



CHEMISTRY

BOOKS - S DINESH & CO CHEMISTRY (HINGLISH)

STATE OF MATTER (GASEOUS AND LIQUID STATE)

Multiple choice questions

1. All the three i.e., water, ice and vapour exist simultaneously at

A. 3.87 mm and $0.0891^{\circ}C$

B. 6.48 mm and $0.0148^{\circ}C$

C. 4.58 mm and $0.0098^{\circ}C$

D. $273K$ and $1atm$

Answer: C



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2. Kinetic energy of molecules is highest in

A. Gases

B. Liquids

C. Solids

D. Solution

Answer: A



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3. The volume of 1 litre is equal to

A. $10dm^3$

B. $1m^3$

C. 10^3dm^3

D. 10^3cm^3

Answer: D



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4. One atmosphere is equal to

A. 760 cm

B. $10^5 Nm^{-2}$

C. $10^4 \text{ dynes } cm^{-2}$

D. 10 Bar

Answer: B



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5. Atmolysis is a process of

- A. Atomising gas molecules
- B. The breaking of atoms to sub-atomic particles
- C. Separation of gases from their gaseous mixture
- D. Changing of liquids of their vapour state

Answer: C



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6. If the absolute temperature of a gas having volume $V\text{ cm}^3$ is doubled and the pressure is reduced to half, the final volume will be

A. $0.25V$

B. $0.50V$

C. $2V^2$

D. $4V$

Answer: D



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7. Which one of the following plot will be a hyperbola at constant temperature ?

A. P vs $\frac{1}{V}$

B. PV vs P

C. V vs P

D. None of these

Answer: C



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8. Helium gas at $300K$ is shifted from a vessel of $250cm^3$ to a vessel of $1L$ capacity. The pressure of gas will

A. become four times

B. becomes double

C. decrease to half of the original value

D. decrease to $1/4^{th}$ of the original value

Answer: D



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9. If saturated vapours are compressed slowly (temperature remaining constant) to half the initial volume, the vapour pressure will

A. become 4 times

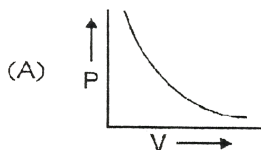
B. becomes $1/2$

C. remain unchanged

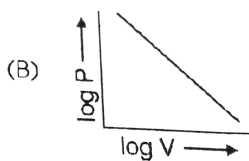
D. become double

Answer: C

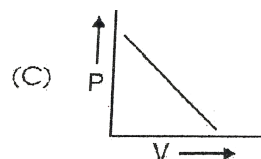
10. Which curve does not represent Boyle's law ?



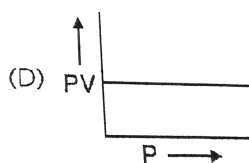
A.



B.



C.



D.

Answer: C

11. Boyle's law may be expressed as

A. $(dP/dV)_T = K/V$

B. $(dP/dV)_T = -K/V^2$

C. $(dP/dV)_T = -K/V$

D. None

Answer: B



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12. If V_0 is the volume of a given mass of gas at 278 K at a constant pressure then according to Charle's law, the volume at $10^\circ C$ will be

A. $11V_0$

B. $\frac{1}{273}(V_0 + 10)$

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

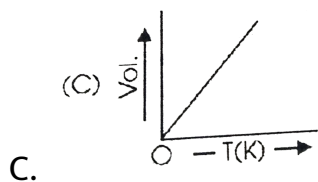
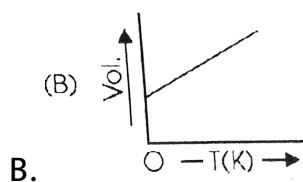
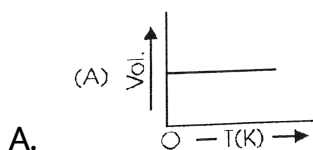
D. $\frac{283}{273}V_0$

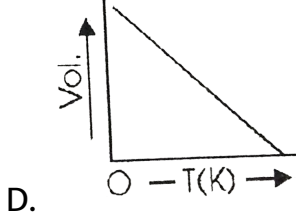
Answer: D



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13. The correct representation of Charles law is given in





Answer: C



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14. 10 g of a gas at NTP occupies 5 litres. The temperature at which the volume becomes double for the same mass of gas at the same pressure is

A. 273 K

B. $-273^{\circ}C$

C. $273^{\circ}C$

D. $546^{\circ}C$

Answer: C



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15. An open vessel containing air is heated from $27^{\circ}C$ to $127^{\circ}C$. The fraction of air originally present which goes out of it is

A. $3/4$

B. $1/4$

C. $2/3$

D. $1/8$

Answer: B



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16. At what temperature, the volume of a gas would become zero ?

A. $0^{\circ}C$

B. $273^{\circ}C$

C. $-273.15^{\circ}C$

D. 273 K

Answer: C



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17. At what temperature would the volume of a given mass of a gas at constant pressure will be twice of its volume at $0^{\circ}C$

A. $100^{\circ}C$

B. $273^{\circ}C$

C. $373^{\circ}C$

D. $546^{\circ}C$

Answer: B



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18. Which of the following will give a linear plot at constant pressure ?

A. V vs T

B. V vs $1/T$

C. T vs $1/V$

D. None of these

Answer: A



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19. According to Charle's law (here k is constant of proportionality)

A. $(dV / dT)_P = K$

B. $(dV / dT)_P = -K$

C. $(dV / dT)_P = -K / T$

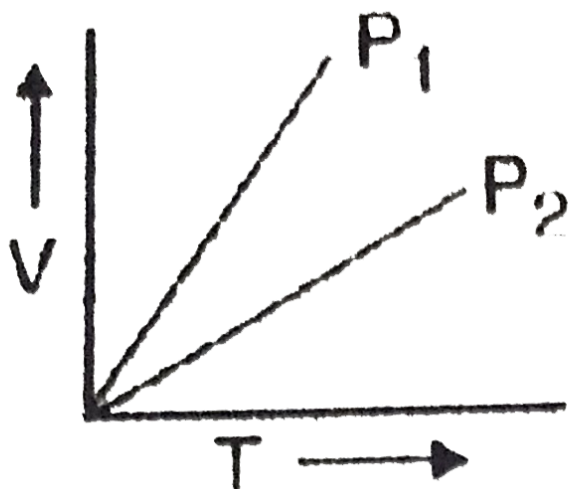
D. None of these

Answer: A



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20. V vs T curves at constant pressure P_1 and P_2 for an ideal gas are shown below



Which is correct ?

A. $P_1 > P_2$

B. $P_1 < P_2$

C. $P_1 = P_2$

D. All of the above

Answer: B

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21. Two sample of air 1cm^3 each are take sample. A is kept at temperature T_0 at sea level and another sample (B) at a height where pressure is $1/3$ atm. The absoulte temperature of (B) at that height is

A. $T_0/3$

B. T_0

C. $3T_0$

D. cannot be determined from above data

Answer: D

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22. At a constant pressure, what should be the percentage increase in the temperature in kelvin for a 10 % increase in the volume

A. 10 %

B. 20 %

C. 5 %

D. 50 %

Answer: A



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23. When the universal gas constant (R) is divided by Avogadro's number (N_0), their ratio is called

A. Planck's constant

B. Rudberg constant

C. Boltzmann constant

D. van der Waal's constant

Answer: C



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24. For n moles of ideal gas, the equation of state may be written as

A. $PT/n = RV$

B. $PV = (RT)^2$

C. $P/T = nR/V$

D. $PV = RT/n$

Answer: C



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25. The approximate temperature at which 1 mol L^{-1} of a sample of pure ideal gas exhibits a pressure of 101.325 k Pa is

A. 12.2 K

B. 122 K

C. 244 K

D. 300 K

Answer: A



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26. 0.30 g of gas was found to occupy a volume of 82.0 mL at 27°C and 3 atm. Pressure. The molecular mass of the gas is

- A. 60
- B. 30
- C. 90
- D. unpredictable

Answer: B



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27. The molar mass of an ideal gas can be calculated from the expression

A.
$$M = \frac{dRT}{PV}$$

B. $M = \frac{RT}{Pd}$

C. $M = \frac{Pd}{RT}$

D. $M = \frac{dRT}{P}$

Answer: D



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28. 8.2 L of an ideal gas weight 9.0 g at 300 K and 1 atm pressure. The molecular mass of gas is

A. 9

B. 27

C. 54

D. 81

Answer: B



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29. A 2.24 L cylinder of oxygen at N.T.P. was found to develop a leakage. When the leakage was plugged the pressure dropped to 570 mm of Hg. The number of moles of gas that escaped escaped will be

A. 0.025

B. 0.5

C. 0.075

D. 0.09

Answer: A



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30. If the density of a gas A is 1.5 times that of B , then the molecular mass of A is M . The molecular mass of B will be

A. $1.5M$

B. $M/1.5$

C. $3M$

D. $M/3$

Answer: B



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31. When the pressure of 5 L of N_2 is double and its temperature is raised from 300 K to 600 K, the final volume of the gas would be

A. 10 L

B. 5 L

C. 15 L

D. 20 L

Answer: B



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32. The numerical value of universal gas constant (R) depends upon

A. the nature of the gas

B. conditions of temperature

C. the units of measurement

D. None of these

Answer: C



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33. Which of the following does not represent ideal gas equation?

A. $PV = 1/2mNu^2$

B. $PV = nRT$

C. $P = \rho RT / M$

D. $PV = RT$

Answer: A



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34. The value of gas constant R is 8.314 X . Here X represents

A. Litre atm. $K^{-1}mol^{-1}$

B. Cal $mol^{-1}K^{-1}$

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

D. None of the above

Answer: C



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35. The molar volume of CO_2 is maximum at

A. NTP

B. $0^\circ C$ and 2.0 atm

C. $27^{\circ}C$ and 1 atm.

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

Answer: C



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36. The numerical value of $\frac{RT}{PV}$ for a gas at critical condition is Times of $\frac{RT}{PV}$ at normal conditions

A. 4

B. $3/8$

C. $8/3$

D. $1/4$

Answer: C

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

$$[R = 0.082 \text{ litre atm mol}^{-1} \text{ K}^{-1}]$$

- A. At STP
- B. When $V = 22.4\text{ L}$
- C. When $T = 12\text{ K}$
- D. Impossible under any condition

Answer: C

38. A box of 1 L capacity is divided into two equal compartments by a thin partition which are filled with 2g H_2 and 16 g CH_4 respectively. The pressure in each compartment is recorded as P atm. The total pressure when partition is removed will be:

A. P

B. 2P

C. $P/2$

D. $P/4$

Answer: A



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39. At constant temperature 200cm^3 of N_2 at 720 mmHg and 400cm^3 of O_2 at 750 mmHg pressure are put together in a liter

flask. The final pressure of mixture will be

A. 111 mmHg

B. 222 mmHg

C. 333 mmHg

D. 444 mmHg

Answer: D



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40. If 500 mL of gas A at 1000 torr and 1000 mL of gas B at 800 torr are placed in a 2 L container, the final pressure will be

A. 100 torr

B. 650 torr

C. 1800 torr

D. 2400 torr

Answer: B



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41. The partial pressure of hydrogen in a flask containing 2 g of H_2 and 32 g of SO_2 is

A. $1/16$ of total pressure

B. $1/2$ of total pressure

C. $2/3$ of total pressure

D. $1/8$ of total pressure

Answer: C

42. 2L of SO_2 gas at 760 mm Hg are transferred to 10 L flask containing oxygen at a particular temperature, the partial pressure of SO_2 in the flask is

- A. 63.33 mm Hg
- B. 152 mm Hg
- C. 750 mm Hg
- D. 1330 mm Hg

Answer: B

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

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

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

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

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

Answer: A



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44. To which of the following gaseous mixture, the Dalton's law of partial pressures will not apply ?

A. Hydrogen and carbon dioxide

B. Hydrogen and nitrogen

C. Nitric oxide and oxygen

D. Oxygen and nitrogen.

Answer: C



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45. A $0dm^3$ flask contains gas A and $1dm^3$ flask contains gas B at the same temperature. If density of $A = 3.0gdm^{-3}$ and that of $B = 1.5gdm^{-3}$ and the molar mass of $A = \frac{1}{2}$ of B, then the ratio of pressure exerted by gases is

A. $P_A / P_B = 2$

B. $P_A / P_B = 1$

C. $P_A / P_B = 4$

D. $P_A / P_B = 3$

Answer: C



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46. A closed vessel contains equal number of H_2 and O_2 molecules at a total pressure of 740 mm. If oxygen is completely removed, the pressure will

A. drop to $740/2$

B. drop to $740/3$

C. remain unchanged

D. cannot be predicted

Answer: A

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47. Equal masses of SO_2 , CH_4 and O_2 are mixed in empty container at 298 K, when total pressure is 2 atm. The partial pressure of CH_4 in the mixture is

- A. 0.5 atm
- B. 0.75 atm
- C. 1.2 atm
- D. 0.6 atm

Answer: C

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48. Aqueous tension of water depends on

- A. the amount of water taken
- B. the temperature only
- C. both amount of water and temperature
- D. neither temperature nor amount of water

Answer: B



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49. The partial pressure of a dry gas is

- A. less than that of wet gas
- B. greater than that of wet gas
- C. equal to that of wet gas
- D. None of these

Answer: A



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50. If two gases X and Y have their molecules travelling at the velocities in the ratio of 3:1. The ratio of their molecular mass M_x / M_y will be

A. 1/9

B. 9

C. 3

D. 1/3

Answer: A



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51. The increasing order of effusion among the gases H_2 , O_2 , NH_3 and CO_2 is

A. H_2 , CO_2 , NH_3 , O_2

B. H_2 , NH_3 , O_2 , CO_2

C. H_2 , O_2 , NH_3 , CO_2

D. CO_2 , O_2 , NH_3 , H_2

Answer: B



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52. If the densities of methane and oxygen are in the ratio 1:2, the ration of rate diffusion of O_2 and CH_4 is respectively

A. 1:2

B. 1 : 1.414

C. 2 : 1

D. 1.414 : 1

Answer: B



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53. The rate of diffusion of a gas is

A. directly proportional to its density

B. directly proportional to its molecular mass

C. directly proportional to the square root of its molecular mass

D. inversely proportional to the square root of its molecular mass.

Answer: D



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54. A gas X diffuses three times faster than another gas Y, the ratio of their densities i.e., $D_x : D_y$ is

A. $1/3$

B. $1/9$

C. $1/6$

D. $1/12$

Answer: B

55. A football bladder contains equimolar proportions of H_2 and O_2 . The composition by mass of the mixture effusing out of punctured football is in the ration ($H_2 : O_2$)

- A. 1 : 4
- B. $2\sqrt{2} : 1$
- C. $1 : 2\sqrt{2}$
- D. 4 : 1

Answer: A

56. The rate of diffusion of a gas is proportion

A. $\sqrt{P/d}$

B. P/d

C. $\sqrt{PV/d}$

D. $\frac{PV}{M}$

Answer: A



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57. Two flasks A and B of 1 L capacity each contain SO_2 and Br_2 gases respectively maintained at 340 K and pressure of 1.5 atmosphere. If number of Br_2 molecules in flask I is N, the total number of atoms in flask A will be

A. N

B. 2N

C. $N/2$

D. $3N$

Answer: D



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58. A gas has a vapour density 11.2. The volume occupied by 1 gram of the gas at N.T.P. will be

A. 11.2 L

B. 22.4 L

C. 1L

D. Unpredictable

Answer: C



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59. Which of the next represents the Avogadro number ?

