CHEMISTRY

BOOKS - PATHFINDER CHEMISTRY (BENGALI ENGLISH)

STATES OF MATTER

Question Bank

1. Based upon Boyle's law draw the plot of P vs V and also PV vs P.

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2. Draw the plot of log P vs log V for Boyle's law.

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3. Draw the plot of log V vs log T.

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4. Can a gas with a=0 be liquified?

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5. How will you justify that the collisions among the gas molecules are perfectly elastic?

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6. Arrange CO_2, SO_2 and CO according to their rate of diffusion.

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7. What is the physical significance of R?

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8. Explain why Dalton's law of partial pressure is not applicable to a gaseous mixture of NH_3 and HCl.

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9. What is compressibility factor.

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10. Write the van der Waals equation for 5 mole of ideal gas.

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11. Why is it difficult to soften food at hills?

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12. An astronaut is an orbiting spaceship spilled a few drops of his drink , and the liquid floated around the cabin. In what geometric shape is each drop most likely to be found? Explain.

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13. Explain why the viscosity of ethyl alcohol is greater than that of diethyl ether.

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14. If the pressure volume temperature molecular weight and molar gas constant of an ideal gas be P,V,T, M and R respectively , then density of one mole of the gas is :

A. RT/PM

B. P/RT

C. M/V

D. MP/RT

Answer:

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15. The pressure of real gas is less than that of ideal gas because

A. of the size of the molecule

B. of the increase of the kinetic energy of the molecules

C. of intermolecular force of attraction

D. all of them are correct

Answer:

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16. In a closed container at P atm pressure N_2 and O_2 are present in equimolar quantities. If N_2 is taken out from that container then the pressure will be:

A. P

B. 2P

C. P/2

D. P^2

Answer:

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17. The term which has been included for intermolecular force of attraction in Van Der Waals equation is :

A. (V-b)

B. RT

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

D. RT^{-1}

Answer:

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18. Ne gas will have the maximum density at-

A. STP

B. $0^\circ C$ and 2 atm

C. $273^\circ C$ and 1 atm

D. $273^\circ C$ and 2 atm

Answer:

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19. The value of compressibility factor of an ideal gas:

A. 1.5

B. 1

C. 2

D. Infinity

Answer:

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20. Any gas will behave as an ideal gas at

A. Low temperature and low pressure

B. Low temperature and high pressure

C. high temperature and low pressure

D. high temperature and high pressure

Answer:

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21. when the temperature is raised the viscosity of the liquid decreases this is because

A. Decreased volume of the solution

B. Increase in temperature increases the average kinetic energy of molecules which overcome the attractive force

between them

C. Decreased covalent and hydrogen bond forces

D. none of these

Answer:

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22. Positive deviation from ideal behaviour takes place because of

A. Molecular interaction between atoms and $PV/nRT > 1$

B. Molecular interaction between atoms and $PV/nRT < 1$

C. Finite size of the atoms and $PV/nRT > 1$

D. Finite size of the atoms and $PV/nRT < 1$

Answer:

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23. A gas can be liquified

A. above its critical temperature

B. as its critical temperature

C. below its critical temperature

D. at any temperature

Answer:

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24. A manometer is connected to a gas containing bulb. The open and reads 43.7 cm whereas the arm connected to the bulbs read 15.6 cm. if the barometic pressure is 743 mm mercury, what is the pressure of the gas in bar?

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25. Draw Z vs P for H_2 and CO_2 at $0^\circ C$

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26. Write the van der Waals equation for real gas ? Write the unit of a and b.

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27. What is the Boyle's temperature and critical temperature? Give the relation between them.

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28. Give two differences between ideal gas and real gas?

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29. State Dalton's law of partial pressure.

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30. An iron cylinder contains helium at pressure of 250 kpa at 300 k . The cylinder can withstand a pressure of 1×10^5 Pa. The

room in which the cylinder is placed catches fire. Predict whether the cylinder will blow before it melts or not (M.P of cylinder =1800K)

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31. Critical temperature for carbon dioxide and methane are $31.1^{\circ}C$ and -81.9 respectively. Which of these has stronger intermolecular forces and why?

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32. Explain the significance of Vander Waal parameter.

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33. Using the equation of state PV=nrt show that at a given temperature , the density of the gas is proportional to the gas pressure P.

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34. How do you explain Boyle's law on the molecular level?

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35. State Boyle's and Charles's law Use these laws to derive the relationship

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

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36. At constant temperature V/T ratio for different quantities of any ideal gas will be different is the statement right?

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37. Two real gases have the same value of 'b' but the values of 'a' are different , molar volume of which of the gases will be less?

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38. What happens when $AgNO_3$ is strongly heated?

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39. For H_3PO_4 and H_3PO_3 the correct choice is:

A. (A) H_3PO_3 is $dibasic\ acid$

B. (B) H_3PO_3 is $tribasic\ acid$

C. (C) H_3PO_4 is $dibasic\ acid$

D. (D) H_3PO_4 is $tribasic\ acid$

Answer:

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40. Temperature of an ideal gas is 340 K. At constant pressure the gas is so heated volume increases by 18% . What is the final temperature of the gas ?

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41. Why can a gas be compressed to any extent?

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42. Define the term surface tension and surface energy? What will be the effect on surface tension of increasing temperature.

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43. Calculate the average volume available to nitrogen molecule in a sample of gas at NTP. What is the average distance between the neighbouring molecules if nitrogen molecules is assumed to be spherical ?

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44. Define the term viscosity. Define the term coefficient of viscosity and give the S.I. unit what will be the effect of viscosity on increasing temperature of liquid and gases.

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45. Which two postulates of kinetic theory of gases are responsible for the deviation of gases from the ideal gas behaviour.

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46. Equal masses of the two gases A and B are kept in two separate vessels at the same temperature and pressure. If the

ratio of the molecular masses of A and B is 2:3 Find the ratio of the volume of the two vessels.

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47. A 1000 mL sample of a gas at $-73^{\circ}C$ and 2 atmosphere is heated to $123^{\circ}C$ and the pressure is reduced 0.5 atm. What will be the final volume ?

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48. A balloon of diameter 20m weights 100kg calculate its payload if it filled with helium at 1.00 atm and $27^{\circ}C$

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49. 113 L of helium gas at $1360^{\circ}c$ and prevailing barometric pressure is passed through molten silver at result the liquid silver loses 0.120 g in mass. What is vapour pressure in mmHg of liquid silver at $1360^{\circ}C$? neglect any change in gas volume due to vaporisation of the silver.

Plan : Under given condition 0.120 g of molten silver is vaporised (indicated by loss in mass). Thus pressure can be calculated by $P = \frac{n}{V}RT$

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50. what will be the minimum pressure required to compress 500 dm^3 of air at 1 bar to 200 dm^3 at $30^{\circ}C$?

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51. A vessel of 120 mL capacity contains amount of gas at $35 \circ C$ and 1.2bar pressure. The gas is transferred to another vessel of volume 180 mL at 35°. What would be its pressure ?

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52. At $0^{\circ} C$ the density of a gaseous oxide at 2 bar is same as that of nitrogen 5 bar. What is the molecular mass of the oxide ?

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53. The drain cleaner, Drainex contains small bits of aluminium which reacts with caustic soda to produce hydrogen. What volume of hydrogen at $20^{\circ} C$ and one bar will be released when 0.15 g of aluminium reacts ?

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54. What will be the pressure exerted by a mixture of 3.2g of methane and 4.4. g of carbon dioxide contained in a $9dm^3$ flask at $27^\circ C$?

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55. Density of a gas is found to be 5.46 g/dm^3 at $27^\circ C$ at 2 bar pressure. What will be its density at STP ?

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56. A student forgot to add the reaction mixture to the round bottomed flask at $27^\circ C$ but put it on the flame.After a lapse of

time, he realized his mistake. Using a pyrometer he found the temperature of the flask was$477^{\circ}C$ fraction of air would have been expelled ?

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57. Using the equation of state PV=nrt show that at a given temperature , the density of the gas is proportional to the gas pressure P.

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58. 34.05 mL of phosphorus vapour weighs 0.0625g at $546^{\circ}C$ and 0.1 bar pressure .what is the molar mass of phosphorus ?

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59. Calculate the temperature of 4.0 moles of a gas occupying $5dm^3$ at 3.32 ber.

(R = 0.083 bar $dm^3K^{-1}mol^{-1}$

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60. Pay load is defined as the difference between the mass of displaced air and the mass of the balloon .calculate the payload when a balloon of radius 10 m mass 100 kg is filled with helium at 1.66 ber at $27^\circ C$ (Density of air =1.2kgm^(-3)) and $R = 0.083^{-}$dm^3k^(-1)mol^(-1)`

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61. Calculate the volume occupied by 8.8g of CO_2 at $31.1^\circ C$ and 1 bar pressure.R=0.83bar $Dm^3.\ k^1 mol^{-1}$

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62. A manometer is connected to a gas containing bulb. The open and reads 43.7 cm whereas the arm connected to the bulbs read 15.6 cm. if the barometic pressure is 743 mm mercury, what is the pressure of the gas in bar?

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63. Assuming that the air is essentially a mixture of nitrogen and oxygen in mole ratio of 4 : 1 by volume. Calculate the

partial pressures of N_2 and O_2on a day when the atmospheric pressure is 750 mm of Hg. Neglect the pressure of other gases.

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64. Calculate the total pressure in a mixture of 8 g oxygen and 4g of hydrogen confined in a vessel of 1 dm^3 at `27^@C. (R=0.083 bar dm^3k^(-1) mol^(-1))

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65. A mixture of hydrogen and oxygen at one bar pressure contains 20% by weight of hydrogen. Calculate partial pressure of hydrogen.

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66. Pressure of 1 g of an ideal gas A at $27^{\circ}C$ is found to be 2 bar when 2g of another ideal gas B is introduce in the same flask at same temperature the pressure becomes 3 bar. Find a relationship between their molecular masses.

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67. What will be the pressure of the gas mixture when 0.5 L of H^2 at 0.8 bar and 2.0L of oxygen at 0.7 bar are introduced in a 1L vessel at $27^{\circ}C$?

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68. Equal volumes of two gases A and B diffuse through a porous pot in 20 and 10 seconds respectively. If the molar mass

ofA be 80,find the molar mass of B.

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69. Write the names of all essential amino acids .

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70. A mixture containing 1.12 litre of H^2 and 1.12 litre of D^2 (deuterium) at STP is taken inside a bulb connected to another bulb by a stop-cock wilh a small opening. The second bulb is fully evacuated, the stop-cock is opened for a certain time and then closed. The first bulb is found to contain 0.05 g of H^2. Determine the percentage composition by mass of the gases in the second bulb.

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71. Find the temperatures at which methane and ethane will have the same rms speed as carbon dioxide at $400^{\circ}C$. Also calculate the mean velocity and most probable velocity of methane molecules at $400^{\circ}C$.

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72. Explain the significance of Vander Waal parameter.

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73. The compressibility factor for nitrogen at 223K and 800 atm is 1.95 and at 373K and 200 atm is 1.10. A certain mass of nitrogen occupies a volume of 1.0 dm^3 at 223K and 800 atm.

Calculate the volume occupied by the same quantity of nitrogen at 373K and 200 atm.

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74. What is RMS velocity of O_2 gas at $127^\circ C$

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75. Two flasks of equal volumes have been joined by a narrow tube of negligible volume. Initially both flasks are at 300 K containing 0.60 mol of O_2 gas at 0.5 atm pressure. One of the flasks is then placed in a thermostat at 600 K. Calculate number of moles of $\_ 22$ gas in each flask.

