces are stronger than

A. London forces

B. Electrostatic forces

C. Ton-dipole forces

D. Ton-Ton forces

Answer: A

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94. Molecules of liquid hydrogenchloride are held with

A. London, dispersion forces

B. Dipole-induced dipole forces

C. Dipole-dipole forces

D. Induced dipole-induced dipole forces

Answer: C

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95. The gas that has relatively stronger intermolecular forces

A. H_2

B. O_2

C. CH_4

D. NH_3

Answer: D

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96. A liquid can exist only,

A. Between triple point and critical point

B. At any temperature above melting point

C. Between melting point and critical point

D. Between boiling and melting points.

Answer: D

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97. Ion-dipole attractions are present in

A. Water

B. NaCl + Water

C. Benzene

D. CCl_4 + Benzene

Answer: B

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OBJECTIVE EXERCISE -2

1. A gas of volume 2000ml is kept in a vessel at a pressure of 10^3 pascals at a temperature of $27^\circ C$. If the pressure is increased to 10^5 pascals at the same temperature, the volume of the gas becomes

A. 1000ml

B. 20ml

C. 2ml

D. 200ml

Answer: B

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2. At a constant temperature a gas is initially at 2 atm pressure. To compress it to 1/8th of its initial volume, pressure to be applied is

A. 4atm

B. 8atm

C. 12atm

D. 16atm

Answer: D

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3. The volume of a given mass of a gas is 100ml at $100^{\circ}C$. If pressure is kept constant at what temperature will the sample have the volume of 200ml?

A. $50^{\circ}C$

B. $473^{\circ}C$

C. $200^{\circ}C$

D. $400^{\circ}C$

Answer: B

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4. At what temperature, the volume of 'V' of a certain mass of gas at $37^\circ C$ will be doubled, keeping the pressure constant?

A. $327^\circ C$

B. $347^\circ C$

C. $527^\circ C$

D. $54^\circ C$

Answer: B

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5. One litre of a gas weights 28 at 300 K and latm pressure. If the pressure is made 0.75 atm, at what temperature will one litre of the same gas weigh lg

A. 600K

B. 800 K

C. 900 K

D. 450K

Answer: D

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6. The total pressure of a mixture of 8g of oxygen and 14g of nitrogen contained in a 11.2L vessel at 0°C is.

A. $0.5 atm$

B. $1 atm$

C. $1.5 atm$

D. $2 atm$

Answer: C

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7. The density of a gas is 2.5g/L at $127^{\circ} C$ and 1 atm. The molecular weight of the gas is

A. 82.1

B. 41.05

C. 56

D. 28

Answer: A

Watch Video Solution

8. The molar volume of an ideal gas at one atmosphere and $273^{\circ} C$ is

A. $22.4L$

B. $44.8L$

C. $11.2L$

D. 5.6L

Answer: B

Watch Video Solution

9. The density of a gas is 2g/L at 1 atm and $27^{\circ} C$. The density of the same gas at 2 atm and $127^{\circ} C$ is

A. $3g/L$

B. $1.33g/L$

C. $2g/L$

D. $1g/L$

Answer: A

Watch Video Solution

10. How much should the pressure be increased in order to decrease the volume of a gas by 5% at constant temperature

A. 25%

B. 10%

C. 4.26%

D. 5.26%

Answer: D

Watch Video Solution

11. 16gm of oxygen and 3gm of hydrogen are present in a vessel at $0^{\circ}C$ and 760mm of Hg pressure. Volume of the vessel is

A. $22.4L$

B. $44.8L$

C. $11.2L$

D. $5.6L$

Answer: B

Watch Video Solution

12. If the pressure and absolute temperature of 4 litres of SO_2 gas are doubled, the volume of this gas would be

A. 1 litre

B. 4 litres

C. 2 litres

D. 8 litres

Answer: B

Watch Video Solution

13. For a given mass of gas, if pressure is reduced to half and temperature is increased two times, then the volume of gas would become ___ times .

A. $V/4$

B. $4V$

C. $2V^2$

D. $6V$

Answer: B

Watch Video Solution

14. When the pressure of 2 litres of O_2 gas is doubled and its temperature is also doubled from 300K to 600K, the final volume of the gas is

A. 4 lit

B. 20 lit

C. 40 lit

D. 2 lit

Answer: D

Watch Video Solution

15. If one mole of a gas A (mol.wt-40) occupies a volume of 201itres, under the same conditions of temperature and pressure the volume occupied by 2 moles of gas B (mol.wt=80) is

A. 80 L

B. 60 L

C. 50 L

D. 40 L

Answer: D

Watch Video Solution

16. Four one litre flasks are seperately filled with gases O_2, F_2, CH_4 and CO_2 under same conditions. The ratio of number of molecules in these flasks is

A. $2:2:4:3$

B. $1:1:1:1$

C. $1:2:3:4$

D. $2:2:3:4$

Answer: B

Watch Video Solution

17. The weight of one litre of a gas at latm pressure and 300K is 4g. At what temperature the weight of the gas is 4g when the pressure is made 0.5 atm and volume is 1 litre?

