CHEMISTRY

BOOKS - A2Z CHEMISTRY (HINGLISH)

STATES OF MATTER

Gas Law (Boyle'S Law, Gay - Lussac'S Law, Avogadro'S Law)

1. Which of the following is true about gaseous state?

A. Thermal energy = Molecular attraction

B. Thermal energy > Molecular attraction

C. Thermal energy < Molecular attraction

D. None of these

Answer: B

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2. A cylinder containing cooking gas can withstand a pressure of $15atm$. The pressure gauge of the cylinder indicates $12atm$ at $27^{\circ}C$. Due to a sudden fire in the building, the temperature starts rising. At what temperature will the cylinder explode?

A. $42.5^{\circ} C$

B. $67.8^{\circ} C$

C. $99.5^{\circ} C$

D. $25.7^{\circ} C$

Answer: C

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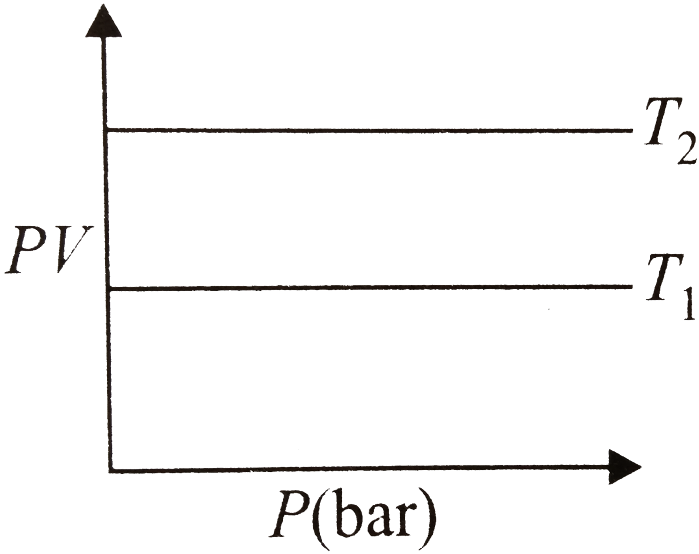
3. The product of PV is potted aginst P at two temperatures T_1 and T_2 and the 'result is shown in the figure. What is correct about T_1 and T_2?



A. $T_1 > T_2$

B. $T_2 > T_1$

C. $T_1 = T_2$

D. $T_1 + T_2 = 1$

Answer: B

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4. Which of the following statements is wrong for gases?

A. Gases do not have a definite shape and volume

B. Volume of the gas is equal to the volume of the container the gas

C. Confined gas exerts uniform pressure on the walls of its container in all directions.

D. Mass of the gas cannot be determined by weighing a container in which it is enclosed

Answer: D

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5. If $P, V, \text{ and } T$ represent pressure, volume and temperature of the gas, the correct representation of Boyle's law is

A. $V \propto \frac{1}{T}$ (at constant P)

B. $PV = RT$

C. $V \propto 1/P$ (at constant T)

D. $PV = nRT$

Answer: C

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6. If V_0 is the Volume of a given mass of gas at $273K$ at constant pressure, then according to Charles's law, the volume at $10^\circ C$ will be:

A. $10V_0$

B. $\frac{2}{273}(V_0 + 10)$

C. $V_0 + \frac{10}{273}$

D. $\frac{283}{273}V_0$

Answer: D

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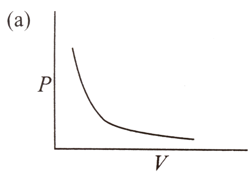
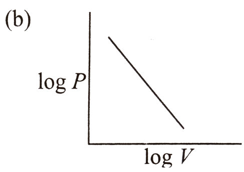
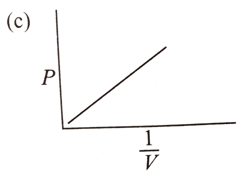
7. Which of the following curves does not represent Boyle's law?

A. 

B. 

C. 

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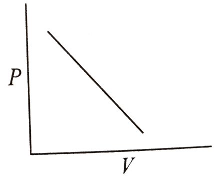
D. 

Answer: D

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8. Pressure remaining the same, the volume of a given mass of an ideal gas increases for every degree centigrade rise in temperature by define fraction of its volume at

A. $0^\circ C$

B. Its critical temperature

C. Absolute zero

D. Its Boyle temperature

Answer: A

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9. O_2 gas at STP contained in a flask was replaced by SO_2 under same conditions. The weight of SO_2 will be

A. half

B. one-fourth

C. twice

D. four times

Answer: C

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10. For the given ideal gas equation $PV = nRT$, answer the following questions:

At constant temperature, in a given mass of an ideal gas

A. The ratio of pressure and volume always remains constant

B. Volume always remains constant

C. Pressure always remains constant

D. The product of pressure and volume always remains constant.

Answer: D

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11. According to Charles's law

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. none

Answer: A

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12. A gas at a pressure of 5.0 atm is heated from $0^\circ C$ to $546^\circ C$ and simultaneously compressed to one-third of its original volume. Hence final pressure is

A. $10.0 atm$

B. $30.0 atm$

C. $45.0atm$

D. $5.0atm$

Answer: C

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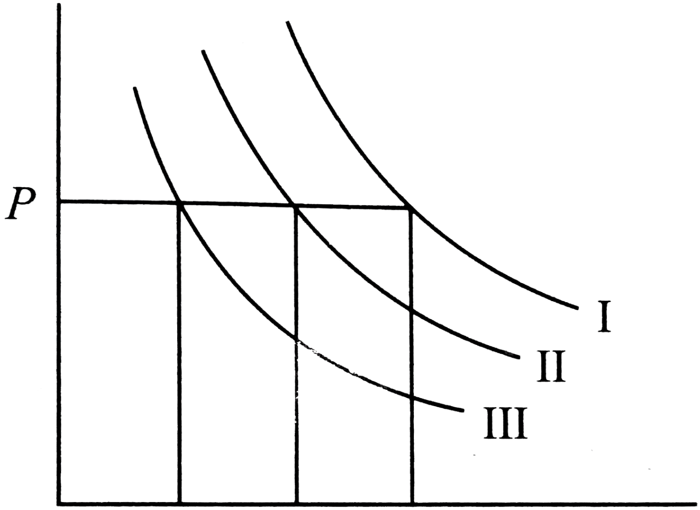
13. I, II, and III are three istherms, respectively, at T_1, T_2, and T_3. Temperature will be in order



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: C

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14. A certain sample of gas has a volume of 0.2 litre measured at $1 atm$ pressure and $0^{\circ} C$. At the same pressure but at $273^{\circ} C$, its volume will be

A. $0.4 litres$

B. $0.8 litres$

C. $27.8^{\circ} C,$

D. 55.6 litres

Answer: A

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15. An open vessel containing air is heated form $300K$ to $400K$. The fraction of air originally present which goes out of it is at $400K$

A. $3/4$

B. $1/3$

C. $2/3$

D. $1/8$

Answer: B

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16. Air at sea level is dense. This is a practical application of

A. Boyle's law

B. Charles's law

C. Avogardo's law

D. Dalton's law

Answer: A

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17. $400 cm^3$ of oxygen at $27^\circ C$ were cooled to $-3^\circ C$ without change in pressure. The contraction in volume will be as per Boyle's law?

A. $40 cm^3$

B. $30 cm^3$

C. $44.4 cm^3$

D. $360 cm^3$

Answer: A

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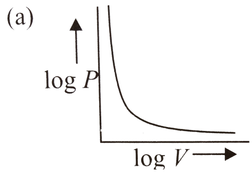
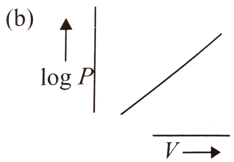
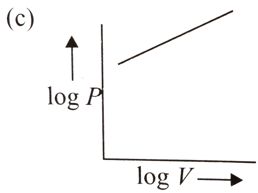
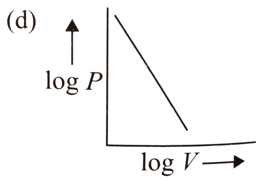
18. Which of the following represent $\log P vs. \log V$ variation as per Boyle's law?

A. 

B. 

C. 

D. 

Answer: D

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19. If $20cm^3$ gas at $1atm$ is expanded to $50cm^3$ at constant T, then what is the final pressure

A. $20 \times \frac{1}{50}$

B. $50 \times \frac{1}{20}$

C. $1 \times \frac{1}{20} \times 50$

D. None of these

Answer: A

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20. If the pressure of a gas contined in closed vessel in increased by 0.4% when heated by $1K$, its initial temperature must be:

A. $250K$

B. $250^\circ C$

C. $25^\circ C$

D. $25K$

Answer: A

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21. $300ml$ of a gas at $27^{\circ}C$ is cooled to $-3^{\circ}C$ at constant pressure, the final volume is

A. $540ml$

B. $135ml$

C. $270ml$

D. $350ml$

Answer: C

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22. A sample of gas at $35^{\circ}C$ and $1atm$ pressure occupies a volume of 3.75 litres. At what temperature should the gas be keep if it si required should the gas be keep if it is required to reduce the volume to 3 litres a the same pressure:

A. $-26.6^{\circ}C$

B. $0^{\circ}C$

C. $3.98^{\circ}C$

D. $28^{\circ}C$

Answer: A

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23. Which of the following statement is false?

A. The product of pressure and volume of fixed amount of a gas is independent of temperature

B. Molecules of different gases have the same KE at a given temperatue

C. The gas equation is not valid at high pressure and low temperature

D. The gas constant per molecule is known as Boltzmann constant

Answer: A

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24. Two closed vessels of equal volume containing air at pressure P_1 and temperature T_1 are connected to each other through a narrow tube. If the temperature in one of the vessels is now maintained at T_1 and that in the other at T_2, what will be the pressure in the vessels?

A. $\dfrac{2P_1T_1}{T_1 + T_2}$

B. $\dfrac{T_1}{2P_1T_2}$

C. $\frac{2P_1T_2}{T_1 + T_2}$

D. $\frac{2P_1}{T_1 + T_2}$

Answer: C

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25. As per Boyle's law which of the following is/are kept constant?

A. Pressure

B. Mass

C. Temperature

D. Mass and temperature both

Answer: D

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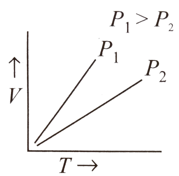
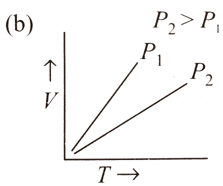
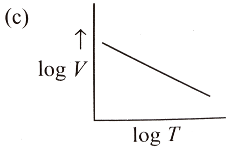
26. Which of the folloiwng graph is/are correct as per charles law?

A. 

B. 

C. 

D. Both (b) and (c) are correct

Answer: B

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27. Volume of the air that will be expelled from a vessel of $300cm^3$ when it is heated from $27^\circ C$ to $37^\circ C$ at the same pressure will be

A. $310cm^3$

B. $290cm^3$

C. $10cm^3$

D. $37cm^3$

Answer: C

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28. As per Charles law which of the following is/are correct

A. Pressure remains definite

B. Mass remains definite

C. volume is proportional to the absolute temperature

D. All of the above are correct

Answer: D

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29. To determine the value of R, which of the PV value is considered to be equal for every gas at $273K$?

A. $\lim_{P \to 1atm} (PV_m)$

B. $\lim_{P \to 0} (PV_m)$

C. $\lim_{P \to \infty} (PV_m)$

D. $\lim_{V \to 0} (PV_m)$

Answer: B

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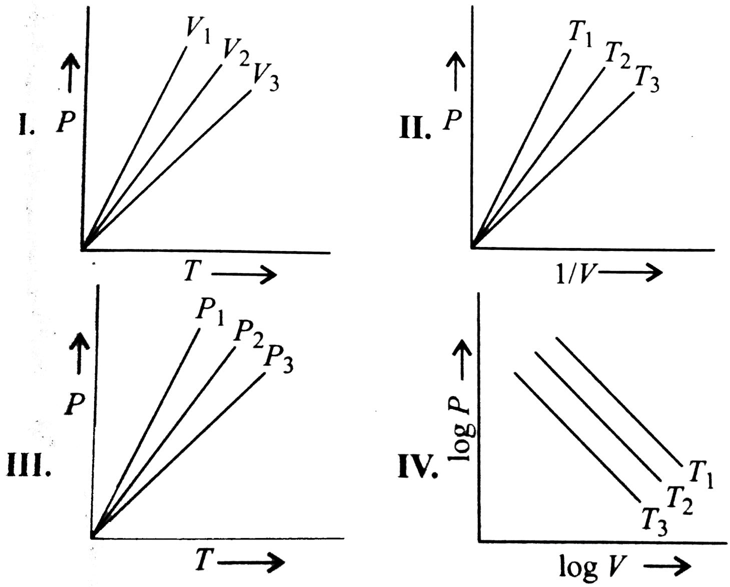
30. For $1 mol$ of an ideal gas, $V_1 > V_2 > V_3$ in fig. (I), $T_1 > T_2 > T_3$ in fig. (II), $P_1 > P_2 > P_3$ in fig. (III), and $T_1 > T_2 > T_3$ in fig. (IV) , then which curves are correct.