- A. Number of molecules present in 1 L of gas at N.T.P.
- B. Number of molecules present in 22.4 mL of gas at N.T.P.
- C. Number of molecules present in 22.4 L of gas at 298 K and
1 atm. Pressure
- D. Number of molecules present in one mole of gas at any
temp, and pressure

Answer: D



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60. A flask filled with CCl_4 was weighted 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. same as that of oxygen
- B. 1/5th as heavy as oxygen
- C. 5 times as heavy as oxygen
- D. twice as heavy as oxygen

Answer: C



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61. Four one liter flasks are separately filled with the gases, O_2 , F_2 , CH_4 and CO_2 under the same conditions. The ratio of

number of molecules in these gases :

A. 2: 2: 4: 3

B. 1: 1: 1: 1

C. 1: 2: 3: 4

D. 2: 2: 3: 4

Answer: B



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62. Two flasks X and Y have capacity 1 L and 2 L respectively and each of them contains 1 mole of a gas. The temperature of the flasks are so adjusted that average speed of molecules in X is twice as those in Y . The pressure in flask X would be

A. same as that in Y

B. half of that in Y

C. twice of that in Y

D. 8 times of that in Y

Answer: D



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63. Average K.E. of CO_2 at $27^\circ C$ is E . the average kinetic energy of N_2 at the same temperature will be

A. E

B. $22E$

C. $E/22$

D. $E/\sqrt{2}$

Answer: A



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64. Which of the following relation is true about ideal gas ?

A. $\text{K.E.} = 3PV / 2N$

B. $\text{K.E.} = 3 / 2RT$

C. $\text{K.E.} = 3RT / PV$

D. $\text{K.E.} = 2 / 3KT$

Answer: B



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65. The molecules of which of the following gases have the largest mean average K.E. at $250^{\circ}C$?

A. Ar

B. CO

C. He

D. All have same K.E.

Answer: D



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66. The kinetic energy of one mole of any gas depends upon

A. pressure of gas

B. volume of gas

C. absolute temperature of gas

D. nature of gas

Answer: C



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67. The temperature at which the r.m.s. velocity of carbon dioxide becomes the same as that of nitrogen at $21^{\circ}C$ is

A. $462^{\circ}C$

B. $273K$

C. $189^{\circ}C$

D. $546K$

Answer: C

68. Four molecules of a gas have speeds of 1, 2, 3, 4cm s^{-1} respectively. The root mean square velocity is

A. $\sqrt{7.5}$

B. $\sqrt{30}$

C. 30

D. 15

Answer: A

69. The average velocity of an ideal gas at 0°C is 0.4ms^{-1} . If the temperature of gas is increased to 546°C its average

velocity will be

A. $0.8ms^{-1}$

B. $1.6ms^{-1}$

C. $0.346ms^{-1}$

D. $0.69ms^{-1}$

Answer: D



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70. The ratio of most probable velocity (α), average velocity (\bar{v}), root mean square velocity (u) is

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

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

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

D. $1 : \sqrt{8\pi} : \sqrt{3}$

Answer: A



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71. The temperature at which the average speed of the gas molecules is double to that at a temperature of $27^{\circ}C$ is

A. $54^{\circ}C$

B. $198^{\circ}C$

C. $327^{\circ}C$

D. $927^{\circ}C$

Answer: D

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72. Which of the following expression does not give root mean square velocity ?

A. $\left(\frac{3RT}{M}\right)^{\frac{1}{2}}$

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

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

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

Answer: B

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73. If the r.m.s. velocity of $5.15ms^{-1}$ at 298 K, then a velocity of $10.30ms^{-1}$ will be possessed at a temperature

- A. 149 K
- B. 172.6 K
- C. 596 K
- D. 1192 K

Answer: D



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74. By how many folds the temperature of a gas would increase when the r.m.s. velocity of gas molecules in a closed container of fixed volume is increased from $5 \times 10^4 cms^{-1}$ to $10 \times 10^4 cms^{-1}$?

A. 0.5 times

B. 2 times

C. 4 times

D. 16 times

Answer: C



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75. Which one of the following gases would have the highest r.m.s. velocity at $25^{\circ}C$?

A. Oxygen

B. Carbon dioxide

C. Sulphur dioxide

D. Carbon monoxide

Answer: D



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76. Which of the following is true ?

A. $u_{\text{rms}} > \bar{v} > \alpha$

B. $u_{\text{rms}} < \bar{v} < \alpha$

C. $u_{\text{rms}} > \bar{v} < \alpha$

D. $u_{\text{rms}} < \bar{v} > \alpha$

Answer: A



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77. Which of the following is true about the mass of molecules m and u_{rms} ?

A. $u_{\text{rms}} \propto m$

B. $u_{\text{rms}} \propto \frac{1}{m}$

C. $u_{\text{rms}} \propto 1/\sqrt{m}$

D. $u_{\text{rms}} \propto 1/m^2$

Answer: C



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78. Most probable velocity, average velocity and root mean square velocity are related as

A. $1 : 1.128 : 1.224$

B. 1 : 1.128 : 1.424

C. 1 : 2.128 : 1.224

D. 1 : 1.428 : 1.442

Answer: A



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

A. decreases with the rise in temperature

B. increases with the rise in temperature

C. decreases initially and thereafter increases

D. unpredictable

Answer: B

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80. If X is the total number of collision which a gas molecule registers with others per unit time under particular condions, then the collision frequency of the gas containing N molecules per unit volume is

A. X / N

B. NX

C. $2NX$

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

Answer: D

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81. If the collision frequency of a gas at 1 atm pressure is Z , then its collision frequency at 0.5 atm is

- A. $1.0 Z$
- B. $0.25 Z$
- C. $2Z$
- D. $0.5 Z$

Answer: B



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82. The collision taking place among gas molecules depends upon

- A. mean free path

- B. pressure
- C. temperature
- D. all the above

Answer: D



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83. The closest distance between the centres of two molecules of a gas taking part in collision is called

- A. collision diameter
- B. collision number
- C. molecular diameter
- D. Both A and C

Answer: D



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84. With increase in pressure, the mean free path

- A. increase
- B. becomes zero
- C. decrease
- D. remains constant

Answer: C



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85. Longest mean free path stands for

A. Nitrogen (N_2)

B. Oxygen (O_2)

C. Hydrogen (H_2)

D. Chlorine (Cl_2)

Answer: C



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86. If the mean free path is l at one atm. Pressure then its value at 5 atm. Pressure is

A. $5l$

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

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

D. unpredictable

Answer: C



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87. Which of the following represents the units of van der Waal constant a ?

A. $Lmol^{-1}$

B. $atmL^2mol^{-2}$

C. $Latm. Mol^{-1}$

D. $Latm. Mol^{-2}$

Answer: B



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88. The correct expression for the van der Waal's equation of state is

A. $(p + a/n^2V^2)(V - nb) = nRT$

B. $(p + an^2/V^2)(V - nb) = \Delta nRT$

C. $(P + an^2/V^2)(V - b) = nRT$

D. $(p + an^2/V^2)(V - nb) = nRT$

Answer: D



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89. van der Waal's equation explains the behaviour of

A. Elementary gases

B. Real gases

C. Ideal gases

D. Mixture of ideal and real gases

Answer: B



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90. A real gas obeying van der Waal equation will resemble ideal gas if the

A. constant a and b are small

B. a is large and b is small

C. a is small and b is large

D. constant a and b are large

Answer: A



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91. In van der Waal's equation of state for non ideal gas, the term which accounts for the intermolecular forces is

A. b

B. a/V^2

C. RT

D. $1/RT$

Answer: B



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92. At relatively high pressure, van der Waal's equation reduces to

A. $PV = RT$

B. $PV = RT - a/V$

C. $PV = RT + Pb$

D. $PV = RT - a/V^2$

Answer: C



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93. The ratio of excluded volume (b) to molar volume of a gas molecule is

A. 2

B. 3

C. 4

D. 5

Answer: C



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94. The constant 'a' in van der Waal's equation is maximum in

A. Helium

B. Hydrogen

C. Oxygen

D. Ammonia

Answer: D



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95. Critical temperature of the gas is the temperature

- A. below which it cannot be liquefied
- B. above which it cannot be liquefied
- C. at which it occupies 22.4 L of volume
- D. at which one mole of it occupies volume of 22.4 L

Answer: B



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96. When an ideal gas undergoes unrestricted expansion

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

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

C. cooling occurs as molecules collide with each other with loss of energy.

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

Answer: B



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97. A gas X causes heating effect when allowed to expand. This is because

- A. the gas is a noble gas
- B. the inversion temperature of the gas is very low
- C. the gas is ideal gas
- D. the boiling point of the gas is very low

Answer: B



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98. The gas that is heated up during Joule Thomson effect at ordinary temperature is

- A. O_2
- B. CO_2
- C. H_2

D. SO_2

Answer: C



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99. Two substances with the same reduced pressure and the same reduced temperature will have the same reduced volume.

This is called

- A. Gay-Lussac's law
- B. Law of corresponding states
- C. Law of reciprocal proportions
- D. Continuity of state

Answer: B

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

- A. Below critical temperature
- B. Above critical temperature
- C. Above absolute zero
- D. Below absolute zero

Answer: B

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101. 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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102. NH_3 can be liquefied at ordinary temperature without the application of pressure. But O_2 cannot be because :

A. its critical temperature is very high

B. its critical temperature is low

C. its critical temperature is moderate

D. its critical temperature is higher than that of ammonia

Answer: B



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103. The gas which can be liquefied under high pressure at $4^{\circ}C$ is

A. nitrogen

B. hydrogen

C. Oxygen

D. Ammonia

Answer: D



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

- A. Higher than its critical temperature
- B. Lower than its critical temperature
- C. Equal to its critical temperature
- D. None

Answer: B



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105. A gas is found to have a formula $[CO]_x$. If its vapour density is 70, then value of x is

A. 2.5

B. 3.0

C. 5.0

D. 6.0

Answer: C



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106. Which of the following gases is/are heavier than dry air?

A. moist air

B. SO_2

C. Cl_2

D. O_2

Answer: A



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107. Two flasks of equal volume contain CO_2 and SO_2 respectively at $25^\circ C$ and 1.5 atm pressure. Which of the following is equal in them ?

- A. Masses of the two gases
- B. Rates of effusion
- C. Number of molecules
- D. Molecular structures

Answer: C



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108. One litre of an unknown gas weighs 1.25 g at N.T.P. which of the following gas pertains to the above data ?

A. CO_2

B. NO_2

C. N_2

D. O_2

Answer: C



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109. Which of the following gas when passed through dilute blood will impart a cherry red colour to the solution ?

A. CO_2



Answer: D



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

A. Thermal energy = Molecular attraction

B. Thermal energy > Molecular attraction

C. Thermal energy < Molecular attraction

D. Molecular forces > those in liquids

Answer: B



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111. In which of the following states of matter the average distance between the molecules lies between 10^{-5} cm to 10^{-7} cm ?

A. solide

B. liquid

C. gas

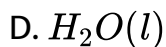
D. None of these

Answer: B



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112. Which of the following liquid will exhibit highest vapour pressure ?



Answer: B



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113. Out of the four liquids given below, the one having lowest vapour pressure at $25^{\circ}C$ is

A. Carbon tetrachloride

B. Benzene

C. Chloroform

D. Water

Answer: D



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114. The normal boiling point of the liquid is approximately

A. 1.55 times of its critical temperture

B. two -third of its critical temperature

C. half of its critical temperature

D. one third of its critical temperature

Answer: B

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115. The correct relationship between enthalpy (in cal mol^{-1}) of vaporisation of liquid and its boiling point is

A. $\Delta H_{\text{vap}} \approx 21T_b$

B. $\Delta H_{\text{vap}} \approx 1.55T_b$

C. $\Delta H_{\text{vap}} \approx 2/3T_b$

D. $\Delta H_{\text{vap}} \approx 2.303T_b$

Answer: A

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116. Trouton's rule gives the relation between

A. T_b and T_C

B. T_b and critical pressure

C. Enthalpy of vaporisation boiling point

D. Normal boiling point and boiling point

Answer: C



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117. One litre of a gas at S.T.P. weight 1.16 g. It can possibly be

A. C_2H_2

B. CO

C. O_2

D. CH_4

Answer: A



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118. A flask containing air (open to the atmosphere) is heated from 300 K to 500 K. The percentage of air escaped to the atmosphere is

A. 16.6

B. 40

C. 60

D. 20

Answer: B



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119. A weather balloon filled with hydrogen at 1 atm and 27°C has volume equal to 1200 litres. On ascending, it reaches a place where temperature is -23°C and pressure is 0.5 atm . The volume of the balloon is

A. 24000 litres

B. 20000 litres

C. 10000 litres

D. 12000 litres

Answer: B



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120. The pressure of a mixture of equal weight of two gases of mol wt. 4 and 40, is 1.1 atm. The partial pressure of the lighter

gas in this mixture is

A. 0.55 atm

B. 0.11 atm

C. 1 atm

D. 0.1 atm

Answer: C



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121. A bottle of cold drink has 200 mL liquid in which CO_2 is 0.1 molar. If CO_2 behaves as ideal gas the volume of CO_2 at S.T.P. solution of cold drink is

A. 0.224 litre

B. 0.448 litre

C. 22.4 litre

D. 2.24 litre

Answer: B



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122. If two moles of an ideal gas at 546 K occupy volume of 44.8 L, then pressure must be

A. 2 atm

B. 3 atm

C. 4 atm

D. 1 atm

Answer: A

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123. The rate of diffusion of two gases A and B is in the ratio of 1 : 4 and that of B and C in the ratio of 1 : 3. The rate of diffusion of C with respect to A is

A. $\frac{1}{12}$

B. 12

C. 6

D. 4

Answer: B

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124. 32 g of oxygen and 3.0 g of hydrogen are mixed and kept in a vessel at 760 mm pressure and $0^{\circ}C$. The total volume occupied by the mixture will be nearly

A. 22.4 litres

B. 33.6 litre

C. 56.0 litres

D. 44.8 litres

Answer: C



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125. In two containers X and Y same gas is filled. If the pressure, volume and absolute temperature of gas in X are three times as

compared to that in Y and if the mass of X is mg , the mass of Y is

A. mg

B. $m/3g$

C. $m/2g$

D. $2mg$

Answer: B



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126. The molecular weights of oxygen and sulphur dioxide are 32 and 64 respectively. If 1 litre of oxygen are 32 and 64 respectively. If 1 litre of oxygen at $15^{\circ}C$ and 740 mm pressure contains N molecules, the number of molecules in 2 litre of

sulphur dioxide under the same conditions of temperature and pressure will be

A. N

B. $2N$

C. $N/2$

D. 4

Answer: B



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127. Two litres of gas are maintained at $25^{\circ}C$ and two atmospheric pressure. If the pressure is double and absolute temperature is halved, the gas will now occupy

A. 2.0 litre

B. 4.0 litre

C. 0.5 litre

D. 1.0 litre

Answer: C



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128. A pre weighed vessel was filled with oxygen at N.T.P. and weighted. It was then evacuated, filled with SO_2 at the same temperature and pressure, and again weighed. The weight of oxygen will be

A. Same as that of SO_2

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

C. Twice that of SO_2

D. One -fourth that of SO_2

Answer: B



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129. The vapour density of a gas (X) is 11.2. The volume occupied by 11.2g of this gas at N.T.P. is

A. 2.4 litres

B. 11.2 litres

C. 2.0 litres

D. 20 litres

Answer: B



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130. A gaseous mixture contains oxygen and nitrogen in the ratio of 1:4 by weight therefore the ratio of their number of molecules is

A. 1:4

B. 1:8

C. 7:32

D. 3:16

Answer: C



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131. Assume that air is 21% nitrogen by volume. If the barometer pressure is 740 mm, the partial pressure of oxygen is closest to

which one of the following ?