A. 200 K

B. 150 K

C. 600 K

D. 1200 K

Answer: B

Watch Video Solution

18. The Molecular weight of a gas is 40. At 400K if 120 g of this gas has a volume of 20 litres, the pressure of the gas in atm is

A. 4.92

B. 5.02

C. 49.6

D. 0.546

Answer: A

Watch Video Solution

19. At 127°C and latm pressure, a mixture of a gas contains 0.3 mole of N_2, 0.2 mole of O_2 The volume of the mixture is

A. 15 lit

B. 22.4lit

C. 18.2lit

D. 16.4lit

Answer: D

Watch Video Solution

20. 'X' moles of N_2 gas at S.T.P. conditions occupy a volume of 10 litres, then the volume of '2x' moles of CH_4 at $273\,^{\circ}C$ and 1.5 atm is

A. 20 lit

B. 26.6 lit

C. 5 lit

D. 16.6 lit

Answer: B

Watch Video Solution

21. A gaseous mixture containing 0.35g of N_2 and 5600 ml of O_2 at STP is kept in a 5 litres flask at 300K. The total pressure of the gaseous mixture is

A. 1.293atm

B. 1.2315 atm

C. 12.315 atm

D. 0.616atm

Answer: A

Watch Video Solution

22. Balloons of 4L capacity are to be filled with Hydrogen at a pressure of 1 atm and $27\,^{\circ}C$ from an 8L cylinder containing Hydrogen at 10 atm at the same temperature. The number of balloons that can be filled is

A. 20

B. 18

C. 40

D. 38

Answer: B

Watch Video Solution

23. A steel cylinder of 8 litres capacity contain hydrogen gas at 12atm pressure. At the same temperature how many cycle tubes of 4 litres capacity at 2 atm can be filled up with this gas.

A. 12

B. 48

C. 5

D. 10

Answer: D

Watch Video Solution

24. An open vessel at $27^{\circ}C$ is heated until three-fourths mass of the air in it has been expelled. Neglecting the expansion of the vessel, the temperature to which the vessel has been heated is

A. $927^{\circ}C$

B. $108^{\circ}C$

C. $1000^{\circ}C$

D. $477^{\circ}C$

Answer: A

Watch Video Solution

25. An open flaskh has Helium gas at 2 atm and $327^{\circ}C$. The flask is heated to $527^{\circ}C$ at the same pressure. The fraction of original gas remaining in the flask is

A. $3/4$

B. $1/4$

C. $1/2$

D. $2/5$

Answer: A

Watch Video Solution

26. A gas cylinder withstands a pressure of 14.9 atm. Its pressure gauze indicates 12 atm at $27^{\circ}C$. If the building catches fire suddenly, at what temperature the cylinder explodes?

A. $9.95^{\circ} C$

B. $0.995^{\circ} C$

C. $1.990^{\circ} C$

D. $99.5^{\circ} C$

Answer: D

Watch Video Solution

27. When 2g of a gas A is introduced into an evacuated flask kept at 25°C, the pressure is found to be 1 atmosphere. If 3g of another gas is then added to the same flask, the total pressure becomes 1.5 atm. Assuming ideal behaviour, the ratio of their molecular weights $M_A : M_B$ is

A. $3:1$

B. $1:3$

C. $2:3$

D. $3:2$

Answer: B

Watch Video Solution

28. The vapour density of a gas is 11.2. The volume occupied by 10g of the gas at STP is

A. $10L$

B. $1L$

C. $11.2L$

D. $5.6L$

Answer: A

Watch Video Solution

29. 112ml. of oxygen at STP is subjected to liquefication. The mass of liquid oxygen obtained is

A. $0.64g$

B. $0.16h$

C. $0.32g$

D. $0.96g$

Answer: B

Watch Video Solution

30. "m" is the mass of a molecule, "k" is the Boltzmann constant, P is the pressure and T is the absolute temperature. The density of the gas is given by

A. $\frac{kT}{pm}$

B. $\frac{PT}{km}$

C. $\frac{pm}{kT}$

D. $\frac{pK}{Tm}$

Answer: C

Watch Video Solution

31. The density of a gas at 27°C and 1 atm is d. Pressure remaining constant at what temperature its density becomes 0.75 d

A. $36^{\circ} C$

B. $127^{\circ} C$

C. $30^{\circ} C$

D. $54^{\circ} C$

Answer: B

Watch Video Solution

32. A steel cylinder of 8 litres capacity contain hydrogen gas at 12atm pressure. At the same temperature how many cycle tubes of 4 litres capacity at 2 atm can be filled up with this gas.

A. 12

B. 48

C. 5

D. 10

Answer: D

Watch Video Solution

33. A glass tube of volume 112ml. containing a gas is partially evacuated till the pressure in it drops to 3.8×10^{-5} torr at $0^\circ C$. The number of molecules of the gas remaining in the tube is

A. $3x10^{17}$

B. 1.5×10^{14}

C. 4.5×10^{18}

D. 6×10^{18}

Answer: B

Watch Video Solution

34. A sample of gas has a volume of 0.2 lit measured at 1 atm pressure and $0^\circ C$. At the same pressure, but at $273^\circ C$, its volume will become

A. 0.1 lit

B. 0.4 lit

C. 27.8 lit

D. 5.6 lit

Answer: B

Watch Video Solution

35. 35ml of dry H_2 gas were collected at $6\,^{\circ}C$ and 758 mm pressure. What is the volume in ml of H_2 at STP?

A. 32

B. $24, 6$

C. 34.16

D. 30.16

Answer: C

Watch Video Solution

36. At T kelvin and a pressure of a P atm, certain gas is present in a vessel. If the vessel is divided into two equal compartments by a partition, the pressure in each compartment is equal to

A. 4P atm

B. P atm

C. P/4 atm

D. 2 P atm

Answer: B

Watch Video Solution

37. The centre of the Sun consists of gases whose average molecular weight is 2 . If the density of the gases is 2.73×10^3 kg/ m^3 at a pressure of 1.12×10^9 atm , the temperature at the centre of the Sun is (assuming ideal behaviour)

A. $10^8 K$

B. $10^6 C$

C. $10^7 K$

D. $10^9 K$

Answer: C

Watch Video Solution

Watch Video Solution

38. One litre of a gas weighs 4g at 300 K and 1 atm. If the pressure is reduced to 0.75 atm, the temperature at which one litre of the same gas weights 2g is

A. 600 K

B. 900K

C. 450 K

D. 800 K

Answer: C

Watch Video Solution

39. 0.2 g of a gas 'x' occupy a volume of 440 ml . If 0.1 g of CO_2 gas occupy a volume of 320 ml at the same temperature and pressure , then the gas 'x' could be

