CHEMISTRY

BOOKS - KUMAR PRAKASHAN KENDRA CHEMISTRY (GUJRATI ENGLISH)

STATES OF MATTER

Section A Questions

1. What is intermolecular force and van der Waals forces ? Which forces are not included

in it ? Explain its types and uses ?

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2. Explain formation of London forces.

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3. What is London force ? Give its characteristics ?

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4. Explain London force in detail.

5. Explain Dipole - Dipole forces snd its characteristics ?

6. Explain Dipole - Dipole forces snd its characteristics ?

7. Explain Dipole - induced dipole forces.

8. What is Dipole - induced dipole forces ? Give its characteristic.

9. Give types of van der Waals forces and explain any one.

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10. Explain : Hydrogen Bond.

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11. What is hydrogen bond ? Explain its characteristics with example.

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12. Explain : Thermal Energy

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13. Intermolecular forces and thermal energy decide physical state of matter. Explain

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14. The Gaseous state is characterized by which following properties ?

15. Explain simplicity of gases.

16. If distance between two molecules of gases becomes half then which type of changes

occurs in London forces ?

17. What is difference between barometer and nanometer ?

18. Which scientists gave gas laws from the basis of physical properties of gas ? Give their Laws.

19. Explain relation between pressure - volume and density of gases.

20. Explain Boyle.s law and derive its equation and plot isothermal graph.

21. Explain effect of high pressure and low temperature according to Boyle.s law.

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22. Explain effect of Boyle.s law.

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23. Which effect observed when pressure of gas increases ?

24. Give Charle.s law in brief.

25. Explain mathematical formula, graph and absolute zero temperature.

26. Explain absolute temperature scale.

27. In terms of Charles. law explain why $-273^\circ C$ is the lowest possible temperature.

28. The mathematical from of Chart.s law is given under $V_t = V_0 \left(\dfrac{273.15 + t^\circ C}{273^\circ C} \right)$, From

this equation explain $V \rightarrow T$ in Kelvin.

29. Explain following terms :

(i) Isotherm (ii) Isochore (iii) Isobar

30. Explain : Gay Lussac.s Law.

31. Explain Law between pressure and temperature.

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32. What is NTP or STP and SATP ? Mention its volume.

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33. Explain : Avogadro.s Law.

34. Give relation between mass volume of gas.

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35. Explain terms of Avogadro constant, molecules volume of 1 mole gases, STP.

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36. Explain relation between, moles of gas volume and density of gas.

37. Derive relation between density of gases and molecular mass by using of Avogadro.s law.

38. What is called a Ideal gas ? Why ?

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39. what is Ideal gas equation ? Derive equation of ideal gas and give characteristic of R and its value.

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40. What is volume of n mole gas ? Derive the formula of combined gas low.

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41. Derive relation between density of gases and molecular mass by using of Avogadro.s law.

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42. Given Dalton.s Law of partial Pressure, its mathematical formula and explain aqueous tension.

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43. Mathematical form of Dalton.s Law of Partial Pressure.

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44. Give relation between partial pressure and mole fraction.

45. Explain Assumptions (postulates) of the kinetic molecular theory.

46. Explain microscopic model of gases.

47. Explain speed of molecule of gas and average speed (u_{av}).

48. Explain velocity distribution curve ?

49. Explain Maxwell and Boltzman law with Graph.

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50. Explain effect of temperature on Maxwell Boltzman velocity distribution.

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51. Explain effect of mass of molecule from the basis of Maxwell - Boltzman speed distribution.

52. Explain following terms :

(i) u_{mp}

(ii) u_{av}

(iii) u^2

(iv) u_{rms}

53. Relationship between different types of speeds.

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54. Explain kinetic energy and average translation kinetic and average square speed.

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55. Explain Real gases do not completely follow Boyle.s law, Charle.s law and Avogadro.s law under all conditions.

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56. Real gases shows deviation than ideal gases. Explain with examples.

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57. Explain : Why real gases behave deviation than ideal gas ?

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58. Given two unfair assumptions of Kinetic theory of gas. Justify them.

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59. Derive van der Waal.s equations.

60. Derived the formula of van-der-Waals by correcting the statement 'Real gas shows deviation from ideal gas".

Write Charle's law by derived its mathematical form with explanation by graph.

61. At which situation intermolecular forces becomes effective ?

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62. A gas behaves more closely as an ideal gas at

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63. Explain compressibility factor (Z).

64. What is compressibility factor (Z) ?

(i) deviation factor (Z = 1) (ii) $Z > 1$ (iii) $Z < 1$

(iv) deviation graph and (v) relation between

molar volume and Z.

65. Give difference between Ideal Gas and Real

Gas.