A. 155 mm

B. 310 mm

C. 580 mm

D. 740 mm

Answer: A



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132. The average kinetic energy in Joule of the molecules in 8 grams of CH_4 at $27^\circ C$ is

A. 18.7065

B. 187.065

C. 1870.65

D. 1.87065

Answer: C



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133. The temperature at which the root mean square velocity of SO_2 molecules is same as that of O_2 molecules at $27^\circ C$

A. $327^\circ C$

B. 327 K

C. $32.7^\circ C$

D. 32.7 K

Answer: A

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134. The kinetic energy for 14 g of nitrogen gas at 127°C is nearly (mol. Mass of nitrogen = 28 and gas constant = 8.31 J/mol K)

- A. 8.3 kJ
- B. 4.15 kJ
- C. 2.5 kJ
- D. 3.3 kJ

Answer: C

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135. A sample of air contains only N_2 , O_2 and H_2O . It is saturated with water vapours and the total pressure is 640 torr. The vapours of water is 40 torr and the molar ratio of $N_2 : O_2$ is 3: 1. The partial pressure of N_2 in the sample is

- A. 480 torr
- B. 600 torr
- C. 525 torr
- D. 450 torr

Answer: D



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136. A sample of O_2 gas is collected over water at $23^\circ C$ at a barometric pressure of 751 mm Hg (vapour pressure of water at

23°C is 21 mm Hg). The partial pressure of O_2 gas in the sample collected is

- A. 21 mm Hg
- B. 751 mm Hg
- C. 0.96 atm
- D. 1.02 atm

Answer: C



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137. The volume of 2.89 g of carbon monoxide at 27°C and 0.821 atm pressure is

- A. 1.5 lit
- B. 0.3 lit

C. 3 lit

D. 30 lit

Answer: C



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138. The tempeature at which nitrogen under 1 atmospheric pressure has the same root mean square velocity as that of CO_2 at STP is

A. $-99.27^{\circ}C$

B. $-99.27K$

C. $-9.927^{\circ}C$

D. $156^{\circ}C$

Answer: A



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139. 50 mL of gas A effuses through a pin hole in 146 seconds. The same volume of CO_2 under identical condition effuses in 115 seconds. The molar mass of A is

A. 44

B. 35.5

C. 71

D. None of these

Answer: C



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140. A gaseous mixture of three gases A, B and C has a pressure of 10 atm. The total number of moles of all the gases is 10. If the partial pressure of A and B are 3.0 and 1.0 atm respectively and if C has a mol/wt. of 2.0. What is the weight of C in g present in the mixture ?

A. 6

B. 3

C. 12

D. 8

Answer: C



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141. What weight of hydrogen at STP could be contained in a vessel that holds 4.8 g of oxygen at STP

A. 4.8 g

B. 3.0 g

C. 0.6 g

D. 0.3 g

Answer: D



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142. In a flask of volume V litres, 0.2 mole of oxygen, 0.4 mole of nitrogen, 0.1 mole of NH_3 and 0.3 mole of He are enclosed at $27^\circ C$. If the total pressure exerted by these non-reacting gases is one atmosphere, the partial pressure exerted by nitrogen is

A. 1 atm

B. 0.1 atm

C. 0.2 atm

D. 0.4 atm

Answer: D



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143. In the equation $PV = nRT$, the gas constant R is not equal to

A. $8.31 \times 10^7 \text{ erg K}^{-1} \text{ mol}^{-1}$

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

C. $8.31 \text{ J K}^{-1} \text{ mol}^{-1}$

D. $8.31 \text{ LatmK}^{-1} \text{ mol}^{-1}$

Answer: D



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144. At the top of the mountain, the thermometer reads $0^{\circ}C$ and the barometer reads 710 mmHg . At the bottom of the mountain the temperature is $30^{\circ}C$ and the pressure is 760 mmHg . The ratio of the density of air at the top with that at the bottom is

A. 1 : 1.04

B. 1.04 : 1

C. 1.5 : 1

D. 1 : 1

Answer: B



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145. A quantity of gas is collected in a graduated tube over the mercury. The volume of the gas at $20^{\circ}C$ is 50.0mL and the level of the mercury in the tube is 100mm above the outside mercury level. The barometer reads 750mm . Volume at STP is

A. 40 mL

B. 42 mL

C. 39.8 mL

D. 60 mL

Answer: C



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146. A gas at a pressure of 5.0 atm is heated from 0°C to 546°C and simultaneously compressed to one-third of its original volume. Hence, final pressure is:

- A. 10.0 atm
- B. 30.0 atm
- C. 45.0 atm
- D. 5.0 atm

Answer: C



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147. Which of the following contains maximum number of nitrogen atoms ?

A. $22.4L$ of N_2 at STP

B. 500 mL of $2.0M NH_3$

C. 6.02×10^{23} molecules of NO_2

D. 1.00 mol of NH_4Cl

Answer: A



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148. In an auto engine having no pollution control device 5% of the fuel (C_8H_{18}) is left unburnt. Molar ratio under same P and T of CO and C_8H_{18} emitted in exhaust gas is .

A. 100

B. 152

C. 50

D. 5

Answer: B



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149. A quantity of hydrogen gas occupies a volume of 30.0mL at a certain temperature and pressure. What volume would half of this mass of hydrogen occupy at triple the initial temperature, if the pressure was one-ninth that of the original gas?

A. 270 mL

B. 90 mL

C. 405 mL

D. 135 mL

Answer: C



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150. For critical constant factor, compression factor Z is

A. 1

B. > 1

C. < 1

D. 0

Answer: C



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151. For a given gas, $T_C = 40K$, then T_i is

- A. 40 K
- B. 270 K
- C. 135 K
- D. 540 K

Answer: B



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152. Boyle temperature of various gases are given below :

| Gas | $T_B(K)$ |
|-----|----------|
|-----|----------|

| | |
|-------|-----|
| H_2 | 117 |
|-------|-----|

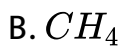
| | |
|------|----|
| He | 23 |
|------|----|

| | |
|--------|-----|
| CH_4 | 498 |
|--------|-----|

| | |
|-------|-----|
| O_2 | 406 |
|-------|-----|

Which gas can be liquefied most easily ?

- A. H_2



Answer: B



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153. Which has least value ?

A. $\frac{T_1}{T_B}$

B. $\frac{T_i}{T_C}$

C. $\frac{T_C}{T_B}$

D. $\frac{T_B}{T_C}$

Answer: C



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154. At 100 K, $N_2(g)$ is called (T_C for $N_2 = 132.2^\circ C$)

A. gas

B. vapour

C. super cooled gas

D. super critical fluid

Answer: B



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155. Select the correct alternative.

A. $T_i > T_B$

B. $T_B > T_i$

C. $T_C > T_i$

D. $T_C = T_i$

Answer: A



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156. The correct order for T_i , T_B and T_C is

A. $T_I < T_C < T_B$

B. $T_B < T_C < T_i$

C. $T_C < T_B < T_i$

D. $T_i < T_B < T_C$

Answer: C



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157. The temperature at which both centigrade and Fahrenheit thermometer will read same temperature is

A. 273°

B. -273°

C. 0°

D. -40°

Answer: D



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158. At low pressures, the van der waal's equation is written as

$$\left[P + \frac{a}{V^2} \right] V = RT$$

The compressibility factor is then equal to

A. $\left(1 - \frac{a}{RTV} \right)$

B. $\left(1 - \frac{RTV}{a} \right)$

C. $\left(1 + \frac{a}{RTV} \right)$

D. $\left(1 + \frac{RTV}{a} \right)$

Answer: A



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159. Ideal gas equation in terms of KE per unit volume, E , is

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

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

C. $P = \frac{2}{3}RT$

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

Answer: B



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

A. V_m (molar volume) $> 22.4L$

B. $V_m < 22.4L$

C. $V_m = 22.4L$

D. $V_m = 44.8L$

Answer: B



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

A. 400 K

B. 300 K

C. 346 K

D. 533 K

Answer: D



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162. The rms velocity of hydrogen is $\sqrt{7}$ times the rms velocity of nitrogen. If T is the temperature of the gas then .

A. $T(H_2) = T(N_2)$

B. $T(H_2) > T(N_2)$

C. $T(H_2) < T(N_2)$

D. $T(H_2) = \sqrt{7}T(N_2)$

Answer: C



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163. The average molecular speed is greatest in which of the following gas samples?

A. 1.0 mole N_2 at 560 K

B. 0.50 mole of Ne at 500 K

C. 0.20 mole CO_2 at 440 K

D. 2.0 mole of He at 140 K

Answer: D



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164. 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. $3/4$

B. $1/2$

C. $1/4$

D. $1/8$

Answer: C



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165. The density of neon will be minimum at

A. STP

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

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

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

Answer: C



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166. The average velocity of an ideal gas molecule at $27^{\circ}C$ is $0.3ms^{-1}$. The average velocity at $927^{\circ}C$ will be

A. $0.6ms^{-1}$

B. $0.3ms^{-1}$

C. $0.9ms^{-1}$

D. $3ms^{-1}$

Answer: A



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167. A 1 L sample of CO initially at S.T.P. is heated to $546^{\circ}C$ and its volume is increased to 2 L. Which of the following is affected to the maximum extent ?

- A. R.M.S. velocity
- B. Kinetic energy
- C. Average velocity
- D. Most probable velocity

Answer: B



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168. If excluded volume is taken as zero, compressibility factor Z is

A. $\left(1 - \frac{a}{RTV}\right)$

B. $\left(1 + \frac{Pb}{RT}\right)$

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

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

Answer: A



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169. A large cylinder of helium filled at 1000 pascal had a thin orifice through which helium escaped into an evacuated space at the rate of 6.4 m mol/h. How long would it take for 10 m mol SO_2 to leak through a similar orific if the SO_2 were confined at the same pressure ?

A. 6.25 h

B. 0.39 h

C. 4.42 h

D. 1.00 h

Answer: A



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170. Rate of effusion of LPG (a mixture of n -butane and propane) is 1.25 times that of SO_3 . Hence, mole fraction of n -butane in LPG is

A. 0.75

B. 0.25

C. 0.5

D. 0.67

Answer: C



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171. 100 mL of H_2 gas diffuses in 10 sec. X mL of O_2 gas diffuses in t sec. X and t cannot be

A. 100 mL, 40 sec

B. 25 mL, 10 sec

C. 100 mL, 10 sec

D. 5 mL, 2 sec

Answer: C



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172. 100 mL O_2 gas diffuses in 10 sec. 100 mL of gas X diffuses in t sec. Gas X and time t can be

A. H_2 , 2.5 sec

B. SO_2 , 16 sec

C. CO , 10 sec

D. He , 4 sec

Answer: A



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173. A mixture of C_3H_8 and CH_4 exerts a pressure of 320 mm Hg at temperature T K in a V litre flask. On complete combustion, gaseous mixture contains CO_2 only and exerts a pressure of 448 mm Hg under identical conditions. Hence mole fraction of C_3H_8 in the mixture is

A. 0.2

B. 0.8

C. 0.25

D. 0.75

Answer: A



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174. Average volume available to a molecule in a sample of ideal gas at S.T.P. is

A. $3.72 \times 10^{-20} \text{ cm}^3$

B. $2.69 \times 10^{19} \text{ cm}^3$

C. 22400 cm^3

D. $22400 \times 6.02 \times 10^{23} \text{ cm}^3$

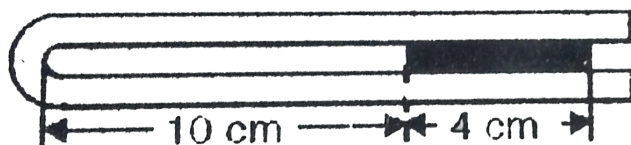
Answer: A

175. Assume that for every increase in height of 1 m, pressure decreases by 10 mm Hg. Initially, an experimental air balloon of maximum 200 L capacity has 150 L air at 1 atm at sea-level. At what height, the balloon is expected to burst ?

- A. 15 m above sea-level
- B. 19 m above sea-level
- C. 10 m above sea-level
- D. 20 m above sea-level

Answer: D

176. A 10.0 cm column of air is trapped by a column of Hg 4.00 cm long in capillary tube of uniform bore when the tube is held horizontally in a room at 1 atm. Length of the air column when the tube is held vertically with the open end up is



- A. 9.50 cm
- B. 10.52 cm
- C. 3.53 cm
- D. 4.61 cm

Answer: A



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1. The maximum proportion of available volume that can be filled by hard sphere in diamond is

A. 0.52

B. 0.34

C. 0.32

D. 0.68

Answer: B



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

A. 15 atm, and 200 K

B. 1 atm, and 273 K

C. 0.5 atm, and 500 K

D. 15 atm, and 500 K

Answer: C



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3. A sample of a given mass of gas at a constant temperature occupies 95cm^3 under a pressure of $9.962 \times 10^4 \text{Nm}^{-2}$. At the same temperature its volume at a pressure of $10.13 \times 10^4 \text{Nm}^{-2}$ is

A. 190cm^3

B. 93cm^3

C. 46.5cm^3

D. 47.5cm^3

Answer: B



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4. The correct value of the gas constant R is close to

A. $0.082 \text{ litre-atm } K^{-1} \text{ mol}^{-1}$

B. $0.82 \text{ litre } atm^{-1} K \text{ mol}$

C. $0.082 \text{ litre-atm } K$

D. $0.082 \text{ litre } atm^{-1} K \text{ mol}^{-1}$

Answer: A



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5. One litre of a gas weights 2 g at 300 K and 1 atm pressure. If the pressure is made 0.75 atm at which of the following temperature will one litre of the same gas weight one gram ?

A. 450 K

B. 600 K

C. 800 K

D. 900 K

Answer: A



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6. The density of a gas at $27^{\circ}C$ and 1 atm is d . Pressure remaining constant, at which of the following temperature will

its density become $0.70d$?

A. $20^{\circ}C$

B. $30^{\circ}C$

C. $400K$

D. $300K$

Answer: C



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7. Select one correct statement. In the gas equation,

$$PV = nRT$$

A. n is the number of molecules of a gas

B. n moles of the gas have a volume V

C. V denotes volume of one mole of the gas

D. P is the pressure of the gas when only one mole of gas is present

Answer: B



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8. 3.2 g of oxygen (At. wt. = 16) and 0.2 g of hydrogen (At. wt. = 1) are placed in a 1.12L flask at $0^{\circ}C$. The total pressure of the gas mixture will be

A. 1 atm

B. 4 atm

C. 3 atm

D. 2 atm

Answer: B



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9. 50 mL of a gas A diffuse through a membrane in the same time as for the diffusion of 40 mL of a gas B under identical pressure temperature conditions. If the molecular weight of $A = 64$ that of B would be

A. 100

B. 250

C. 200

D. 80

Answer: A



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10. An ideal gas can never be liquefied because .

- A. its critical temperature is always above $0^{\circ}C$
- B. its molecules are relatively small in size
- C. it solidifies before becoming a liquid
- D. forces operative between its molecules are negligible

Answer: D



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11. Which of the following is most polarised among noble gases ?

A. He

B. Xe

C. Kr

D. Rn

Answer: D



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

A. $1/25$

B. $1/5$

C. 25

D. 5

Answer: A



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13. Which of the following statement is false ?

- A. The product of pressure volume of fixed amount of a gas is independent of temperature
- B. Molecules of different gases have the same K.E. at a given temperature
- C. The gas equation is not valid at high pressure and low temperature
- D. The gas constant per molecule is known as Boltzmann constant

Answer: A



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

A. 2

B. $1/2$

C. 4

D. $1/4$

Answer: C



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15. The molecular velocities of two gases at same temperature are u_1 and u_2 , their masses are m_1 and m_2 respectively, which of the following expression is correct ?

A. $\frac{m_2}{u_1^2} = \frac{m_2}{u_2^2}$

B. $m_1 u_1 = M_2 u_2$

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

D. $m_1 u_1^2 = m_2 u_2^2$

Answer: D



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16. The density of methane at 2.0 atmosphere pressure at $27^\circ C$ is

A. 0.13gL^{-1}

B. 0.26gL^{-1}

C. 1.30gL^{-1}

D. 26.0gL^{-1}

Answer: C



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17. The number of moles of H_2 in 0.224 L of hydrogen gas at STP (273 K, 1 atm) assuming ideal gas behaviour is

A. 1

B. 0.1

C. 0.01

D. 0.001

Answer: C



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18. The temperature of the gas is raised from $27^{\circ}C$ to $927^{\circ}C$, the root mean square velocity is

A. $\sqrt{927 / 27}$ times the earlier value

B. same as before

C. halved

D. doubled

Answer: D



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19. 50 mL of hydrogen diffuses through a small hole from vessel in 20 minutes time. Time taken for 4 mL of oxygen to diffuse out under similar conditions will be

A. 12 min

B. 64 min

C. 8 min

D. 32 min

Answer: B



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20. Which of the following statement is false ?