A. C_4H_{10}

B. NO_2

C. O_2

D. SO_2

Answer: D

Watch Video Solution

40. N_2 gas is present in one litre flask at a pressure of 7.6×10^{-10}mm of Hg. The number of N_2 gas molecules in the flask at $0^{\circ} C$ are

A. 2.68×10^{9}

B. 2.68×10^{10}

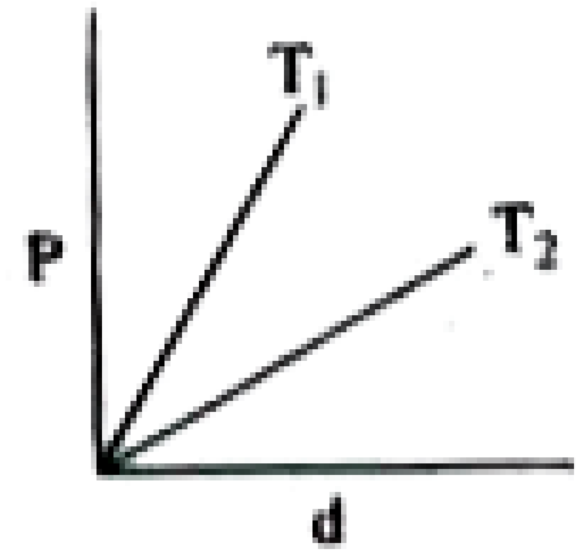
C. 1.34×10^{28}

D. 2.68×10^{22}

Answer: B

Watch Video Solution

41. Diagram shows a graph between pressure and density for an ideal gas at two temperatures T_1 and T_2 which is correct



A. $T_1 > T_2$

B. $T = T_2$

C. $T_1 < T_2$

D. None

Answer: A

Watch Video Solution

42. A sample of gas has a volume of 0.2 lit measured at 1 atm pressure and $0^\circ C$. At the same pressure, but at $273^\circ C$, its volume will become

A. 0.1 lit

B. 0.4 lit

C. 0.8 lit

D. 0.6 lit

Answer: B

Watch Video Solution

43. If the weight of 5.6 lit of a gas at NTP is 11g, the gas may be (at.wt of P = 31, N = 14,0 = 16 and Cl = 35.5)

A. PH_3

B. $COCl_2$

C. NO

D. N_2O

Answer: D

Watch Video Solution

44. The volume of 10 moles of an ideal gas at $27^\circ C$ and latm pressure is 1 lit. What is the volume of 20 moles of same gas at same pressure and temperature?

A. 2 lit

B. 4 lit

C. 1 lit

D. 8 lit

Answer: A

Watch Video Solution

45. At $27^{\circ}C$, one mole of an ideal gas exerted a pressure of 0.821 atmospheres. What is its volume in litres ? $\left(R = 0.082\text{lit-atm/mol}^{-1}K^{-1}\right)$

A. 300

B. 30

C. 0.3

D. 3

Answer: B

Watch Video Solution

46. A bulb of unknown volume 'V' Contains an ideal gas at 2 atm pressure. It was connected to another evacuated bulb of volume 0.5 litre through a stopcock. When the stopcock was opened the pressure in each bulb became 0.5 atm. Then V is

A. $0.1L$

B. $0.3L$

C. $1.7L$

D. $3.0L$

Answer: A

Watch Video Solution

47. 2gm of hydrogen is present in a closed vessel at S.T.P. If the same quantity of another gas 'X' when introduced into the vessel the pressure becomes 1.5 atm. The gas 'X' would be

A. CH_4

B. SO_2

C. He

D. O_2

Answer: C

Watch Video Solution

48. An open vessel at $27^\circ C$ is heated until 2/5 th of the air in it has expelled . Assuming the volume of the vessel remains constant , the temperature to which the vessel has been heated is

A. $477^\circ C$

B. $227^\circ C$

C. $377^\circ C$

D. $500^\circ C$

Answer: B

Watch Video Solution

49. An open bulb containing air at $19^{\circ} C$ was cooled to a certain temperature at which the number of moles of the gaseous molecules increased by 25% . The final temperature is

A. $-39.4^{\circ} C$

B. $233.6^{\circ} C$

C. $39.4^{\circ} C$

D. $240^{\circ} C$

Answer: A

Watch Video Solution

50. A five litre flask contains 3.5gm of $N_2 3 g of H_2$ and $8 g$ of O_2 at $27^{\circ} C$. The total pressure exerted by the mixture of these gases is

A. 90 atm

B. 0.9 atm

C. 9 atm

D. 900 atm

Answer: C

Watch Video Solution

51. If 10 gm of a gas at atmospheric pressure is cooled from 273°C to 0°C keeping the volume constant, its pressure would become

A. 2 atm

B. 273 atm

C. $1/273$ atm

D. $1/2$ atm

Answer: D

Watch Video Solution

52. The molecular weights of two ideal gases A and B are respectively 100 and 200. One gram of A occupies V litres of volume at STP. What is the volume (in litres) occupied by one gram of B at STP ?

A. V/2

B. V

C. V^2

D. $2V$

Answer: A

Watch Video Solution

53. A gas occupies a volume of 300 cc at $27^{\circ}C$ and 620 mm pressure. The volume of the gas at $47^{\circ}C$ and 640 mm pressure is

A. 260

B. 310

C. 390

D. 450

Answer: B

Watch Video Solution

54. Two samples of gases 'a' and 'b' are at the same temperature. The molecules of 'a' are travelling 4 times faster than molecules of 'b'. The ratio of M_a/M_b will be

A. $1/4$

B. $16/1$

C. $4/1$

D. $1/16$

Answer: D

Watch Video Solution

55. A bulb of unknown volume 'V' Contains an ideal gas at 2 atm pressure. It was connected to another evacuated bulb of volume 0.5 litre through a stopcock. When the stopcock was opened the pressure in each bulb became 0.5 atm. Then V is