A. I, II

B. I, II, III

C. II, IV

D. I, III, IV

Answer: C

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31. At definite temperature the volume of a definite mass of gas is $10L$ at $5atm$ pressure, at the same temperature if the pressure of the gas is decreased to $1atm$, the volume of same gas becomes

A. $50L$

B. $2L$

C. $5L$

D. $0.5L$

Answer: A

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Ideal Gas Equation

1. If the pressure of a given mass of gas is reduced to half and temperature is doubled simultaneously the volume will be

A. Same as before

B. Twice as before

C. $1/4$ the as before

D. None

Answer: D

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2. Calculate the total pressure in a mixture of $4g$ of oxygen and $2g$ of hydrogen confined in a total volume of $1L$ at $0^\circ C$.

A. $25.184 atm$

B. $31.205 atm$

C. $45.215 atm$

D. $15.210 atm$

Answer: A

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3. A $0.5dm^3$ flask contains gas A and $1dm^3$ flask contains gas B at the same temperature. If density of $A = 3g/dm^3$ and that of $B = 1.5g/dm^3$ and the molar mass of $A = 1/2$ of B, the ratio of pressure excerted by gases is:

A. $\frac{P_A}{P_B} = 2$

B. $\frac{P_A}{P_B} = 1$

C. $\frac{P_A}{P_B} = 4$

D. $\frac{P_A}{P_B} = 3$

Answer: C

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4. In the equaiton $PV = nRT$, which one cannot be the numerical value of R

A. $8.31 \times 10^7 ergK^{-1}mol^{-1}$

B. $8.31 \times 10^7 \text{dyne}cmK^{-1}mol^{-1}$

C. $8.31JK^{-1}mol^{-1}$

D. $8.31atm.\ K^{-1}mol^{-1}$

Answer: D

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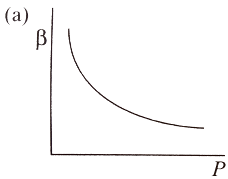
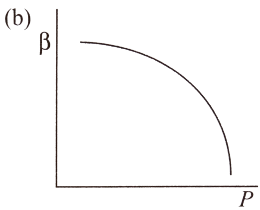
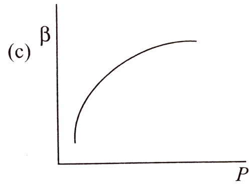
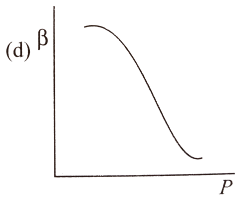
5. Which of the following graphs correctly represents the variation of $\beta = -\left(\frac{dV}{dP}\right)/V$ with P for an ideal gas at constant temperature

A. 

B. 

C. 

D. 

Answer: A

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6. When $100ml$ sample of methane and ethane along with excess of O_2 is subjected to electric spark, the contraction in volume was observed to be $212ml$.

When the resulting gases were passed through KOH solution, further contraction in volume was

A. $60 ml$

B. $96 ml$

C. $108 ml$

D. $124 ml$

Answer: D

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7. Densities of two gases are in the ratio $1:2$ and their temperatures are in the ratio $2:1$, then the ratio of their respective pressure is

A. $1:1$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: A

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8. Which of the following is/are incorrect regarding the universal gas constant (R)?

A. R is independent of pressure

B. R is independent of temperature

C. R is independent of volume of gas

D. R is dependent on nature of gas

Answer: D

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9. Liquefied natural gas (LNG) is mainly methane. A $10m^3$ tank is constructed to store LNG at - $164^\circ C$ and $1atm$ pressure,under this condition density of LNG is $415kg/m^3$. The volume of strorage tank capable of holding .... Mass of LNG as a gas at $20^{\circ} C$ and $1 atm$ pressure will be

A. $1250 m^3$

B. $5280 m^3$

C. $6230 m^3$

D. $9870 m^3$

Answer: C

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10. Two separate bulbs contain ideal gas A and B. The density of a gas A is twice that of a gas B. The molecular mass of A is half that of gas B. The two gases are at the same temperature. The ratio of the pressure of A to that gas B is

A. 2

B. $1/2$

C. 4

D. $1/4$

Answer: C

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11. If two mole of an ideal gas at $546K$ occupies a volume of $44.8 litres$, the pressure must be :

A. $2atm$

B. $3atm$

C. $4atm$

D. $1atm$

Answer: A

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12. The volume of a gas increased by a factor of 2 while the pressure decrease by a factor of 3. Given that the number of moles is unaffected, the factory by which the temperature changes is:

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

B. 3×2

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

D. $\frac{1}{2} \times 3$

Answer: C

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13. A closed vessel contains equal number of nitrogen and oxygen molecules at pressure of Pmm. If nitrogen is removed from the system, then the pressure will be:

A. P

B. $2P$

C. $P/2$

D. P^2

Answer: C

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14. If $10g$ of a gas at atmospheric pressue is cooled from $273^\circ C$ to $0^\circ C$, keeping the volume constant, its pressure would become

A. $1/2atm$

B. $1/273atm$

C. $2atm$

D. $273atm$

Answer: A

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15. Under what conditions will a pure sample of an ideal gas not only exhibit a pressure of $1 atm$ but also a concentration of $1 mol litre^{-1}$

$[R = 0.082$ iltre atm $mol^{-1} K^{-1}]$

A. at STP

B. when $V = 22.42L$

C. when $T = 12K$

D. impossible under any condition

Answer: C

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16. A constant volume and temperature conditions, the rate of diffusion D_A and D_B of gases A and B having densities ρ_A and ρ_B are related by the expression

A. $D_A = \left[D_B . \dfrac{\rho_A}{\rho_B}\right]^{1/2}$

B. $D_A = \left[D_B . \dfrac{\rho_B}{\rho_A}\right]^{1/2}$

C. $D_A = D_B\left(\dfrac{\rho_A}{\rho_B}\right)^{1/2}$

D. $D_A = D_B\left(\dfrac{\rho_B}{\rho_A}\right)^{1/2}$

Answer: D

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17. What is the molecular weight of a gas whose density $40^{\circ} C$ and $785 mm$ of Hg pressure is $1.3 g L^{-1}$?

A. 32

B. 40

C. 15

D. 98

Answer: A

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18. $120g$ of an ideal gas of molecular weight 40 is confirmed to a volume of $20 litre at 400K$, then the pressure of is:

A. $490atm$

B. $4.92atm$

C. $2236atm$

D. $22.4atm$

Answer: B

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19. Oxygen is present in a $1L$ flask at a pressure of $7.6 \times 10^{-10} mmHg$. Calculate the number of oxygen molecules in the flask at $0^{\circ} C$.

A. 2.7×10^{9} molecules

B. 2.7×10^{10} molecules

C. 2.7×10^{11} molecules

D. 2.7×10^{12} molecules

Answer: B

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20. At a temperature T, K, the pressure of $4.0 gm$ argon in a bulb is P. The bulb is put in a bath having temperature higher by $50K$ than the first one 0.8 of argon gas had to be removed to maintain original pressure. The temperature T is

A. $510K$

B. $200K$

C. $100K$

D. $73K$

Answer: B

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21. A hydrocarbon contains $10.5g$ of carbon per gram of hydrogen. $1L$ of vapour of the hydrocarbon at $127^{\circ} C$ and 1 atm pressure weighs $2.8g$. Find the molecular formula of the hydrocarbon.

A. C_6H_8

B. C_7H_8

C. C_5H_{12}

D. C_8H_4

Answer: B

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22. A cylinder contains accetylene gas at $27^\circ C$ and $4.05 Mpa$. The pressure in the cylinder after half the mass of gas is used up and temperature has fallen to $12^\circ C$ will be:

A. $4.05 MPa$

B. $2.025 MPa$

C. $3.84 MPa$

D. $1.92 MPa$

Answer: D

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23. For a definite amount of gas, pressure and volume are increased to triple of the initial amount, Therefore

A. Temperature increased to nine times of its initial value

B. Temperature increased to thrice of its initial value

C. Temperature remains unaltered

D. Temperature reduced to thrice of its initial value

Answer: A

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24. $3.2g$ of S is heated to occupy a volume of $780ml$ at $450^\circ C$ and $723mm$ pressure. Formula of sulphure is

A. S_2

B. S

C. S_4

D. S_8

Answer: D

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25. The pressure and temperature of $4dm^3$ of carbon dioxide gas are doubled. Then the volume of carbon dioxide gas would be

A. $2dm^3$

B. $3dm^3$

C. $4dm^3$

D. $8dm^3$

Answer: C

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26. The weight of $350 mL$ of a diatomic gas at $0^\circ C$ and 2 atm pressure is $1 g$. The weight in g of one atom at NTP is:

A. $2.64 \times 10^{-23} g$

B. $2.64 \times 10^{-22} g$

C. $5.28 \times 10^{-23} g$

D. $0.82 \times 10^{-22} g$

Answer: A

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27. The volume of 10moles of an ideal gas at $10 atm$ and $500 K$ is

A. $82 L$

B. $41 L$

C. $20.5 L$

D. $\frac{82}{3} L$

Answer: B

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Dalton'S Law Of Partial Pressure, Graham'S Law Of Diffusion/ Effusion

1. The molecules of a gas A travel four times faster than the molecules of gas B at same temperature. The ratio of molecular weights (M_A / M_B) is

A. $1/16$

B. 4

C. $1/4$

D. 16

Answer: A

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

A. The same as that of SO_2

B. $\frac{1}{2}$ that of SO_2

C. Twice that of SO_2

D. One-fourth that of SO_2

Answer: B

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3. Equal weights of methane and hydrogen are mixed in an empty container at $25^{\circ} C$. The fraction of the total pressure exerted by hydrogen is

A. $1/2$

B. $8/9$

C. $16/19$

D. $1/9$

Answer: B

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4. $X mL$ of H_2 gas effuses through a hole in a container in $5s$. The time taken for the effusion of the same volume of the gas specified below, under identical conditions, is

A. $10 \sec s : He$

B. $20 \sec s : O_2$

C. $25 \sec s : CO$

D. $55 \sec s : CO_2$

Answer: B

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5. Which of the following pair will diffuse at the same rate?

A. CO_2 and N_2O

B. CO_2 and NO

C. CO_2 and CO

D. N_2O and NO

Answer: A

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6. 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. $1:\sqrt{2}$

Answer: C

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7. A glass bulb contains $2.24 of H_2$ and $1.12L$ of D_2 at STP. It is connected a fully evacuated bulb by a stop-cock with a small opening. The stop-cock is opened for sometime and then closed. The first bulb now contains $0.10g$ of H_2. The percentage of H_2 in the mixture is

A. $41.6\ \%$

B. $58.4\ \%$

C. $46.2\ \%$

D. $50\ \%$

Answer: A

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8. Equal moles of CO, B_2H_6, H_2 and CH_4 are placed in a container. If a hole was made in container after 5minute, partial pressure of gases in container would be

(Atomic weights of C, O, B and H are $12, 16, 11, 1$ respectively)

A. $P_{CO} > P_{B_2H_6} > P_{H_2} > P_{CH_4}$

B. $P_{CO} = P_{B_2H_6} > P_{CH_4} > P_{H_2}$

C. $P_{CO} > P_{B_2H_6} = P_{H_2} > P_{CH_4}$

D. $P_{B_2H_6} > P_{H_2} > P_{CH_4} > P_{CO}$

Answer: B

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9. N_2 is found in a litre flask under $100 kPa$ pressure and O_2 is found in another $3 litre$ flask under $20 KPa$ pressure. If the two flask are connected, the resultant pressure is

A. $310 kPa$

B. $210 kPa$

C. $420 kPa$

D. $265 kPa$

Answer: D

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10. When a jar containing gaseous mixture of equal volumes of CO_2 and H_2 is placed in a solution of sodium hydroxide, the solution level will

A. Rise

B. Fall

C. Remain constant

D. Become zero

Answer: A

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11. A mixture of H_2 and O_2 in $2:1$ volume is allowed to diffuse through a porous partition what is the composition of gas coming out initially

A. $1:2$

B. $4:1$

C. $8:1$

D. $1:4$

Answer: C

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12. When $2g$ of a gas A is introduced into an evacuated flask kept at $25^{\circ}C$, the pressure is found to be $1atm$. If $3g$ of another gas B is then heated in the same flask, the total pressure becomes $1.5atm$. Assuming ideal gas behaviour, calculate the ratio of the molecular weights M_A and M_B.

A. $1:1$

B. $1:2$

C. $2:3$

D. $1:4$

Answer: C

Watch Video Solution

13. A cylinder is filled with a gaseous mixture containing equal masses of CO and N_2. The partial pressure ratio is:

A. $P_{N_2} = P_{C_O}$

B. $P_{CO} = 0.875 P_{N_2}$

C. $P_{C_O} = 2P_{N_2}$

D. $P_{CO} = \frac{1}{2}P_{N_2}$

Answer: A

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14. A and B are two idential vessels. A contains $15g$ ethane at $1atm$ and $298K$. The vessel B contains $75g$ of a gas X_2 at same temperature and pressure. The vapour density of X_2 is :

A. 75

B. 150

C. 37.5

D. 45

Answer: A

Watch Video Solution

15. A mixture of hydrogen and oxygen at one bar pressue contains 20% by weight of hydrogen . Partial pressure of hydrogen will be

A. $0.2bar$

B. $0.4bar$

C. $0.6 bar$

D. $0.8 bar$

Answer: D

Watch Video Solution

16. 20 dm^3 of SO_2 diffuse through a porous partition in 60 s. what volume of O_2 will diffuse under similar conditions in 30 s ?

A. $12.14 L$

B. $14. 14 L$

C. $18.\ 14L$

D. $28.14L$

Answer: B

Watch Video Solution

17. A bottle of dry NH_3 and another bottle of dry HCl connected through a long tube are opened simultaneously at both ends of the tube. The white ring (NH_4Cl) first formed will be

A. A

B. B

C. C

D. A, B &C simultaneously

Answer: C

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18. The vapour density of a mixture containing NO_2 and N_2O_4 is $38.3 at 27^\circ C$. Calculate the mole of NO_2 in $100g$ mixture.