- A. Avogadro number $= 6.01 \times 10^{21}$
- B. The relationship between average velocity (\bar{v}) and root mean square velocity (u) is $\bar{v} = 0.9213u$
- C. The mean kinetic energy of an ideal gas is independent of the pressure of the gas
- D. The root mean square velocity of the gas can be calculated by the formula $(3RT / M)^{1/2}$

Answer: A



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21. The internal energy of one mole of ideal gas is

A. $3/2RT$

B. $1/2kT$

C. $1/2RT$

D. $3/2kT$

Answer: A



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22. An ideal gas obeying the kinetic theory of gases can be liquefied if

A. its temperature is more than critical temperature

B. its pressure is more than critical pressure

C. its pressure is more than critical pressure but temperature is less than critical temperature

D. it cannot be liquefied at any value of P and T

Answer: D



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23. Dimensions of pressure are same as that of

A. Energy

B. Energy per unit volume

C. Force

D. Force per unit volume

Answer: B



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24. The densities of two gases are in the ratio of 1: 16. The ratio of their rates of diffusion is

A. 16: 1

B. 4: 1

C. 1: 4

D. 1: 16

Answer: B



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25. The pressure of 2 mole of ideal gas at $546K$ having volume $44.8L$ is

A. 2 atm

B. 3 atm

C. 4 atm

D. 1 atm

Answer: A



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26. The average kinetic energy of an ideal gas per molecule in SI units at $25^{\circ}C$ will be

A. $6.17 \times 10^{-21} kJ$

B. $6.17 \times 10^{-21} J$

C. $6.17 \times 10^{-20} J$

D. $7.16 \times 10^{-20} J$

Answer: B



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27. Gas deviates from ideal gas nature because molecules

- A. are colourless
- B. attract each other
- C. contain covalent bond
- D. show Brownian movement

Answer: B



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28. The value of compressibility factor (Z) for an ideal gas is

A. 0

B. 1

C. 2

D. 4

Answer: B



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29. van der Waal's equation is true for

A. Ideal gas

B. Real gas

C. Gaseous substance

D. None of the above

Answer: B



Watch Video Solution

30. If the volume of 2 moles of an ideal gas at 540 K is 44.8 litres then its pressure will be

- A. 1 atmosphere
- B. 2 atmosphere
- C. 3 atmosphere
- D. 4 atmosphere

Answer: B



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31. A gaseous mixture of three gases A, B and C has a pressure of 10 atm. The total number of moles of all the gases is 10. If the partial pressure of A and B are 3.0 and 1.0 atm respectively and if C has a mol/wt. of 2.0. what is the weight of C in g present in the mixture ?

A. 8

B. 12

C. 3

D. 6

Answer: B



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32. The volume of 2.8g of carbon monoxide at $27^{\circ}C$ and 0.821atm pressure ($R = 0.0821\text{atmK}^{-1}\text{mol}^{-1}$)

A. 30 L

B. 3 L

C. 0.3 L

D. 1.5 L

Answer: B



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33. At $25^{\circ}C$ and 730 mm pressure, 380 mL of dry oxygen was collected. If the temperature is constant, what volume will be oxygen occupy at 760mm pressure ?

A. 365 mL

B. 449 mL

C. 569 mL

D. 621 mL

Answer: A



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34. Which one of the following statement is wrong for gases ?

A. Gases do not have a definite shape and volume

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

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

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

Answer: D



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35. The value of universal gas constant R depends on :

A. temperature of the gas

B. volume of gas

C. number of moles of gas

D. None of these

Answer: D



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36. Two moles of an ideal gas at 1 atm are compressed to 2 atm at 273 K. The enthalpy change for the process is

A. 2 litre atm

B. 1 litre atm

C. zero

D. 1 litre atm

Answer: C



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37. In a mole of water vapours at STP, the volume actually occupied or taken by the molecules (i.e., Avogadro's No. \times volume of one molecule) is

- A. zero
- B. less than 0.1% of 22.4 litres
- C. about 10 % of the volume of the container of 22.4 litres
- D. between 10% to 2% of 22.4 litres

Answer: B



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38. At STP, a container has 1 mole of Ar, 2 mole of CO_2 , 3 moles of O_2 and 4 moles of N_2 . Without changing the total pressure if one mole of O_2 is removed, the partial pressure of O_2

A. is changed by about 26%

B. is halved

C. is unchanged

D. changed by 33%

Answer: A



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39. If two moles of an ideal gas at 546 K occupy volume of 44.8 L, then pressure must be

A. 4 atm

B. 3 atm

C. 2 atm

D. 1 atm

Answer: A



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40. The relationship which describes the variation of vapour pressure with temperature is called

A. Hess's law

B. Arrhenius equation

C. Kirchoff's law

D. Clausis-Clapeyron equation

Answer: D



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41. Gas equation $PV = nRT$ is obeyed by

- A. only isothermal process
- B. only adiabatic process
- C. both A and B
- D. None of these

Answer: C



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42. The temperature below which a gas does not exist is called its

- A. Inversion temperature

B. Critical temperature

C. Neutral temperature

D. Curie point

Answer: B



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43. Van der Waal's equation reduces itself to the ideal gas equation at :

A. high pressure and low temperature

B. low pressure and low temperature

C. low pressure and high temperature

D. high pressure alone

Answer: C



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44. In a flask of volume V litres, 0.2 mol of oxygen 0.4 mol of nitrogen, 0.1 mole of NH_3 and 0.3 mol of He are enclosed at $27^\circ C$. If the total pressure exerted by these non reacting gases is one atmosphere, the partial pressure exerted by nitrogen is

A. 1 atm

B. 0.1 atm

C. 0.2 atm

D. 0.4 atm

Answer: D



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45. At what temperature will the r.m.s. velocity of SO_2 be the same as the O_2 at 303 K ?

A. 403 K

B. 303 K

C. 606 K

D. 273 K

Answer: C



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46. For an ideal gas, number of moles per litre in terms of its pressure P , gas constant R and temperature T is

A. PT / R

B. PRT

C. P / RT

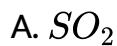
D. RT / P

Answer: C



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47. Which of the following has maximum root mean square velocity at the same temperature ?



D. H_2

Answer: D



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48. Equal volumes of gases at the same temperature and pressure contain equal number of particles. This statement is a direct consequence of

A. Perfect gas law

B. Partial law of volumes

C. Charle's law

D. Ideal gas equation

Answer: D



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49. Use of hot air balloons in sports and meteorological observations is an application of

- A. Boyle's law
- B. Newton's law
- C. Kelvin's law
- D. Charles's law

Answer: D



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

- A. Boyle's law
- B. Charle's law
- C. Avogadro's law
- D. Dalton's law

Answer: A



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51. When the product of pressure and volume is plotted against pressure for a given amount of gas, the line obtained is

- A. parallel of X-axis
- B. parallel to Y-axis
- C. linear with positive slope

D. linear with negative slope

Answer: A



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52. If the four tubes of a car are filled to the same pressure with N_2 , O_2 , H_2 , and helium separately, then which one will be filled first ?

A. N_2

B. O_2

C. H_2

D. He

Answer: C



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53. van der Waal's equation reduces itself to the ideal gas equation at

- A. high pressure and low temperature
- B. low pressure and low temperature
- C. low pressure and high temperature
- D. high pressure alone

Answer: C



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54. When the temperature is raise, the viscosity of liquid decreases, this is because,

- A. decreased volume of the solution
- B. increase in temperature increases the average kinetic energy of molecules which overcomes the attractive force between them
- C. decreased covalent and hydrogen bond forces
- D. increased attraction between the molecules

Answer: B



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55. The rates of diffusion of gases A and B of molecular mass 36 and 64 are in the ratio

- A. 9: 16

B. 4:3

C. 3:4

D. 16:9

Answer: B



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56. Which is distilled first ?

A. Liquid CO_2

B. Liquid N_2

C. Liquid O_2

D. Liquid H_2

Answer: D

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57. The kinetic energy of two moles of

N_2 at 27°C is ($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

A. 5491.6 J

B. 6491.6 J

C. 7491.6 J

D. 8882.4 J

Answer: C

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58. According to kinetic theory of gases in an ideal gas between two successive collisions a gas molecule travels .

- A. in a circular path
- B. in a wavy path
- C. in a straight line path
- D. with an accelerated velocity

Answer: C



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59. The closed containers of the same capacity and at the same temperature are filled with 44 g of H_2 in one and 44 g of CO_2 in the other . If the pressure of carbon dioxide in the second

container is 1 atm , then pressure of hydrogen in the first container would be :

- A. 22 atmosphere
- B. 44 atmosphere
- C. 2 atmosphere
- D. 1 atmosphere

Answer: A



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60. Kinetic energy of one of an ideal gas at 300 K in kJ is

- A. 34.8
- B. 3.48

C. 3.74

D. 384

Answer: C



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61. The process of converting vapor into liquid is known as

A. condensation

B. vaporisation

C. freezing

D. melting

Answer: A



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62. Absolute temperature is the temperature at which

- A. all molecular motion ceases
- B. volume becomes zero
- C. mass becomes zero
- D. None of these

Answer: A



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

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

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

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

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

Answer: B



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64. Which of the following statements is not true ?

- A. The pressure of a gas is due to collision of the gas molecules with the walls of the container
- B. The molecular velocity of any gas is proportional to the square root of the absolute temperature

C. The rate of diffusion of a gas is directly proportional to the density of the gas at constant pressure

D. Kinetic energy of an ideal gas is directly proportional to the absolute temperature

Answer: C



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65. The relationship between the coefficient of viscosity of a liquid and temperature can be expressed as

A. $\eta = Ae^{ERT}$

B. $\eta = Ae^{E/RT}$

C. $\eta = ET/R$

D. $\eta = Ae^{RT/E}$

Answer: B



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66. The kinetic energy of 4mol of nitrogen gas at 127°C is

$\text{cal} (R = 2\text{calmol}^{-1}\text{K}^{-1})$

A. 4400

B. 3200

C. 4800

D. 1524

Answer: C



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67. The correct expression for the van der Waal's equation of state is

A. $nRT = (P + a/V^2)(V - B)$

B. $nRT = (P - a/V^2)(V - b)$

C. $nRT = (P + a/V^2)(V + b)$

D. $nRT = (P + n^2a/V^2)(V - nb)$

Answer: D



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68. Under identical conditions of temperature and pressure the ratio of the rates of effusion of O_2 and CO_2 gases is given by

- A. $\frac{\text{rate of effusion of oxygen}}{\text{rate of effusion of carbon dioxide}} = 0.87$
- B. $\frac{\text{rate of effusion of oxygen}}{\text{rate of effusion of carbon dioxide}} = 1.17$
- C. $\frac{\text{rate of effusion of oxygen}}{\text{rate of effusion of carbon dioxide}} = 8.7$
- D. $\frac{\text{rate of effusion of oxygen}}{\text{rate of effusion of carbon dioxide}} = 0.117$

Answer: B



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69. The rate of diffusion of a gas is proportional to

A. P / \sqrt{d}

B. $\sqrt{P / d}$

C. P / d

D. \sqrt{P} / d

Answer: B



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70. Molar volume of CO_2 is maximum at

A. NTP

B. $0^\circ C$ and 2.0 atm

C. $127^\circ C$ and 1 atm

D. $273^\circ C$ and 2.0 atm

Answer: C



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71. As the temperature is raised from $20^{\circ}C$ to $40^{\circ}C$ the average kinetic energy of neon atoms changes by a factor .

A. $1/2$

B. 2

C. $313/293$

D. $\sqrt{313/293}$

Answer: C



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72. In Van der Waals' equation of state of the gas law, the constant 'b' is a measure of :

A. intermolecular repulsions

B. intermolecular collisions per unit volume

C. volume occupied by the molecules

D. intermolecular attraction

Answer: C



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73. The mass of 11.2 L of ammonia gas at STP is

A. 8.5 g

B. 85 g

C. 17 g

D. 1.7 g

Answer: A



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74. Which of the following contains maximum number of molecules

A. 100 cc of CO_2 at STP

B. 150 cc of N_2 at STP

C. 50 cc of SO_2 at STP

D. 200 cc of NH_3 at STP

Answer: D



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75. A gas mixture contains 50 % helium and 50 % methane by volume. What is the percent by weight of methane in the mixture.

A. 0.1997

B. 0.205

C. 0.5

D. 0.8003

Answer: D



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76. To which of the following mixture Dalton's law of partial pressure is not applicable ?

A. CO and CO_2

B. CO_2 and N_2

C. CH_4 and C_2H_6

D. HCl and NH_3

Answer: D



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

A. $2dm^3$

B. $3dm^3$

C. $4dm^3$

D. 8dm^3

Answer: C



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78. Hydrogen diffuses six times faster than gas A . The molar mass of gas A is

A. 72

B. 6

C. 24

D. 36

Answer: A



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

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

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

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

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

Answer: C



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80. What is the pressure of 2 mole of NH_3 at $27^\circ C$ when its volume is 5 lit. in van der Waal's equation ?
($a = 4.17, b = 0.03711$)

A. 10.33 atm

B. 9.333 atm

C. 9.74 atm

D. 9.2 atm

Answer: B



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81. What is kinetic energy of 1 gm of O_2 at $47^\circ C$?

A. $2.17 \times 10^2 J$

B. $2.24 \times 10^2 J$

C. $1.24 \times 10^2 J$

D. None of these

Answer: C



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82. 4.4 g of CO_2 contains how many litres of CO_2 at STP ?

- A. 2.4 litre
- B. 2.24 litre
- C. 44 litre
- D. 22.4 litre

Answer: B



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

A. 1 : 2

B. 2 : 1

C. 1 : 4

D. 4 : 1

Answer: B



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84. Triple point of water is

A. 273 K

B. 373 K

C. 203 K

D. 193 K

Answer: A



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85. To what temperature must a neon gas sample be heated to double its pressure, if the initial volume of gas at 75°C is decreased by 15.0% by cooling the gas

A. 319°C

B. 592°C

C. 128°C

D. 60°C

Answer: A



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86. A and B are ideal gases. The molecular weights of A and B are in the ratio of 1:4. The pressure of a gas mixture containing equal weights of A and B is P atm. What is the partial pressure (in atm.) of B in the mixture

A. $P/5$

B. $P/2$

C. $P/2.5$

D. $3P/4$

Answer: A



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87. The liquid crystal method is applicable to locate a vein in the body because

- A. blood pressure of vein is enough high
- B. temperature of vein is slightly lower than that of the skin
- C. the electric field produced is sufficient to produce the polarity
- D. geometry of haemoglobin molecule is like a liquid crystal

Answer: B



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88. The factor responsible for lower mercury level in a capillary tube is

- A. high density
- B. surface tension
- C. liquid state
- D. viscosity resistance

Answer: D



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89. A gas can be liquefied

- A. above its critical temperature
- B. at its critical temperature

C. below its critical temperature

D. at any temperature

Answer: C



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90. The rate of diffusion of methane is twice that of X. The molecular mass of X is

A. 16

B. 32

C. 80

D. 64

Answer: D

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91. The slope of the plot between pV and p at constant temperature is

A. zero

B. 1

C. $1/2$

D. $1/\sqrt{2}$

Answer: A

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92. Which one of the following statement is not true about the effect of an increase in temperature on the distribution of

molecular speed of gas ? .

- A. The most probable speed increases
- B. The fraction of the molecules with the most probable speed increases
- C. The distribution becomes broader
- D. The area under the distribution curve remains the same as under the lower temperature.

Answer: B



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93. Equation for 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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94. If the v_{rms} is $30R^{1/2}$ at $27^\circ C$ then calculate the molar mass of gas in kilogram.

A. 1

B. 2

C. 4

D. 0.001

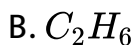
Answer: D



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95. The density of a gas is 1.964 g dm^{-3} at 273 K and 76 cm Hg .

The gas is



Answer: C



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96. Two gases bulbs A and B are connected by a tube having a stopcock. Bulb A has a volume of 100mL and contains H_2 gas . After opening the gas from A to the evacuated bulb B , the pressure falls down by 40% . The volume (mL) of B must be

A. 75

B. 150

C. 125

D. 200

Answer: B



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97. $X\text{mL}$ of H_2 gas effuses through a hole in a container in 5s .