A. $21cc$

B. $42c, c$

C. $105cc$

D. $63cc$

Answer: A

Watch Video Solution

56. Rate of diffusion of gases is not influenced by

A. Both A and R are correct. R is the correct explanation of A.

B. Both A and R are correct. R is not the correct explanation of A.

C. A is true, but R is false

D. A is false, but R is true

Answer: A

Watch Video Solution

57. Under the same conditions the rates of diffusion of two gases are in the ratio 1:4. The ratio of their vapour densities is

A. $2:1$

B. $1:2$

C. $16:1$

D. $1:16$

Answer: C

Watch Video Solution

58. The rate of diffusion of methane at given temperature is twice that of gas 'X'. The Molecular weight of 'X' is

A. 32

B. 16

C. 8

D. 64

Answer: D

Watch Video Solution

59. 2 grams of Helium diffuses from a porous plate in 4min. How many grams of CH_4 would diffuse through the same plate in same time under similar conditions?

A. 4g

B. $16g$

C. $8g$

D. $2g$

Answer: A

Watch Video Solution

60. $350cm^3$ of $CH4$ and $175cm^3$ of an unknown gas 'A' diffused in the same time under similar conditions. The molecular mass of gas A is

A. 32

B. 64

C. 30

D. 71

Answer: B

Watch Video Solution

61. At what temperature will the rate of diffusion of N_2 be 1.6 times the rate of diffusion of SO_2 at 27°C?

A. $336^{\circ} C$

B. $300K$

C. $50^{\circ} K$

D. $63^{\circ} C$

Answer: D

Watch Video Solution

62. 50 ml of oxygen diffuses under certain conditions through a porous membrane. The volume of Hydrogen that diffuses in the same time under the same conditions is

A. 12.5 ml

B. `25 ml

C. 100 ml

D. 200 ml

Answer: D

Watch Video Solution

63. A certain volume of Methane diffuses in 10 Sec through a porous partition. The time taken by an equal volume of oxygen to diffuse under the same condition is

A. 14.14sec

B. 7.07sec

C. 20sec

D. 5sec

Answer: A

Watch Video Solution

64. A pre-weighed vessel was filled with oxygen at NTP and weighed. It was then evacuated, filled with SO_2 at the same temperature and pressure and again weighed. The weight of oxygen will be

A. The same as SO_2

B. 1/2 that of SO_2

C. Twice that of SO_2

D. 1/4 that of SO_2

Answer: B

Watch Video Solution

65. The reaction between gaseous NH_3 and HBr produces a white solid NH_4Br. Suppose that NH_3 and HBr are introduced simultaneously into the opposite ends of an open tube of 1 metre length. Where would you expect the white solid to form?

A. At a distance of 34.45 cm from NH_3 end

B. At a distance of 68.5 cm from NH_3 end

C. At a distance of 44.45 cm from HBr end

D. At a distance of 45.45 cm from HBr end

Answer: B

Watch Video Solution

66. If the molecules of SO_2 effuse a distance of 150cm in a certain period of time, the distance travelled by the molecules of CH_4 effusing in the same time is

A. 300 cm

B. $600cm$

C. $37.5cm$

D. 75 cm

Answer: A

Watch Video Solution

67. A vessel contains equal number of moles of helium and methane. Through a small orifice the half of gas effused out. The ratio of the number of mole of helium and methane remaining in the vessel is

A. $2:1$

B. $1:2$

C. $1:4$

D. $4:1$

Answer: B

Watch Video Solution

68. A vessel contains equal volumes of SO_2 and CH_4 Through a small hole, the gases effused into vacuum. After 200sec, the total volume is reduced to half. What is the ratio of SO_2 and CH_4 remaining in the vessel?

A. $1:2$

B. $2:1$

C. $1:1$

D. $1:4$

Answer: B

Watch Video Solution

69. 180ml of hydrocarbon having a molecular weight 16 diffuses in 1.5 min. Under similar conditions time taken by 120ml of So, to diffuse is

A. 2 min

B. 1.5 min

C. 1 min

D. 1.75 min

Answer: A

Watch Video Solution

70. CH_4 diffuses two times faster than a gas X. The number of molecules present in 32 g of gas X is (N is Avogadro number)

A. N

B. $\frac{N}{2}$

C. $\frac{N}{4}$

D. $\frac{N}{16}$

Answer: B

Watch Video Solution

71. If 240mL of a gas X diffuses through a porous membrane in 20 min whereas the same volume of methane diffuses in 10 min at the same temperature and pressure, the molar mass in g mol^{-1} of gas X is

A. 128

B. 8

C. 64

D. 32

Answer: C

Watch Video Solution

72. X ml of H_2 gas effuses through a hole in a container in 5 sec. The time taken for the effusion of same volume of gas specified below under identical conditions is

A. 10 sec, He

B. 20 sec, O_2

C. 25sec, CO

D. 55sec, CO_2

Answer: B

Watch Video Solution

73. Under similar conditions, 390$cm^{\#}$ of gas A of molar mass M_A and 130 cm^3 of gas B of molar mass M_B diffuesed out through a porous container i nthe time ratio of 2:1. The ratio of M_A to M_B is

A. $3:8$

B. $8:3$

C. $4:9$

D. $9:4$

Answer: C

Watch Video Solution

74. A sample of water gas contains 42% by volume of carbon monoxide. If the total pressure is 760 mm. the partial pressure of carbon monoxide is

A. 380 m.m.

B. 319.2 m.

C. 38 m.m

D. 360 m.m

Answer: B

Watch Video Solution

75. A 600 ml vessel containing oxygen at 800 mm and a 400 ml vessel containing Nitrogen at 600 mm at the same temperature are kept in communication with each other through a stop-cock. Neglecting the volume of the stopcock, the final pressure of the mixture is

A. 1400 m.m.

B. 1000 m.m

C. 720 m.m

D. 700 m.m

Answer: C

Watch Video Solution

76. Two identical vessels are filled with 44g of Hydrogen and 44g of carbon dioxide at the same temperature. If the pressure of CO_2 is 2 atm, the pressure of Hydrogen is

A. 1 atm

B. 44 atm

C. 2 atm

D. 22 atm

Answer: B

Watch Video Solution

77. A gaseous mixture of three gases A, B and C has a pressure of 10atm. The total number of moles of all the gases is 10. The partial pressure of A and B are 3 and I am respectively. If C has a molecular weight of 2, what is the weight of C in grams present in the mixture?