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76. Explain why water would fill a fine capillary tube which is open at both ends when one end is immersed in water.

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77. A capillary tube of diameter 0.4 mm is dipped in a beaker containing mercury of density 13.6x10 3 kgm −3 and surface tension 0.49Nm −1 .The angle of contact of mercury w.r.t. glass is 130 o . [Cos 130 o = -0.64280]. The depression of the meniscus in the capillary tube is (g = 9.8 ms −2).

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78. Relative viscosity of a liquid with respect to H_2O is measured using Ostwald's viscometer. Time of flow of the given

volume through a fine capillary was 60 s with water and 80 s with the liquid. 25 mL of the liquid weighed 28 g while 25 mL of H^2O weighed 25 g. What is relative viscosity of the liquid ?

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79. Stearic acid, $C_{17}H_{35}COOH$, has a density of $0.85g/cm^3$. The molecule occupies an area of $0.205nm^2$ in a closed packed surface film. Calculate the length of the molecule. (Molecular weight of Stearic acid is 284.48gm/mole)

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80. Critical temperature for carbon dioxide and methane are $31.1^\circ C$ and -81.9 respectively. Which of these has stronger intermolecular forces and why?

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81. Explain why ice has a sharp melting point where as glass melts over a range of temperature ?

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82. A 5 litre bulb contains n moles of nitrogen at 0.5 atm and T K, on adding 2.5×10^{-2} mole of oxygen, it becomes necessary to cool the gas mixture to $10^{o}C$ to maintain the same pressure. Calculate n and T.

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83. A U-tube with limbs A and B of equal length is closed at the top of B. Mercury is now poured gradually into the limb A, so that air gets trapped in B, it is found that when the mercury level reaches the top of A, the level in B reaches half its height. The external pressure is 1 atm. What is the length of the limb, A ? Neglect the volume of the connecting tube.

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84. A 2 g sample of hydrogen at temperature T and of volume V exerts pressure P. Deuterium, ${}_{1}^{2}H$ is an isotope of hydrogen. Which of the following would also exert a pressure P at the same temperature T ?

A. 2 g of deuterium of volume V

B. 4 g of deuterium of volume $\frac{V}{2}$

C. A mixture of 1g of hydrogen and 2g of deuterium of total volume V

D. A mixture of 2 g of hydrogen and 1 g of deuterium of total volume 2V

Answer: C

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85. The vapour pressure of water is 17.5 torr at $20^\circ C$. When the relative humidity is 45%, the number of moles, of water present at $20^\circ C$ in 1 L of air is

A. 1.04×10^{-3}

B. 2.43×10^{-3}

C. 4.30×10^{-4}

D. 5.12×10^{-4}

Answer: C

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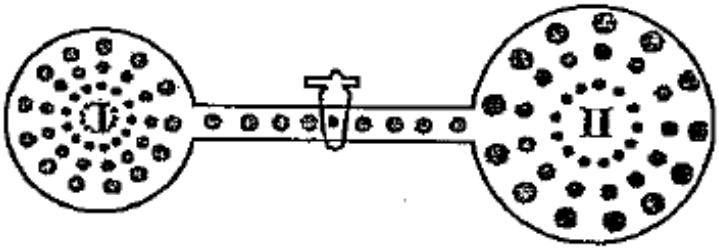
86. Two bulbs are connected with a tube of negligible volume.



Bulb I has $2.8 g N_2 at T_1 K$.The other bulb(II) is completely evacuated. The bulb (I) is heated to $T_2 K$ while bulb (II) is maintained at $\frac{T_2}{3} K$. Volume of bulb (I) is half that of bulb (II). If the valve is opened, then what is the weight ratio of N_2 in both bulbs, $\left(\frac{W_1}{W_2}\right)$?

A. $1:6$

B. $1:3$

C. $3:1$

D. $1:2$

Answer: A

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87. A vessel of unknown volume V contains a mixture of propane and methane at a temperature T and exerts a pressure of 320 mm Hg. The gas is burnt in excess O_2 and all the carbon is recovered as CO_2. The CO_2 is found to have a pressure of 448 mm Hg in a volume V, at the same temperature T. The mole fraction of propane in the original mixture is

A. 0.8

B. 0.2

C. 0.4

D. 0.6

Answer: B

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88. What is the pressure of 2 mole of $NH_3 at 27^\circ C$ when its volume is 5 litre 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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89. If the mean free path is 'a' at one atm pressure, then its value at 5 atm pressure is

A. 5a

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

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

D. unpredictable

Answer: C

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90. The relationship between P_c, V_c and T_c is

A. $P_c, V_c = RT$

B. $P_c, V_c = 3RT_c$

C. $P_c, V_c = \frac{3}{5}RT_c$

D. $P_c, V_c = \frac{3}{8}RT_c$

Answer: D

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91. a' and 'b' are van der Waals constants for gases. Chlorine is more easily liquefied than ethane because

A. a and b for $Cl_2 < a$ and b for C_2H_6

B. a for $Cl_2 < a$ for C_2H_6 but b for $Cl_2 > b$ for C_2H_6

C. a for $Cl_2 > a$ for C_2H_6 but b for $Cl_2 < b$ for C_2H_6

D. a and b for $Cl_2 > a$ and b for C_2H_6

Answer: C

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92. What happens when ammonia reacts with excess of chlorine?

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93. The critical temperature and reduced temperature of a gas are 150 K and 3 respectively. What is the temperature of the gas ?

A. 50 K

B. 147 K

C. 153 K

D. 450 K

Answer: D

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94. In terms of critical constants, the compressibility factor is

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

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

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

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

Answer: A

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95. Which of the following statements is correct about a liquid at constant temperature before equilibrium is attained ?

A. Rate of evaporation (R_e) decreases with time whereas rate of condensation `(R_c) increases with time

B. R_e increases with time where R_c decreases with time

C. R_e remains constant whereas R_c increases with time

D. R_c remains constant whereas R_e increases with time

Answer: C

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96. The integrated form of Clausius-Clapeyron equation is:

A. $\frac{d \ln K}{dT} = \frac{\triangle H}{RT^2}$

B. $\log_{10} \frac{K_2}{K_1} = \frac{\triangle H}{2.303R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

C. $\log_{10} \frac{P_2}{P_1} = \frac{\triangle H_vap}{2.303R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

D. none of these

Answer: C

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97. The surface tension of which of the following liquid is maximum ?

A. CH_3OH

B. C_2H_5OH

C. C_6H_6

D. H_2O

Answer: D

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98. If η is the coefficient of viscosity and T is the temperature in kelvin, a linear plot is obtained for

A. $\eta vs T$

B. $\eta vs \frac{1}{T}$

C. $\log \eta vs \frac{1}{T}$

D. $\eta vs \log T$

Answer: C

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99. The boiling points of water, ethyl alcohol and diethyl ether are $100^\circ C, 78.5^\circ C$ and $34.6^\circ C$ respectively. The intermolecular forces will be in the order

A. $water > ethylalcohol >$ diethylether

B. $ethylalcohol > water >$ diethyl ether

C. $diethylether > ethylalcohol > water$

D. $diethylether > water > ethylalcohol$

Answer: A

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100. 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 an average, 100 ml blood contains 0.02 g of O_2 and 0.08 g of CO_2. The volume of O_2 and CO_2 at 1 atm and at body temperature $37^\circ C$, assuming 10 L blood in human body, is

A. 2 L, 4L

B. 1.5 L, 4.5 L

C. 1.59 L, 4.62 L

D. 3.82 L, 4.62 L

Answer: C

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101. A mixture of $NH_3(g)$ and $N_2H_4(g)$ is placed in a sealed container at 300 K. The pressure within the container is 0.6 atm. When the container is heated to 1000 K where the two gases undergo decomposition reactions $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$ and $N_2H_4(g) \rightarrow N_2(g) + 2H_2(g)$ The pressure of the container now becomes 4.8 atm. The mole percent of $NH_3(g)$ in the original mixture was

A. 40

B. 50

C. 60

D. 70

Answer: C

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102. What happens when excess ammonia reacts with chlorine?

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103. A box is divided into two equal parts A and B having two gases X and Y respectively. The two parts have equal pressure of 250 mmHg. The pressure after removing the partition will be :

A. 125 mm

B. 250 mm

C. 350 mm

D. 500 mm

Answer: B

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104. A bubble of air is underwater at temperature $15^{\circ}C$ and the pressure 1.5 bar. If the bubble rises to the-surface where the temperature is $25^{\circ}C$ and the pressure is 1.0 bar, what will happen to the volume of the bubble ?

A. Volume will become greater by a factor of 2.5

B. Volume will become greater by a factor of 1.6

C. Volume will become greater by a factor of 1.1

D. Volume will become smaller by a factor of 0.70

Answer: B

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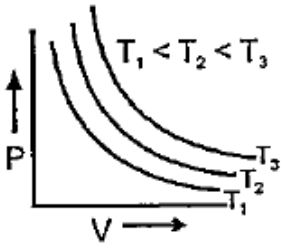
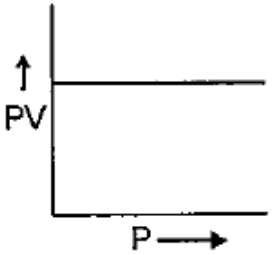
105. Which of the following graph is/are correct in accordance with Boyle's law ?



(I)



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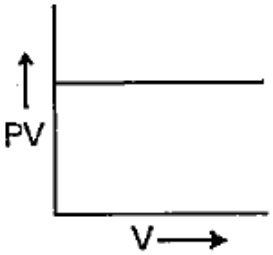

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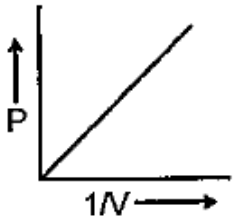

(IV)

A. I

B. I, II

C. I, II, III

D. I, II, III, IV

Answer: D

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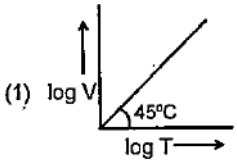
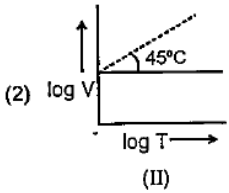
106. Ten moles of an ideal gas are filled In a closed vessel. The vessel has cylinder and piston type arrangement and pressure of the gas remains constant at 0.821 atm. Which of the following graph represents correct variation of log V vs log T ? (V = volume in litre and T = temperature in Kelvin)

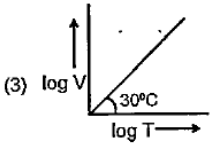
A.



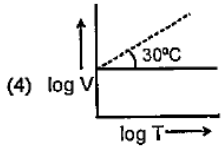
B.



C.



D.



Answer: A

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107. A flask filled with CCl_4 vapour was weighed at a temperature and pressure. The flask was then filled with oxygen at the same temperature and pressure. The mass of CCl_4 vapour would be about

A. the same as that of the oxygen

B. one-fifth as heavy as oxygen

C. five times as heavy as oxygen

D. twice as heavy as oxygen

Answer: C

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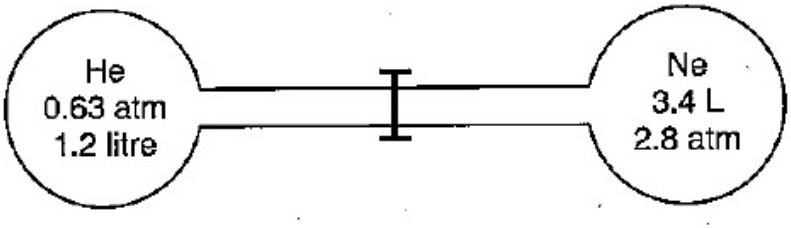
108. Two gas bulbs are connected by a thin tube. Calculate the partial pressure of helium after the connective valve is opened at a constant temperature of $27^{\circ} C$.