The time taken for the effusion of the same volume of the gas

specified below, under identical conditions, is

A. 10 sec, H_2

B. 20 sec, O_2

C. 25 sec, O

D. 55 sec, CO_2

Answer: B



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98. If a mixture of CO and N_2 in equal amount have total 1 atm pressure, then partial pressure of N_2 in the mixture is

A. 1 atm

B. 0.5 atm

C. 2 atm

D. 3 atm

Answer: B



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99. Steam distillation is based on

A. Boyle's law

B. Charle's law

C. Dalton's law of partial pressures.

D. Avogadro's law

Answer: C



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100. A 4 : 1 mixture of helium and methane contained in a vessel at 10 bar pressure. During a hole in the vessel, the gas mixture leaks out. The composition of the mixture effusing out initially is

A. 8 : 1

B. 8 : 3

C. 4 : 1

D. 1 : 1

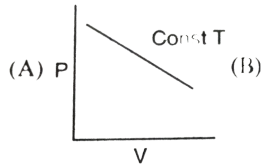
Answer: A



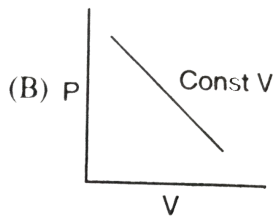
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101. Which of the following diagrams correctly describes the behavior of a fixed mass of an ideal gas ? (T is measured in K)

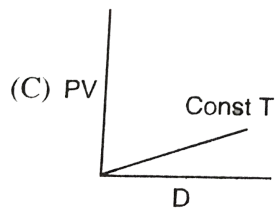
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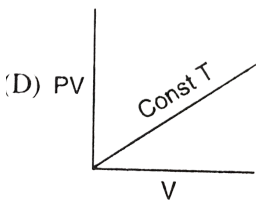
B.



C.



D.



Answer: D



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102. If the ratio of the masses of SO_3 and O_2 gases confined in a vessel is 1 : 1, then the ratio of their partial pressure would be

A. 5 : 2

B. 2 : 5

C. 2 : 1

D. 1 : 2

Answer: B



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103. Gas deviates from ideal gas nature because molecules

A. have kinetic energy

B. are bound by covalent bonds

- C. attract one another
- D. show the Tyndall effect

Answer: C



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104. In order to increase the volume of a gas by 10% , the pressure of the gas should be

- A. decreased by 10%
- B. decreased by 1%
- C. increased by 10%
- D. increased by 1%

Answer: A



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105. Helium is used in balloons in place of hydrogen because it is

- A. radioactive
- B. more abundant than hydrogen
- C. incombustible
- D. lighter than hydrogen

Answer: C



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106. Surface tension vanishes at

- A. Boiling point
- B. Critical temperature
- C. Condensation point
- D. Triple point

Answer: B



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107. Which of the following represents total kinetic energy of one mole of gas?

A. $1/2RT$

B. $3/2RT$

C. $(C_P - C_V)R$

D. $2/3RT$

Answer: B



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108. A $4.0dm^3$ flask containing N_2 at 4 bar was connected to a $6.0dm^3$ flask containing helium at 6 bar, and the gases were allowed to mix isothermally. The total pressure of the resulting mixture will be

A. 10.0 bar

B. 5.2 bar

C. 1.6 bar

D. 5.0 bar

Answer: B



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109. When a sample of gas is compressed at constant temperature from 15 atm to 60 atm, its volume changes from 76cm^3 to 20.5cm^3 . Which of the following statements are possible explanation of this behaviour ?

- (1) The gas behaves non-ideally
- (2) The gas dimerises
- (3) The gas is adsorbed into the vessel walls

A. 1, 2 and 3

B. 1 and 2 only

C. 2 and 3 only

D. 1 only

Answer: D



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110. The vapour pressure of two liquid P and Q are 80 torr and 60 torr respectively. The total vapour pressure obtained by mixing 3 moles of P and 2 mole of Q would be

- A. 68 Torr
- B. 140 Torr
- C. 48 Torr
- D. 72 Torr

Answer: D



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111. At 300 K the vapour pressure of an ideal solution containing 1 mole of liquid A and 2 moles of liquid B is 500 mm of Hg. The vapour pressure of the solution increases by 25 mm of Hg, if one more mole of B is added to the above ideal solution at 300K. Then the vapour pressure of A in its pure state is

- A. 300 mm of Hg
- B. 400 mm of Hg
- C. 500 mm of Hg
- D. 600 mm Hg

Answer: A



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112. The vapour of a substance effuses through a small hole at the rate 1.3 times faster than SO_2 gas at 1 atm pressure and 500 K. The molecular weight of the gas is

A. 49.2

B. 37.9

C. 41.6

D. 83.2

Answer: B



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113. The *rms* velocity molecules of a gas of density 4kgm^{-3} and pressure $1.2 \times 10^5 \text{Nm}^{-2}$ is

A. $300ms^{-1}$

B. $900ms^{-1}$

C. $120ms^{-1}$

D. $600ms^{-1}$

Answer: A



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114. $0.5mol$ of H_2 , SO_2 , and CH_4 is kept in a container. A hole was made in the container. After $3hours$, the order of partial pressure in the container will be

A. $pSO_2 > pH_2 > pCH_4$

B. $pSO_2 > pCH_4 > pH_2$

C. $pH_2 > pSO_2 > pCH_4$



Answer: B



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115. If 1 ml of water contains 20 drops. Then no. of molecules in a drop of water is

A. 6.023×10^{23} molecules

B. 1.376×10^{26} molecules

C. 1.667×10^{21} molecules

D. 4.346×10^{20} molecules

Answer: C



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116. A 1.0g sample of substance A at 100°C is added to 100mL of H_2O at 25°C . Using separate 100mL portions of H_2O , the procedure is repeated with substance B and then with substance C . How will the final temperatures of the water compare?

| Substance | Specific heat |
|-----------|---------------|
|-----------|---------------|

| | |
|-----|---|
| A | $0.60\text{Jg}^{-1}^\circ\text{C}^{-1}$ |
|-----|---|

| | |
|-----|---|
| C | $0.20\text{Jg}^{-1}^\circ\text{C}^{-1}$ |
|-----|---|

A. $T_C > T_B > T_A$

B. $T_B > T_A > T_C$

C. $T_A > T_B > T_C$

D. $T_A = T_B = T_C$

Answer: C



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117. Equation of state is

A. $M \times V = wPRT$

B. $\frac{MT}{R} = \frac{wV}{P}$

C. $\frac{wR}{P} = \frac{VM}{T}$

D. None of these

Answer: C



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118. If P, V, M, T and R are symbols of pressure, volume, molecular weight, temperature and Gas constant, what is the equation of density of ideal gas

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

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

C. $\frac{M}{V}$

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

Answer: D



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119. 56 g of nitrogen and 96 g of oxygen are mixed isothermally and at a total pressure of 10 atm. The partial pressures of oxygen and nitrogen (in atm) are respectively :

A. 4, 6

B. 5, 5

C. 2, 8

D. 6, 4

Answer: D



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120. Two separate bulbs contains ideal gases P and q, respectively maintained at the same temperature. The density of gas P is twice of that of the Q, and the molecular weight of the gas P is half of that of the gas Q. The ratio of the pressure of gas P to that of gas Q is

A. 2

B. $1/2$

C. 4

D. $1/4$

Answer: C

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

A. 215216 Pa

B. 13405 Pa

C. 41648 Pa

D. 31684 Pa

Answer: C

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122. At identical temperature and pressure the rate of diffusion of hydrogen gas is $3\sqrt{3}$ times that of a hydrocarbon having molecular formula C_nH_{2n-n} What is the value of n ? .

A. 1

B. 4

C. 6

D. 8

Answer: B



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123. 56 g of nitrogen and 96 g of oxygen are mixed isothermally and at a total pressure of 10 atm. The partial pressures of oxygen and nitrogen (in atm) are respectively :

A. 4, 6

B. 5, 5

C. 2, 8

D. 6, 4

Answer: D



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124. An evacuated vessel weights 50 g when empty, 144 g when filled with a liquid of density 0.47gmL^{-1} and 50.0g when filled with an ideal gas at 760 mm Hg at 300 K. The molar mass ideal gas is (given $R = 0.0821\text{LK}^{-1}\text{mol}^{-1}$)

A. 61.575

B. 130.98

C. 123.73

D. 47.87

Answer: A



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125. In which one of the following does the given amount of chlorine gas exert the least pressure in a vessel of capacity of 1dm^3 at 273 K ?

A. 0.0355 g

B. 0.071 g

C. 6.023×10^{21} molecule

D. 0.02 mole

Answer: A



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126. For one mole of an ideal gas, increasing the temperature from $10^{\circ}C$ to $20^{\circ}C$

- A. increases the average kinetic energy by two times
- B. increases the *rms* by $\sqrt{2}$ times
- C. increases the *rms* by 2 times
- D. increases both the average kinetic energy and *rms* velocity but not significantly

Answer: D



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127. Given RMS velocity of hydrogen at 300 K is $1.9 \times 10^3 \text{ m/sec}$.

The RMS velocity of oxygen at 1200 K will be

A. $7.6 \times 10^3 \text{ m/sec}$

B. $3.5 \times 10^3 \text{ m/sec}$

C. $0.95 \times 10^3 \text{ m/sec}$

D. $0.475 \times 10^3 \text{ m/sec}$

Answer: C



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128. The temperature of an ideal gas is increased from $27^\circ \text{C} \rightarrow 127^\circ \text{C}$, the percentage increase in V_{rms} is [2013]

A. 1.56

B. 2.56

C. 15.6

D. 82.4

Answer: C



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129. By what factor does the average velocity of a gaseous molecule increase when the temperature (in Kelvin) is doubled?

A. 1.4

B. 2.0

C. 2.8

D. 4.0

Answer: A



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130. 28 g each of the following gases are taken at 27°C and 600 mm pressures. Which of these will have least volume ?

A. HBr

B. HCl

C. HF

D. HI

Answer: D



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131. 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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132. What will happen to volume of a bubble of air found under water in a lake where temperature is $15^\circ C$ and the pressure is 1.5 atm, if the bubble rises to the surface where the temperature is $25^\circ C$ and the pressure is 1.0 atm?

- A. its volume will becomes greater by a factor of 2.5
- B. its volume will become greater by a factor of 1.6
- C. its volume will become greater by a factor of 1.1
- D. its volume will become smaller by a factor

Answer: B



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133. The bubble of a 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

- A. 80 m

B. 90 m

C. 40 m

D. 70 m

Answer: D



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134. Three different gases x , y , z of molecular masses 2, 16 and 64 were enclosed in a vessel at a constant temperature is correct

A. Gas z will be at the top of the vessel

B. Gas y will be at the bottom and x will be at the top

C. Gas x will be at the bottom and y will be at the top

D. Gases will form a homogeneous mixture

Answer: D



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135. Choose the incorrect statement in the following

- A. Surface tension is the force acting per unit length perpendicular to the line drawn on the surface of the liquid
- B. Surface tension of a liquid increases with the increase in temperature
- C. The SI unit of the surface tension is Jm^{-2}
- D. Viscosity is a measure of resistance for the flow of liquid

Answer: B

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136. 2 mole of N_2O_4 (g) is kept in a closed container at 298 K and 1 atmosphere pressure. It is heated to 596 K when 20% by mass of $N_2O_4(g)$ decomposes to NO_2 . The resulting pressure is

A. 2.4 atm

B. 1.2 atm

C. 4.8 atm

D. 2.8 atm

Answer: A

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137. 50mL of each gas A and of gas B takes 150 and 200 seconds respectively for effusing through a pin hole under the similar conditon. If molecular mass of gas B is 36, then the molecular mass of gas A will be

A. 96

B. 20.25

C. 32

D. 64

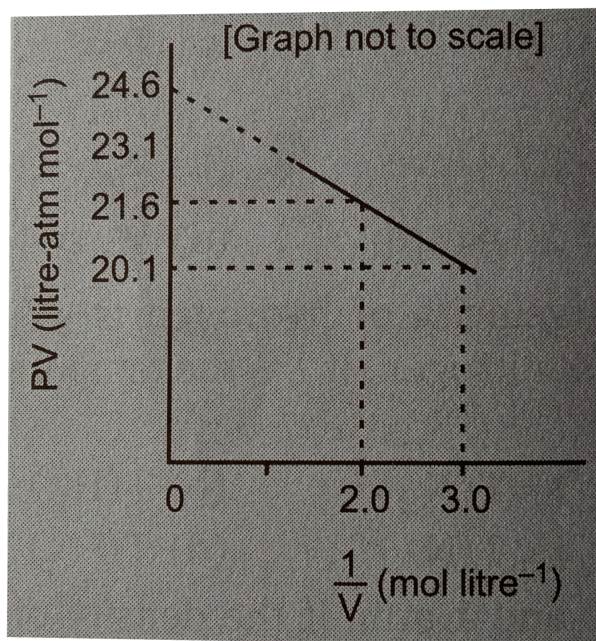
Answer: B



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138. For one mole of a van der Waals gas when $b = 0$ and $T = 30\text{K}$ the $PV \text{ vs } 1/V$ plot is shown below The value of the

van Waals constant a ($\text{atm litre}^2\text{mol}^{-2}$) is



A. 1.0

B. 4.5

C. 1.5

D. 3.0

Answer: C

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

A. 27μ

B. 36μ

C. 64μ

D. 9μ

Answer: B

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140. For real gases, van der Waal's equation is written as

$$\left[p + \frac{an^2}{V^2} \right] (V - b) = nRT \text{ where } a \text{ and } b \text{ are van der Waal's}$$

constant. Two sets of gases are

(I) O_2 , CO_2 , H_2 and He (II) CH_4 , O_2 , H_2 .