A. 0.043

B. 4.4

C. 3.4

D. 0.437

Answer: D

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19. A vessel is filled with a mixture of oxygen and nitrogen. At what ratio of partial pressures will the mass of gases be identical?

A. $P(O_2) = 0.785P(N_2)$

B. $P(O_2) = 8.75P(N_2)$

C. $P(O_2) = 11.4P(N_2)$

D. $P(O_2) = 0.875P(N_2)$

Answer: D

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20. A sample of gas is at $0^\circ C$. The temperature at which its rms speed of the molecule will be doubled is

A. $103^\circ C$

B. $273^\circ C$

C. $723^{\circ} C$

D. $819^{\circ} C$

Answer: D

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21. A vessel contains $0.1 mole of He$, 0.1 mole of O_2 and 0.3 mole of N_2. The total pressure is 1 atomosphere. The pressure exerted by O_2 is

A. 380mm of Hg

B. 456mm of Hg

C. 304mm of Hg

D. 152mm of Hg

Answer: D

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22. A vessel has N_2 gas and water vapours at a total pressure of $1atm$. The partial pressure of water vapours is $0.3atm$. The contents of this vessel are transferred to another vessel having one-third of the capacity of original volume, completely 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. $2.4 atm$

Answer: D

Watch Video Solution

23. The rates of diffusion of SO_3, CO_2, PCl_3 and SO_2 are the following order:

A. $PCl_3 > SO_3 > SO_2 > CO_2$

B. $CO_2 > SO_2 > PCl_3 > SO_3$

C. $SO_2 > SO_3 > PCl_3 > CO_2$

D. $CO_2 > SO_2 > SO_3 > PCl_3$

Answer: D

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24. A sample of air contains only $N_2, O_2, \text{ and } H_2O$. It saturated with water vapours and total pressure is 6torr. The vapour pressure of water is 40torr and the mol ratio of $N_2 : O_2$ is $3 : 1$. The partial pressure of N_2 in the sample is

A. 540torr

B. 900torr

C. 1080torr

D. 450torr

Answer: D

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25. An effusion experiment requires $40s$ of a certain number of moles of a gas of unknown molar mass to pass through a small orifice into a vaccum. Under the same conditions, $16s$ was required for the same number of moles of O_2 to effuse. What is the molar mass of the unknown gas?

A. $5.1g/mol$

B. $12.8g/mol$

C. $80g/mol$

D. $200g/mol$

Answer: D

Watch Video Solution

26. Under identical conditions of temperature, the density of a gas X is three times that of gas Y while molecular mass of gas Y is twice that of X. The ratio of pressure of X and Y will be

A. 6

B. $1/6$

C. $2/3$

D. $3/2$

Answer: A

Watch Video Solution

27. NH_3 and SO_2 gases are being prepared at two corners of a laboratory. The gas that will be detected first in the middle of the laboratory is:

A. NH_3

B. SO_2

C. both at the same time

D. can't determine

Answer: A

Watch Video Solution

28. Dalton's law of partial pressure are applicable to

A. Non-reacting gases

B. Ideal gases

C. Temperature of the component gases in the mixture

D. All of the above

Answer: D

Watch Video Solution

29. $1000ml$ of a gas A at 600torr and $500ml$ of a gas B at 800torr are placed in a $2L$ flask. The final pressure will be

A. 2000torr

B. 1000torr

C. 500torr

D. 1400torr

Answer: C

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30. Which of the following is/are true regarding vapour pressure?

A. Vapour pressure is surface property of the solvent

B. Vapour pressure is independent of temperature

C. The saturation vapour pressure is corresponding to the liquid vapour equilibrium

D. Both (a) and (c) are correct

Answer: C

Watch Video Solution

31. Hydrogen gas diffuses four times as rapidly as a mixture of C_2H_4 and CO_2. The molar ration of $._2\ H_4$ to CO_2 in the mixture is

A. $1:1$

B. $2:1$

C. $3:1$

D. $3:2$

Answer: C

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32. Equal weights of methane and oxygen are mixed in an empty container at $25^{\circ}C$. The fraction of the total pressure exerted by oxygen is

A. $1/3$

B. $1/2$

C. $2/3$

D. $(1/3)(273/298)$

Answer: A

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33. Which of the following differentiate between diffusion and effusion?

A. Diffusion is the intermixing of the gas molecules at any direction and effusion is the reverse of diffusion

B. Diffusion is the property of the gas molecules and effusion is the property of the gas container only

C. Diffusion occurs at any direction, whereas effusion occurs under the potential difference

D. Diffusion is the intermixing gas molecules, whereas effusion is the passage of gas molecules through the pores in one direction

Answer: D

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34. The ratio of rates of diffusion of SO_2, O_2 and CH_4 is

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

B. $1:2:4$

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

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

Answer: A

Watch Video Solution

35. The rate of diffusion of methane at a given temperature is twice that of a gas X. The molecular weight of X is

A. 64.0

B. 32.0

C. 4.0

D. 8.0

Answer: A

Watch Video Solution

36. The ratio of rates of diffusion of CO_2 and SO_2 at the same pressure and temperatue is:

A. $4 : \sqrt{11}$

B. $11 : 4$

C. $1 : 4$

D. $1:6$

Answer: A

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37. To a given container having a pore of definite size, gas A $(mol. wt. 81)$ is filled till the final pressure become $10atm$. It was seen that in $50\text{minutes}10g$ of A was effused out. Now the container was compelety evacuated and filled with gas $B(mol. wt. 100)$ till the final pressure becomes $20atm$. In 75 minuter how many gram of B will be effused out?

A. $\frac{100}{6}g$

B. $\frac{100}{3}g$

C. $\frac{200}{3}g$

D. $\frac{250}{3}g$

Answer: B

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Kinectic Theory Of Gases, Maxwell Distribution Of Speed

1. Root mean square velocity of a gas molecule is proprotional to

A. $m^{1/2}$

B. m^{0}

C. $m^{-1/2}$

D. m

Answer: C

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2. The $r.m.s.$ velocity of hydrogen at $27^\circ C, R = 8.314 J mol^{-1} K^{-1}$ is:

A. $1.934 m/s$

B. $19.34 m/s$

C. $193.4 m/s$

D. $1934 m/s$

Answer: D

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3. In a closed vessel, a gas is heated from 300K to $600K$ the kinetic energy becomes/remains

A. half

B. double

C. same

D. four times

Answer: B

Watch Video Solution

4. The ratio between enrgies of $16g$ of O_2 and $28g$ of N_2 respectively at $300K$ will be

A. $1:1$

B. $1:2$

C. $2:1$

D. $4:7$

Answer: B

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5. The ratio among most probable velocity, mean velocity and root mean velocity is given by

A. $1:2:3$

B. $1:\sqrt{2}:\sqrt{3}$

C. $\sqrt{2}:\sqrt{3}:\sqrt{8/\pi}$

D. $\sqrt{2}:\sqrt{8/\pi}:\sqrt{3}$

Answer: D

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6. The r.m.s velocity of hydrogen is $\sqrt{7}$ times the r.m.s velocity of nitrogen. If T is the temperature 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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7. Temperature at which $r.m.s$ speed of O_2 is equal to that of neon at $300K$ is:

A. $280K$

B. $480K$

C. $680K$

D. $180K$

Answer: B

Watch Video Solution

8. At STP, the order of mean square velocity of molecules of H_2, N_2, O_2, and HBr is

A. $H_2 > N_2 > O_2 > HBr$

B. $HBr > O_2 > N_2 > H_2$

C. $HBr > H_2 > O_2 > N_2$

D. $N_2 > O_2 > H_2 > HBr$

Answer: A

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9. A large cylinder of helium filled at $200 mm$ ofHg has small orifice through which helium escaped into evacuated space at the rate of $6.4 moles / hour$. How long would it take for $10 moles$ of CO to leak through a similar orifice if the CO was confined at the same pressure?

A. $2.1 \mathrm{hour}$

B. $4.2 \mathrm{hour}$

C. $5.6 \mathrm{hour}$

D. $11.2 \mathrm{hour}$

Answer: B

10. Four particles have speed $2, 3, 4$ and 5 cm/s respectively Their RMS speed is .

A. $3.5cm / s$

B. $(27 / 2)cm / s$

C. $\sqrt{54}cm / s$

D. $\sqrt{54} / 2cm / s$

Answer: D

11. For two gases A and B with molecular weights M_A and M_B, respectively, it is observed that at a certain temperature T, the mean velocity of A is equal to the V_{rms} of B. Thus, the mean velocity of A can be made equal to the mean velocity of B, if

A. P is lowered to a temperature T_2 and $T_2 < T$ and Q is maintained at temperature T

B. P is at a temperature T and Q at a temperature T_2 where $T > T_2$

C. both p and Q are raised to higher temperature

D. both P and Q are placed at lower temperature

Answer: A

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12. The ratio between the root mean square speed of H_2 at $50K$ and that of O_2 at $800K$ is

A. 4

B. 2

C. 1

D. $1/4$

Answer: C

Watch Video Solution

13. Under similar conditions, which of the following gas will have same value of μ_{rms} as CO_2?

A. NO

B. C_3H_8

C. CO

D. N_2

Answer: B

Watch Video Solution

14. Which of the following gases would have the highest rms speed at $0^{\circ} C$?

A. O_2

B. CO_2

C. SO_3

D. CO

Answer: D

15. If two gases of moleuclar weight M_1 and M_2 at temperature T_1 and $T_2, T_1M_2 = T_2M_1$, then which property has the same magnitude of both the gases?

A. Temperature

B. Pressure

C. KE per mole

D. Root mean square velocity

Answer: D

16. The ratio, $\frac{\text{rms velocity of} SO_2}{\text{rms velocity of He}}$, of sulpur dioxide and helium gases at $30^{\circ} C$ is equal to:

A. 4

B. 0.25

C. 0.10

D. 8

Answer: B

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17. The most probable velocity of a neutron at $20^{\circ} C$ is nearby:

A. $220 m / s$

B. $2124 m / s$

C. $22200 m / s$

D. $22 m / s$

Answer: B

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18. At what temperature, the average speed of gas molecules be double of that at temperature, $27^{\circ} C$?

A. $120^{\circ} C$

B. $108^{\circ} C$

C. $927^{\circ} C$

D. $300^{\circ} C$

Answer: C

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19. At the same temperature and pressure, which of the following will have highest KE per mole

A. H_2

B. O_2

C. CH_4

D. All have same KE

Answer: D

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20. At what temperature will the total KE of $0.3 mol$ of He be the same as the total KE of $0.40 mol$ of Ar at $400 K$

A. $533 K$

B. $400 K$

C. $346 K$

D. $300 K$

Answer: A

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21. The $R.M.S.$ Speed of the molecules of a gas of density kgm^{-3} and pressure $1.2 \times 10^{5} Nm^{-2}$ is:

A. $120ms^{-1}$

B. $300ms^{-1}$

C. $600ms^{-1}$

D. $900ms^{-1}$

Answer: B

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22. When a gas is compressed as constant temperature:

A. the speeds of the molecule increase

B. the collisions between the molecules increase

C. the speeds of the molecules decrease

D. the collisions between the molecule decrease

Answer: B

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23. The root mean square velocity of an ideal gas to constant pressure varies with density (d) as

A. d^2

B. d

C. $\sqrt{d}$

D. $1/\sqrt{d}$

Answer: D

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24. The average speed of an ideal gas molecule at $27^\circ C$ is $0.3m, \sec^{-1}$. The average speed at $927^\circ C$

A. $0.15m \sec^{-1}$

B. $0.6m \sec^{-1}$

C. $1.2m \sec^{-1}$

D. $0.6cm \sec^{-1}$

Answer: B

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25. A helium atom is two times heavier than a hydrogen molecule. At $298K$, the average kinetic energy of a helium atom is

A. two times that of hydrogen molecule

B. Same as that of the hydrogen molecule

C. four times that of a hydrogen molecule

D. half that of a hydrogen molecule

Answer: B

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26. The temperature at which CO_2 has the same $R.\,M.\,S.$ Speed to that of O_2 at STP is/are:

A. $375.\,38K$

B. $102.\,38^{\circ}C$

C. $275.38K$

D. $202.38^{\circ}C$

Answer: A

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

A. $u/2$

B. $2u$

C. $4u$

D. $14u$

Answer: B

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28. At what temperature root mean sqaure of N_2 gas is equal to that of propance gas at STP conditions.

A. $173.7^\circ C$

B. $173.7K$

C. STP

D. $-40^\circ C$

Answer: B

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29. The temperature at which the most probable speed of CO_2 molecules be twice as that of $50^\circ C$ is:

A. $200^\circ C$

B. $1292K$

C. $100^\circ C$

D. $646K$

Answer: B

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30. The ratio of most probable velocity to that of average velocity is

A. $\pi / 2$

B. $2 / \pi$

C. $\sqrt{\pi} / 2$

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

Answer: C

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31. Calculate the average kinetic energy (in joule) per molecule in $8.0g$ of methane at $27^{\circ}C$.