A. 1 atm

B. 0.328 atm

C. 1.64 atm

D. 0.166 atm

Answer: D

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109. A large cylinder of helium filled at 2000 mm of Hg had a small orifice through which helium escaped into evacuated space at the rate of 6.4 moles/hour. How long would it take for 10 mole of CO to teak through a similar orifice if the CO were confined at the same pressure?

A. 2.1 hour

B. 4.2 hour

C. 5.6 hour

D. 11.2 hour

Answer: B

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110. Three grams of helium diffuses from a container in 15 min. The mass of sulphur dioxide diffusing from the same container over the same time interval will be

A. 3 g

B. 6 g

C. 9 g

D. 12 g

Answer: D

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111. For two gases A and B with molecular masses M_A and M_B, it is observed that at a certain temperature T_1 the mean velocity of A is equal to the root mean square velocity of B, thus the mean velocity of A can be made equal to the mean velocity of B if

A. A is at higher temperature than B

B. A is at lower temperature than B

C. Both A and B are raised to a higher temperature

D. Both A and B are placed at lower temperature

Answer: B

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112. The kinetic energy of N molecules of O_2 is x joule at -$123^\circ C$. Another sample of O_2 at $27^\circ C$ has a kinetic energy of 2x joule. The later sample contains:

A. N molecules of O_2

B. 2N molecules of O_2

C. $\frac{N}{2}$ molecules of O_2

D. $\frac{N}{4}$ molecules of O_2

Answer: A

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113. Helium atom is two times heavier than a hydrogen molecule. At 298 K, the average kinetic energy of a Helium atom is

A. two times that of hydrogen molecule

B. same as that of a hydrogen molecule

C. four times that of a hydrogen molecule

D. half that of a hydrogen molecule

Answer: B

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114. Which of the following statement is not true?

A. the ratio of the mean speed to the rms speed is independent of the temperature.

B. the square of the mean speed of the molecules is equal to the square of rms speed at a certain temperature.

C. mean kinetic energy of the gas molecules at any given temperature is independent of the mean speed.

D. the difference between rms speed and mean speed at any temperature for different gases diminishes as larger and yet larger molar masses are considered.

Answer: B

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115. Four particles have speed 2,3,4 and 5 cm/s respectively. Their R.M.S speed is

A. $3.5\text{cm}/s$

B. $27/2\text{cm}/s$

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

D. $\sqrt{\frac{54}{4}}\text{cm}/s$

Answer: D

Watch Video Solution

116. If a gas expand at constant temperature :

A. The K.E. of molecules remains same

B. The K.E. of molecules increases

C. The number of molecules of gas increases.

D. The pressure increases

Answer: A

Watch Video Solution

117. The heat capacity of the following gases at room temperature are such that

A. $NH_3 > CO_2 = O_2 = N_2 > Ar$

B. $NH_3 = CO_2 > O_2 > N_2 > Ar$

C. $NH_3 > CO_2 > O_2 = N_2 > Ar$

D. $NH_3 > CO_2 > O_2 > N_2 > Ar$

Answer: C

Watch Video Solution

118. Which of the following expressions does not represent an ideal gas ?

A. $p = nRT / V$

B. $p = dRT / M$

C. $pV = \frac{1}{3} mNu^{-2}$

D. $p = \frac{2}{3} N(KT)$

Answer: D

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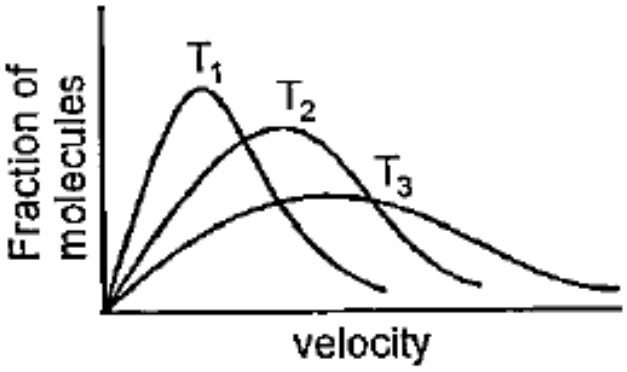

119.

Above graph is plotted for CO_2 at three different temperature, i.e., 273 K, 1273 K and 2773 K. Which of the following option is correct about these temperature:

A. T_1 273 K T_2 1273 K T_3 2773 K

B. T_1 2773 K T_2 1273 K T_3 273 K

C. T_1 1273 K T_2 2773 K T_3 273 K

D. T_1 2773 K T_2 273 K T_3 1273 K

Answer: A

Watch Video Solution

120. At what temperature is the rms speed of hydrogen molecules the same as that of oxygen molecules at $1327^\circ C$?

A. 173 K

B. 100 K

C. 400 K

D. 523 K

Answer: B

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121. The root mean square velocity of a gas is 'c'. if pressure of gas is doubled at constant temperature, what will be the root

mean square velocity of the gas sample?

A. 2c

B. $\sqrt{2}c$

C. c

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

Answer: C

Watch Video Solution

122. By what factor does the average velocity of a gaseous molecule increases, when the temperature (tn Kelvin) is doubled ?

A. 1.4

B. 2

C. 2.8

D. 4

Answer: A

Watch Video Solution

123. Consider an ideal gas contained in a vessel. If the intermolecular attraction suddenly begins to act, which of the following will happen ?

A. The pressure decreases

B. The pressure increases

C. The pressure remains unchanged

D. The gas collapse

Answer: A

Watch Video Solution

124. A real gas at a very high pressure occupies

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

B. less volume than that of an ideal gas under identical conditions

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

D. cannot predict.

Answer: A

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125. 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 constant 'a' and 'b' are negligible

D. both the constant 'a' and ‘b’ are not negligible

Answer: A

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126. At Boyle's temperature compressibility factor Z for a real gas is :

A. $Z = 1$

B. $Z = 0$

C. $Z > 1$

D. $Z < 1$

Answer: A

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127. The inversion temperature Ti(K) of hydrogen is (Given van der Waal's constant a and b are 0.244 atm $L^2 mol^{-2}$ and 0.027 $Lmol^{-1}$ respectively.)

A. 440

B. 220

C. 110

D. 330

Answer: B

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128. Triple point of water exists at

A. $T = 0.0098^\circ C, P = 4.7mmHg$

B. $T = 0.98^\circ C, P = 470mmHg$

C. $T = 25^\circ C, P = 760mmHg$

D. $T = 298^\circ C, P = 760mmHg$

Answer: A

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129. Excluded volume of a gas will be larger, if $\frac{T_c}{P_c}$ is

A. Small

B. Large

C. 1

D. less than 1

Answer: B

Watch Video Solution

130. The critical temperature of O_2 is less than. H_2O because the H_2O molecules have

A. Fewer electron than O_2

B. Two covalent bond

C. V-shaped structure

D. Dipole moment

Answer: D

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131. What happens when ammonium dichromate is heated ?

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132. The work done which is to be required to increase the area of soap film of $10cm \times 6cm$ to $10cm \times 11cm$ is 3×10^{-4} J. The surface tension of the soap film is

A. $3 \times 10^{-4} Nm^{-1}$

B. $3 \times 10^{-3} Nm^{-1}$

C. $3 \times 10^{-2} Nm^{-1}$

D. $3 \times 10^{-1} Nm^{-1}$

Answer: C

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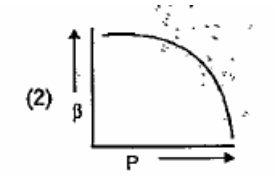
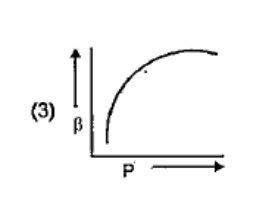
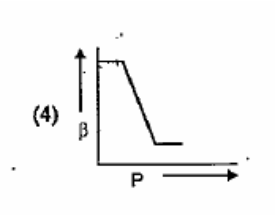
133. Which of the following graphs correctly represents the variation of $B\eta = -\frac{dv/dp}{v}$ with P for n ideal gas at constant temperature ?

A. https://haygot.s3.amazonaws.com/choices/179862_614134.png

B. 

C. 

D. 

Answer: A

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134. Two thermal insulated vessels 1 and 2 are filled with air at temperature T_1 and T_2,volume V_1 and V_2 and pressure P_1 and

P_2 respectively. If the valve joining the vessels is opened, the temperature inside the vessel at equilibrium will be

A. $T_1 + T_2$

B. $\frac{T_1 + T_2}{2}$

C. $\frac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_2 + P_2 V_2 T_1}$

D. $\frac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_1 + P_2 V_2 T_2}$

Answer: C

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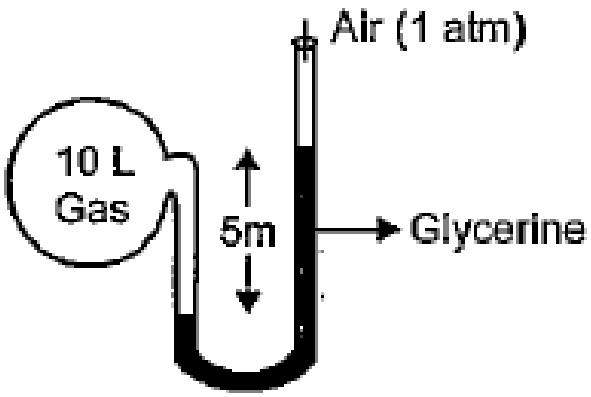

135.

Calculate the number of moles in the glass bulb shown in figure at 300 K. Given : d (glycerine)= 2.72 g/mL,d (mercury) = 13. 6 g/mL

A. 0.36 mol

B. 0.94 mol

C. 0.49 mol

D. 0.64 mol

Answer: B

Watch Video Solution

136. A gaseous mixture contains three gases A, B and C with a total number of moles of 10 and total pressure of 10 atm. The partial pressures of A and B are 3 atm and 1 atm respectively and if C has molecular weight of 2. Then, the weight of C present in the mixture will be

A. 8 g

B. 12 g

C. 3 g

D. 6 g

Answer: B

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

A. X ml He : 10 seconds

B. X ml `O_2 : 20 seconds

C. X ml CO_2 : 25 seconds

D. X ml CO_2 : 20 seconds

Answer: B

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138. At identical temperature and pressure, the rate of diffusion of H_2 gas is $3\sqrt{3}$ times that of a hydrocarbon having molecular

formular C_nH_{2n-2}. What is the value of n ?

A. 1

B. 4

C. 3

D. 8

Answer: B

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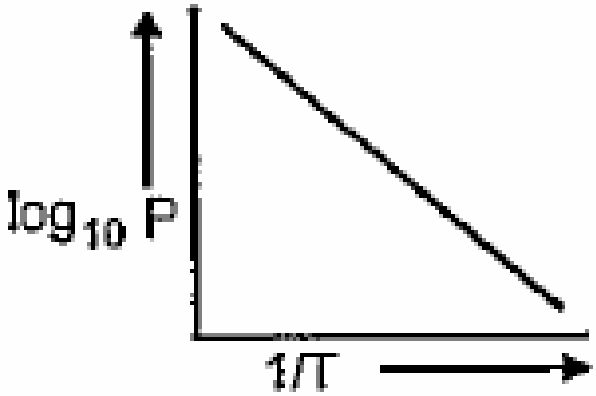

139. (plot of log P, where P = vapour pressure of liquid against 1/T) The slope of the line will be equal to :

A. ΔH_{vap}

B. $-\Delta H_{vap}$

C. $-\dfrac{\Delta H_{vap}}{2.303R}$

D. $+\dfrac{\Delta H_{vap}}{2.303R}$

Answer: C

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140. Five molecules of a gas are moving with speed 1, 2, 3, 4, 5 km/sec. What is their root mean square speed ?