The gases given in set I in increasing order of b and gases given in set II in decreasing order of a are arranged below. Select the correct order from the following :

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

(II) $CH_4 > H_2 > O_2$

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

(II) $H_2 > O_2 > CH_4$

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

(II) $CH_4 > O_2 > H_2$

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

(II) $O_2 > CH_4 > H_2$

Answer: C



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

A. 1

B. $1 + Pb/RT$

C. $1 - Pb/RT$

D. $1 + RT/Pb$

Answer: B



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142. Equal weight of CH_4 and H_2 are mixed in an empty container at $25^\circ C$. The fraction of the total pressure exerted by

H_2 is

A. $1/9$

B. $1/2$

C. $8/9$

D. $16/17$

Answer: C



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143. A mixture contains 64 g of dioxygen and 60 g of neon at a total pressure of 10 Bar. The partial pressure in bar of dioxygen and neon are respectively (atomic masses $O = 16$, $Ne = 20$)

A. 4 and 6

B. 6 and 4

C. 5 and 5

D. 8 and 2

Answer: A



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144. The gas with the highest critical temperature is

A. H_2

B. He

C. N_2

D. CO_2

Answer: D



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

A. H_2O and alcohol

B. Cl_2 and CCl_4

C. HCl and the atoms

D. SiI_4 and H_2 atom

Answer: C



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

A. $C^* : C^- : C = 1 : 1.225 : 1.128$

B. $C^* : C^- : C = 1.225 : 1.128 : 1$

C. $C^* : C^- : C = 1.128 : 1.125 : 1$

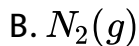
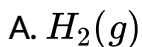
D. $C^* : C^- : C = 1 : 1.128 : 1.125$

Answer: D



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147. Maximum deviation from ideal gas is expected from



Answer: A



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Selected straight objective types MCQs

1. According to Boyle's law

A. $(dP/dV)_T = K/V^2$

B. $(dP/dV)_T = -K/V$

C. $(dV/dP)_T = -K/P^2$

D. $(dV/dP)_T = -K/P$

Answer: A,C



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2. Charle's law may be expressed as

A. $(dV / dT)_P = K$

B. $(dV / dT)_P = KT$

C. $(dV / dT)_P = -K / T^2$

D. $V = KT$

Answer: A,B



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

A. Argon

B. Fluorine

C. Neon

D. Moist air

Answer: A,B



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4. Real gases do not obey ideal gas equation,

A. at low temperature

B. at low pressures

C. at high pressure

D. at high temperature

Answer: A,C



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5. If a gas expands at constant temperature

- A. the pressure decreases
- B. the kinetic energy of the molecules remains the same
- C. the kinetic energy of the molecules decreases
- D. the number of molecules of the gas increases

Answer: A,B



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6. The following statements (s) is (are) correct

- A. A plot of $\log K_p$ versus $1/T$ is linear

B. A plot of $\log [X]$ versus time is linear for a first order

reaction $X \rightarrow P$

C. A plot of $\log P$ versus $1/T$ is linear at constant volume

D. A plot of P versus $1/V$ is linear at constant temperature

Answer: B,D



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7. According to kinetic theory of gases:

A. collisions are always elastic

B. heavier molecules transfer more momentum to the wall of
the container

C. only a small number of molecules have very high velocity

D. between collision, the molecules move in straight lines
with constant velocities

Answer: A,B,C,D



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8. Two glass bulbs A and B are connected by a very small tube having a stop cock. Bulb A has a volume of 100 cm^3 and contained the gas, while bulb B was empty. On opening the stop cock. The pressure fell down to 40%. The volume of the bulb B must be:

A. 75cm^3

B. 125cm^3

C. 150cm^3

D. 250cm^3

Answer: C



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9. In a container m g of a gas is placed. After some time some gas is allowed to escape from container. The pressure of the gas becomes half and its absolute temperature $2/3\text{rd}$. The amount of gas escaped is

A. $2/3$

B. $1/2$

C. $1/4$

D. $1/6$

Answer: C



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10. 4.0 g of argon (at mass = 40) in a bulb at a temperature of T K had a pressure P atm. When the bulb was placed in hotter bath at a temperature 50° more than the first one, 0.8 g of gas had to be removed to get the original pressure. T is equal to

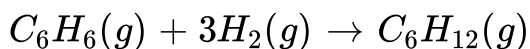
- A. 510 K
- B. 200 K
- C. 100 K
- D. 73 K

Answer: B



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11. Gaseous benzene reacts with hydrogen gas in presence of a nickel catalyst to form gaseous cyclohexane according to the reaction



A mixture of C_6H_6 and excess H_2 has a pressure of 60 mm of Hg in an unknown volume. After the gas had been passed over a nickel catalyst and all the benzene converted to cyclohexane, the pressure of the gas was 30 mm of Hg in the same volume at the same temperature. The fraction of C_6H_6 (by volume) present in the original volume is

A. $1/3$

B. $1/4$

C. $1/5$

D. $1/6$

Answer: D



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

A. 2.5 cm

B. 5.0 cm

C. 7.5 cm

D. 10.0 cm

Answer: C

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13. Root mean square velocity of gas molecules is 300 m/sec .

The *r.m.s* velocity of molecules of gas with twice the molecular weight and half the absolute temperature is :

A. 300 m/sec

B. 600 m/sec

C. 75 m/sec

D. 150 m/sec

Answer: D

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

A. 0.05

B. 0.0526

C. 0.1

D. 0.0426

Answer: B



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15. Reducing the pressure from 1.0 to 0.5 atm would change the number of molecules in one mole of ammonia to

A. 75% of initial value

B. 50% of initial value

C. 25% of initial value

D. None of these

Answer: D



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16. A 2.24 L cylinder of oxygen at N.T.P. is found to develop of leakage. When the leakage was plugged the pressure dropped to 570 mm of Hg. The number of moles of gas that escaped escaped will be

A. 0.025

B. 0.05

C. 0.075

D. 0.09

Answer: A



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17. An *L. P. G* cylinder contains 15kg of butane gas at 27°C and 10 atm pressure It was leaking and its pressure fell down to 8 atm pressure after one day Calculate the amount of leaked gas .

A. 1 kg

B. 2 kg

C. 3 kg

D. 4 kg

Answer: C



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18. A box of 1 L capacity is divided into two equal compartments by a thin partition which are filled with 2g H_2 and 16 g CH_4 respectively. The pressure in each compartment is recorded as P atm. The total pressure when partition is removed will be:

A. P

B. 2P

C. $P/2$

D. $P/4$

Answer: A



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

- A. 157.5 mm of Hg
- B. 175.5 mm of Hg
- C. 3125.0 mm of Hg
- D. None of these

Answer: A



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20. The root mean square velocity of a gas molecule at 100 K and 0.5 atm pressure is 106.4ms^{-1} . If the temperature is rased

to 400 K and the pressure is raised to 2 atm, then root mean square velocity becomes

A. 106.4ms^{-1}

B. 425.6ms^{-1}

C. 212.8ms^{-1}

D. 851.2ms^{-1}

Answer: C



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21. Equal masses of methane and oxygen are mixed in an empty container at 25°C . The fraction of the total pressure exerted by oxygen is:

A. $1/3$

B. $1/2$

C. $2/3$

D. $1/3 \times 273/298$

Answer: A



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

A. Critical temperature

B. Boyle temperature

C. Inversion temperature

D. Reduced temperature

Answer: B



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23. Equal weights of methane and hydrogen are mixed in an empty container at 25°C . The fraction of the total pressure exerted by hydrogen is

A. $1/2$

B. $8/9$

C. $1/9$

D. $16/17$

Answer: B



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24. A liquid is in equilibrium with its vapour at its boiling point .

On an average the molecules in the two phases have equal :

A. intermolecular forces

B. potential energy

C. total energy

D. kinetic energy

Answer: C



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25. The average velocity of an ideal gas molecule at $27^{\circ}C$ is $0.3ms^{-1}$. The average velocity at $927^{\circ}C$ will be

A. 0.6 m/sec

B. 0.3 m/sec

C. 0.9 m/sec

D. 3.0 m/sec

Answer: A



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26. A bottle of dry ammonia and a bottle of dry hydrogen chloride connected through a long tube are opened simultaneously at both ends. The white ammonium chloride ring first formed will be

A. at the centre of the tube

B. near the hydrogen chloride bottle

C. near the ammonia bottle

D. throughout the length of the tube

Answer: B



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27. The value of van der Waals constant a for the gases O_2 , N_2 , NH_3 , and CH_4 are 1.360, 1.390, 4.170, and $2.253 L^2 atm mol^{-2}$, respectively. The gas which can most easily be liquefied is

A. O_2

B. N_2

C. NH_3

D. CH_4

Answer: C

[Watch Video Solution](#)

28. The density of neon will be highest at

A. STP

B. 0°C , 2atm

C. 273°C , 1atm

D. 273°C , 2atm

Answer: B

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

A. 64.0

B. 32.0

C. 4.0

D. 8.0

Answer: A



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30. According to the kinetic theory of gases,

A. the pressure exerted by a gas is proportional to mean square velocity of the molecules

B. the pressure exerted by the gas is proportional to the root mean square velocity of the molecules

C. the root mean square velocity is inversely proportional to the temperature

D. the mean translational K.E. of the molecule is directly proportional to the absolute temperature

Answer: D



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

A. increases in average molecular speed

B. increase in rate of collisions amongst

C. increase in molecular attraction

D. increase in mean free path

Answer: A



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32. Equal weights of ethane and hydrogen are mixed in an empty container at 25°C . The fraction of the total pressure exerted by hydrogen is

A. 1:2

B. 1:1

C. 1:16

D. 15:16

Answer: D

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

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

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

C. $D_A = D_B [\rho_A / \rho_B]^{1/2}$

D. $D_A = D_B [\rho_B / \rho_B]^{1/2}$

Answer: D

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34. A gas behave most like an Ideal gas under conditions of

- A. High pressure and low temperature
- B. High temperature and high pressure
- C. low pressure and high temperature
- D. Low pressure and low temperature

Answer: C



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

A. $\left[\frac{n_1 C_1^2 + n_2 C_2^2 + n_3 C_3^2 + \dots}{n_1 + n_2 + n_3 + \dots} \right]^{1/2}$

B. $\frac{[n_1 C_1^2 + n_2 C_2^2 + n_3 C_3^2 + \dots]^{1/2}}{n_1 + n_2 + n_3 + \dots}$

C. $\frac{(n_1 C_1^2)^{1/2}}{n_1} + \frac{(n_2 C_2^2)^{1/2}}{n_2} + \frac{(n_3 C_3^2)^{1/2}}{n_3} + \dots$

$$D. \left[\frac{(n_1 C_1 + n_2 C_2 + n_3 C_3 + \dots)^2}{(n_1 + n_2 + n_3 + \dots)} \right]^{1/2}$$

Answer: A



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

A. 4

B. 2

C. 1

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

Answer: C



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37. $X\text{ mL}$ of H_2 gas effuses through a hole in a container in 5 s .

The time taken for the effusion of the same volume of the gas specified below, under identical conditions, is

A. 10 seconds : He

B. 20 seconds : O_2

C. 25 seconds : CO

D. 55 seconds : CO_2

Answer: B



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38. The compressibility factor for an ideal gas is

A. 1.5

B. 1.0

C. 2.0

D. ∞

Answer: B



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

A. fewer electrons than O_2

B. two covalent bonds

C. V-shape

D. dipole moment

Answer: D



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40. The rms velocity of hydrogen is $\sqrt{7}$ times the rms velocity of nitrogen. If T is the temperature of the gas then .

A. $T(\text{He}) = T(\text{N}_2)$

B. $T(\text{H}_2) > T(\text{N}_2)$

C. $T(\text{H}_2) < T(\text{N}_2)$

D. $T(\text{H}_2) = \sqrt{7}T(\text{N}_2)$

Answer: C



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

A. $V_m > 22.4$ litres

B. $V_m < 22.4$ Litres

C. $V_m = 22.4$ litres

D. $V_m = 44.8$ litres

Answer: B



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42. At $100^{\circ}C$ and 1 atm, if the density of the liquid water is $1.0gcm^{-3}$ and that of water vapour is $0.0006gcm^{-3}$, then the

volume occupied by water molecules in $1L$ steam at this temperature is

A. $6cm^3$

B. $60cm^3$

C. $0.6cm^3$

D. $0.06cm^3$

Answer: C



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

A. d^2

B. d

C. \sqrt{d}

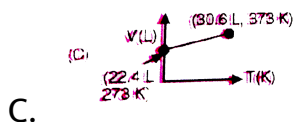
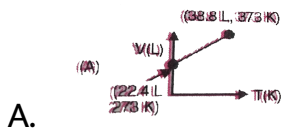
D. $1/\sqrt{d}$

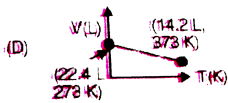
Answer: D



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44. Which of the following volume-temperature ($V - T$) plots represents the behaviour of 1mole of an ideal gas at the atmospheric pressure?





D.

Answer: C



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45. When the temperature is increased surface tension of water

.

A. increases

B. decreases

C. remains constant

D. shows irregular behaviour

Answer: B



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46. 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 atoms and $PV/nRT > 1$
- D. finite size of atoms and $PV/nRT < 1$

Answer: B

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47. The root mean square speed of one mole of a monoatomic gas having molecular mass M is u_{rms} The relation between the

average kinetic energy (E) of the gas and u_{rms}) is .

A. $U_{rms} = \sqrt{\frac{3E}{2M}}$

B. $U_{rms} = \sqrt{\frac{2E}{3M}}$

C. $U_{rms} = \sqrt{\frac{2E}{M}}$

D. $U_{rms} = \sqrt{\frac{E}{3M}}$

Answer: C



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48. The ratio of the rate of diffusion of helium and methane under indentical conditions of pressure and temperature will be

A. 2

B. 0.5

C. 16

D. 4.0

Answer: A



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49. Dominance of strong repulsive forces among the molecules of the gas (Z = compressibility factor)

A. depends on Z and indicated by $Z = 1$

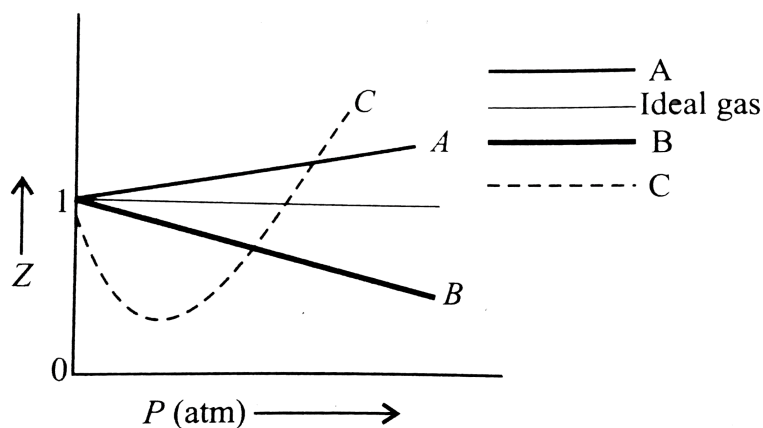
B. depends on Z and indicated by $Z > 1$

C. depends on Z and indicated by $Z < 1$

D. is independent of Z

Answer: B

50. The given graph represents the variations of compressibility factor $Z = PV/nRT$ vs P for three real gases A , B , and C .



Identify the incorrect statements.

- A. For the gas A , $a = 0$ and its dependence on P is linear at all pressures
- B. For the gas B $b = 0$ and its dependence on P is linear at all pressures

- C. For the gas C, which is a typical real gas for which neither a nor $b = 0$. By knowing the minima and the point of intersection with $Z = 1$, a and b can be calculated
- D. At high pressure, the slope is positive for all real gases

Answer: C



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

A. $1/2$

B. $2/3$

C. $\frac{1}{2} \times \frac{273}{298}$

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

Answer: D



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

- A. kinetic energy of the molecules decreases
- B. pressure of the gas increases
- C. kinetic energy of the molecules remains the same
- D. number of molecules of the gas increases

Answer: C



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53. The term that corrects for the attractive forces present in a real gas in the van der Waal's equation is

A. nb

B. n^2a/V^2

C. $-(n^2a/V^2)$

D. $-nb$

Answer: B



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54. If $10^{-4}dm^3$ of water is introduced into a $1.0dm^3$ flask to $300K$ how many moles of water are in the vapour phase when equilibrium is established ? (Given vapour pressure of H_2O at $300K$ is $3170Pa$ $R = 8.314JK^{-1}mol^{-1}$).

A. $1.27 \times 10^{-3} \text{ mol}$

B. $5.56 \times 10^{-3} \text{ mol}$

C. $1.53 \times 10^{-2} \text{ mol}$

D. $4.46 \times 10^{-2} \text{ mol}$

Answer: A



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55. The number of atoms in 0.1 mol of a triatomic gas is:

A. 1.806×10^{23}

B. 3.600×10^{23}

C. 1.800×10^{22}

D. 6.026×10^{23}

Answer: A



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56. '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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57. A gaseous mixture was prepared by taking equal moles of CO and N_2 . If the total pressure of the mixture was found to be 1 atmosphere, the partial pressure of the nitrogen (N_2) in the mixture is

A. 0.9 atm

B. 1 atm

C. 0.5 atm

D. 0.8 atm

Answer: C



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

A. $6.50u$

B. $25.00u$

C. $50.00u$

D. $12.25u$

Answer: D



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Linked Comprehension type MCQs

1. The van der Waal's equation of state for 1 mole real gas is

$$\left(P + \frac{a}{V^2}\right)(v - b) = RT \dots (i)$$

The Virial equation for 1 mole real gas is

$$PV = RT \left[1 + \frac{x}{V} + \frac{y}{V^2} + \frac{z}{V^3} + \dots \right] \quad \text{To higher power of } V$$

....(ii)

when x, y and z are constants which are known as 2nd, 3rd and 4th co-efficients respectively. The temperature at which real gas obeys ideal gas equation i.e., $(PV = nRT)$ is known as Boyle's temperature.

Answer the following questions on the basis of the above write up :

If equation (ii) can be one of the way of writing of equation (i), then what will be the value of y?