A. $6.21 \times 10^{-20} J / \text{molecule}$

B. $6.21 \times 10^{-21} J / \text{molecule}$

C. $6.21 \times 10^{-22} J / \text{molecule}$

D. $3.1 \times 10^{-22} J / \text{molecule}$

Answer: B

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32. A temperature at which rms speed of SO_2 molecule is half of that of helium molecules at $300K$

A. $1200K$

B. $600K$

C. $800K$

D. $900K$

Answer: A

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33. At what temperature will the total KE of $0.3 mol$ of He be the same as the total KE of $0.40 mol$ of Ar at $400 K$

A. $533 K$

B. $400 K$

C. $346 K$

D. $300 K$

Answer: A

Watch Video Solution

34. The average molecular speed is gretest in which of the following gas samples?

A. $1.0mol$ of O_2 at $560K$

B. $0.50mol$ of Ne at $500K$

C. $0.20mol$ of CO_2 at $440K$

D. $2.0mol$ of He at $140K$

Answer: D

Watch Video Solution

35. At what temperature most probable speed of O_2 molecules have the same value of root mean square speed of O_2 molecules at $300K$?

A. $150K$

B. $600K$

C. $750K$

D. $450K$

Answer: D

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36. What is the pressure of 2moles of NH_3 at $27^{\circ} C$ when its voulume is 5litre in van der waals equation $(a = 4, 17, b = 0.03711)$?

A. $10.33 atm$

B. $9.33 atm$

C. $9.74 atm$

D. $9.2 atm$

Answer: B

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37. At what temperature, the root-mean-square velocity of SO_2 will be the same as that of CH_4 at $27^\circ C$?

A. $3000K$

B. $1345K$

C. $1200K$

D. $1700K$

Answer: C

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38. If $C_1, C_2, C_3.....$ represent the speeds on $n_1, n_2, n_3.....$ molecules, then the root mean square speed is

A. $\left(\dfrac{n_1C_1^2 + n_2C_2^2 + n_3C_3^2 + \dots\dots\dots}{n_1 + n_2 + n_3 + \dots.}\right)^{1/2}$

B. $\dfrac{\left(n_1C_1^2 + n_2C_2^2 + n_3C_3^2 + \dots\dots\right)^{1/2}}{n_1 + n_2 + n_3 + \dots.}$

C. $\dfrac{\left(n_1C_1^2\right)^{1/2}}{n_1} + \dfrac{\left(n_2C_2^2\right)^{1/2}}{n_2} + \dfrac{\left(n_3C_3^2\right)^{1/2}}{n_3}$

D. $\left[\dfrac{\left(n_1C_1 + n_2C_2 + n_3C_3 + \dots.\right)^2}{\left(n_1 + n_2 + n_3\dots.\right)}\right]^{1/2}$

Answer: A

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39. The KE of N molecule of O_2 is x joules at $-123^{\circ}C$. Another sample of O_2 at $27^{\circ}C$ has a KE of $2x$ joules. The latter sample contains

A. N molecules of O_2

B. $2N$ molecules of O_2

C. $N/2$ molecules of O_2

D. $N/4$ molecules of O_2

Answer: A

Watch Video Solution

40. If two gases of moleuclar weight M_1 and M_2 at temperature T_1 and $T_2, T_1M_2 = T_2M_1$, then which property has the same magnitude of both the gases?

A. density

B. pressure

C. KE per mole

D. V_{rms}

Answer: D

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41. If the v_{rms} is $30R^{1/2}$ at $27^\circ C$ then calculate the molar mass of gas in kilogram.

A. 1

B. 2

C. 4

D. 0.001

Answer: D

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42. A helium atom is two times heavier than a hydrogen molecule. At $298K$, the average kinetic energy of a helium atom is

A. two times that of hydrogen molecule

B. Same as that of the hydrogen molecule

C. four times that of a hydrogen molecule

D. half that of a hydrogen molecule

Answer: B

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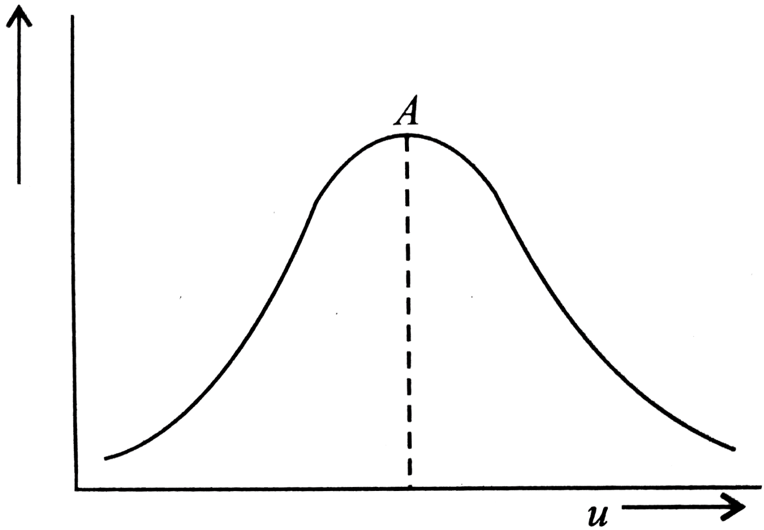
43. Distribution of molecules with velocity is represented by the curve



Velocity corresponding to point A is

A. $\sqrt{\frac{3RT}{M}}$

B. $\sqrt{\frac{2RT}{M}}$

C. $\sqrt{\frac{8RT}{\pi M}}$

D. $\sqrt{\frac{RT}{M}}$

Answer: B

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44. What is the relationship between the average velocity (v), root mean square velocity (u) and most probable velocity

A. ?

B. $a : v : u : : 1 : 1.128 : 1.224$

C. $a : v : u : : 1.128 : 1.224$

D. $a : v : u : : 1.124 : 1.228 : 1$

Answer: A

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45. Temperature at which most probable speed of O_2 becomes equal to root mean square speed of N_2 is [Given : N_2 at $427^\circ C$]

A. $732K$

B. $1200K$

C. $927K$

D. $800K$

Answer: B

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Van Der Waals Gas Equation And Liquefaction Of Gases

1. For the non-zero value of the force of attraction between gas molecules, gas equation will be

A. $PV = nRT - \frac{n^2 a}{V}$

B. $PV = nRT + nbP$

C. $PV = nRT$

D. $P = \frac{nRT}{V - B}$

Answer: A

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2. NH_3 is liquefied more easily than N_2. Hence

A. a and b of $NH_3 >$ that of N_2

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

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

D. None

Answer: B

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3. At low pressure, the van der Waals equation is reduced to

A. $Z=\frac{pV_m}{RT}=1-\frac{ap}{RT}$

B. $Z=\frac{pV_m}{RT}=1+\frac{b}{RT}P$

C. $pV_m=RT$

D. $Z=\frac{pV_m}{RT}=1-\frac{a}{RT}$

Answer: A

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4. The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is called

A. critical temperature

B. Boyle temperature

C. boiling temperature

D. reduced temperature

Answer: B

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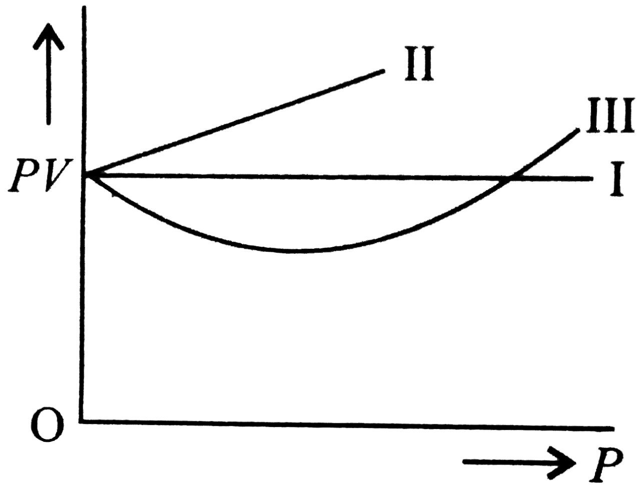
5. Actual graph for the given parameters in (Q.25) will be



A. I, III

B. I, II

C. II

D. I

Answer: C

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6. A real gas at a very pressure occupies

A. more volume than that of an ideal gas under identical conditions

B. less volume than of an ideal under indentical conditions

C. same volume than that of an ideal gas under identical conditions

D. can't predict

Answer: A

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7. Calculate the compressibility factor for CO_2 if one mole of it occupies 0.4 litre at $300K$ and $40atm$. Comment on the result:

A. 0.40, CO_2 is more compressible than ideal gas

B. 0.65, CO_2 is more compressible than ideal gas

C. 0.55, CO_2 is more compressible than ideal gas

D. 0.62, CO_2 is more compressible than ideal gas

Answer: B

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8. For the non-zero value of the force of attraction between gas molecules, gas equation will be

A. $PV - nRT - \frac{n^2a}{V}$

B. $PV = nRT + nbP$

C. $PV = nRT$

D. $P = \frac{nRT}{V - b}$

Answer: A

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9. The compressibility of a gas is less than unity at STP, therefore,

A. $V_m > 22.4\text{litres}$

B. $V_m < 22.4\text{litres}$

C. $V_m = 22.4\text{litres}$

D. $V_m = 44.8$ litres

Answer: A

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10. Compressibility factor for H_2 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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11. The value of compressibility factor at the critical state the gas matches with the Z_c is

A. $CH_4, Z_c = 0.29$

B. $CF_4, Z_c = 0.375$

C. $CH_3CN, Z_c = 0.29$

D. $H_2O, Z_c = 0.35$

Answer: A

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12. Pressure exerted by 1 mole of methane, in a 0.25 litre container at $300K$ using van der Waals' equation (given $a = 2.253 atm L^2 mol^{-2}, b = 0.0428 L mol^{-}$) is

A. $82.82 atm$

B. $152.51 atm$

C. $190.52 atm$

D. $70.52 atm$

Answer: A

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13. If $\overline{V}$ is the observed molor volume of real gas and $\overline{V}_{id}$ is the molar volume of an ideal gas, then Z is

A. $\overline{V}\,\overline{V}_{id}$

B. $\dfrac{\overline{V}}{\overline{V}_{id}}$

C. $\dfrac{\overline{V}}{\overline{V}_{id}}$

D. $\dfrac{\overline{V}}{\overline{V}_{id}}$

Answer: B

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14. Which of the following is the correct set of volume calculated by ideal gas equation and van der Waals equation respectively for 1 mole CO_2 gas at $300K$ and $10atm$ pressure. $(R = 0.0821 LatmK^{-1}mol^{-1})$

A. $2.463L, 2.56L$

B. $2.463L, 2.38L$

C. $2.463L, 2.463L,$

D. $2.463L, 2.5L$

Answer: B

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

A. higher than its critical temperature

B. lower than its critical temperature

C. either of these

D. none

Answer: B

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16. Regarding the van der Waals constant which of the following is/are correct?

A. $''a''$ depends on the intermolecular interactions

B. $''b''$ depends on the size of the gas molecules

C. $''a''$ and $''b''$ are the characterstic constant not the universal gas constant

D. All of the above are correct

Answer: D

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17. Which of the following satisfies the greater compressibility of real gas?

A. $Z < 1$

B. At the higher pressure

C. Above the Boyle's temperature

D. Lesser the value of $''a''$ but higher value of $''b''$

Answer: A

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18. The correct order of normal boiling of O_2, N_2, NH_3 and CH_4 for whom the values of van der Waals constant $'a'$ are $1.360, 1.390, 4.170$ and $2.253 L^2 atm mol^{-2}$ respectively, is:

A. $O_2 < N_2 < NH_3 < CH_4$

B. $O_2 < N_2 < CH_4 < NH$

C. $NH_3 < CH_4 < N_2 < O_2$

D. $NH_3 < CH_4 < O_2 < N_2$

Answer: B

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19. Which of the following characterstics the critical point?

A. At the critical point both liquid and solid phase coexist

B. At the critical point, solid, liquid and gas phase coexist

C. At the critical point liquid and gas phase coexist together

D. At the critical point liquid and gas phase have unequal density.

Answer: C

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20. A real gas most closely approaches the behaviour of an ideal gas at:

A. $15 atm$ and $200 K$

B. $1 atm$ and $273 K$

C. $0.5 atm$ and $500 K$

D. $15 atm$ and $500 K$

Answer: C

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21. Which of the following is true at the critical point?

A. At the critical point three roots of van der Waals equation are equal

B. Below the critical point two roots of the van der Waals equation are equal and imaginary but one root is real

C. Above the critical point density of gas is greater than density of liquid

D. Above the critical point three roots of van der Waals equation are real but unequal.

Answer: A

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22. Which of the given sets of temperature and pressure will cause a gas to exhibit the greatest deviation from ideal gas behaviour?

A. $100^{\circ} C$ and $4atm$

B. $100^{\circ} C$ and $2atm$

C. $-100^{\circ} C$ and $4atm$

D. $0^{\circ} C$ and $2atm$

Answer: C

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23. The ratio a/b (the terms used in van der Waals' equation) has the unit .

A. atm litre mol^{-1}

B. atm $dm^3 mol^{-1}$

C. dyne $cm mol^{-1}$

D. All of these

Answer: D

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24. Which of the following is most suitable for liquefaction?

A. $T > T_C \& P > PC$

B. $T < T_C \& P < P_C$

C. $T < T_C \& P > P_C$

D. $T < T_C \& P = 0$

Answer: C

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25. Under critical conditions, the compressibility factor for a gas is .

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

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

C. 1

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

Answer: A

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26. For which of the following gas/gases, $\frac{P_C V_C}{RT_C}$ close to 0.22?