A. $\sqrt{55}$ km/sec

B. $\sqrt{44}$ km/sec

C. $\sqrt{11}$ km/sec

D. $\sqrt{6}$ km/sec

Answer: C

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141. Most probable velocity of hydrogen molecules at $T^{\circ}C$ is V_0. At $(2T + 273)^{\circ}C$, all the molecules are dissociated, into atoms. Then new most probable velocity will be

A. v_0

B. $2v_0$

C. $3V_0$

D. $4V_0$

Answer: B

Watch Video Solution

142. For a fixed mass of gas at constant pressure, which of the following statements is/are not correct ?

A. Plot of volume versus Celsius temperature, is linear with intercept zero.

B. Plot of volume versus kelvin temperature is linear with a non-zero intercept.

C. Plot of V/T versus T.is linear with a positive slope.

D. Plot of V/T versus T is linear with a zero slope.

Answer: A::B::C

Watch Video Solution

143. Which of the following statements are correct?

A. The molar mass of a gas may be calculated through the expression $M = \left(\frac{d}{p}\right)RT$

B. The value of $\frac{d}{p}$ of an ideal gas at a constant temperature is independent of the pressure of the gas

C. The Avogadro constant has a value of $6.626 \times 10^{26} mol^{-1}$

D. The volume of a fixed mass of gas at constant pressure varies nonlinearJy with temperature expressed in Celsius whereas it varies when expressed in kelvin

Answer: A::B

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144. Which of the following statements are correct?

A. The unit of K in the expression V = KT is $M^2 K^{-1}$

B. A gas is heated at constant pressure from $25^\circ C$ to $50^\circ C$. It expands to twice its initial volume

C. The volume occupied by 32 g of oxygen is greater than that occupied by 16 g of methane, both being at the same T and P.

D. All real gases can be liquefied and solidified.

Answer: A::D

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145. Which of the following statements are not correct ?

A. at low pressure the molecules of an ideal gas move with slower speed as compared to the gas at high pressure.

B. The value of gas constant R is $8.314.\ JK^{-1}Mol^{-1}$

C. The value of Boltzmann constant k is $1.38 \times 10^{-23} JK^{-1} mo \leq c\underline{e}^{-1}$

D. The van.der waals constant a is a measure of forces of attraction between gaseous molecules of a gas.

Answer: A::B::C

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146. Let u_{av}, u_{rms} and u_{mp} respectively denote the average speed, root mean square average speed and most probable, speed in an ideal monatomic gas at Kelvin temperature "E The mass of an atom is m. Then correct statement(s) are

A. no atom can have a speed greater than $\sqrt{2}u_{rms}$

B. no atom can have a speed-greater than $u_{mp}\sqrt{2}$

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

D. the average kinetic energy of an atom is (3/4) `"mu"_(mp)^2

Answer: C::D

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147. Which of the following statements are not correct ?

A. The ratio of u_{av} and u_{mp} is 2 : 3

B. The unit of van der waals: constant a is L^{-2} atm mol^{-1}

C. The mean square speed of a gas varies linearly with kelvin temperature

D. The increasing order of average, most probable and root mean square speeds is $u_{rms} < u_{av} < u_{mp}$

Answer: A::B::D

Watch Video Solution

148. Which of the following statements are not correct?

A. A real gas can be liquefied if its temperature is greater than its critical temperature

B. A real gas is expected to behave ideally at high temperature and low pressure

C. At constant pressure, the ratio of increase in volume of an ideal gas per degree rise in kelvin temperature to its

original volume is T

D. The rate of diffusion is directly proportional to the square root of its kelvin temperature and also inversely proportional to the square root of its molar mass

Answer: B::D

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149. Which of the following statements are correct?

A. Equal masses of all gases occupy the same volume at STP.

B. An ideal gas cannot be liquefied

C. Kinetic energy of gaseous molecules is zero at $0^{\circ}C$

D. Gases having very low critical temperatures often show near ideal behaviour at room temperature.

Answer: B::D

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150. Which of the following statements are not correct ?

A. The expression of kinetic gas equation is $pV = \frac{1}{3}mN\overline{u^2}$

B. The symbols $\overline{u^2}$ and $\left(u^2\right)av$ represent one and the same physical quantity.

C. The density of an ideal gas increase with increase in temperature provided its pressure is constant.

D. The average kinetic energy of gaseous molecules depends on temperature and nature of gaseous molecules.

Answer: B::C::D

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151. For an ideal gas under isobaric condition a graph between log V and logT:

A. is linear with unit slope

B. represents Boyle's law

C. represents Charle's law

D. represents Gay Lussac law

Answer: A::C

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152. Let us consider 1 mol of gas. If It Is an ideal gas then< br>

$\frac{P\bar{V}}{RT}$ = 1 where , $\bar{V}$ = molar volume of a gas

For a non-ideal gas this quotient may not be equal to 1. It can also be less than or greater than 1. Therefore, the above quotient is defined as compressibility factor Z.

Z = $\frac{P\bar{V}}{RT}$ = (Molar volume of real gas)/ (Molar volume of ideal gas)

The compressibility factor of real gases can be written as Z = $\frac{P\bar{V}}{RT} = 1 + \frac{B}{\bar{V}} + \frac{C}{\bar{v}^2} + \frac{D}{\bar{v}^3} \ldots\ldots (Viralequation)$

Where B,C,D are called virial coefficients and are dependent on the nature of the gas and temperature. $B = \left(b - \frac{a}{RT}\right)$ .At Boyle's temperature,second virial coefficient becomes zero.

when $Z > 1$repulsive forces are dominant and when $Z < 1$ the

forces of attraction are dominant. Which of the following statements is correct ?

A. 2

B. 1

C. 0.02

D. 0.01

Answer: D

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153. Let us consider 1 mol of gas. If It Is an ideal gas then< br>

$\frac{P\bar{V}}{RT}$ = 1 where , $\bar{V}$ = molar volume of a gas

For a non-ideal gas this quotient may not be equal to 1. It can also be less than or greater than 1. Therefore, the above

quotient is defined as compressibility factor Z.

Z = $\frac{P\bar{V}}{RT}$ = (Molar volume of real gas)/ (Molar volume of ideal gas)

The compressibility factor of real gases can be written as Z = $\frac{P\bar{V}}{RT} = 1 + \frac{B}{\bar{V}} + \frac{C}{\bar{v}^2} + \frac{D}{\bar{v}^3} \ldots\ldots (Viralequation)$

Where B,C,D are called virial coefficients and are dependent on the nature of the gas and temperature. $B = \left(b - \frac{a}{RT}\right)$ .At Boyle's temperature,second virial coefficient becomes zero.

when $Z > 1$repulsive forces are dominant and when $Z < 1$ the forces of attraction are dominant. Which of the following statements is correct ?

A. When $Z > 1$, real gases are difficult to compress

B. When Z = 1, real gases are difficult to compress

C. When Z =1 .real gases are easily compressed

D. When $Z > 1$, real gases are easier to compress

Answer: D

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154. The root mean square velocity of hydrogen is $\sqrt{5}$ times than that 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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155. The root mean square speed of N_2 molecules in a sample at temperature T is 'X'. If the temperature is doubled, then nitrogen molecules dissociate into atoms, the root mean square speed of nitrogen atoms becomes :

A. x

B. 2x

C. 4x

D. 14x

Answer: B

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156. Match Column-I with Column-II

Q1. Match Column-I with Column-II

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

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157. Match Column-I with Column-II

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

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158. Match Column-I with Column-II

Column-I		Column-II	
(A)	Boyle's temperature	(P)	$\frac{a}{Rb}$
(B)	Inversion temperature	(Q)	$\frac{8a}{27Rb}$
(C)	Critical temperature	(R)	$\frac{2a}{Rb}$
(D)	Critical pressure	(S)	$\frac{a}{27b^2}$

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159. Match Column-I with Column-ll

	Columan-I		Columan-ll
(A)	Real gas at high pressure	(P)	$PV = RT + Pb$
(B)	Force of attraction among gas molecules is negligible	(Q)	$PV = nRT$
(C)	At high temperature and low presssure	(R)	$Z = 1$
(D)	Real gas at N. T. P	(S)	$\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT$

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160. Match Column-I with Column-II

	Column-I		Column-II
(A)	Internal energy of gas	(P)	$\frac{3}{2}$ RT
(B)	Translational kinetic energy of gas molecules	(Q)	$\frac{5}{2}$ RT
(C)	The temperature at which there is no molecular motion	(R)	–273°C
(D)	The lowest possible temperature at which gas molecules have no heat	(S)	3.716 kJ at 298 K

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161. 304 cm Hg pressure is equal to how many atm unit of pressure ?

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162. What is the pressure necessary to compress isothermally a $105 dm^3$ sample of air at one atmosphere to $35 dm^3$.

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163. A sample of gas at $0^\circ C$ and 1.00 atm pressure occupies 3.00 L. What change in temperature in $\circ C$ is necessary to adjust the pressure of that gas to 1.5 atm after it has been transferred.to a 2.00 L container ?

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164. At 400 K, the root mean square (rms) speed of gas X - (molecular mass = 40) is equal the most probable speed of gas Y at 60K. The molecular mass of the gas Y is

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165. A sample of a gas occupies 10 litre under a pressure of 1 atmosphere. What will be its volume if the pressure is increased to 2 atmosphere ? Assume constant temperature.

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166. One litre flask contains air, water vapour and a small amount of liquid water at a pressure of 200 mmHg. If this is connected to another one litre evacuated flask, what will be the final pressure of the gas mixture at equilibrium? Assume the temperature to be $50^{\circ}C$. Aqueous tension at $50^{\circ}C = 93$ mmHg

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167. A sample of a gas occupies 10 litre under a pressure of 1 atmosphere. What will be its volume if the pressure is increased to 2 atmosphere ? Assume constant temperature.

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168. . 3.7 g of a gas at $25^{\circ}C$ occupied the same volume as 0.184 g of hydrogen at $17^{\circ}C$ and at the same pressure. What is the molar mass of the gas ?

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169. Write the formula of indian saltpetre.

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170. Two containers A and B have the same volume. Container A contains 5 moles of O_2 gas. Container B contains 3 moles of He and 2 moles of N_2. Both the containers are separately kept in vacuum at the same temperature. Both the containers have very small orifices of the same area through which the gases leak out. Compare the rate of effusion of O_2 with that of He gas mixture.

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171. For 10 minutes each, at $27^\circ C$, from two identical holes nitrogen and an unknown gas are leaked into a common vessel of 3 litre capacity. The resulting pressure is 4.18 bar and the mixture contains 0.4 mole of nitrogen. What is the molar mass of the unknown gas ?

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172. The density of steam at $100.0^{\circ}C$ and $1x10^{5}$ Pa is 0.6 kgm^{-3} Calculate the compressibility factor (z) from these data.

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173. Calculate molecular diameter of He if b (van der Waals' constant for volume) for He is 24. mL mol^{-1}.

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174. The critical constant for water are $374^{\circ}C$, 218 atm and 0.0566 L mol^{-1}. Calculate a, b and R.