66. Explain situation of ideal gas behaviour of gas.

67. What is Boyle.s temperature ? Give its relation with value of Z.

68. Explain Liquifaction of CO_2 gas by Thomas Andrews plot graph and different effect of temperature and pressure and critical constant.

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69. Explain Liquifaction of CO_2 gas by Thomas Andrews plot graph and different effect of temperature and pressure and critical constant.

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70. Explain Liquefaction of Real Gas and Permanent Gas.

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71. Liquifasction occurs in different steps in same phase. - Explain with example.

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72. Explain relation between Fluid State, Liquid - Gas State, Critical temperature and Vapour form of substances.

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73. Explain vapour pressure of liquid.

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74. Explain : Surface tension

75. Give in detail about Viscosity.

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

77. Explain the physical significance of van der Waals parameters.

78. A balloon is filled with hydrogen at room temperature. It will burst if pressure exceeds 0.2 bar. If at 1 bar pressure the gas occupies 2.27 L volume, upto what volume can be balloon be expanded ?

79. What will be the minimum pressure required to compress $500dm^3$ of air at 1 bar to $200dm^3$ at $30°C$?

80. A vessel of 120 mL capacity contains a certain amount of gas at temperature $35°C$ and 1.2 bar pressure. The gas is transferred to another vessel of volume 180 mL at

temperature $35°C$, What would be its pressure ?

81. On a ship sailing in pacific ocean where temperature is $23.4(\circ)C$, a balloon is filled with 2L air. What will be the volume of the balloon when the ship reaches Indian ocean, where temperature is $26.1°C$?

82. A student forgot to add the reaction mixture to the round bottomed flask at $27°C$ but instead he/she placed the flask on the flame. After a lapse of time, he realized his mistake, and using a pyrometer he found the temperature of the flask was $477°C$. What fraction of air would have been expelled out ?

83. At $25°C$ and 760 mm of Hg pressure a gas occupies 600 mL volume. What will be its

pressure at a height where temperature is $10°C$ and volume of the gas is 640 mL.

84. 34.05 mL of phosphorus vapour weights 0.0625 g at $546°C$ and 1 bar pressure. What is the molar mass of phosphorus ?

85. Calculate the temperature of 4.0 mol of a gas occupying $5dm^3$ at 3.32 bar. (R = 0.083 bar $dm^3 K^{-1} mol^{-1}$).

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86. Calculate the total number of electrons present in 1.4 dinitrogen gas. (N of Z = 7).

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87. How much time would it take to distribute one Avogadro number of wheat grains, if 10^{10} grains are distributed each second ?

88. Calculate the volume occupied by 8.8 g of CO_2 at $31.1°C$ and 1 bar pressure. R = 0.083 bar L $K^{-1}mol^{-1}$.

89. 2.9 g of a gas at $95°C$ occupied the same volume as 0.184 g of dihydrogen at $17°C$, at the same pressure. What is the molar of the gas ?

90. A neon - dioxygen mixture contains 70.6 g dioxygen and 167.5 g neon. If pressure of the mixture of gases in the cylinder is 25 bar. What isd the partial pressure of dioxygen and neon in the mixture ?

91. Using the equation of state pV = nRT , show that at a given temperature density of a gas is proportional to gas pressure p.

92. At $0°C$, the density of a certain oxide of a gas at 2 bar is same as that of dinitrogen at 5 bar. What is the molecular mass of the oxide ?

93. Pressure of 1 g of an ideal gas A at $27°C$ is found to be 2 bar. When 2 g of another ideal gas B is introduced in the same flask at same temperature the pressure becomes 3 bar. Find a relationship between their molecular masses.

94. The drain cleaner, Drainex contains small bits of aluminum which react with caustic soda to produce dihydrogen. What volume of dihydrogen at $20°C$ and one bar will be released when 0.15 g of aluminum reacts ?

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95. What will be the pressure exerted by a mixture of 3.2 g of methane and 4.4 g of

carbon dioxide contained in a $9dm^3$ flask at $27°C$?

96. What will be the pressure of the gaseous mixture when 0.5 L of H_2 at 0.8 bar and 2.0 L of dioxygen at 0.7 bar are introduced in a 1 L vessel at $27°C$?

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

98. Calculate the total pressure in a mixture of 8 g os dioxygen and 4 g of dihydrogen confined in a vessel of $1dm^3$ at $27°C$.

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

99. Pay load is defined as the difference between the mass of displaced air and the mass of the balloon. Calculate the pay load when a balloon of radius 10 m, mass 100 kg is filled with helium at 1.66 bar at $27°C$. (Density of air = 1.2 kg m^{-3} and R = 0.083 bar $dm^3 K^{-1}mol^{-1}$).