A. Cl_2

B. CH_3OH

C. C_2H_4

D. CH_4

Answer: B

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27. The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is called

A. Critical temperature

B. Inversion temperature

C. Boyle's temperature

D. kinding temperature

Answer: C

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28. Weight of $112ml$ of oxygen at NTP on liquefaction would be

A. $0.32g$

B. $0.64g$

C. $0.16g$

D. $0.96g$

Answer: C

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29. Virial equation is: $PV_M = RT\left[A + \frac{B}{V_M} + \frac{C}{V_{M^2}} + \ldots\right]$, where A, B, C, ... are first second,third, ... virial coefficent, respectively, For an ideal gas

A. $A =$ unity and B, C are zero.

B. A, B, C are all equal to unity

C. A is dependent of temperature

D. All A, B, C depend on temperature.

Answer: A

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30. It is eaiser to liquefy oxygen than hydrogen because.

A. oxygen has a higher T_c and lower inversion temperature (T_i)

B. oxygen has lower T_c and higher T_i than hydrogen

C. oxygen has a high T_c and high T_i than hydrogen

D. oxygen has lower T_c and low T_i than hydrogen

Answer: C

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31. Which of the following statements is incorrect?

A. Joul-Thomson coefficient is zero at inversion temperature of a real gas

B. Ideal gas do not show, Joule-Thomson effect

C. Inversion temperature of H_2 and He is very - very low

D. Joule-Thomson coefficient $\mu = \left(\frac{\delta T}{\delta P}\right)_H$

Answer: D

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32. It is possible to liquefy a gas

A. at a temperature above critical temperature and at a pressure above critical pressure

B. at a temperature at critical temperature and at a pressure lower than critical pressure

C. at critical temperature and a pressure equal to critical pressure

D. at a temperature above critical temperature and pressure below critical pressure.

Answer: C

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33. The correct order of temperature for a real gas is

Boyle temp.	Critical temp.	Inversion temp.
(I)	(II)	(III)

A. $III > I > II$

B. $I > II > III$

C. $II > I > III$

D. $I > III > II$

Answer: A

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34. Ratio of C_p and C_v of a gas X is 1.4, the number of atom of the gas 'X' present in 11.2 litres of it at NTP will be

A. 6.02×10^{23}

B. 1.2×10^{24}

C. 3.0×10^{23}

D. 2.01×10^{23}

Answer: A

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35. Which of the following exhibits the weakest intermolecular forces?

A. NH_3

B. HCl

C. He

D. H_2O

Answer: C

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Liquid State

1. The surface tension of water at $20^{\circ}C$ is 73 dynes cm^{-1}, The minimum value of work done needed to increases surface are of water from $2cm^2$ to $5cm^2$ is

A. 192 dynes cm

B. 219 dynes cm

C. 921 dynes cm

D. 912 dynes cm

Answer: B

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2. Association of molecules in water is due to:

A. covalent bonding

B. hydrogen bonding

C. ionic bonding

D. van der Waals forces

Answer: B

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3. Which of the following statements is wrong?

A. Evaporation is a spontaneous process

B. Evaporation is a surface phenomenon

C. Vapour pressure decreases with increase temperature

D. The vapour pressure of a solution is always less than the vapour pressure of pure solvent.

Answer: C

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4. Normal boiling point of a liquid is that temperature which vapour pressure of the liquid is equal to:

A. zero

B. $380mm$ of Hg

C. $760mm$ of Hg

D. $100mm$ of Hg

Answer: C

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5. A liquid is in equilibrium with its vapour at its boiling point. On average, the molecules in the two phases have equal

A. Intermolecular

B. kinetic energy

C. Total energy

D. Potential energy

Answer: B

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6. Water boils at lower temperature on high altitude because:

A. atomspheric pressure is low there

B. atomospheric pressure is high there

C. water is weakly hydrogen bonded there

D. water in pure form is found there

Answer: A

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7. When a student was given a viscometer, the liquid was sucked with difficulty, the liquid may be:

A. benzene

B. toluene

C. water

D. glycerine

Answer: D

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8. Mark the correct statement.

A. Surface tension of a liquid increases with temperature

B. Addition of chemicals reduces the surface tension of liquid

C. Stalagmometer is used for measuring viscosity of liquid

D. Viscosity of the liquid does not depend intermolecular forces

Answer: B

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9. With the increasing molecular mass of a liquid the velocity:

A. decreases

B. increases

C. no effect

D. all wrong

Answer: B

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10. The viscosity of which of the following liquid is the maximum.

A. water

B. glycol

C. acetone

D. ethanol

Answer: B

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11. The rise of a liquid in a capillary tube is due to :

A. viscosity

B. osmosis

C. diffusion

D. surface tension

Answer: B

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12. With increase in temperature, the fluidity of liquids

A. increases

B. decreases

C. remains constant

D. may increase of decrease

Answer: A

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13. If η_1 and η_2 are the coefficients of viscosity of two liquids, d_1 and d_2 their densities and t_1 and t_2 the flow times in Ostwald viscometer, then:

A. $\frac{\eta_1}{\eta_2} = \frac{d_1 t_2}{d_2 t_1}$

B. $\frac{\eta_1}{\eta_2} = \frac{d_2 t_2}{d_1 t_1}$

C. $\frac{\eta_1}{\eta_2} = \frac{d_1 t_1}{d_2 t_2}$

D. $\frac{\eta_1}{\eta_2} = \frac{d_2 t_1}{d_1 t_2}$

Answer: C

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14. Which of the following expressions regarding the unit of coefficient of viscosity is not true?

A. dyne $cm^{-2}\sec$

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

C. $Nm^{-2}\sec$

D. 1 poise $= 10^{-1}Nm^{-2}\sec$

Answer: C

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15. The boiling point of water, ethyl alcohol and diethyl ether are $100^\circ C, 78.5^\circ C$ respectively. The intermolecular forces will be in the order of:

A. water gt ethyl alcohol gt diethyl ether

B. ethyl gt alcohol gt water gt diethyl ether

C. diethyl gt ethyl alcohol gt water

D. diethyl ethar gt water gt ethyl alcohol

Answer: A

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16. Viscosity of a liquid is increased by:

A. increases in temperature

B. decreases in molecular size

C. increase in molecular size

D. none of the above

Answer: C

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17. Which of the following statements is correct if the intermolecular forces in liquid A, B and C are in the order $A < B < C$?

A. B evaporates more readily than A

B. B evaporates less readily than C

C. A and B evaporates at the same rate

D. A evaporates more readily than C

Answer: D

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Section B - Assertion Reasoning

1. Assertion: Compressibility factor for hydrogen varies with pressure with positive slope at all pressures.

Reason: Even at low pressures, repulsive forces dominate hydrogen gas.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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2. Assertion:Pressure is exerted by gas in a container with increasing temperature of the gas.

Reason: With the rise in temperature, the average speed of gas molecules increases.

A. If both assertion and reason are true and the reason is the correct explanation of the

assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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3. Assertion: Gases do not settle at the bottom of container.

Reason: Gases have high kinetic energy.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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4. Assertion: A mixture of He and O_2 is used for respiration for deep sea divers.

Reason: He is soluble in blood.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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5. Assertion: Wet air is heavier than dry air.

Reason: The density of the dry air is more than density of water.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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6. Assertion: The increase in compressibility factor with increasing pressure in due to a.

Reason: $Z = 1 + \frac{bP}{RT}$ for real gas can be obtained by neglecting a / V^2 term in van der Waals equation.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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7. Assertion: A gas can be liquefied at $T = T_c$ and $P < P_c$

Reason: A gas can be liquefied when $T < T_c$ and $P < P_c$.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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8. Assertion: The gas heated, if its temperature is less than its inversion temperature in Joule-Thomson effect.

Reason: Heating in gas is noticed durting Joule-Thomson effect when $T > Y_i$.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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9. Assertion: All molecules in a gas are moving with same speed.

Reason: Speed of molecules in a gas follows Maxwell's distribution law.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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10. Assertion: The compressibility factor for H_2 and He is

$$\left[1+\frac{bP}{RT}\right]$$

Reason: The compressibility factor H_2 and He can be derived from van der Waal's equation.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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11. Assertion: The numerical values of P_c, V_c and T_c are $\frac{a}{27b^2}, 3b$ and $\frac{8a}{27Rb}$ respectively.

Reason: The compressibility factor Z at critical conditions is $3/8$

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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12. Assertion: At low pressure van der Waal's equaiton is ruduced to $\left[P+\frac{a}{V^2}\right]V=RT$

Reason: The compressibility factor corresponding to low pressure is given by: $1-\frac{RTV}{a}$

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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13. Assertion: Molar specific heat at constant volume of an ideal diatomic gas is $\left[\frac{3}{2}R + R\right]$.

Reason: On heating 1 mole an ideal diatomic gas at constant pressure of $1^{\circ}C$ rise in temperature, the increase in internal energy of gas is $\frac{7}{2}R$.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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14. Assertion: The gas on subjecting to Joule-Thomson effect gets heated if its temperature is less than its inversion temperature.

Reason: Hetaing effect has $-ve$ Joule-Thomson coefficient.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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15. Assertion: On heating a sample of gas collision frequency increases.

Reason: Heat is produced by the collision of gas molecules against each other.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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16. Assertion: The coefficient of isothermal expansion at critical point is zero.

Reason: $\left(\dfrac{\partial V_c}{\partial T_c}\right)_{P_c} = 0$

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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17. Assertion: Poisson ratio of atmospheric gases is approximately equal to 1.4.

Reason: Gases present in atomosphere are mainly diatomic.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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18. Assertion: Absolute zero temperature is a theoretically possible temperature at which the volume of the gas becomes zero.

Reason: The total kinetic energy of molecules is zero at this temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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19. Assertion: In a container containing gas $'A'$ at temperature $400K$, some more gas A at temperature $300K$ is introduced. The pressure of the system increases.

Reason: Increase in gaseous particle increses the number of collisions among the molecules.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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20. Assertion: Pressure exerted by a mixture of gases is equal to the sum of their partial pressure.

Reason: Reacting gases react to form a new gas having pressure equal to the sum of both.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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21. Assertion: Gases like N_2, O_2 behave as ideal gases at high temperature and low pressure.

Reason: Molecular interaction diminihes at high temperature and low pressure.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.
B. If both assertion and reason are true but reason is not the correct explanation of the assertion.
C. If assertion is true but reason is false.
D. If assertion is false but reason is true.

Answer: A

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22. Assertion: Most probable velocity of particles of gas is the velocity possessed by maximum fraction of particels at the same temperature.

Reason: On collision, more and more molecules acquire higher speed at the same temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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23. Assertion: The diffusion rate of oxygen is smaller than that of nitrogen under identical conditions.

Reason: Molecular mass of nitrogen is smaller than that of oxygen.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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AIPMT/ NEET Questions

1. What is the density of N_2 gas at $227^\circ C$ and $5.00 atm$ pressure? $(R = 0.0821 atm K^{-1} mol^{-1})$

A. $0.29 g / ml$

B. $1.40 g / ml$

C. $2.81 g / ml$

D. $3.41 g / ml$

Answer: D

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2. Van der Waals real gas acts 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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3. The surface tension of which of the following liquid is maximum?

A. C_2H_5OH

B. CH_3OH

C. H_2O

D. C_6H_6

Answer: C

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4. If a gas expands at constant temperature, it indicates that

A. Pressure of the gas increases

B. number of the molecules of gas increases

C. kinetic energy of molecules remains the same

D. kinetic energy of molecules decreases

Answer: C

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5. Three moles of an ideal gas expanded spontaneously into vacuum. The work done will be

A. 9 joules

B. 3 joules

C. Zero

D. Infinite

Answer: C

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6. The pressure exerted by $6.0g$ of methane gas in a $0.03m^3$ vessel at $129^\circ C$ is: (Atomic masses of $C = 12.01, H = 1.01$ and $R = 8.314JK^{-1}mol^{-1}$)

A. $215216Pa$

B. $13409Pa$

C. $41648Pa$

D. $31684Pa$

Answer: C

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7. Two gases A and B having the same volume diffuse through a porous partition in 20 and 10 seconds respectively. The molar mass of A is $49u$. Molar mass of B will be

A. $25.00u$

B. $50.00u$

C. $12.25u$

D. $6.50u$

Answer: C

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8. A gaseous mixture was prepared by taking equal moles of CO and N_2. If the total pressure of the mixture was found to be 1 atomosphere, the partical pressure of the nitrogen (N_2) in the mixture is

A. $1atm$

B. $0.9atm$

C. $0.8atm$

D. $0.5atm$

Answer: D

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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. 1.4

B. 2.0

C. 2.8

D. 4.0

Answer: A

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10. 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 smaller by a factor of 0.70

B. Volume will become greater by a factor of 1.1

C. Volume will become greater by a factor of 1.6

D. Volume will become greater by a factor of 2.5

Answer: C

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11. Which of the following is correct option for the free expansion of an ideal gas under adiabatic condition ?

A. $q \neq 0, \Delta T = 0, w = 0$

B. $q \neq 0, \Delta T = 0, w = 0$

C. $q = 0, \Delta T = 0, w = 0$

D. $q = 0, \Delta T < 0, w \neq 0$

Answer: C

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12. A certain gas takes three times as long to effuse out as helium. Its molar mass will be

A. $27u$

B. $36u$

C. $64u$

D. $9u$

Answer: B

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13. 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 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.

$(I) H_2 < He < O_2 < CO_2, (II) CH_4 > O_2 > H_2$

D.