A. 6

B. 3

C. 12

D. 8

Answer: C

Watch Video Solution

78. The total pressure of a mixture of 6.4 grams of oxygen and 5.6 grams of nitrogen present in a 2 lit vessel is 1200mm. What is the partial pressure of nitrogen in mm?

A. 1200

B. 600

C. 900

D. 200

Answer: B

Watch Video Solution

79. At $27^{\circ}C$, a closed vessel contains a mixture of equal weights of helium (mol.wt = 4) , methane (mol.wt = 16) and sulphur dioxide (mol.wt = 64) . The pressure exerted by the mixture is 210 mm . If the partial pressures of helium , methane and sulphurdioxide are P_1, P_2 and P_3 respectively , which one of the following is correct ?

A. $P_3 > P_2 > P_1$

B. $P_1 > P_2 > P_3$

C. $P_1 > P_3 > P_2$

D. $P_2 > P_3 > P_1$

Answer: B

Watch Video Solution

80. A and B are ideal gases. The molecular weights of A and B are in the ratio of 1 : 4. The pressure of a gas mixture containing equal weights of A and B is P atm. What is the partial pressure (in atm) of B in the mixture?

A. $P/5$

B. $P/2$

C. $P/2.5$

D. $3P/4$

Answer: A

Watch Video Solution

81. In a mixture of N_2 and CO_2 gases, the partial pressure of CO_2 is 1.25 atm. The total pressure of the mixture is 5 atm. The mole fraction of N_2 in the mixture is

A. 0.82

B. 0.75

C. 0.80

D. 0.65

Answer: B

Watch Video Solution

82. 0.157g of a certain gas collected over water occupies a volume of 135ml at 27°C and 750mm of Hg. Assuming ideal behaviour, the molecular weight of the gas is (aqueous tension at 27°C is 26.7 mm of Hg)

A. 30

B. 32

C. 28

D. 16

Answer: C

Watch Video Solution

83. In a ten litre vessel, the total pressure of a gaseous mixture containing H_2, N_2 and CO_2 is 9.8atm. The partial pressures of H_2 and N_2 are 3.7 and 4.2 atm respectively. Then the partial pressure of CO_2 is

A. 1.9 atm

B. 0.19 atm

C. 2.4 atm

D. 0.019 atm

Answer: A

Watch Video Solution

84. A mixture contains 16g of oxygen, 28g of nitrogen and 8g of methane. Total pressure of the mixture is 740mm. What is the partial pressure of nitrogen in mm? (E-1999)

A. 185

B. 370

C. 555

D. 740

Answer: B

Watch Video Solution

85. Equal weights of methane and oxygen are mixed in an empty container at 250C. The fraction of the total pressure exerted by oxygen is

A. $1/2$

B. $2/3$

C. $1/4$

D. $1/3$

Answer: D

Watch Video Solution

86. Pressure exerted by 2 grams of helium present in a vessel is 1.5 atm. If 4 grams of gas 'x' is introduced into the same vessel keeping the condition constant, the pressure is 2.25 atm Gas 'x' is

A. hydrogen

B. methane

C. oxygen

D. sulphurdioxide

Answer: B

Watch Video Solution

87. A certain quantity of a gas occupies 100ml when collected over water at 15°C and 750mm pressure. If it occupies 91.9ml in dry state at STP, the vapour pressure of water at 15°C is

A. 12.8mm

B. 14.8mm

C. 13.2mm

D. 13.7mm

Answer: C

Watch Video Solution

88. A sample of air contains Nitrogen, Oxygen and saturated with water vapour under a total pressure of 640 mm. If the vapour pressure of water at that temperature is 40 mm and the molecular ratio of $N_2 : O_2$ is 3:1, the partial pressure of Nitrogen in the sample is

A. 480 mm.

B. 600 mm

C. 450 mm.

D. 160 mm.

Answer: C

Watch Video Solution

89. The average kinetic energies of helium (mol.wt.4), methane (mol.wt.16) and sulphurdioxide (mol.wt.64), at certain temperature are respectively x, y and z kJ mol^{-1}. The ratio of x, y and z is

A. $1:4:16$

B. $1:2:4$

C. $1:1:1$

D. $4:2:1$

Answer: C

Watch Video Solution

90. The temperature at which Methane molecules have the same average Kinetic energy as that of oxygen molecules at 27°C is

A. $327\,^{\circ}C$

B. $27\,^{\circ}C$

C. $927^\circ C$

D. $627^\circ C$

Answer: B

Watch Video Solution

91. The kinetic energy of 1 mole of oxygen molecules in cal mol^{-1} at 27°C

A. 300

B. 600

C. 900

D. 800

Answer: C

Watch Video Solution

92. The average K.E. of an ideal gas per molecule in SI units at 25° C is

A. $6.17 \times 10^{-21} KJ$

B. $6.17 \times 10^{-21} J$

C. $6.17 \times 10^{-20} J$

D. $7.16 \times 10^{-20} J$

Answer: B

Watch Video Solution

93. The kinetic energy of 'N' molecules of H_2 is 3J at -73°C. The kinetic energy of the same sample of H_2 at 127°C is

A. $12J$

B. $6J$

C. $9J$

D. $3J$

Answer: B

Watch Video Solution

94. SO_2 , molecule is twice as heavy as O_2 molecule. Hence at 25°C the ratio of the average kinetic energies of Sulphur dioxide and oxygen is

A. $1:1$

B. $2:1$

C. $1:2$

D. $4:1$

Answer: A

Watch Video Solution

95. The ratio of the kinetic energies of equal number of moles of H_2 and He at the same temperature is

A. $1:2$

B. $2:1$

C. $1:1$

D. $4:1$

Answer: C

Watch Video Solution

96. A cubical vessel has a side with 'l' cm length contained a gas at a pressure of 'P'. When the side of the vessel is made l/2 cm, the pressure of the gas becomes

A. P

B. $P/8$

C. $2P$

D. $8P$

Answer: D

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97. Calculate the kinetic energy of 5 moles of O_2 at $37^\circ C$.