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175. Calculate the pressure exerted by 5 mole of CO_2 in one litre vessel at $47^\circ C$ using van der Waals equation. Also report the pressure of gas if it behaves ideal in nature. Given that a = 3.592 atm $L^2 mol^{-1}$, $b = 0.0427 L mol^{-1}$. Also, if the volume occupied by CO_2 molecules is negligible, then calculate the pressure exerted by one mole of CO_2 gas at 273 K.

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176. According to Charles' 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 of these

Answer: A

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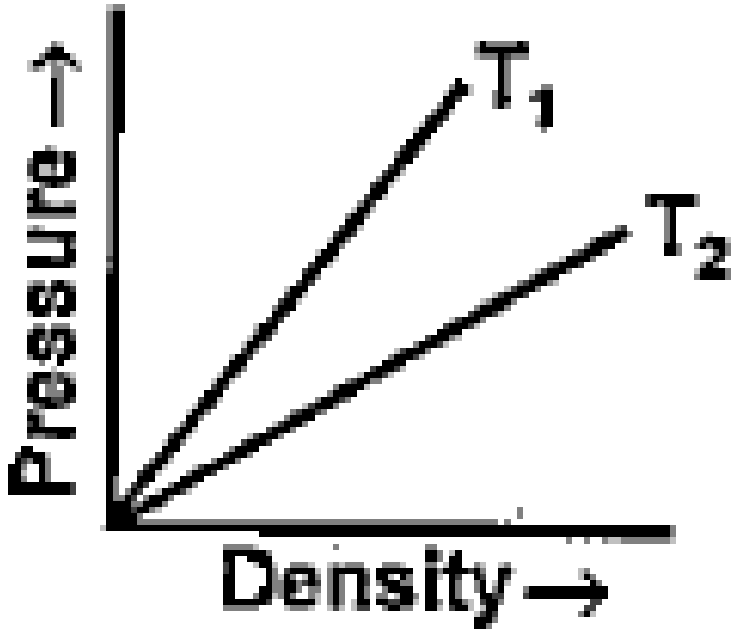
177. Figure shows graphs of pressure versus density for an ideal gas at two temperatures T_1 and T_2. Which is correct:



A. $T_1 > T_2$

B. $T_1 = T_2$

C. $T_1 < T_2$

D. none of these

Answer: A

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178. . A gas in an open container is heated from $.27^\circ C$ to $127^\circ C$. The fraction of the original amount of gas remaining in the container will be :

A. $\frac{3}{4}$

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

C. $\frac{1}{2}$

D. $\frac{1}{8}$

Answer: A

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179. If there is no intermolecular force, what will be the volume of 4.5 kg water vapour at STP ?

A. $5.6M^3$

B. $4.5M^3$

C. $11.2M^3$

D. $11.2M^3$

Answer: A

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180. If the pressure of (N_2, H_2) mixture in a closed vessel is 100 atmospheres and $20\,\%$ of the mixture then reacts, the pressure at the same temperature would be :

A. The same

B. 110 atmospheres

C. 90 atmospheres

D. 80 atmospheres

Answer: C

Watch Video Solution

181. The heat capacity of the following gases at room temperature are such that

A. $NH_3 > CO_2 = O_2 = N_2 > Ar$

B. $NH^3 = CO_2 > O_2 > N_2 > Ar$

C. $NH_3 > CO_2 > O_2 = N_2 > Ar$

D. $NH_3 > CO_2 > O_2 > N_2 > Ar$

Answer: C

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182. If one mole of a monatomic gas $\left(\gamma = \frac{5}{3}\right)$ is mixed with one mole of a diatomic gas $\left(\gamma = \frac{7}{5}\right)$ the value of γ for the mixture is :

A. 1.4

B. 1.5

C. 1.53

D. 3.07

Answer: B

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183. The rate of diffusion of NH_3 is 3.32 times faster than that of an unknown gas when both gases are. at 350 K. The molecular weight of the unknown gas is :

A. 188

B. 56

C. 94

D. 31.0

Answer: A

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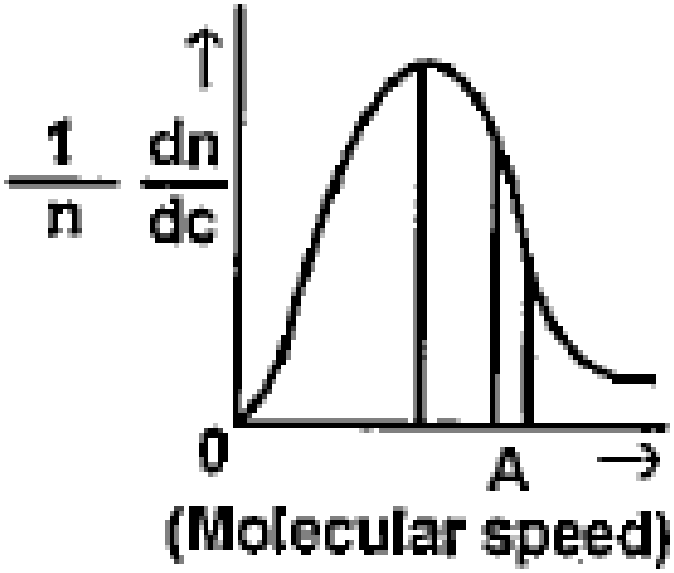
184. The Maxwell- Boltzmann distribution law of molecular speeds is graphically represented as : This curve has which of the following characteristic:



1. It has symmetrical distribution

2. The point A on X-axis represents the most probable speed

3. The area under the curve gives the total number of molecules

4. The maximum shifts to the right as the temperature increases.

Choose the correct answer using the codes given below :

A. 1,2 and 3

B. 2,3 and 4

C. 1 and 2

D. 3 and 4

Answer: D

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185. The kinetic energy of N molecules of O_2 is x joule at $-123^\circ C$. Another sample of O_2 at $27^\circ C$ has a kinetic energy of 2x joule. The later sample contains:

A. N molecules of O_2

B. 2N molecules cf O_2

C. $\frac{N}{2}$ molecules of O_2

D. None of these

Answer: D

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186. At what temperature will hydrogen molecules have the same kinetic energy as nitrogen molecules have at $35^\circ C$?

A. $\frac{28 \times 35}{2}{}^{\circ}C$

B. $\frac{2 \times 35}{28}{}^{\circ}C$

C. $\frac{2 \times 28}{35}{}^{\circ}C$

D. $35{}^{\circ}C$

Answer: D

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187. The ratio of average speed of an oxygen molecule to the rms. speed of a nitrogen molecule at the same temperature is :

A. $\left(\frac{3\pi}{7}\right)^{1/2}$

B. $\left(\frac{7}{3\pi}\right)^{1/2}$

C. $\left(\frac{3}{7\pi}\right)^{1/2}$

D. $\left(\frac{7\pi}{3}\right)^{1/2}$

Answer: B

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188. At $27^\circ C$ the ratio of root mean square speeds of ozone and oxygen is:

A. $\sqrt{(3/5)}$

B. $\sqrt{(4/3)}$

C. $\sqrt{(2/3)}$

D. 0.25

Answer: C

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189. The temperature of an ideal gas is increased from 140 K to 560 K. If.at 140 K the root mean square velocity of the gas molecules is u, at 560 K it becomes :

A. 5u

B. 2u

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

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

Answer: B

Watch Video Solution

190. The average molecular speed is greatest in case of a gas sample of:

A. 2.0 mole of He at 140 K

B. 0.05 mole of Ne at 500 K

C. 0.40 mole of O_2 at.400 K

D. 1.0 mole of N2 at 560- K

Answer: B

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191. The root mean square speed of an ideal gas in a closed container of fixed volume is increased from $5 \cdot 10^4 cms^{-1}$ to $10 \cdot 10^4 cm^{-1}$. Which statement might correctly explain how the change accomplished'?

A. By heating the gas, the temperature is doubled

B. By heating the gas, the pressure is made four ' times

C. By heating the gas, the volume is tripled

D. By heating the gas, the pressure is made three .times

Answer: B

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192. The root mean square speed of the molecules of diatomic gas is u. When the temperature is doubled, the molecules dissociates into two atoms. The new rms speed of the atom is :

A. $\sqrt{2}u$

B. u

C. 2u

D. 4u

Answer: C

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193. A certain gas diffuses from two different vessels A and B. The vessel A has a circular orifice while vessel B has square orifice of length equal to the radius of the orifice of vessel A. The ratio of the rates of diffusion of the gas form vessel A to vessel B

A. π

B. $7:22$

C. $1:1$

D. $2:1$

Answer: A

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194. At $47^\circ C$ and 16.0 atm, the molar volume of NH_3 gas is about $10\,\%$ less than the molar volume of an ideal gas. This is due to :

A. NH_3 decomposes to N_2 and H_2 at $47^\circ C$

B. the force of attraction between NH_3 molecules is significant at this temperature and pressure

C. the volume occupied by NH3 molecules themselves is a significant fraction of the volume of the container at this temperature and pressure

D. at 16 atm, NH_3 molecules no longer move randomly

Answer: B

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195. Consider following equations :

PV =nRT

$$U_{rms} = \frac{\sqrt{3RT}}{M}$$

$$\frac{R_1}{R_2} = \sqrt{\frac{M_2}{M_1}}$$

$$KE = \frac{1}{2}\mu^2$$

Which of the above equations involve only microscopic properties ?

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196. Energy of sublimation of solid helium is much lower than that of ice because :

A. large part of sublimation energy of ice is used to overcome hydrogen bonding

B. ice melts at much higher temperature

C. in solid helium there is van der Waals force of attraction between helium atoms

D. all of the above are correct

Answer: D

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197. If the mean free-path of gaseous molecule is 60 cm.at a pressure of 1×10^{-4} mm mercury, what will be its mean free-path when the pressure is increased to 1×10^{-2} mm mercury

A. $6.0 \times 10^{-1} cm$

B. 6.0 cm

C. 6.0×10 2cm`

D. 6.0×10^3

Answer: A

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198. The ratio $\left(\frac{a}{b}\right)$ (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: A

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199. A gas obeys the equation of state P(V-b) = RT (The parameter b is a constant). The slope for an isochore will be :

A. Negative

B. Zero

C. $\frac{R}{V-b}$

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

Answer: C

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200. Which of the following statements on critical constants of gases are correct:

1. Larger $\frac{T_c}{P_c}$ the value of a gas, larger would be the excluded volume

2. Critical temperature(T_c) of gas is greater than its Boyle.temperature (T_b)

3. At the critical point in the van der Waals' gas isotherm $\left(\frac{\delta p}{\delta V_m}\right)_{T_c} = 0$

Select the correct answer using the codes given below: Code

A. 1 and 2

B. 1 and 3

C. 2 and 3

D. 1,2 and 3

Answer: B

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201. If X_m, X_p and X_v represent mole fraction, pressure fraction and volume fraction respectively then :

A. $X_m = X_p = X_v$

B. $X_m = \frac{1}{X_p} = \frac{1}{X_v}$

C. $X_m = X_p = \frac{1}{X_v}$

D. $\frac{1}{X_m} = \frac{1}{X_p} = X_v$

Answer: A

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202. For the non-zero values of 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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203. Match list I with list II and select the correct answer using the codes given below the lists :

List I		List II	
a.	Critical temperature	1.	$\frac{a}{Rb}$
b.	Boyle temperature	2.	$\frac{2a}{Rb}$
c.	Inversion temperature	3.	$\frac{T}{T_c}$
d.	Reduced temperature	4.	$\frac{8a}{27Rb}$

Code : a b c d

A. 2 1 4 3

B. 4 3 2 1

C. 2 3 4 1

D. 4 1 2 3

Answer: D

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204. If the pressure at the triple point of a substance is greater than 1 atm, we expect:

A. The boiling point of the liquid to be lower than triple point temperature

B. That the substance cannot exist as a liquid

C. The solid sublimes without melting at any pressure

D. The melting point of the solid to be at a lower temperature than the triple point temperature

Answer: C

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205. The surface tension of water at $20^\circ C$ is 72.75 dyne cm^{-1}. Its value in SI system is

A. $2.275 Nm^{-1}$

B. $0.7275 Nm^{-1}$

C. $0.07275 Nm^{-1}$

D. none of the above

Answer: C

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206. What is the excess pressure inside a spherical soap bubble of radius 5 cm if the surface tension of the soap film is $3.5 \times 10^{-2} Nm^{-1}$?