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

B. b^2

C. b^3

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

Answer: B



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2. The van der Waal's equation of state for 1 mole real gas is

$$\left(P + \frac{a}{V^2}\right)(v - b) = RT \dots (i)$$

The Virial equation for 1 mole real gas is

$$PV = RT \left[1 + \frac{x}{V} + \frac{y}{V^2} + \frac{z}{V^3} + \dots \right] \quad \text{To higher power of } V$$

$\dots (ii)$

when x , y and z are constants which are known as 2nd, 3rd and 4th co-efficients respectively. The temperature at which real gas obeys ideal gas equation i.e., $(PV = nRT)$ is known as Boyle's temperature.

Answer the following questions on the basis of the above write up :

Which of the following is the incorrect statement about the Boyle's temperature ?

- A. Temperature at which first virial co-efficient become zero
- B. Temperature of which first virial coefficient is RT
- C. Temperature at which third virial co-efficient vanishes
- D. Both A and C

Answer: A



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3. The van der Waal's equation of state for 1 mole real gas is

$$\left(P + \frac{a}{V^2}\right)(v - b) = RT \dots (i)$$

The Virial equation for 1 mole real gas is

$$PV = RT \left[1 + \frac{x}{V} + \frac{y}{V^2} + \frac{z}{V^3} + \dots \right] \quad \text{To higher power of } V$$

....(ii)

when x, y and z are constants which are known as 2nd, 3rd and 4th co-efficients respectively. The temperature at which real gas obeys ideal gas equation i.e., ($PV = nRT$) is known as Boyle's temperature.

Answer the following questions on the basis of the above write up :

The third virial coefficient of He gas is $4 \times 10^{-2} \text{ (litre/mole)}^2$, then what will be volume of 2 mole He gas at NTP

- A. 22.0 litres
- B. 44.0 litre
- C. 44.8 litre
- D. 45.3 litre

Answer: D



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4. The van der Waal's equation of state for 1 mole real gas is

$$\left(P + \frac{a}{V^2}\right)(v - b) = RT \dots (i)$$

The Virial equation for 1 mole real gas is

$$PV = RT \left[1 + \frac{x}{V} + \frac{y}{V^2} + \frac{z}{V^3} + \dots \right] \text{ To higher power of } V \dots (ii)$$

when x, y and z are constants which are known as 2nd, 3rd and 4th co-efficients respectively. The temperature at which real gas obeys ideal gas equation i.e., $(PV = nRT)$ is known as Boyle's temperature.

Answer the following questions on the basis of the above write up :

If the critical temperature of the gas be

$T_C = \frac{8a}{27Rb}$ and T_B is the Boyle's temperature, then which of the following is the correct relation between T_C and T_B ?

A. $T_C = \frac{8}{28}T_B$

B. $T_C = \frac{27}{8}T_B$

C. $T_C = \frac{8}{27}T_B$

D. $T_C = \frac{27}{4}T_B$

Answer: A



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5. Real gases deviated from ideal behaviour due to the following two faulty assumptions of kinetic theory of gases :

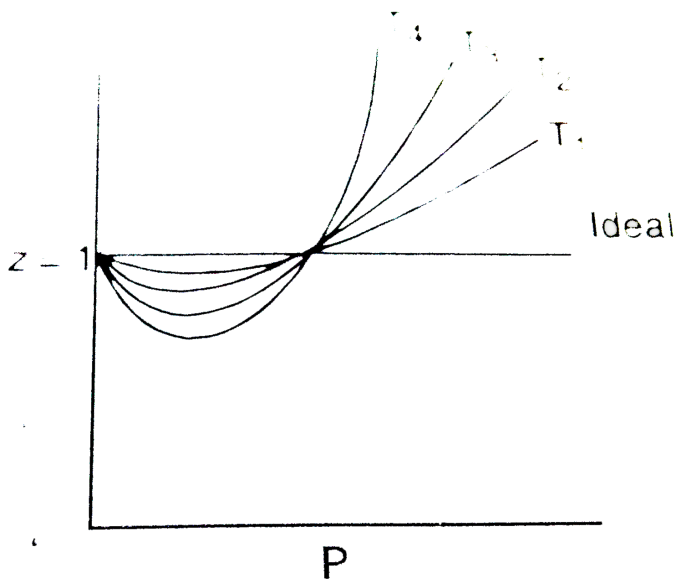
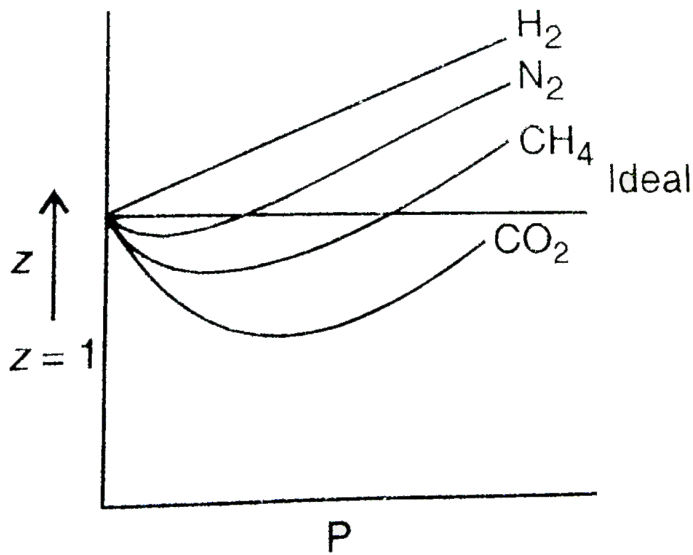
(i) Actual volume occupied by the gas molecule is negligible as compared to the total volume of the gases

(ii) Forces of attraction and repulsion among gas molecules are negligible

To explain the extent of deviation of the real gas from ideal behaviour in terms of compressibility or compression factor (z), which is the function of pressure and temperature for real gases $z = \frac{P_0 V_0}{nRT}$ For ideal gases $z = 1$. for real gases either $z > 1$ or $z < 1$.

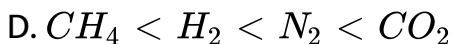
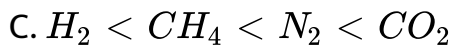
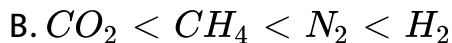
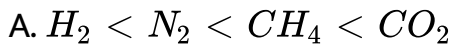
When $z > 1$, then it is less compressible because force of repulsion dominates over force of attraction. When $z < 1$, force of attraction dominates over the repulsion and it is more compressible.

Graph in between z and P is shown below on increasing the temperature, z increases and approaches to unity. Graph between z and p at different temperature are as under



Answer the following questions on the basis of above write up :

What is correct increasing order of liquefability of the gases shown in the above graph ?



Answer: A



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6. Real gases deviated from ideal behaviour due to the following two faulty assumptions of kinetic theory of gases :

(i) Actual volume occupied by the gas molecule is negligible as compared to the total volume of the gases

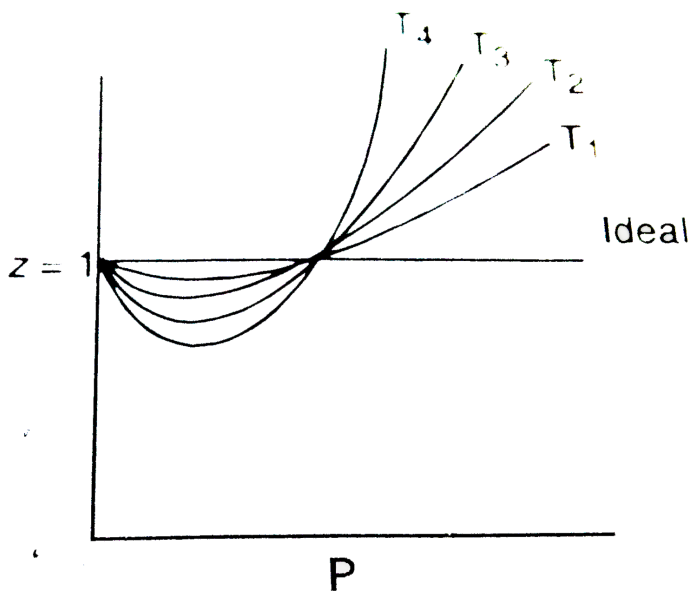
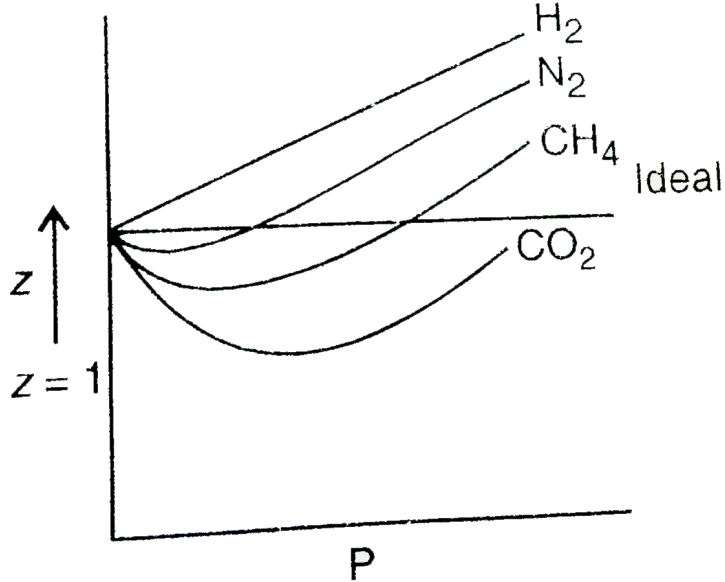
(ii) Forces of attraction and repulsion among gas molecules are negligible

To explain the extent of deviation of the real gas from ideal

behaviour in terms of compressibility or compression factor (z), which is the function of pressure and temperature for real gases $z = \frac{P_0 V_0}{nRT}$ For ideal gases $z = 1$. for real gases either $z > 1$ or $z < 1$.

When $z > 1$, then it is less compressible because force of repulsion dominates over force of attraction. When $z < 1$, force of attraction dominates over the repulsion and it is more compressible.

Graph in between z and P is shown below on increasing the temperature, z increases and approaches to unity. Graph between z and p at different temperature are as under



Answer the following questions on the basis of above write up :

Which of the following statements is correct ?

- A. The compressibility factor for ideal gases is dependent of temperature and pressure
- B. $\left(\frac{dz}{dP}\right)_T$ for real gas is independent of pressure
- C. $\left(\frac{dz}{dP}\right)_T$ for all real gases have same value
- D. $\left(\frac{dz}{dP}\right)_T$ for different real gases have different values

Answer: A



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7. Real gases deviated from ideal behaviour due to the following two faulty assumptions of kinetic theory of gases :

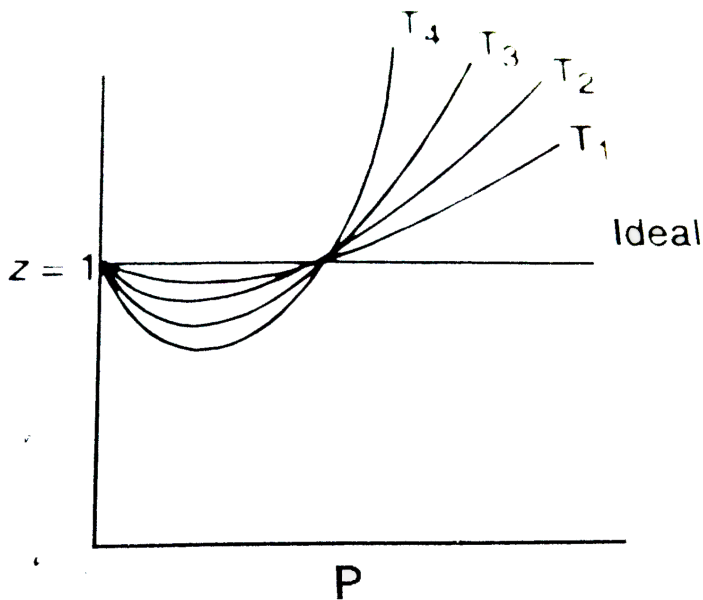
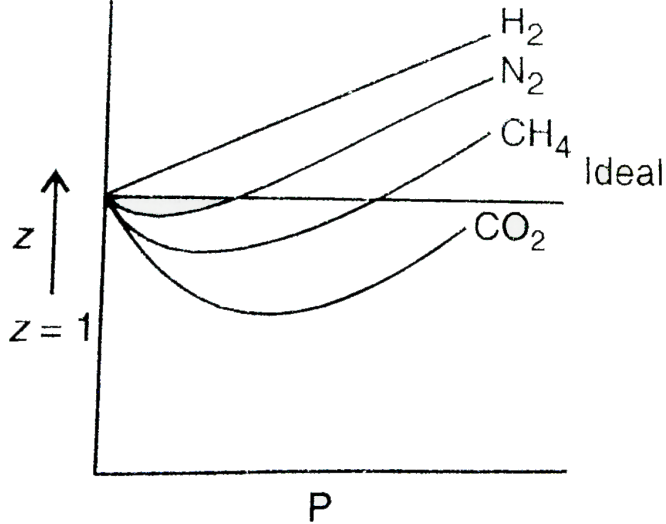
(i) Actual volume occupied by the gas molecule is negligible as compared to the total volume of the gases

(ii) Forces of attraction and repulsion among gas molecules are negligible

To explain the extent of deviation of the real gas from ideal behaviour in terms of compressibility or compression factor (z), which is the function of pressure and temperature for real gases $z = \frac{P_0 V_0}{nRT}$ For ideal gases $z = 1$. for real gases either $z > 1$ or $z < 1$.

When $z > 1$, then it is less compressible because force of repulsion dominates over force of attraction. When $z < 1$, force of attraction dominates over the repulsion and it is more compressible.

Graph in between z and P is shown below on increasing the temperature, z increases and approaches to unity. Graph between z and p at different temperature are as under



Answer the following questions on the basis of above write up :

Which of the following is the correct order of temperature shown in the above graph z vs P for the same gas

A. $T_4 > T_3 > T_2 > T_1$

B. $T_1 > T_2 > T_3 > T_4$

C. $T_1 > T_2 > T_4 > T_3$

D. $T_3 > T_4 > T_2 > T_1$

Answer: A



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8. Real gases deviated from ideal behaviour due to the following two faulty assumptions of kinetic theory of gases :

(i) Actual volume occupied by the gas molecule is negligible as compared to the total volume of the gases

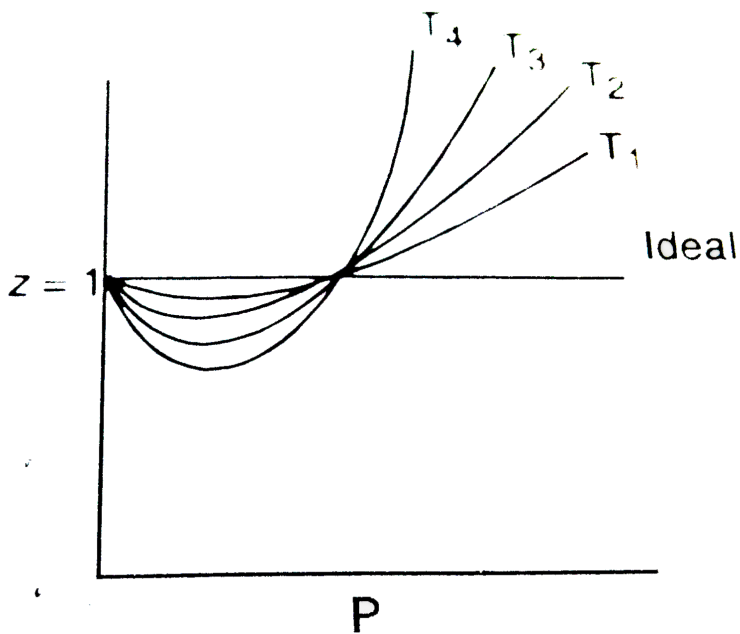
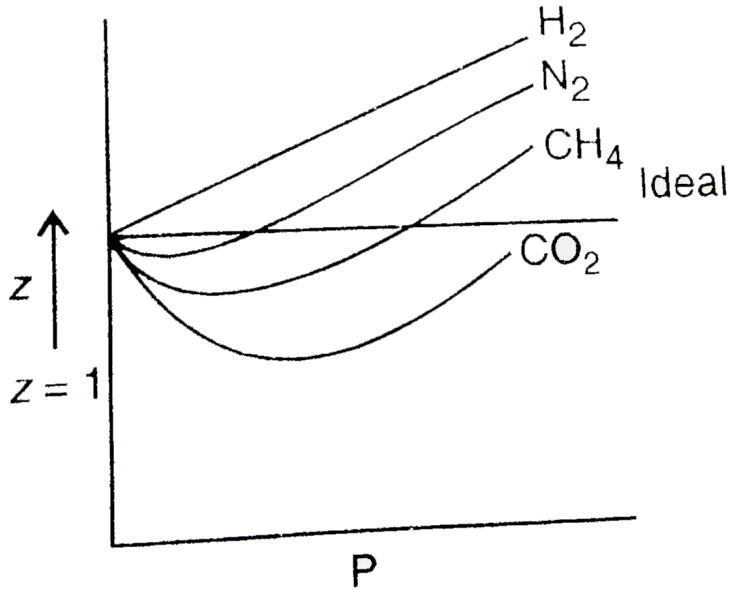
(ii) Forces of attraction and repulsion among gas molecules are negligible

To explain the extent of deviation of the real gas from ideal

behaviour in terms of compressibility or compression factor (z), which is the function of pressure and temperature for real gases $z = \frac{P_0 V_0}{nRT}$ For ideal gases $z = 1$. for real gases either $z > 1$ or $z < 1$.