A. $19330J$

B. $6443J$

C. 12886 J

D. $38660J$

Answer: A

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98. The rms velocity of CO_2 at a temperature, T (in kelvin) is x $eras^1$. At what temperature (in kelvin), the rms velocity of nitrous oxide would be 4 x ems^{-1}? (Atomic weights of C, N and O are 12, 14 and 16 respectively),

A. 16 T

B. 2T

C. 4T

D. 32 T

Answer: A

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99. When the temperature of a gas is raised from $27^\circ C$ to $927^\circ C$, its RMS velocity

A. gets halved

B. gets doubled

C. remains same

D. becomes $\sqrt{\frac{927}{27}}$ times

Answer: B

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100. RMS velocity of a gas at a given temperature is how much factor higher than its most probable velocity

A. $\frac{3}{2}$

B. $\frac{\sqrt{3}}{2}$

C. $\sqrt{\frac{3}{2}}$

D. $2/3$

Answer: C

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101. At a given temperature the ratio of RMS and average velocities is

A. $1.086:1$

B. $1:1.086$

C. $2 : 1.086$

D. $1.086 : 2$

Answer: A

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102. If a gas contains only three molecules that move with velocities of 100,200, 500 ms^{-1}. What is the rms velocity of that gas in ms^{-1} ?

A. $100\sqrt{8/3}$

B. $100\sqrt{3}$

C. $100\sqrt{10}$

D. $800/2$

Answer: C

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103. The rms velocity of hydrogen is $\sqrt{7}$ times to that of nitrogen. If T is temperalure of the gas, then

A. $T_{H_2} = T_{N_2}$

B. $T_{H_2} > T_{N_2}$

C. $T_{H_2} < T_{N_2}$

D. $T_{H_2} = \sqrt{7} T_{N_2}$

Answer: C

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104. The RMS velocity of a gas at 0°C is 2m/s. The RMS velocity of the same gas at 819°C

A. $1m/s$

B. $4m/s$

C. $8m/s$

D. $16 m / s$

Answer: B

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105. At the same temperature carbon monoxide molecules have the same most probable velocity as the molecules of

A. Nitrogen dioxide

B. Nitrogen

C. Nitrous Oxide

D. Oxygen

Answer: B

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

A. $\sqrt{\frac{3}{5}}$

B. $\sqrt{\frac{1}{4}}$

C. $\sqrt{\frac{4}{3}}$

D. $\sqrt{\frac{2}{3}}$

Answer: D

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107. At what temperature the most probable velocity of O_2 gas is equal to the RMS velocity of O_2 at 't' $^\circ C$?

A. $(273 + t)\sqrt{\frac{3}{2}K}$

B. $(273 + t)\sqrt{\frac{2}{3K}}$

C. $(273 + t)K$

D. $\frac{3}{2}(273 + t)K$

Answer: C

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108. What is the RMS speed of a moist particle of mass 10^{-12} g at 27°C according to kinetic molecular theory?

A. 0.35 cm/sec

B. 0.45 cm/sec

C. 0.6 cm/sec

D. 0.7 cm/sec

Answer: A

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109. The temperature at which the average speed of oxygen molecules is double that of the same molecules at $0^{\circ} C$ is

A. 546 K

B. $1092K$

C. $277K$

D. $1911^{\circ} C$

Answer: B

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110. The most probable velocity of the molecules of a gas is 1 km/sec. The R.M.S velocity of the molecules is

A. $1.128 km / \sec$

B. $1.224 km / \sec$

C. $1.5 km / \sec$

D. $1.086 km/\sec$

Answer: B

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111. The average speed at $T_1 K$ and most probable speed at $T_2 K$ of CO_2 gas is 9×10^4 cm/sec. The values of T_1 and T_2 are

A. 2143K, 1694K

B. 2126K, 1726K

C. 1684 K, 2143K

D. 1684K, 3368K

Answer: C

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112. Air is cooled from $25\,^\circ C$ to $0\,^\circ C$. Calculate the decrease in rms speed of the molecules.

A. $4\,\%$

B. $12\,\%$

C. $29\,\%$

D. $50\,\%$

Answer: C

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113. If two gases of molecular weights M_A and M_B at temperature T_A and T_B are taken such that, $T_AM_B = T_BM_A$, then which property has the same magnitude for both the gases.

A. Pressure

B. Kinetic energy

C. RMS velocity

D. Density

Answer: C

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114. A uniform glass tube of 100 cm length is connected to a bulb containing hydrogen at one end and and another bulb containing oxygen at the other end at the same temperature and pressure. The two gases meet for the first time at the following distance from the oxygen end

A. 80 cm

B. 50 cm

C. 20 cm

D. 6.66 cm

Answer: C

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115. The density of an ideal gas is 0.03 g/cm^3, its pressure is 10^6 dy/cm^2. What is its R.M.S velocity (in cm/s)?

A. 10^8

B. 3×20^4

C. 10^6

D. 10^4

Answer: D

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116. The rms velocity of an ideal gas at 300 K is 12240 ems^{-1}, what is the most probable velocity at that temperature?