A. 1.4 Pa

B. 2.8 Pa

C. 5.6 Pa

D. 11.2 Pa

Answer: B

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207. Which of the following statement is not correct ?

A. Viscosity of glycol is greater than that of ethanol

B. Viscosity of a liquid increases with increase in impurities

C. Variation of viscosity with temperature is given by n - Ae

—BRT

D. Capillary action of a liquid is due to force of surface tension

Answer: C

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208. Equal masses of CH_4 and O_2 are mixed in an empty container at $25^\circ C$. The fraction of the total pressure exerted by O_2 is ?

A. $1/3$

B. $1/2$

C. $(1/3) \times 273/298$

D. $2/3$

Answer: A

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209. When an ideal gas undergoes unrestricted expansion, no cooling occurs because the molecules ?

A. Are above the inversion temperature

B. Exert no attractive force on each other

C. Do work equal to loss in kinetic energy

D. Collide without loss of energy

Answer: B

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210. The values of van der Waal's constant a for the gases O_2, N_2, NH_3 and CH_4 is 1.360, 1.390, 4.170 and $2.253L^2$ atm. mol^{-2} respectively. The gas which can most easily be liquefied is ?

A. O_2

B. N_2

C. NH_3

D. CH_4

Answer: C

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211. The rms velocity of an ideal gas at constant pressure varies with density (d) as ?

A. d^2

B. $\sqrt{d}$

C. $1/\sqrt{d}$

D. d

Answer: C

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212. Two chemically inactive gases are contained separately in two bulbs of same capacity at pressure P_1 and P_2 respectively.

If the two bulbs are connected, the total pressure of gaseous mixture would be ?

A. Equal to $(P_1 + P_2)$

B. Greater than $(P_1 + P_2)$

C. Less than $(P_1 + P_2)$

D. Equal to $(P_1 x P_2)$

Answer: C

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213. The quantity $\left(\frac{PV}{RT}\right)$ represents ?

A. Mass of the gas

B. KE of the gas

C. Number of moles of the gas

D. Number of molecules in the gas

Answer: C

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214. A real gas can be liquefied by ?

A. Isothermal expansion

B. Adiabatic expansion

C. Isothermal compression

D. Adiabatic compression

Answer: B

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215. Under which of the following conditions a real gas resembles an ideal gas ?

A. ‘a’ and 'b' are very small

B. ‘a’ and ‘b’ are very large

C. `a' is large and 'b' is small

D. a' is small and 'b’ is large.

Answer: A

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216. If there is no intermolecular force, what will be the volume of 4.5 kg water vapour at STP ?

A. $7.5m^3$

B. $11.2m^3$

C. $6.5m^3$

D. $5.6m^3$

Answer: D

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217. An evacuated glass vessel weighs 50g when empty, 144 g when filled with liquid of density $0.47gmL^{-1}$ and 50.5 g when filled with an ideal gas at 760 mm Hg at 300 K. The molar mass of idea! gas is ? $\left(R = 00.0821Latm.\ K^{-1}mol^{-1}\right.$

A. 61.575

B. 130.98

C. 123.75

D. 47.87

Answer: A

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218. For three different gases values of van der Waals' constant 'a' and 'b' are given. What is the correct order of liquefaction of gases ?

Gases	a	b
X_2	1.3	0.090
Y_2	4.1	0.023
Z_2	2.2	0.075

A. $X_2 > y_2 > Z_2$

B. $Y_2 > Z_2 > X_2$

C. $Z_2 > Y_2 > X_2$

D. $X_2 > Z_2 > Y_2$

Answer: B

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219. The van der Waals Constants 'a' for different gases have been given as

Gas	a (atm L^2 mol^{-2})
O_2	1.36
N_2	1.39
CH_4	2.25
NH_3	4.17

The gas that can be most easily liquefied is

A. O_2

B. N_2

C. CH_4

D. NH_3

Answer: D

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220. 5 g of unknown gas has pressure P at a temperature TK in a vessel. On increasing the temperature by $50^\circ C$, 1 g of the gas was given out to maintain the pressure P. The original temperature was

A. 73. K

B. 100 K

C. 200 K

D. None of these

Answer: C

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

A. 1 atm and 273 K

B. 0.5 atm and 500 K

C. 15 atm and 200 K

D. 15 atm and 500 K

Answer: B

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

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

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

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

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

Answer: A

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223. Density ratio of $O_2$and H_2 is 16:1.The ratio of their rms velocities will be

A. $4:1$

B. $1:16$

C. $1:4$

D. $16:1$

Answer: C

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224. The density of air is 0.001295 g/cc at S.T.P. Its vapour density is

A. 0.0011293

B. 8.2786

C. 14.48

D. 6.2706

Answer: C

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225. Equation of Boyle's law is

A. $\frac{dP}{P} = -\frac{dV}{V}$

B. $\frac{dP}{P} = +\frac{dV}{V}$

C. $\frac{d^2P}{P} = -\frac{dV}{dT}$

D. $\frac{d^2P}{P} = +\frac{d^2V}{dT}$

Answer: A

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226. An ideal gas

A. can be liquefied if its temperature is more than critical temperature

B. can be liquefied if its pressure is more than critical pressure

C. cannot be liquefied at any pressure and temperature

D. can be liquefied ,if its temperature is more than Boyle's temperature

Answer: C

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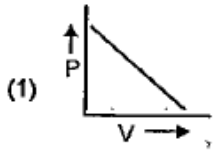
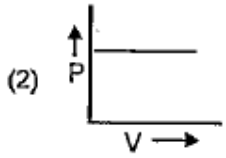
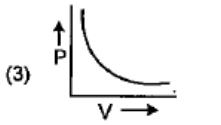
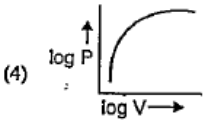
227. Among-the plots of P versus V at constant temperature as given below, which one corresponds to Boyle's law ?

A. 

B. 

C. 

D. 

Answer: C

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228. The real gas will approach the ideal behaviour at

A. low temperature and low pressure

B. low temperature and high pressure

C. high temperature and low pressure

D. high temperature and high pressure

Answer: C

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229. When an open vessel is heated from 300 K to 500 K, what percentage of the gas will escape out ?

A. 20

B. 60

C. 40

D. 80

Answer: C

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230. If pressure is tripled and temperature (in kelvin) is halved, the volume of given mass of an ideal gas becomes

A. $\frac{3}{2}$times its original volume

B. $\frac{2}{3}$rd of its original volume

C. $\frac{1}{6}$th of its original volume

D. 6 times its original volume

Answer: C

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231. Which of the following gases are heavier than air?

A. Ar

B. moist air

C. O_2

D. Ne

Answer: A::C

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232. Which of the following statement(s) is/are correct ?

A. A plot of $Vvs\left(\frac{1}{T}\right)$ is linear at constant P

B. A plot of $PvsT$ is hyperbolic at constant V

C. A plot of $PvsT$ is linear at constant V

D. A plot of $Pvs\left(\frac{1}{V}\right)$ is linear at constant T

Answer: B::D

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233. If a gas expand at constant temperature :

A. the pressure decreases

B. K.E. of molecules remains the same

C. K.E. of molecules decreases

D. the number of molecules of the gas increases

Answer: A::B

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234. The kinetic energy of one mole of a gas is given by the expression $K.E = \frac{3PV}{2}$ and $K.E. = \frac{3}{2}RT$

A. $K.E \propto P$ at constant temperature

B. $K.E \propto T$ at constant pressure

C. $K.E. is$ not $directly \propto$ to volume at constant temperature

D. $K.E \propto V$ at constant temperature

Answer: B::C

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235. Write the names of the monomers of Glyptal.

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236. The van der Waals' constants of a gas are $a = 0.687 dm^2 mol^{-2} b = 0.0226 dm^3 mol^{-1}$

A. $V_c = 0.678 dm^3 mol^{-1}$

B. $V_c = 0.0678 dm^3 mol^{-1}$

C. $P_c = 49.7 atm$

D. $T_c = 109.84 K$

Answer: B::C::D

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237. Which of the following statement(s) is/are correct?

A. At absolute zero, thermal motion of the molecules □f gas ceases to exist

B. As temperature increases, the fractions of the molecules having average kinetic energy decreases

C. At very high temperature, all real gases show +ve deviation as pressure increases and intermolecular forces of attraction decrease.$i, e\left(P+\frac{a}{V^2}\right)(V-b)=RT$

D. At low pressures, all real gases show-ve deviation as excluded volume can be neglected.

Answer: A::B::D

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238. Which of the following is/are true?

A. $\frac{V_1}{V_2} = \left(\frac{T_2}{T_1}\right)^{3/2}$ for reversible adiabatic expansion

B. At low pressure $Z = 1 - \frac{a}{V_m RT}$ for real gas

C. A gas can be liquified below critical temperature at high pressure

D. Higher the value of 'a' weaker is intermolecular forces of attraction

Answer: A::B::C

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239. Boyle temperature is the temperature at which the gas obeys Boyle's law for an appreciable range of pressure from

zero pressure. This implies.

A. $\lim_{p-0}\left[\frac{\delta(PV)}{\delta P}\right]=0$

B. At low pressure $Z=1-\frac{a}{V_mRT}$ for real gas

C. $T_B=\frac{a}{Rb}$

D. $T_B=\frac{P_cV_c}{R}$

Answer: A::C

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240. Which of the following statements are incorrect ?

A. Molar volume of every gas at STP is 22.4 L

B. Under critical states compressibility factor is 1

C. All gases will have equal value of average KE at a given temperature

D. At absolute zero, KE is $\frac{3}{2}$ R.

Answer: B::D

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241. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: Compressibility factor (Z) of CH_4 and CO_2 are less than unity.

Statement - II : Z< 1, indicates predominance of attraction force among gas molecules.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement -I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement - I

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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242. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement -I: The gas with greater value of 'a'can be easily

liquefied.

Statement - II : The van der Waals constant 'a' measures the intermolecular force among gas molecules.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement -I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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243. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: van der Waals constant 'a' of NH_3 is greater than that of N_2.

Statement - II: intermolecular force of NH_3 is greater than that of N_2 because NH_3 involves intermolecular H-bond.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement -I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -1 is false, Statement - II is true.

Answer: A

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244. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: van der Waals' constant 'b' of N_2 is greater than that of NH_3

Statement - II: Molecular Size of N_2 is smaller than that of NH_3

.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement -1

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: C

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245. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: Kinetic energy and momentum of ideal gas molecules are conserved during intermolecular collision

Statement - II: Collision among real gas molecules is inelastic.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement -I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: B

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246. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: There is no gas in the atmosphere of moon.

Statement - II: Root mean square velocity of gases are greater than escape velocity of moon.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement -I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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247. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I : Rate of diffusion of N_2O and CO_2 are same at

constant temperature.