$(I) H_2 < O_2 < He < CO_2, (II) O_2 > CH_4 > H_2$

Answer: C

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14. $50mL$ of each gas A and of gas B takes 150 and 200 seconds respectively for effusing through a pin hole under the similar conditon. If molecular mass of gas B is 36, then the molecular mass of gas A will be

A. 96

B. 128

C. 32

D. 64

Answer: C

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15. Maximum deviation from ideal gas is expected from

A. $N_2(g)$

B. $CH_4(g)$

C. $NH_3(g)$

D. $H_2(g)$

Answer: C

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16. Dipole-induced dipole interaction are present in which of the following pairs

A. Cl_2 and CCl_4

B. HCl and He atoms

C. SiF_4 and He atoms

D. H_2O and alcohole

Answer: B

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17. 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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18. A gas such as carbon monoxide would be most likely to obey the ideal gas law at

A. high temperature and high pressure

B. low temperature and low pressure

C. high temperature and low pressure

D. low temperature and low pressure

Answer: C

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19. 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. $1/2$

B. $1/8$

C. $1/4$

D. $3/8$

Answer: B

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20. Consider the following liquid-vapour equilibrium.

$\text{Liquid} \Leftrightarrow \text{Vapour}$

Which of the following relations is correct?

A. $\dfrac{d \ln P}{dT} = \dfrac{\Delta H_v}{RT^2}$

B. $\dfrac{d \ln G}{dT^2} = \dfrac{\Delta H_v}{RT^2}$

C. $\dfrac{d \ln P}{dT} = \dfrac{-\Delta H_v}{RT^2}$

D. $\dfrac{d \ln P}{dT^2} = \dfrac{-\Delta H_v}{T^2}$

Answer: A

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21. A gas is allowed to expand in a well insulated container against a constant external pressure of $2.5 atm$ from an initial volume of $2.50L$ to a final volume of $4.50L$. The change in internal energy ΔU of the gas in joules will be:

A. $-500J$

B. $-505J$

C. $+505J$

D. $1136.25J$

Answer: B

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22. A 20 litre container at $400K$ contains $CO_2(g)$ at pressure $0.4atm$ and an excess of SrO (neglect the volume of solid SrO). The volume of the container, when pressure of CO_2 attains its maximum value, will be:

(Given that:

$SrCO_3(s) \Leftrightarrow SrO(s) + CO_2(g) K_p = 1.6atm$)

A. $10 litre$

B. $4 litre$

C. $2 litre$

D. $5 litre$

Answer: D

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23. Given van der Waals constant for NH_3, H_2, O_2 and CO_2 are respectively $4.17, 0.244, 1.36$ and $3.59,$ which one of the following gases is most easily liquefied?

A. NH_3

B. H_2

C. O_2

D. CO_2

Answer: A

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24. The correction factor a to the ideal gas equation corresponds to

A. density of the gas molecules

B. volume of the gas molecules

C. electric field present between the gas molecules

D. forces of attraction between the gas molecules

Answer: D

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AIIMS Questions

1. The pressure p of a gas is plotted against its absolute temperature T for two different constant volumes, V_1 and V_2 when $V_1 > V_2$, the

A. curves have the same slope and do not intersect

B. curves must intersect at some point other than

$T = 0$

C. curves for V_2 has a greater slope than that for

V_1

D. curve for V_1 has a greater slope than that for

V_2`

Answer: C

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2. Two closed vessels of equal volume containing air at pressure P_1 and temperature T_1 are connected to each other through a narrow tube. If the temperature in one of the vessels is now maintained at T_1 and that in the other at T_2, what will be the pressure in the vessels?

A. $\frac{2P_1T_1}{T_1+T_2}$

B. $\frac{T_1}{2P_1T_2}$

C. $\frac{2P_1T_2}{T_1+T_2}$

D. $\frac{2P_1}{T_1+T_2}$

Answer: C

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3. Which of the following exhibits the weakest intermolecular forces?

A. NH_3

B. HCl

C. He

D. H_2O

Answer: C

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4. If rate of diffusion of A is 5 times that of B, what will be the density ratio of A and B ?

A. $1/25$

B. $1/5$

C. 25

D. 4

Answer: A

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5. Containers A and B have same gases. Pressure, volume and temperature of A are all twice that of B, then the ratio of number of molecules of A and B are

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6. The ratio γ for inert gases is

A. 1.33

B. 1.66

C. 2.13

D. 1.99

Answer: B

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7. The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is called

A. Critical temperature

B. Boyle temperature

C. Inversion temperature

D. Reduced temperature

Answer: B

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

A. above its critical temeprature

B. at its critical temperature

C. below its critical temperature

D. at any temperature

Answer: C

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9. What is the relationship between the average velocity (v), root mean square velocity (u) and most probable velocity (a) ?

A. $a : v : u : : 1 : 1.128 : 1.224$

B. $a : v : u : : 1.128 : 1 : 1 : 1.224$

C. $a : v : u : : 1.128 : 1.224 : 1$

D. $a : v : u : : 1.124 : 1.228 : 1$

Answer: A

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10. At high temperature and low pressure the van der Waals equation is reduced to .

A. $\left(p + \frac{a}{V_m^2}\right)(V_m) = RT$

B. $pV_m = RT$

C. $p(V_m - b) = RT$

D. $\left(p + \frac{a}{V_m^2}\right) = (V_m - b) = RT$

Answer: B

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11. In van der Waals' equation of state of the gas law the constnat 'b' is a measure of .

A. volume occupied by the molecules

B. intermolecular attraction

C. intermolecular repulsions

D. intermolecular collisions per unit volume

Answer: A

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12. Calculate the total pressure in a mixture of $4g$ of oxygen and $2g$ of hydrogen confined in a total volume of $1L$ at $0^\circ C$.

A. $25.215atm$

B. $31.205atm$

C. $45.215atm$

D. $15.210atm$

Answer: A

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13. If pressure becomes double at the same absolute temperature on $2LCO_2$, then the volume of CO_2 becomes

A. $2L$

B. $4L$

C. $25L$

D. $1L$

Answer: D

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14. If the inversion temperature of a gas is $-80^{\circ} C$, then it will produce cooling under Joule-Thomson effect at

A. $298K$

B. $273K$

C. $193k$

D. $173K$

Answer: D

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15. Ratio of C_p and C_v of a gas $'X' is 1.4$. The number of atoms of the gas $'X'$ presents in $11.2 litres$ of it a NTP is

A. 6.02×10^{23}

B. 1.2×10^{24}

C. 3.01×10^{23}

D. 2.01×10^{23}

Answer: A

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16. The critical temperature of water is higher than that of O_2 because the H_2O molecule has

A. fewer electrons than oxygen

B. two covalent bonds

C. V-shape structure

D. dipole moment

Answer: D

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17. A gas $(1g)$ at 4 bar pressure. If we add $2gm$ of gas B then the total pressure inside the container is 6 bar. Which of the following is true?

A. $M_A = 2M_B$

B. $M_B = 2M_A$

C. $M_A = 4M_B$

D. $M_B = 4M_A$

Answer: D

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Assertion - Reasoning Questions

1. Assertion: Ideal gas does not show Joule-Thomson effect as well as they cannot be liquefied.

Reason: $\left(\frac{\partial E}{\partial V}\right)_T$ and $\left(\frac{\partial T}{\partial P}\right)_H$ for ideal gas is zero.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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2. Assertion: Andrews worked on a temporary gas (so called at that time) and derived the condition to liquefy the permanent gases (so called at that time).

Reason: Andrews studied isotherms of CO_2 and obtained the required conditions of liquefaction of gas as $Tgas < Tc$ (critical temperature).

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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3. Assertion: Effusion rate of oxygen is smaller than nitrogen.

Reason: Molecular size of nitrogen is smaller than oxygen.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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4. Assertion: The value of van der Waals constant a is larger for ammonia than for nitrogen.

Reason: Hydrogen bonding is present in ammonia.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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5. Assertion: The Poisson's ratio for diatomic gases is more than for monoatomic gases.

Reason: Diatomic gases possess more degree of freedom.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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Section D - Chapter End Test

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

A. higher than its critical temperature

B. lower than its critical temperature

C. either of these

D. none

Answer: B

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2. Boyle's law may be experssed 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. none

Answer: B

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3. A vessel has N_2 gas and water vapours at a total pressure of $1 atm$. The partial pressure of water vapours is $0.3 atm$. The contents of this vessel are transferred to another vessel having one-third of the capacity of original volume, completely 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. $2.4 atm$

Answer: D

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4. For two gases A and B with molecular weights M_A and M_B, respectively, it is observed that at a certain temperature T, the mean velocity of A is equal to the V_{rms} of B. Thus, the mean velocity of A can be made equal to the mean velocity of B, if

A. A is at temperature T and B at T', $T > T'$

B. A is lowered to a temperature $T_2, T_2 < T$ while B is at T

C. Both A and B are raised to higher temperature

D. Both A and B are placed at lower temperature

Answer: B

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5. The circulation of blood in human body supplies O_2 and releases CO_2 The concentration of O_2 and CO_2 is variable but on the average $100mL$ blood contains $0.02g$ of O_2 and $0.08g$ of CO_2 Calcultate the volume of O_2 and CO_2 at 1 atm and body temperature $37^\circ C$ assuming 10 litre blood in human body .

A. $2L, 4L$

B. $1.5L, 4.5L$

C. $1.59L, 4.62L$

D. $3.82L, 4.62L$

Answer: C

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6. At $100^\circ C$ and 1 atm, if the density of the liquid water is $1.0gcm^{-3}$ and that of water vapour is $0.0006gcm^{-3}$, then the volume occupied by water molecules in $1L$ steam at this temperature is

A. $6cc$

B. $60cc$

C. $0.6cc$

D. $0.06cc$

Answer: C

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7. The KE of N molecule of O_2 is x joules at $-123^{\circ}C$. Another sample of O_2 at $27^{\circ}C$ has a KE of $2x$ joules. The latter sample contains

A. N molecules of O_2

B. $2N$ molecules of O_2

C. $N/2$ molecules of O_2

D. $N/4$ molecules of O_2

Answer: A

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8. If for two gases of molecular weights M_A and M_B at temperature T_A and T_B, respectively, $T_A M_B = T_B M_A$, then which property has the same magnitude for both the gases?

A. density

B. Pressure

C. KE per mole

D. V_{rms}

Answer: D

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9. A helium atom is two times heavier than a hydrogen molecule. At $298K$, the average kinetic energy of a helium atom is

A. two times that of hydrogen molecule

B. Same as that of the hydrogen molecule

C. four times that of a hydrogen molecule

D. half that of a hydrogen molecule

Answer: B

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10. Dalton's law of partial pressures is not applicable to

A. H_2 and N_2 mixture

B. H_2 and Cl_2 mixture

C. H_2 and CO_2 mixture

D. H_2 and O_2 mixture

Answer: B

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11. The ratio between the root mean square speed of H_2 at $50K$ and that of O_2 at $800K$ is

A. 4

B. 2

C. 1

D. $1/4$

Answer: C

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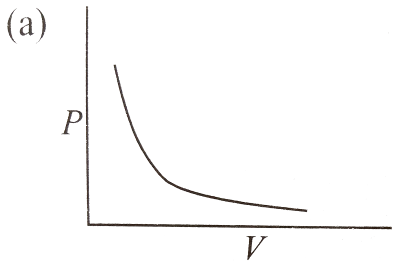
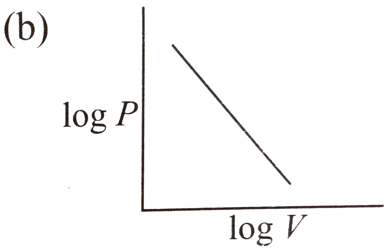
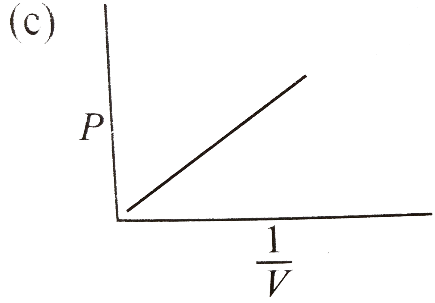
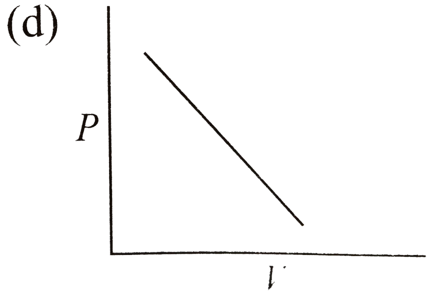
12. Which of the following curves does not represent Boyle's law?

A. 

B. 

C. 

D. 

Answer: D

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13. The temperature of an ideal gas is increased from $140K$ to $560K$. If a $140K$ the root mean square velocity of the gas molecule is V, at $560K$ it becomes

A. $5V$

B. $2V$

C. $V/2$

D. $V/4$

Answer: B

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14. The behaviour of a real gas is usually depicted by plotting compressibility factor Z versus P at a constant temperature At high temperature and high pressure Z is usually more than one This fact can be explained by van der Waals' equation when .

A. the constant $'a'$ is negligible and not b

B. the constant $'b'$ is negligible and not a

C. both constants $'a'$ and $'b'$ are negligible

D. both the constants $'a'$ and $'b'$ are not negligible.

Answer: A

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15. $X mL$ of H_2 gas effuses through a hole in a container is 5 second. The time taken for the effusion of the same volume of the gas specified below under identical conditions is .