A. 10000

B. 11280

C. 1000

D. 12240

Answer: A

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117. The rms speed of helium in ms^{-1} (atomic mass = 4.0g mol^{-1}) at 400K is

A. 1580

B. 15.8

C. 28

D. 158

Answer: A

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118. The density of a gas is l gm/lit at STP. At 6 atm pressure and $546\,^{\circ}C$, ihe density of the same gas is

A. $\sqrt{\frac{3 \times 76 \times 13.6 \times 981}{1.25}}$

B. $\sqrt{\frac{3 \times 76 \times 13.6 \times 981}{1.25 \times 1000}}$

C. $\sqrt{\frac{3 \times 76 \times 13.6 \times 981 \times 1000}{1.25}}$

D. $\sqrt{\frac{2 \times 76 \times 13.6 \times 981 \times 1000}{1.25}}$

Answer: C

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119. The rms velocity of an ideal gas at 300 K is 12240 ems^{-1}, what is the most probable velocity at that temperature?

A. 10000

B. 112800

C. 1000

D. 122400

Answer: A

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120. At what temperature the velocity of O_2 molecules will have the same velocity as SO_2 at 47ºC?

A. $113^\circ C$

B. $160^\circ C$

C. $-113^\circ C$

D. $-160^\circ C$

Answer: C

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121. In Vander Waal's equation of state of the gas law, the constant 'b' is a measure of

A. Volume occupied by the molecules

B. Intermolecular attractions

C. Intermolecular repulsions

D. Intermolecular collisions per unit volume

Answer: A

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122. A vessel of 25 litre capacity contains 10 moles of steam under pressure of 50.3 atm. Calculate the temperature of steam using van der Waals equation (if for water a=5.46 bar $L^2 mol^{-2}$ and $b = 0.031 L mol^{-1}$)

A. 1539.5K

B. 153.95K

C. 15.395K

D. 1.5395K

Answer: A

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123. The compression factor (compressibility factor) for one mole of a van der Waals gas at 0ºC and 100 atmospheric pressure is found to be 0.5. Assuming that the volume of a gas molecule is negligible, calculate the van der Waals constant a.

A. 1.253 atm lit$^2 mol^{-2}$

B. 12.53 atm lit$^2 mol^{-2}$

C. 0.125 atm lit$^2 mol^{-2}$

D. 22.53 atm lit$^2 mol^{-2}$

Answer: A

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124. The boiling point of water in pressure cooker is

A. $100\ ^\circ C$

B. $> 100\ ^\circ C$

C. $< 100\ ^\circ C$

D. $25\ ^\circ C$

Answer: B

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125. The gas that liquefies first, when cooled from 500K to its critical temperature given in parenthesis is

A. $O_2(154.3K)$

B. $NH_3(405.5K)$

C. $CO_2(304.1K)$

D. $N_2(126.0K)$

Answer: B

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126. Critical temperature is least for

A. H_2

B. He

C. CH_4

D. CO

Answer: B

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127. For a van der Waal's gas, determine Boyle Temperature (given a = 4.5 atm$L^2 mol^{-2}$, $b = 0.9 L mol^{-1}$ and $R = 0.082 L atm K^{-1} mol^{-1}$]

A. $609.8K$

B. $6.09K$

C. $273K$

D. $60.98K$

Answer: D

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128. The viscosity of four liquids P, Q, R and S are 85, 11.4, 18 and 12.3 respectively, then which flows slowly

A. P

B. Q

C. R

D. S

Answer: A

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129. Which one of the following statements is not correct?

A. The kinetic energy of a gas is inversely proportional to temperature (ink).

B. For ideal gases, compressibility factor, z=1 at all temperatures and pressures.

C. Viscosity of a liquid decreases with increasing temperature.

D. The order of velocity values of a gas is $U_{rms} > U_{av} > U_{mp}$

Answer: A

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130. When the temperature is increased, surface tension of water

A. increases

B. decreases

C. reamins constant

D. shows irregular behaviour

Answer: B

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131. Regarding the surface tension property of liquids, the correct statements is/are a) surface tension decreases with increase of temperature b) at $20^{\circ}C$ the surface tension of ethanol is greater than that of water c) the dimensions of surface tension is SI units is Nm^{-1} d) in the fine polishing of the glass, the edges become smooth due to surface tension

A. a and b only

B. a, c and d only

C. a and d only

D. b only

Answer: B

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132. Which of the following expression regarding the unit of coefficient of viscosity is not true?

A. Dynes cm^{-2}s

B. Dynes $cm^{-2}s^{-1}$

C. $Nm^{-2}s$

D. Poise $= 10^{-1}kgm^{-1}s^{-1}$

Answer: B

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133. The surface tension of water at 20°C is 72.75 dyne cm^{-1} . Its value in SI system is

A. 2.275 N m^{-1}

B. 0.7275 N m^{-1}

C. 0.07275 N m^{-1}

D. None of the above

Answer: C

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134. Water drops stick to a glass surface due to

A. Cohesion

B. Adhesion

C. Flocculation

D. None of these

Answer: B

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135. When mercury is dropped over a glass surface the globules are spherical which is due to its

A. Viscosity

B. Surface tension

C. Fluidity

D. Metallic nature

Answer: B

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136. Incorrect statement in the following is

A. Dipole - dipole attractions are more, if the molecules have high dipolemoment values.

B. In liquid HBr, dipole - dipole attractions are present.

C. Dipole - dipole interaction energy between polar molecules as in solids $\propto r^{-3}$

D. Dipole - dipole interaction energy between rotating molecules $\propto r^{6}$

Answer: D

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137. London forces are stronger, except in

A. bigger atoms or molecules than in smaller atoms or molecules

B. more spread shaped molecules than less spread molecules

C. 2,2-dimethyl propane than in pentane

D. I_2 is more polarisable than F_2

Answer: C

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138. F_2, is gas but I_2 is solid, because

A. Larger London forces are present in I_2 when compared with F_2

B. Lesser number of London forces are present in I_2 when compared with F_2

C. F_2 and I_2 have same extent of London forces

D. I_2 has low bond dissociation energy

Answer: A

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139. The average energy of London forces is