Statement -II: Rate of diffusion of a gas is inversely proportional to square root of molecular mass at constant temperature.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement -I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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248. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement -I: The compressibility factor(Z) for H2and He is greater than unity, $Z = 1 + \frac{Pb}{RT}$

Statement - II: Compressibility factor for H_2 and He may be calculated using van der Waals' equation neglecting van der Waals' constant 'a'.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement -I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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249. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement -I: Compressibility factor is defined as the ratio of molar volume of real gas to the molar volume of ideal gas.

Statement - II: The compressibility factor (Z) at critical state is 1

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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250. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: During evaporation of the liquid, its temperature does not change.

Statement - II : K.E. of liquid molecules is directly proportional to the absolute temperature.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: D

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251. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement -1 :At critical state the meniscus between gas and

liquid disappears.

Statement - II : Surface tension of liquid is zero at critical state.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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252. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best

describes the two Statements.

Statement -I: When gas is filled in a balloon it expands. Balloon obeys Boyle's law.

Statement - II: Volume of a definite mass of gas is inversely proportional to pressure at constant temperature.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: D

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253. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: Helium shows positive deviation from ideal behaviour

Statement - II: Helium is a noble gas.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: B

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254. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement -I: Sudden expansion of ideal gases from high pressure to low pressure, will not show any temperature change.

Statement - II : Intermolecular force and joule- Thomson coefficient of ideal gases is zero.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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255. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: The van der Waals constant 'a' of H_2O is greater than that of C_6H_6.

Statement - II: The intermolecular force of H_2O is greater than C_6H_6 due to formation of intermolecular hydrogen bond.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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256. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I : When hydrogen gas expands adiabatically from high pressure to low pressure at room temperature then heating effect is observed.

Statement - II: Hydrogen gas at room temperature is above its inversion temperature.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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257. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best

describes the two Statements.

Statement -I :The internal energy of an ideal gas does not change during isothermal process.

Statement - II: The decrease in volume of a gas is compensated by a corresponding increase in pressure when its temperature is held constant.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement -I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: B

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258. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: The value of PV/T for one gram mole of an ideal gas is $8.4JK^{-1}mol^{-1}$

Statement - II: PV/T = Universal gas constant R for one gram mole of an ideal gas..

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: A

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259. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement -I: Two different ideal gases have equal root mean square speed at the same temperature.

Statement - II: Root mean square speed of a gas molecules increases with increase in temperature.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: D

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260. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement - I: The pressure inside the LPG cylinder remains constant even when it is in use at room temperature.

Statement - II : Vapour pressure of any liquid is independent of its amount, it depends only on temperature

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement -I.

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: C

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261. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement -I: If a gas has compressibility factor (Z) greater than

unity, then repulsive forces are dominant.

Statement - II: Value of Z decreases with increase in pressure.

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement - I

C. Statement -I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: C

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262. This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best

describes the two Statements.

Statement - I: The value of Boyle's temperature for a real gas is $\left(T_a = \frac{a}{Rb}\right)$

Statement - II: At Boyle's temperature, TB, real gases behave ideally over a long range of pressure

A. Statement - I is true, Statement - II is true, Statement - II is a correct explanation of Statement - I

B. Statement - I is true, Statement - II is true, Statement - II is not a correct explanation of Statement - I

C. Statement - I is true, Statement - II is false.

D. Statement -I is false, Statement - II is true.

Answer: B

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263. The behaviour of gases has been expressed in terms of various gas law obtained experimentally i.e, Boyle's law, Charles's law, pressure-temperature law, Graham's law of diffusion and Avogadro's hypothesis. Later on maxwell derived kinetic gas equation $PV = \frac{1}{3}mnC^{\bar{2}}$ theoretically by assuming the concept of molecules and their motion.

For one mole of an ideal gas $\left(\frac{dp}{d\bar{T}}\right)_v . \left(\frac{dv}{dT}\right)_p . \left(\frac{dv}{dp}\right)_T$ is equal to

A. $-\frac{R^2}{P^2}$

B. $\frac{R^2}{P^2}$

C. $+1$

D. -1

Answer: A

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Watch Video Solution

264. The behaviour of gases has been expressed in terms of various gas law obtained experimentally i.e, Boyle's law, Charles's law, pressure-temperature law, Graham's law of diffusion and Avogadro's hypothesis. Later on maxwell derived kinetic gas equation $PV = \frac{1}{3}mnC^{\bar{2}}$ theoretically by assuming the concept of molecules and their motion.

The intercept of plot of log10V vs log10T curves at constant pressure P for 1 mol of gas will be

A. $\log\left(\frac{P}{R}\right)$

B. $\log\left(\frac{-P}{R}\right)$

C. $\log\left(\frac{R}{P}\right)$

D. $\log\left(\frac{-r}{P}\right)$

Answer: C

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265. The ideal gas equation is PV = nRT.Since none of the gas in universe is ideal one and deviation are noticed from ideal gas nature. The deviation from ideal gas nature has been explained in terms of compressibility factor=$\left(Z = \frac{PV}{nNT}\right)$ Usually when Z > 1, repulsive force among molecules predominates When Z < 1, attractive force predominates. However, almost all the gases show ideal gas behaviour within Boyle's temperatures range. The numerical value of Z for 1 mol of gas at critical condition is 3/8.

The gas which always shows predominative repulsive forces :

A. He

B. Ne

C. Ar

D. Kr

Answer: A

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266. The ideal gas equation is PV = nRT.Since none of the gas in universe is ideal one and deviation are noticed from ideal gas nature. The deviation from ideal gas nature has been explained in terms of compressibility factor=$\left(Z = \frac{PV}{nNT} \right)$ Usually when Z > 1, repulsive force among molecules predominates When Z < 1, attractive force predominates. However, almost all the gases show ideal gas behaviour within Boyle's temperatures range. The numerical value of Z for 1 mol of gas at critical condition is 3/8.

The numerical value of 'Z' for gases within Boyle's temperature range is

A. > 1

B. < 1

C. 1

D. ≥ 1

Answer: C

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267. Match Column-I with Column-II

Column-I		Column-II	
(A)	PV = Constant; when T is constant	(P)	Pressure
(B)	Rate of diffusion of a gas	(Q)	Closed container
(C)	Velocity of a gas	(R)	Temperature
(D)	Vapour pressure of a liquid	(S)	Molecular mass

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268. Match Column-I with Column-II

Column-I		Column-II	
(A)	Boyle's temperature	(P)	$\frac{a}{Rb}$
(B)	Inversion temperature	(Q)	$\frac{8a}{27Rb}$
(C)	Critical temperature	(R)	$\frac{2a}{Rb}$
(D)	Critical pressure	(S)	$\frac{a}{27b^2}$

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269. Match Column-I with Column-II

Column-I	Column-II
(A) $P_1V_1 = P_2V_2 = P_3V_3 = ...$	(P) Dalton's law of partial pressures at constant temperature
(B) $\frac{V_1}{T_1} = \frac{V_2}{T_2} = \frac{V_3}{T_3} = ...$ at constant pressure	(Q) Charles' law
(C) $r \propto \sqrt{\frac{1}{d}}$	(R) Graham's law
(D) $P = P_1 + P_2 + P_3 + ...$	(S) Boyle's law
(E) $(V-b)\left(P+\frac{a}{V^2}\right) = RT$	(T) Equation for real gases

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270. Match Column-I with Column-II

Column-I	Column-II
(A) R/N	(P) Kinetic equation of ideal gases.
(B) Molar volume	(Q) 22.4 litre
(C) $PV=\frac{1}{3}mnc^2$	(R) Isotherm
(D) Graph between P and V at constant temperature	(S) Isobar
(E) Graph between V and T at constant pressure	(T) Boltzmann's constant

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271. The stop cock containing two bulbs of volume 5 litre and 10 litre containing an ideal gas-at 9 atm and 6 atm respectively is opened. What is the final pressure in atm if the temperature remains the same ?

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272. 2 moles of ammonia occupied a volume of 5 lit at $27^{\circ}C$. Calculate the pressure if $a = 4.17 atm L^2 mol^{-2}, b = 0.0371 L mol^{-1}$

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273. What is the weight of hydrogen gas (in g) obtained from 42 g of CaH_2 by treatment with water ?

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274. A mixture of non reacting gases exert a pressure of 5 atm. Jf one of the gases occupy $40\,\%$ volume of the mixture, what would be the partial pressure in atm ?

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275. The density of gas A is twice that of a gas B at the same temperature. The molecular mass of gas B is thrice that of A. The ratio of the pressure acting on A and B will be

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276. The pressure exerted by 12 g of an ideal gas at temperature $t^{\circ}C$ in a vessel of volume V litre is one atm.when the temperature is increased by 10 degree at the same volume.the pressure increases by 10% calculate the temperature t and volume v.(molecular weight of the gas =120).

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277. $20\ \%\ N_2O_4$ molecules are dissociated in a sample of gas at $27^\circ C$ and 760 mm hg .calculate the density of equilion mixture.

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278. $20dm^3$ of SO_2 diffuses through a porous partition In 60 second. What volume of O_2 will diffuse under similar condition in 30 second ?

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279. A spherical air bubbles is rising from the depth of a lake when pressure is P atm and temperature is T K what is the percentage increase in its radius when it comes to the surface of a lake. (Assume : temperature and pressure at the surface to be respectively 2T K and $\frac{P}{4}$)

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280. The average speed at T_1 K and the most probable speed at T_2 K of CO_2 gas is $9 \times 10^4 cm \sec^{-1}$. Calculate the value of T_1 and T_2.

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281. The average velocity of gas molecules is 400 m/sec. Calculate its ms velocity at the same temperature.

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282. Calculate the total pressure in a 10 litre cylinder which contains 0.4 g He, 1.6 g O_2 and 1.4 g N_2 at $27^\circ C$. Also calculate

the partial pressure of Helium gas in the cylinder. Assume ideal behaviour of gas (R=0.082 litre-atm $K^{-1}mol^{-1}$

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283. A flask of volume 1 litre contains vapour of CH_3OH at a pressure of 1 atm and $25^\circ C$. The flask was then evacuated till the final pressure drop to 10^{-1} mm. Find the number of molecules of CH_3OH left in the flask.

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284. Calculate the pressure exerted by 5 mol of CO_2 in one litre vessels at $47^\circ C$ If it behaves ideally in nature.

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285. Calculate the pressure exerted by one mole of CO_2 gas at 273 K, if the Vander Waals constant a = $3.592 dm^6 atm mol^{-2}$. Assume that the volume occupied by CO_2 molecules is negligible.