When $z > 1$, then it is less compressible because force of repulsion dominates over force of attraction. When $z < 1$, force of attraction dominates over the repulsion and it is more compressible.

Graph in between z and P is shown below on increasing the temperature, z increases and approaches to unity. Graph between z and p at different temperature are as under



Answer the following questions on the basis of above write up :

Which of the following statements is correct gas A having molar

mass 16 g and density 0.75 g/litre at 2 atmospheric pressure and 27°C temperature

- A. Force of attraction is dominating than force of repulsion among the gas molecules
- B. Force of repulsion is dominating than force of attraction among the gas molecules
- C. Gas molecules are behaving ideally
- D. None

Answer: D



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9. Homogeneous mixing and compressibility both result from the fact that the molecules are far apart in gases. Mixing

occurs because individual gaseous molecules have little interaction with their neighbours, assuming that no reaction taken place, the chemical identities is possible in gases because only about 0.1% of the volume of a typical gas is taken up by the molecules themselves under normal circumstances, the remaining 99.9% is empty space

Compressibility factor of a gas is given by

A. $1 \frac{PV}{R}$

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

C. $\frac{R}{PV}$

D. $\frac{PV}{nRT}$

Answer: D



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10. Homogeneous mixing and compressibility both result from the fact that the molecules are far apart in gases. Mixing occurs because individual gaseous molecules have little interaction with their neighbours, assuming that no reaction takes place, the chemical identities are possible in gases because only about 0.1% of the volume of a typical gas is taken up by the molecules themselves under normal circumstances, the remaining 99.9% is empty space

Assume molecules are spherical of radius 1\AA , volume occupied by molecules in one mole of a gas at NTP is

A. $2.52m^3$

B. $2.52 \times 10^{-4}m^3$

C. $2.5 \times 10^{-6}m^3$

D. $2.52 \times 10^{-2}m^3$

Answer: C



11. Homogeneous mixing and compressibility both result from the fact that the molecules are far apart in gases. Mixing occurs because individual gaseous molecules have little interaction with their neighbours, assuming that no reaction takes place, the chemical identities are possible in gases because only about 0.1% of the volume of a typical gas is taken up by the molecules themselves under normal circumstances, the remaining 99.9% is empty space

For H_2 and He , force of attraction is negligible, hence, compressibility factor is

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

B. $\left(1 + \frac{Pb}{RT}\right)$

C. $\left(1 - \frac{a}{RTV}\right)$

D. $\left(1 + \frac{RT}{Pb}\right)$

Answer: B



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Matrix Match type MCQs

1. Here each question contains statements given in two columns which have to be matched.

Statements in column I are labelled as A, B, C and D whereas the statement in column II are labelled as p, q, r and s. The answers to these questions are to be appropriately bubbled as illustrated in the following example

If the correct matches are

$A - p, A - s, B - q, B - r, C - p, C - q,$ and $D - p$ then

correctly labelled 4×4 matrix should look like the following

| | p | q | r | s |
|---|-----|-----|-----|-----|
| A | ● | ○ | ○ | ● |
| B | ○ | ● | ● | ○ |
| C | ● | ● | ○ | ○ |
| D | ● | ○ | ○ | ○ |

Column I

- (A) Rate of diffusion of a gas
- (B) Root mean square velocity
- (C) Average kinetic energy of a gas
- (D) Vapour pressure of a liquid

Column II

- $p \propto P$ (P = pressure)
- $q \propto 1/\sqrt{d}$ (d = density)
- $r \propto \sqrt{T}$
- $s \propto T$



















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2. Here each question contains statements given in two columns which have to be matched.

Statements in column I are labelled as A, B, C and D whereas the statement in column II are labelled as p, q, r and r. The answers to these questions are to be appropriately bubbled as illustrated in the following example

If the correct matches are $A - p, A - s, B - q, B - r, C - p, C - q,$ and $D - p$ then correctly labelled 4×4 matrix should look like the following

| | p | q | r | s |
|---|---|---|---|---|
| A |  |  |  |  |
| B |  |  |  |  |
| C |  |  |  |  |
| D |  |  |  |  |

Column I

Column II

- | | |
|------------|---|
| (A) Gas | p Exists above the critical temperature |
| (B) Solid | q State of matter |
| (C) Liquid | r Exists below critical temperature |
| (D) Vapour | s Can be converted into liquid by applying pressure above |



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Integer type question

1. At $400K$, the root mean square (rms) speed of a gas X (molecular weight = 40) is equal to the most probable speed of gas Y at 60 K. The molecular weight of the gas Y is.



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2. 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 $0^{\circ}C$ are introduced. Considering the ideal gas behaviour the total volume (in litre) of the gases at $0^{\circ}C$ is close to .



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3. A flask has 10 molecules out of which four molecules are moving at $7ms^{-1}$ and the remaining ones are moving at same

speed of $X\text{ms}^{-1}$. If rms of the gas is 5ms^{-1} , what is X ?



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4. The temperature of the gas is raised from 27°C to 927°C , the root mean square velocity is



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Assertion Reason

1. Assertion :The ratio of volume of gaseous reactants and products is in agreement with their molar ratio.

Reason : Volume of a gas is inversely proportional to the number of mole of a gas

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true

Answer: C



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2. Assertion : One mole of helium atoms should occupy 22.4 litres volume at STP

Reason : Taking 31 pm as radius of helium atoms, if we pack together a mole of helium atoms, the mole of atoms should have a volume of 22.4 litre

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true

Answer: C



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3. Assertion : A sample of 8.00 mole of chlorine gas in 94.00 litre tank at $27^{\circ}C$ leads to a pressure of 49.2 atmosphere according to ideal gas law

Reason : The actual pressure of the sample of chlorine is nearly 20 atmoshpere less than the ideal pressure

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true

Answer: B



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4. Assertion : The pressure of a gas is inversely proportional to the volume at constant temperature and n

Reason : The gas volume is directly proportional to n at constant temperature and pressure

- A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: B



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5. Assertion : The reacting gases combine in volumes that are ratios of small whole number

Reason : The partial pressure of a gas in a mixture is given by its mole fraction times the total pressure of the mixture

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: B



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6. Assertion : The value of van der Waal's constant a is larger for ammonia than for nitrogen

Reason : Hydrogen bonding is present in ammonia

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: A



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7. Assertion : At zero kelvin the volume occupied by a gas is negligible

Reason : All translational molecular motion cease at 0 K

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: D



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8. Assertion : The pressure of real gas is less than the pressure of ideal gas. Reason : Intermolecular forces of attraction in real gases are greater than in ideal gas.

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true

Answer: A



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9. Assertion : When helium is allowed to expand into vacuum, heating effect is observed.

Reason : The inversion temperature of helium is very low.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: A



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10. Assertion : For a certain fixed amount of gas the product PV is always constant

Reason : Real gases deviate from ideal behaviour of low pressure and high temperature

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: D



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11. Assertion : The ratio C_P / C_v is more for helium gas than for hydrogen gas.

Reason : Atomic mass of helium is more than that of hydrogen.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: B



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12. Assertion: Noble gases can be liquefied.

Reason: Attractive forces can exist between nonpolar molecules.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: D



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13. Assertion : Different gases at the same conditions of temperature and pressure have same root mean square speed

Reason : Average K.E. of a gas is directly proportional to temperature in kelvin

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true

Answer: D



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14. Statement I : Balloons made by nylon films are better for containing helium than the conventional rubber balloons.

Statement II : R.M.S. velocity of helium is very high. So helium atom can effuse out through rubber balloons.

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true

Answer: A



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15. Assertion : Equal volumes of all gases under similar conditions of temperature and pressure contain equal number

of molecules

Reason : Volume of a gas is inversely proportional to pressure

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true

Answer: A



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16. Assertion : Boyle's law expresses in a quantitative manner the important fact that gases are compressible

Reason : Temperature remaining constant, the volume of a given mass of a gas is inversely proportional to pressure

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true

Answer: A



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17. Assertion : At higher peaks of mountains, people suffer from high altitude sickness (sluggish feeling, breathlessness etc.) due to lesser oxygen intake at each breather

Reason : Air at sea level is dense because it is compressed by the mass of the air above it. The atmospheric pressure at higher peaks of mountains is lower causing the air at those heights to be much less dense than at sea level.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: A



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18. Assertion : The use of hot air balloons in sports and for meteorological observations is an application of Charles's law

Reason : Hot air is less dense and hence gases expand on heating

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

A

C. A is true but R is false

D. A is false but R is true

Answer: A



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19. Assertion : Gas constant $R = \text{litre atmosphere deg}^{-1} \text{mol}^{-1}$

Reason : Total pressure of a mixture of non-reacting gases = sum of the partial pressures of all the component gases of the mixture

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: B



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20. Assertion : The pressure of a given mass of a gas is directly proportional to the temperature on kelvin scale at constant volume

Reason : With the increase in temperature, the average kinetic energy and hence the average velocity of the molecule increases

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of

A

C. A is true but R is false

D. A is false but R is true

Answer: A



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1. If atomic mass of hydrogen on a hypothetical scale is chosen to be 10.0000, what is the molecular mass of a gas which has a vapour density of 22 ?

A. 44

B. 220

C. 440

D. None of these

Answer: C



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2. Vapour density

- A. decreases with increase in temperature
- B. increases with increase in temperature
- C. does not change with change in temperature
- D. may increase or decrease with change in temperature

Answer: C



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3. Unit of vapour density is

A. mol kg^{-1}

B. mol L^{-1}

C. kg m^{-3}

D. None of these

Answer: D



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4. The gas or vapour heavier than air is

A. Water vapour

B. Fluorine gas

C. Ammonia vapour

D. Neon gas

Answer: B



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

$$[R = 0.082 \text{ litre atm mol}^{-1} \text{ K}^{-1}]$$

- A. At STP
- B. When $T = 8.21 \text{ K}$
- C. When $T = 12 \text{ K}$
- D. Not possible under any conditions

Answer: C



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6. The root mean square speed of the molecules of a diatomic gas is v . When the temperature is doubled, the molecules

dissociates into two atoms. The new root mean square speed of the atom is

A. $\sqrt{2}u$

B. u

C. $2u$

D. $4u$

Answer: C



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

A. 120ms^{-1}

B. 300ms^{-1}

C. $900ms^{-1}$

D. $600ms^{-1}$

Answer: B



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

A. 510 K

B. 200 K

C. 100 K

D. 73 K

Answer: B



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9. One mole each of a monoatomic, diatomic and triatomic gases are mixed C_p / C_v for the mixture is

A. 1.40

B. 1.428

C. 1.67

D. None of these

Answer: B



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10. One mole of an ideal monoatomic gas is mixed with 1 mole of an ideal diatomic gas. The molar specific heat of the mixture at constant volume is .

A. 3 cal

B. 4 cal

C. 8 cal

D. 9 cal

Answer: B



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11. A spark plug is not necessary in a diesel engine because

A. diesel is more volatile than petrol

- B. diesel has a lower ignition temperature than petrol
- C. calorific value of diesel is more than that of petrol
- D. None of these

Answer: D



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12. CO_2 at 600 bar and a temperature above T_c ($T_c = 304.15K$) is called

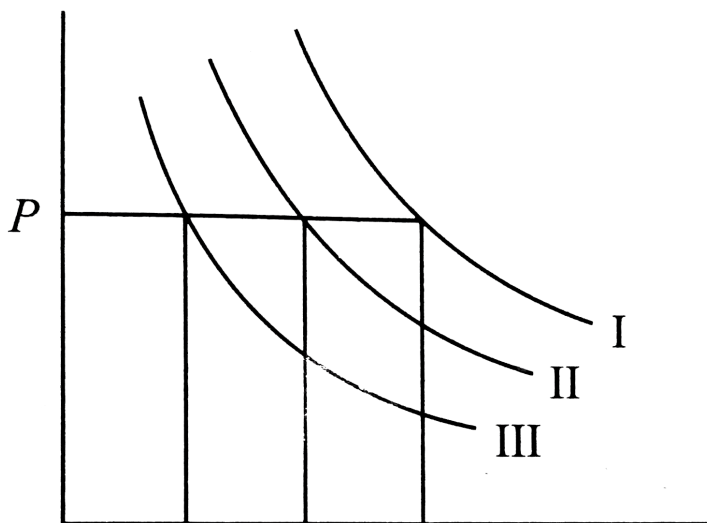
- A. super cooled gas
- B. super critical fluid
- C. super critical liquid
- D. super cooled liquid

Answer: B



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



A. $T_1 = T_2 = T_3$

B. $T_1 < T_2 < T_3$

C. $T_1 > T_2 > T_3$

D. $T_1 > T_2 = T_3$

Answer: C



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14. Compressibility factor for H_2 behaving as real gas is:

A. 1

B. $\left(1 - \frac{a}{RTV}\right)$

C. $\left(1 + \frac{Pb}{RT}\right)$

D. $\frac{RTV}{(1 - a)}$

Answer: C



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15. If \bar{V} is the observed molar volume of real gas and \bar{V}_{id} is the molar volume of an ideal gas, then Z is

A. $V \cdot V_{\text{Ideal}}$

B. $\frac{V}{V_{\text{Ideal}}}$

C. $\frac{V_{\text{Ideal}}}{V}$

D. $\frac{V^2}{V_{\text{Ideal}}}$

Answer: B



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16. Vapour pressure of a pure liquid does not depend upon

A. surface area

B. temperature

C. natural of the liquid

D. Both A and C

Answer: A



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17. When super cooled freezes, its temperature suddenly rises, the ΔH for the spontaneous process is equal to

A. ethalpy of fussion

B. ethyalpy of vaporisation

C. ethalpy of sublimation

D. zero

Answer: D



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18. Two bubbles of different radii are connected by a hollow tube, then

- A. smaller bubble gets smaller, larger gets larger
- B. smaller bubble gets larger and larger gets smaller
- C. no change takes place
- D. both gets larger and ultimately burst

Answer: B



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19. When 1 mole of super cooled water freezes, its temperature suddenly rises. The source of heat for the process is

- A. enthalpy of fusion
- B. enthalpy of vaporisation
- C. enthalpy of sublimation
- D. surroundings

Answer: A



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20. Two identical fully insulated flasks X and Y contain the following

Flask X (10g of ice at 0°C + 500mL of water at 0°C)

Flask Y (10g of ice at 0°C + 500mL of brine at 0°C)

After one hour,

- A. There is no change in the nature of contents of the two
flasks
- B. There is no ice in flask X but contents of flask Y remain
unchanged
- C. There is no change in the contents of flask X but there is
no ice in flask Y
- D. No ice is there in both the flasks X and Y

Answer: C



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