A. 1 to 2 kJ/mole

B. 1 to 10 kJ/mole

C. 10 to 20 kJ/mole

D. 20 to 30 kJ/mole

Answer: B

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140. The intermolecular force of attraction present between NH_3 and C_6H_6 are

A. Dipole - Dipole

B. Ion - Dipole 3

C. Dipole - Induced dipole

D. Dispersion forces

Answer: C

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OBJECTIVE EXERCISE -3

1. Van der Waal's real gas, acts as an ideal gas, at which conditions

A. High temperature, low pressure

B. Low temperature, high pressure

C. High temperature, high pressure

D. Low temperature, low pressure

Answer: A

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2. Volume occupied by one molecule of water (density = 1g cm^{-3}) is

A. $3.0 \times 10^{-23} cm^3$

B. $5.5 \times 10^{-23} cm^3$

C. $9.0 \times 10^{-23} cm^3$

D. $6.023 \times 10^{-23} cm^3$

Answer: A

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3. If a gas expands at constant temperature.

A. kinetic energy of molecules remains the same

B. number of the molecules of gas increases

C. kinetic energy of molecules decreases

D. pressure of the gas increases

Answer: A

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4. The energy absorbed by each molecule (A_2) of a substance is $4.4 \times 10^{-19} J$and bond energy per molecule is $4.0 \times 10^{-19} J$. The kinetic energy of the molecule per atom will be

A. $2.2 \times 10^{-19} J$

B. $2.0 \times 10^{-19} J$

C. $4.0 \times 10^{-20} J$

D. $2.0 \times 10^{-20} J$

Answer: D

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5. The pressure exerted by 6.0 g fo methane gas in 0.03m^3 vessel at $129\ ^\circ C$ is (Atomic masses : C = 12.01, H = 1.01 and R = 8.314$JK^{-1} mol^{-1}$)

A. 215216 Pa

B. 13409Pa

C. 41648 Pa

D. 31684 Pa

Answer: C

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6. A bubble of air is underwater at temperature $15^{\circ}C$ and the pressure 1.5 bar. If the bubble rises to the surface where the temperature is $25^{\circ}C$ and the pressure is 1.0 bar, what will happen to the volume of the bubble?

A. volume will become greater by a factor of 1.6

B. volume will become greater by a factor of 1.1

C. volume will become smaller by a factor of 0.70

D. volume will become greater by a factor of 2.5

Answer: A

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7. A gaseous mixture was prepared by taking equal mole of CO and N_2 If the total pressure of the mixture of the nitrogen (N_2) in the mixture is

A. 0.5 atm

B. 0.8 atm

C. 0.9 atm

D. 1 atm

Answer: A

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8. 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

A. 50.00u

B. 12.25u

C. 6.50u

D. 25.00u

Answer: B

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9. By what factor does the average velocity of a gaseous molecule increase when the temperature (in Kelvin) is doubled?

A. 2.0

B. 2.8

C. 4.0

D. 1.4

Answer: D

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10. Equal volumes of two monatomic gases, A and B at same temperature and pressure are mixed. The ratio of specific heats $\left(C_p/C_v\right)$ of the mixture will be

A. 0.83

B. 1.50

C. 3.3

D. 1.67

Answer: D

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11. For real gases van der Waals equation is written as $\left(P+\frac{an^2}{V^2}\right)(V-nb)=nRT$ where a and b are van der Waals constants two sets of gases are

$(I) O_2, CO_2, H_2$ and He

$(II) CH_4, O_2$ and H_2

The gases given in set - I in increasing order of b and gases given in set - II in decreasing order of a, are arranged below. Select the correct order from the following

A. $(I) He < H_2 < CO_2 < O_2 (II) CH_4 > H_2 > O_2$

B. $(I) O_2 < He < H_2 < CO_2 (II) H_2 > O_2 > CH_4$

C. $(I) He < H_2 < O_2 < CO_2 (II) CH_4 > O_2 > H_2$

D. $(I) H_2 < O_2 < He < CO_2 (II) O_2 > CH_4 > H_2$

Answer: C

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

A. $27u$

B. $36u$

C. $64u$

D. $9u$

Answer: B

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13. What is the density of N_2 gas at $227^{\circ}C$ and 5.00atm. pressure? $\left(R = 0.082 L atm K^{-1} mol^{-1}\right)$

A. $1.40 g/mL$

B. $2.81 g/mL$

C. $3.41 g/mL$

D. $0.29 g/mL$

Answer: C

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14. Maximum deviation from ideal gas is expected from

A. $CH_{4(g)}$

B. $NH_{3(g)}$

C. $H_{2(g)}$

D. $N_{2(g)}$

Answer: B

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15. Dipole-induced dipole interactions are present in which of the following pairs

A. HCl and He atoms

B. SiF_4 and He atoms

C. H_2O and alcohol

D. Cl_2 and CCl_4

Answer: A

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16. Equal masses of H_2, O_2 and methane have been taken in a container of volume V at temperature $27^{\circ}C$ in identical conditions. The ratio of the volume of gases $H_2 : O_2$ methane would be

A. $8:16:1$

B. $16:8:1$

C. $16:1:2$

D. $8:1:2$

Answer: C

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17. A gas such as carbon monoxide would be most likely to obey the ideal gas law at

A. low temperature and high pressures

B. high temperature and high pressures

C. low temperature and low pressures

D. high temperatures and low pressures

Answer: D

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18. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape ?

A. $1/8$

B. $1/4$

C. $3/8$

D. $1/2$

Answer: A

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19. $HgCl_2$ and I_2 both when dissolved in water containing I^- ions the pair of species formed

A. Hg_2I_2, I^-

B. HgI_2, I_3^-

C. HgI_2, I^-

D. HgI_4^{2-}, I_3^-

Answer: D

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