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286. The rms velocity of CO gas molecules at $27^\circ C$ is approximately 1000 m/s. For N_2 molecules at 600 K the rms velocity is approximately

A. 2000 m/s

B. 1414 m/s

C. 1000 m/s

D. 1500 m/s

Answer:

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287. A gas can be liquefied at temperature T and pressure P provided

A. $T = T_C$ and $P < P_c$

B. $T < T_C$ and $P > P_C$

C. $T > T_C$ and $P > P_C$

D. $T > T_C\, P < P_C$

Answer:

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288. The units of surface tension and viscosity of liquids are respectively

A. $kgm^{-1}s^{-1}.\ Nm^{-1}$

B. $kgs^{-2}, kgm^{-1}s^{-1}$

C. $Nm^{-1}, kgm^{-1}s^{-2}$

D. $kgs^{-1}, kgm^{-2}s^{-1}$

Answer:

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

A. high temperatures and low pressures.

B. low temperatures and high pressures.

C. high temperatures and high pressures.

D. low temperatures and low pressures.

Answer:

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290. Four gases P, Q, R and S have almost same values of 'b but their 'a' values (a, b are van der Waals constants) are in the order $Q < R < S < P$ .At a particular temperature among the four gases the most easily liquefiable one is

A. P

B. Q

C. R

D. S

Answer:

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291. At a certain temperature the time required for the complete diffusion of 200 mL of H_2 gas is 30 minutes. The time required for the complete diffusion of 50 mL of O_2 gas at the same temperature will be

A. 60 minutes

B. 30 minutes

C. 45 minutes

D. 15 minutes

Answer:

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292. For one mole of an ideal gas the slope of V vs T curve at constant pressure of 2 atm is X lit $mol^{-1}K^{-1}$. The value of the ideal universal gas constant 'R' in term of X is

A. X lit atm $mol^{-1}K^{-1}$

B. X/2 lit a m $mol^{-1}K^{-1}$

C. 2X lit atm $mol^{-1}K^{-1}$

D. 2X atm $lit^{-1}mol^{-1}K^{-1}$

Answer:

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293. The compressibility factor (Z) of one mole of a van der Waals gas of negligible 'a' value is

A. 1

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

C. 1+(bp)/(RT)`

D. 1-(bp)/(RT)`

Answer:

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294. Two gases $X(Mol.\ Wt.\ M_x)$ and Y(Mol. Wt. $M_y, M_y > M_x$) are at the same temperature T in two different containers. Their root mean square velocities are C_x and C_y

respectively. If the average kinetic energies per molecule of two gases X and Y are E_x and E_y respectively, then which of the following relation (s) is (are) true?

A. $E_x > E_y$

B. $C_x > C_y$

C. $E_x = E_y = \frac{3}{2}RT$

D. $E_x = E_y = \frac{3}{2}k_BT$

Answer:

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295. Equal masses of H_2O_2 and methane have been taken in a container of volume V at temperature $27^\circ C$ in identical

conditions. The ratio of the volumes-of gases $H2:O2:CH_4$ would be-

A. $8:16:1$

B. $16:8:1$

C. $16:1:2$

D. $8:1:2$

Answer:

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296. Density of carbon monoxide is maximum at

A. 2 atm and 600K

B. 0.5 atm and 273 K

C. 6 atm and1092K

D. 4 atm and 500K

Answer:

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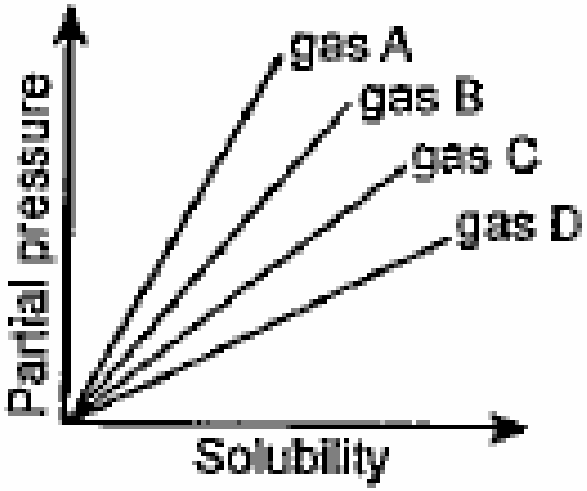
297. From the given graph at constant temperature, which gas has the least solubility?



A. gas B

B. gas D

C. gas A

D. gas C

Answer:

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298. If average velocity of a sample of gas molecules at 300 K is 5 cm s^{-1}, what is RMS velocity of same sample of gas molecules at the same temperature? (Given, α : u : v = 1 : 1.224 : 1.127)

A. 6.112 cm/s

B. 4.605 cm/s

C. 4.085 cm/s

D. 5.430 cm/s

Answer:

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299. For gaseous state, if most probable speed is denoted by C^*, average speed by $\bar{C}$ and root mean square speed by C, then for a large number of molecules, the ratios of these speeds are

A. $C^* : \bar{C} : C$ = 1.225: 1.128:1

B. $C^* : \bar{C} : C$ = 1.128: 1.125:1

C. $C^* : \bar{C} : C$ = 1:1.128:1.225

D. $C^* : \bar{C} : C$ = 1:1.225:1.128

Answer:

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300. The rate of diffusion of methane is twice that of x. The molecular mass of x is:

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301. At what temperature will the RMS velocity of SO_2 be the same as that of O_2 at 303 K ?

A. 403 K

B. 303 K

C. 606 K

D. 273 K

Answer:

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302. Write the Vander Walls equation for n'mole of the real gas.

A. $\left(p+\frac{n^2a}{V^2}\right)(V-nb)=nRT$

B. $\left(p+\frac{na}{V^2}\right)(V-nb)=RT$

C. $\left(p+\frac{a}{V^2}\right)(V-b)=nRT$

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

Answer:

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303. If P,T, p and R represent pressure, temperature, density and universal gas constant respectively then the molar mass of the ideal gas is given by

A. $\frac{pPT}{P}$

B. $\frac{pT}{pR}$

C. $\frac{p}{pRT}$

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

Answer:

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304. Maximum deviation from ideal gas is expected from

A. $H_2(g)$

B. $N_2(g)$

C. $CH_4(g)$

D. $NH_3(g)$

Answer:

Watch Video Solution

305. Write the Vander Walls equation for n'mole of the real gas.

A. $\left(p+\frac{n^2a}{V^2}\right)(V-nb)=nRT$

B. $\left(p+\frac{na}{V^2}\right)(V-nb)=RT$

C. $\left(p+\frac{a}{V^2}\right)(V-b)=nRT$

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

Answer:

Watch Video Solution

306. At what temperature will the RMS velocity of SO_2 be the same as that of O_2 at 303 K ?

A. 403 K

B. 303 K

C. 606 K

D. 273 K

Answer:

Watch Video Solution

307. The compressibility factor for a real gas at high pressure is

A. $1+\frac{RT}{pb}$

B. 1

C. $1+\frac{pb}{RT}$

D. $1-\frac{pb}{RT}$

Answer:

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308. Which of the following is correct at freezing point ?

A. Solid and liquid are in equilibrium

B. Solid and liquid are not in equilibrium

C. Vapour pressure of liquid is greater than solid

D. None of the above

Answer:

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309. The ratio of diffusion of hydrogen and helium gas is

A. $1:14$

B. $1:1$

C. $1.4:1$

D. $1:2$

Answer:

Watch Video Solution

310. A gas is heated through $1^\circ C$ in a closed vessel and so the pressure increases by $0.4\,\%$. The initial temperature of the gas was

A. $-23^\circ C$

B. $+23^\circ C$

C. $250^\circ C$

D. $523^\circ C$

Answer:

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311. 50 mL of each gas A and gas B take 150 and 200 s respectively for effusing through a pin hole under the similar

conditions, if molecular mass of gas B is 36, the molecular mass of gas A will be

A. 20

B. 128

C. 32

D. 20

Answer:

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

A. 27 u

B. 36 u

C. 64 u

D. 9 u

Answer:

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313. 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

O_2CO_2. H_2 and He

CH_4O_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. $(I) H_2 < He < O_2 < CO_2$

$CH_4 > O_2 > H_2$

D. $(I) H_2 < O_2 < He < CO_2$

$O_2 > CH_4 > H_2$

Answer:

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314. During the. evaporation of liquid

A. the temperature of the liquid will rise

B. the temperature of the liquid will fall

C. May raise or fall depending on the nature

D. the temperature remains unaffected

Answer:

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315. Mark out the wrong expression

A. Boyle's temperature, $T_B = \frac{b}{aR}$

B. Critical pressure, $p_c = \frac{a}{27b^2}$

C. Critical temperature, $T_c = \frac{8a}{27Rb}$

D. Critical volume $V_c = 3b$

Answer:

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316. Dalton's law of partial pressure is applicable to which one of the following systems ?

A. $NH_3 + HCl$

B. $NO + O_2$

C. $H_2 + Cl_2$

D. $CO + H_2$

Answer:

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317. One mole of oxygen at 273 K and one mole of sulphur dioxide at 546 K are taken in two separate containers, then,

A. kinetic energy of $O2 >$ kinetic energy of SO_2

B. kinetic energy of $O_2 <$ kinetic energy of SO_2

C. kinetic energy of both are equal

D. None of the above

Answer:

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

A. $(P_A / P_B)^{1/2}(M_A / M_B)$

B. $(P_A / P_B)(M_B / M_A)^{1/2}$

C. $(P_A / P_B)^{1/2}(M_B / M_A)$

D. $(P_A / P_B)(M_A / M_B)^{1/2}$

Answer:

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

A. 25.00 u

B. 50.00 u

C. 12.25 u

D. 6.50 u

Answer:

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320. By what factor does the average velocity of a gaseous molecule increases, when the temperature (tn Kelvin) is doubled ?

A. 1.4

B. 2

C. 2.8

D. 4

Answer:

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321. A gaseous mixture was prepared by taking equal moles of CO and N_2. If the total pressure of the mixture was found 1 atm, the partial pressure of the nitrogen (N_2) in the mixture is

A. 1 atm

B. 0.5 atm

C. 0.8 atm

D. 0.9 atm

Answer:

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322. Equal weights of CH_4 and H_2 are mixed in a container at $25^\circ C$ Fraction of total pressure exerted by methane Is

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{9}$

D. $\frac{8}{9}$

Answer:

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323. A bubble of gas released at the bottom of a lake increases to eight times its original volume when it reaches the surface. Assuming that atmospheric pressure is equivalent to the

pressure exerted by a column of water, 10 m height, the depth of the lake is correct

80 M

90 M

40 m

10 m

70 m

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324. Three different gases X, Y and Z of molecular masses 2, 16 and 64 were enclosed in a vessel at constant temperature till equilibrium is reached. Which of the following statement is correct ?

Gas Z will be be at the top of the vessel

(2) Gas Y will be at the top of the vessel

Gas Z will be at the bottom and X will be at the top

Gas X will be at sthe bottom and Z will be at the top.

Gases will form homogeneous mixture.

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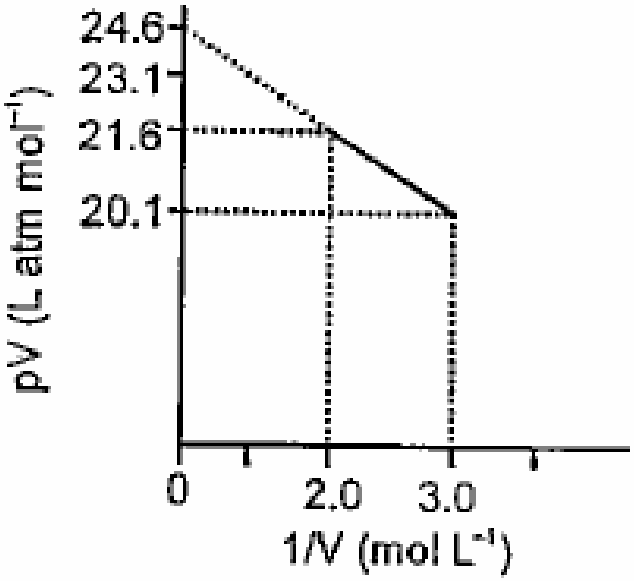
325. For one mole of a van der Waals' gas when b = 0and T =300 K, the pV vs. 1/V plot is shown below. The value of the van der Waals' constant a (atm L mol^{-2}) is



A. 1

B. 4.5

C. 1.5

D. 3

Answer:

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326. To an evacuated vessel with movable piston under external pressure of 1 atm, 0.1 mole of He and 1.0 mole of an unknown compound (vapour pressure 0.68 atm at $0^{o}C$) are introduced. Considering the ideal gas behaviour, the total volume (in litre) of the gases at $0^{o}C$ is close to

A. 3

B. 5

C. 7

D. 9

Answer:

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