A. 10 seconds: He

B. 20 seconds: O_2

C. 25 seconds: CO

D. 35 seconds: CO_2

Answer: B

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16. NH_3 is liquefied more easily than N_2. Hence

A. a and b o f $NH_3 >$ that of N_2

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

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

D. none

Answer: B

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17. 0.2 mole sample of hydrocarbon C_xH_y yields after complete combustion with excess O_2 gas, 0.8 mole of $CO_2 1.1$ mole of H_2O. Hence hydrocarbon is

A. C_4H_{10}

B. C_4H_8

C. C_4H_5

D. C_8H_{16}

Answer: A

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18. When $2g$ of a gas A is introduced into an evacuated flask kept at $25^\circ C$, the pressure is found to be $1atm$. If $3g$ of another gas B is then heated in the same flask, the total pressure becomes $1.5 atm$. Assuming ideal gas behaviour, calculate the ratio of the molecular weights M_A and M_B.

A. $1 : 1$

B. $1 : 2$

C. $2 : 3$

D. $1 : 4$

Answer: C

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19. Air open vessel at $127^{\circ} C$ is heated until $1/5^{th}$ of air in it has been expelled. Assuming that the volume of vessel remains constant the temperature to which the vessel has been heated is

A. $177^{\circ} C$

B. $277^{\circ} C$

C. $377^{\circ} C$

D. $477^{\circ} C$

Answer: D

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20. $3.2g$ of S is heated to occupy a volume of $780ml$ at $450^{\circ}C$ and $723mm$ pressure. Formula of sulphure is

A. S_2

B. S

C. S_4

D. S_8

Answer: D

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21. A gas cyclinder containing cooking gas can withstand a pressure of $14.9 atm$. The pressure gauge of cyclinder indicates $12 atm$ at $27^{\circ} C$. Due to sudden fire in building the temperature starts rising. The temperature at which the cyclinder will explode is

A. $42.5^{\circ} C$

B. $67.8^{\circ} C$

C. $99.5^{\circ} C$

D. $25.7^{\circ} C$

Answer: C

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22. A sample of gas is at $0^\circ C$. The temperature at which its rms speed of the molecule will be doubled is

A. $103^\circ C$

B. $273^\circ C$

C. $723^\circ C$

D. $1092K$

Answer: D

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23. In a closed vessel, a gas is heated from 300K to $600K$ the kinetic energy becomes/remains

A. half

B. double

C. same

D. four times

Answer: B

Watch Video Solution

24. Air contains $79\% N_2$ and $21\% O_2$ by volume. If the barometric pressure is $750 mmHg$. The partial pressure of oxygen is

A. $157.7 mmHg$

B. $175.5 mmHg$

C. $315.0 mmHg$

D. none

Answer: A

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25. Which of the following gases would have the highest rms speed at $0^{\circ} C$?

A. O_2

B. CO_2

C. SO_3

D. CO

Answer: D

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26. Two gases A and B present separately in two vessels X and Y at the same temperature 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 of the length of the square orifice the ratio of rates of effusion of gas A to that of gas B

A. $\sqrt{2}\pi$

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

C. 2π

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

Answer: A

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27. $X mL$ of H_2 gas effuses through a hole in a container is 5 second. The time taken for the effusion of the same volume of the gas specified below under identical conditions is .

A. $10 \sec s : He$

B. $20 \sec s : O_2$

C. $25 \sec s : CO$

D. $55 \sec s : CO_2$

Answer: B

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28. Assertion: A mixture of He and O_2 is used for respiration for deep sea divers.

Reason: He is soluble in blood.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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29. Assertion: Compressibility factor for hydrogen varies with pressure with positive slope at all pressures.

Reason: Event at low pressures, repulsive forces dominate hydrogen gas.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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30. Assetion: Carbon dioxide has greater value of root mean square velocity μ_{rms} than carbon monoxide.

Reason: μ_{rms} is inversely proportional to molar mass.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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Others

1. Which of the following is true about gaseous state?

A. Thermal energy = Molecular attraction

B. Thermal energy > Molecular attraction

C. Thermal energy < Molecular attraction

D. None of these

Answer: B

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2. A cylinder containing cooking gas can withstand a pressure of $15 atm$. The pressure gauge of the cylinder indicates $12 atm$ at $27^\circ C$. Due to a sudden fire in the building, the temperature starts rising. At what temperature will the cylinder explode?

A. $42.5^\circ C$

B. $67.8^\circ C$

C. $99.5^\circ C$

D. $25.7^{\circ} C$

Answer: C

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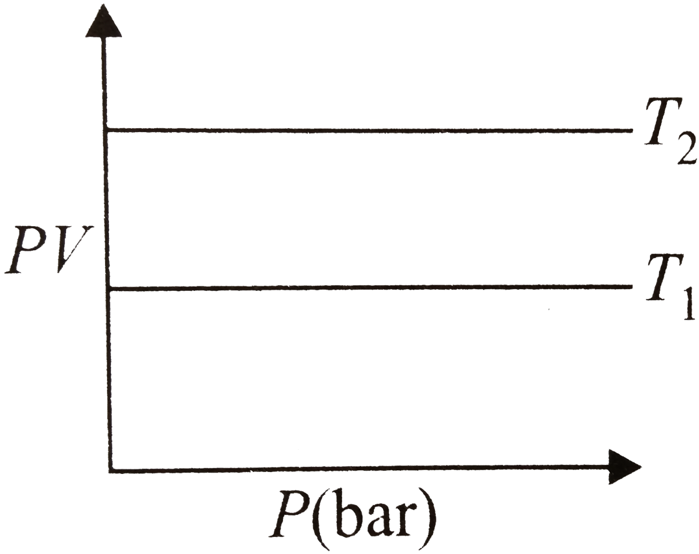
3. The product of PV is potted aginst P at two temperatures T_1 and T_2 and the 'result is shown in the figure. What is correct about T_1 and T_2?



A. $T_1 > T_2$

B. $T_2 > T_1$

C. $T_1 = T_2$

D. $T_1 + T_2 = 1$

Answer: B

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4. Which of the following statements is wrong for gases?

A. Gases do not have a definite shape and volume

B. Volume of the gas is equal to the volume of the container the gas

C. Confined gas exerts uniform pressure on the walls of its container in all directions.

D. Mass of the gas cannot be determined by weighing a container in which it is enclosed

Answer: D

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5. If $P, V, \text{ and } T$ represent pressure, volume and temperature of the gas, the correct representation of Boyle's law is

A. $V \propto \frac{1}{T}$ (at constant P)

B. $PV = RT$

C. $V \propto 1/P$ (at constant T)

D. $PV = nRT$

Answer: C

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6. If V_0 is the Volume of a given mass of gas at $273K$ at constant pressure, then according to Charles's law, the volume at $10^\circ C$ will be:

A. $10V_0$

B. $\frac{2}{273}(V_0 + 10)$

C. $V_0 + \frac{10}{273}$

D. $\frac{283}{273}V_0$

Answer: D

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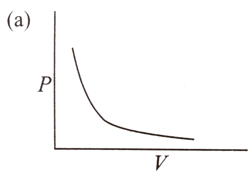
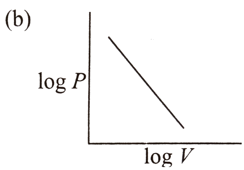
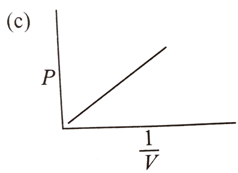
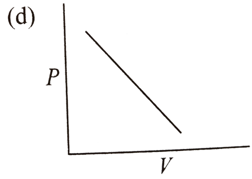
7. Which of the following curves does not represent Boyle's law?

A. 

B. 

C. 

D. 

Answer: D

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8. Pressure remaining the same, the volume of a given mass of an ideal gas increases for every degree centigrade rise in temperature by define fraction of its volume at

A. $0^{\circ} C$

B. Its critical temperature

C. Absolute zero

D. Its Boyle temperature

Answer: A

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9. O_2 gas at STP contained in a flask was replaced by SO_2 under same conditions. The weight of SO_2 will be

A. half

B. one-fourth

C. twice

D. four times

Answer: C

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10. For the given ideal gas equation $PV = nRT$, answer the following questions:

At constant temperature, in a given mass of an ideal gas

A. The ratio of pressure and volume always remains constant

B. Volume always remains constant

C. Pressure always remains constant

D. The product of pressure and volume always remains constant.

Answer: D

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11. According to Charles's law

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. none

Answer: A

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12. A gas at a pressure of 5.0 atm is heated from $0^\circ C$ to $546^\circ C$ and simultaneously compressed to one-third of its original volume. Hence final pressure is

A. $10.0 atm$

B. $30.0 atm$

C. $45.0atm$

D. $5.0atm$

Answer: C

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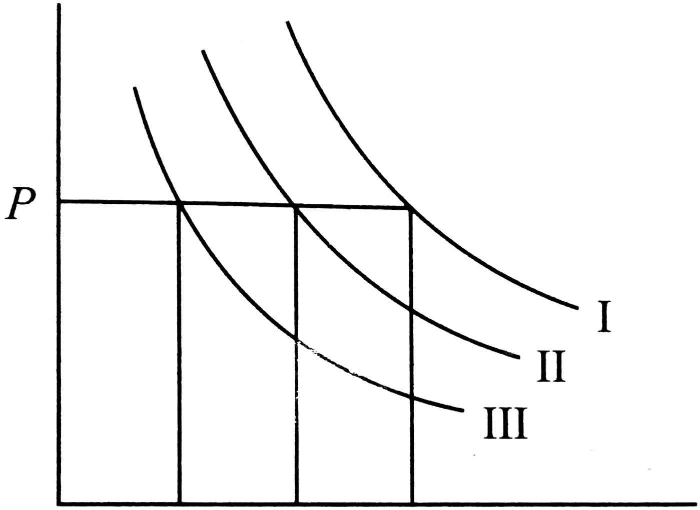
13. I, II, and III are three istherms, respectively, at T_1, T_2, and T_3. Temperature will be in order



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: C

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14. A certain sample of gas has a volume of 0.2 litre measured at $1atm$ pressure and $0^{\circ}C$. At the same pressure but at $273^{\circ}C$, its volume will be

A. $0.4litres$

B. $0.8litres$

C. $27.8^{\circ}C$,

D. 55.6 litres

Answer: A

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15. An open vessel containing air is heated form $300K$ to $400K$. The fraction of air originally present which goes out of it is at $400K$

A. $3/4$

B. $1/3$

C. $2/3$

D. $1/8$

Answer: B

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16. Air at sea level is dense. This is a practical application of

A. Boyle's law

B. Charles's law

C. Avogardo's law

D. Dalton's law

Answer: A

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17. $400 cm^3$ of oxygen at $27^\circ C$ were cooled to $-3^\circ C$ without change in pressure. The contraction in volume will be as per Boyle's law?

A. $40 cm^3$

B. $30 cm^3$

C. $44.4 cm^3$

D. $360 cm^3$

Answer: A

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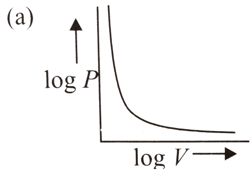
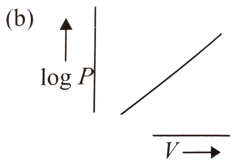
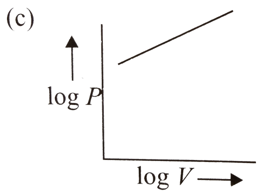
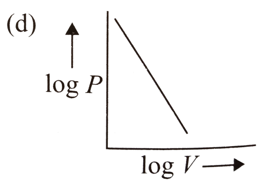
18. Which of the following represent $\log P vs. \log V$ variation as per Boyle's law?

A. 

B. 

C. 

D. 

Answer: D

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19. If $20cm^3$ gas at $1atm$ is expanded to $50cm^3$ at constant T, then what is the final pressure

A. $20 \times \frac{1}{50}$

B. $50 \times \frac{1}{20}$

C. $1 \times \frac{1}{20} \times 50$

D. None of these

Answer: A

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20. If the pressure of a gas contined in closed vessel in increased by 0.4% when heated by $1K$, its initial temperature must be:

A. $250K$

B. $250^{\circ}C$

C. $25^{\circ}C$

D. $25K$

Answer: A

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21. $300ml$ of a gas at $27^\circ C$ is cooled to $-3^\circ C$ at constant pressure, the final volume is

A. $540ml$

B. $135ml$

C. $270ml$

D. $350ml$

Answer: C

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22. A sample of gas at $35^{\circ} C$ and $1 atm$ pressure occupies a volume of 3.75 litres. At what temperature should the gas be keep if it si required should the gas be keep if it is required to reduce the volume to 3 litres a the same pressure:

A. $-26.6^{\circ} C$

B. $0^{\circ} C$

C. $3.98^{\circ} C$

D. $28^{\circ} C$

Answer: A

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23. Which of the following statement is false?

A. The product of pressure and volume of fixed amount of a gas is independent of temperature

B. Molecules of different gases have the same KE at a given temperatue

C. The gas equation is not valid at high pressure and low temperature

D. The gas constant per molecule is known as Boltzmann constant

Answer: A

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24. Two closed vessels of equal volume containing air at pressure P_1 and temperature T_1 are connected to each other through a narrow tube. If the temperature in one of the vessels is now maintained at T_1 and that in the other at T_2, what will be the pressure in the vessels?

A. $\dfrac{2P_1T_1}{T_1 + T_2}$

B. $\dfrac{T_1}{2P_1T_2}$

C. $\frac{2P_1T_2}{T_1+T_2}$

D. $\frac{2P_1}{T_1+T_2}$

Answer: C

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25. As per Boyle's law which of the following is/are kept constant?

A. Pressure

B. Mass

C. Temperature

D. Mass and temperature both

Answer: D

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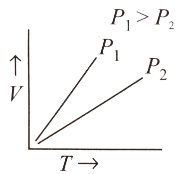
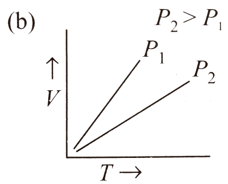
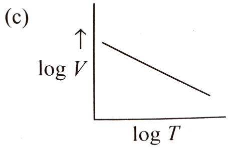
26. Which of the folloiwng graph is/are correct as per charles law?

A. 

B. 

C. 

D. Both (b) and (c) are correct

Answer: B

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27. Volume of the air that will be expelled from a vessel of $300cm^3$ when it is heated from $27^\circ C$ to $37^\circ C$ at the same pressure will be

A. $310cm^3$

B. $290cm^3$

C. $10cm^3$

D. $37cm^3$

Answer: C

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28. As per Charles law which of the following is/are correct

A. Pressure remains definite

B. Mass remains definite

C. volume is proportional to the absolute temperature

D. All of the above are correct

Answer: D

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29. To determine the value of R, which of the PV value is considered to be equal for every gas at $273K$?

A. $\lim_{P \to 1atm} (PV_m)$

B. $\lim_{P \to 0} (PV_m)$

C. $\lim_{P \to \infty} (PV_m)$

D. $\lim_{V \to 0} (PV_m)$

Answer: B

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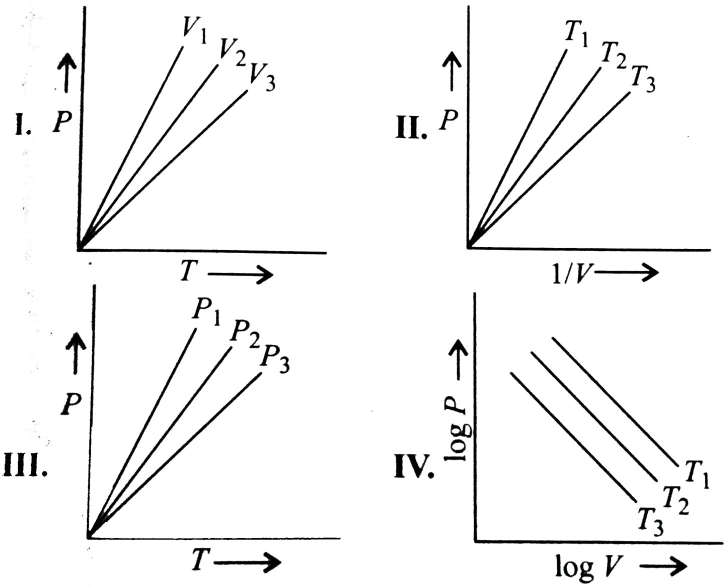
30. For $1 mol$ of an ideal gas, $V_1 > V_2 > V_3$ in fig. (I), $T_1 > T_2 > T_3$ in fig. (II), $P_1 > P_2 > P_3$ in fig. (III), and $T_1 > T_2 > T_3$ in fig. (IV) , then which curves are correct.



A. I, II

B. I, II, III

C. II, IV

D. I, III, IV

Answer: C

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31. At definite temperature the volume of a definite mass of gas is $10L$ at $5atm$ pressure, at the same temperature if the pressure of the gas is decreased to $1atm$, the volume of same gas becomes

A. $50L$

B. $2L$

C. $5L$

D. $0.5L$

Answer: A

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32. The molecules of a gas A travel four times faster than the molecules of gas B at same temperature. The ratio of molecular weights (M_A / M_B) is

A. $1/16$

B. 4

C. $1/4$

D. 16

Answer: A

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

A. The same as that of SO_2

B. $\frac{1}{2}$ that of SO_2

C. Twice that of SO_2

D. One-fourth that of SO_2

Answer: B

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34. Equal weights of methane and hydrogen are mixed in an empty container at $25^{\circ} C$. The fraction of the total pressure exerted by hydrogen is

A. $1/2$

B. $8/9$

C. $16/19$

D. $1/9$

Answer: B

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35. $X mL$ of H_2 gas effuses through a hole in a container in $5s$. The time taken for the effusion of the same volume of the gas specified below, under identical conditions, is

A. $10 \sec s : He$

B. $20 \sec s : O_2$

C. $25 \sec s : CO$

D. $55 \sec s : CO_2$

Answer: B

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36. Which of the following pair will diffuse at the same rate?

A. CO_2 and N_2O

B. CO_2 and NO

C. CO_2 and CO

D. N_2O and NO

Answer: A

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37. 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. $1:\sqrt{2}$

Answer: C

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38. A glass bulb contains $2.24 of H_2$ and $1.12L$ of D_2 at STP. It is connected a fully evacuated bulb by a stop-cock with a small opening. The stop-cock is opened for sometime and then closed. The first bulb now contains $0.10g$ of H_2. The percentage of H_2 in the mixture is

A. $41.6\ \%$

B. $58.4\ \%$

C. $46.2\ \%$

D. $50\ \%$

Answer: A

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39. Equal moles of CO, B_2H_6, H_2 and CH_4 are placed in a container. If a hole was made in container after 5minute, partial pressure of gases in container would be

(Atomic weights of C, O, B and H are $12, 16, 11, 1$ respectively)

A. $P_{CO} > P_{B_2H_6} > P_{H_2} > P_{CH_4}$

B. $P_{CO} = P_{B_2H_6} > P_{CH_4} > P_{H_2}$

C. $P_{CO} > P_{B_2H_6} = P_{H_2} > P_{CH_4}$

D. $P_{B_2H_6} > P_{H_2} > P_{CH_4} > P_{CO}$

Answer: B

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40. N_2 is found in a litre flask under $100kPa$ pressure and O_2 is found in another $3litre$ flask under $20KPa$ pressure. If the two flask are connected, the resultant pressure is

A. $310kPa$

B. $210kPa$

C. $420kPa$

D. $265kPa$

Answer: D

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41. When a jar containing gaseous mixture of equal volumes of CO_2 and H_2 is placed in a solution of sodium hydroxide, the solution level will

A. Rise

B. Fall

C. Remain constant

D. Become zero

Answer: A

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42. A mixture of H_2 and O_2 in $2:1$ volume is allowed to diffuse through a porous partition what is the composition of gas coming out initially

A. $1:2$

B. $4:1$

C. $8:1$

D. $1:4$

Answer: C

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43. When $2g$ of a gas A is introduced into an evacuated flask kept at $25^{\circ} C$, the pressure is found to be $1atm$. If $3g$ of another gas B is then heated in the same flask, the total pressure becomes $1.5atm$. Assuming ideal gas behaviour, calculate the ratio of the molecular weights M_A and M_B.

A. $1:1$

B. $1:2$

C. $2:3$

D. $1:4$

Answer: C

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44. A cylinder is filled with a gaseous mixture containing equal masses of CO and N_2. The partial pressure ratio is:

A. $P_{N_2} = P_{C_O}$

B. $P_{CO} = 0.875 P_{N_2}$

C. $P_{C_O} = 2P_{N_2}$

D. $P_{CO} = \frac{1}{2}P_{N_2}$

Answer: A

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45. A and B are two idential vessels. A contains $15g$ ethane at $1atm$ and $298K$. The vessel B contains $75g$ of a gas X_2 at same temperature and pressure. The vapour density of X_2 is :

A. 75

B. 150

C. 37.5

D. 45

Answer: A

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46. A mixture of hydrogen and oxygen at one bar pressue contains 20% by weight of hydrogen . Partial pressure of hydrogen will be

A. $0.2 bar$

B. $0.4 bar$

C. $0.6 bar$

D. $0.8 bar$

Answer: D

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47. 20 dm^3 of SO_2 diffuse through a porous partition in 60 s. what volume of O_2 will diffuse under similar conditions in 30 s ?

A. $12.14 L$

B. $14.\ 14 L$

C. $18.\ 14L$

D. $28.14L$

Answer: B

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48. A bottle of dry NH_3 and another bottle of dry HCl connected through a long tube are opened simultaneously at both ends of the tube. The white ring (NH_4Cl) first formed will be

A. A

B. B

C. C

D. A, B &C simultaneously

Answer: C

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49. The vapour density of a mixture containing NO_2 and N_2O_4 is $38.3 at 27^{\circ} C$. Calculate the mole of NO_2 in $100 g$ mixture.

A. 0.043

B. 4.4

C. 3.4

D. 0.437

Answer: D

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50. A vessel is filled with a mixture of oxygen and nitrogen. At what ratio of partial pressures will the mass of gases be identical?

A. $P(O_2) = 0.785P(N_2)$

B. $P(O_2) = 8.75P(N_2)$

C. $P(O_2) = 11.4P(N_2)$

D. $P(O_2) = 0.875P(N_2)$

Answer: D

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51. A sample of gas is at $0^\circ C$. The temperature at which its rms speed of the molecule will be doubled is

A. $103^\circ C$

B. $273^\circ C$

C. $723^{\circ} C$

D. $819^{\circ} C$

Answer: D

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52. A vessel contains $0.1 mole of He$, 0.1 mole of O_2 and 0.3 mole of N_2. The total pressure is 1 atomosphere. The pressure exerted by O_2 is

A. 380mm of Hg

B. 456mm of Hg

C. 304mm of Hg

D. 152mm of Hg

Answer: D

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53. A vessel has N_2 gas and water vapours at a total pressure of $1 atm$. The partial pressure of water vapours is $0.3 atm$. The contents of this vessel are transferred to another vessel having one-third of the capacity of original volume, completely 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. $2.4 atm$

Answer: D

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54. The rates of diffusion of SO_3, CO_2, PCl_3 and SO_2 are the following order:

A. $PCl_3 > SO_3 > SO_2 > CO_2$

B. $CO_2 > SO_2 > PCl_3 > SO_3$

C. $SO_2 > SO_3 > PCl_3 > CO_2$

D. $CO_2 > SO_2 > SO_3 > PCl_3$

Answer: D

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55. A sample of air contains only $N_2, O_2, \text{ and } H_2O$. It saturated with water vapours and total pressure is 6torr. The vapour pressure of water is 40torr and the mol ratio of $N_2 : O_2$ is $3:1$. The partial pressure of N_2 in the sample is

A. 540torr

B. 900torr

C. 1080torr

D. 450torr

Answer: D

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56. An effusion experiment requires $40s$ of a certain number of moles of a gas of unknown molar mass to pass through a small orifice into a vaccum. Under the same conditions, $16s$ was required for the same number of moles of O_2 to effuse. What is the molar mass of the unknown gas?

A. $5.1g/mol$

B. $12.8g/mol$

C. $80g/mol$

D. $200g/mol$

Answer: D

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57. Under identical conditions of temperature, the density of a gas X is three times that of gas Y while molecular mass of gas Y is twice that of X. The ratio of pressure of X and Y will be

A. 6

B. $1/6$

C. $2/3$

D. $3/2$

Answer: A

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58. NH_3 and SO_2 gases are being prepared at two corners of a laboratory. The gas that will be detected first in the middle of the laboratory is:

A. NH_3

B. SO_2

C. both at the same time

D. can't determine

Answer: A

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59. Dalton's law of partial pressure are applicable to

A. Non-reacting gases

B. Ideal gases

C. Temperature of the component gases in the mixture

D. All of the above

Answer: D

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60. $1000ml$ of a gas A at 600torr and $500ml$ of a gas B at 800torr are placed in a $2L$ flask. The final pressure will be

A. 2000torr

B. 1000torr

C. 500torr

D. 1400torr

Answer: C

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61. Which of the following is/are true regarding vapour pressure?

A. Vapour pressure is surface property of the solvent

B. Vapour pressure is independent of temperature

C. The saturation vapour pressure is corresponding to the liquid vapour equilibrium

D. Both (a) and (c) are correct

Answer: C

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62. Hydrogen gas diffuses four times as rapidly as a mixture of C_2H_4 and CO_2. The molar ration of $._2\ H_4$ to CO_2 in the mixture is

A. $1:1$

B. $2:1$

C. $3:1$

D. $3:2$

Answer: C

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63. Equal weights of methane and oxygen are mixed in an empty container at $25^{\circ} C$. The fraction of the total pressure exerted by oxygen is

A. $1/3$

B. $1/2$

C. $2/3$

D. $(1/3)(273/298)$

Answer: A

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64. Which of the following differentiate between diffusion and effusion?

A. Diffusion is the intermixing of the gas molecules at any direction and effusion is the reverse of diffusion

B. Diffusion is the property of the gas molecules and effusion is the property of the gas container only

C. Diffusion occurs at any direction, whereas effusion occurs under the potential difference

D. Diffusion is the intermixing gas molecules, whereas effusion is the passage of gas molecules through the pores in one direction

Answer: D

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65. The ratio of rates of diffusion of SO_2, O_2 and CH_4 is

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

B. $1 : 2 : 4$

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

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

Answer: A

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66. The rate of diffusion of methane at a given temperature is twice that of a gas X. The molecular weight of X is

A. 64.0

B. 32.0

C. 4.0

D. 8.0

Answer: A

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67. The ratio of rates of diffusion of CO_2 and SO_2 at the same pressure and temperatue is:

A. $4 : \sqrt{11}$

B. $11 : 4$

C. $1 : 4$

D. $1:6$

Answer: A

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68. To a given container having a pore of definite size, gas A $(mol. wt. 81)$ is filled till the final pressure become $10atm$. It was seen that in $50\text{minutes}10g$ of A was effused out. Now the container was compelety evacuated and filled with gas $B(mol. wt. 100)$ till the final pressure becomes $20atm$. In 75 minuter how many gram of B will be effused out?

A. $\frac{100}{6}g$

B. $\frac{100}{3}g$

C. $\frac{200}{3}g$

D. $\frac{250}{3}g$

Answer: B

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