100. A mixture of dihydrogen and dioxygen at one bar pressure contains 20% by weight of dihydrogen. Calculate the partial pressure of dihydrogen.

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101. $\dfrac{pV^2T^2}{n}$ What would be the SI unit for the quantity.

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102. Velocity of 5 molecules of gas is $4 ms^{-1}$, 3 molecules is $10 ms^{-1}$ and 6 molecules is $6 ms^{-1}$, Then calculate u_{av}, u_{rms} and u_{ms}.

103. Gases possess characteristic critical temperature which depends upon the magnitude of intermolecular forces between the gas particles. Critical temperatures of ammonia and carbon dioxide are 405.5 K and 304.10 K respectively. Which of these gases will

liquify first when you start cooling from 500 K to their critical temperature ?

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Section A Questions Sub Question

1. Derive Boyle.s formula according to his law.

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2. What is Isothermal Curve ? Give isothermal curve presenting Boyle.s law.

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3. Derive relationb between density and pressure of gas by using of Boyle.s law.

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Section A Questions Try Your Self

1. At 300 K constant temperature gas having $20cm^3$, 1 bar pressure it is convert into $50cm^3$ then calculated pressure ?

2. At 300 K temperature pressure of 2.5 gm N_2 gas is 4 bar and volume 2.5 L. It pressure becomes 10 bar then calculate its volume at same temperature.

3. At 300 K temperature, presure and volume of gas is 1 bar and 10 L respectively. If pressure becomes 2 bar then calculate volume of gas at same temperature.

4. At 740 torr pressure volume of N_2 gas is 800 mL, if volume becomes 540 mL then calculate pressure of gas ?

5. Volume and pressure of balloon filled with hydrogen gas is 1 bar and $175dm^3$. When balloon reached to height its pressure will be decreases to 0.8 bar than calculate volume of balloon.

6. At $27°C$ temperature and 1 bar pressure volume of gas is 25 L. If temperature becomes

$77°C$ at constant pressure then calculate volume of gas.

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7. Temperature of a flask becomes $27°C$ to $277°C$. At $277°C$ temperature $0.1dm^3$ gas bubble out from the flask then calculate volume of flask.

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8. At $127°C$ temperature volume of gas is 3 L. If volume of gas becomes half then calculate temperature. Pressure is 1 bar.

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9. At 273 K temperature and 1 bar pressure volume of gas increases 20% then what temperature ?

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10. At $17°C$ temperature volume of gas is 400 mL. Then, at which temperature (i) Volume becomes double (ii) Volume becomes half.

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11. Pressure of Gas cylinder (LPG) is 14.9 bar that is safe but at $27°C$ 12 bar pressure apply then what temperature cylinder will blast ?

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12. At $27°C$ temperature and 4 bar pressure CO_2 is filled in 2 L vessel. Find the pressure if it is filled in 4L vessel at $77°C$ temperature.

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13. At 400 K temperature, 200 mL N_2 has pressure 1.5 bar. Find the volume of N_2 gas at STP.

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14. Find the pressure of a CO_2 gas when 6.022×10^{22} molecules are placed in 2 L vesel at $27°\,C$ temperature. [Molar volume = 22.4 L]

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15. Find the pressure of 5 mole Cl_2 gas filed in a 2L vessel t $27°\,C$ temperature.

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16. Find the moles of O_2 has having pressure 250 bar in 500 mL vessel at 300 K temperature.

$$\left[R = 8.314 \times 10^{-2} \ \text{bar} \ LK^{-1}mol^{-1}\right]$$

17. Find the temperature in $^\circ C$ for a 6.4 gm O_2 gas filled in a 200 mL vessel having pressure 50 bar.

$$\left[R = 8.314 \times 10^{-2} \ \text{bar} \ LK^{-1}mol^{-1}\right]$$

18. Calculate volume of molecules at 300 K temperature and 2 bar pressure of $6.022 \times 10^{21} CO_2$ molecules.

$$\left[R = 8.314 \times 10^{-2} \text{ bar } LK^{-1}mol^{-1}\right]$$

19. Calculate number of total atoms and molecules of 4 Lit SO_2 gas at 350 K

temperature and 10^3 pa pressure. $\left[R = 8.3144 JK^{-1}mol^{-1}\right].$

20. 2×10^6 molecules of N_2 gas enter into the vessel having volume 400 mL at 400 K temperature. Find the pressure of N_2 gas. [R = 0.082 L atom $mol^{-1}K^{-1}$] [1 atom = 1.013 bar]

21. If volume of N_2 gas at STP is 204.75 mL then calculate volume of gas at 1.5 bar pressure at $127°C$ temperature.

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22. At 400 K temperature volume and pressure of gas is 200 mL and 1.5 bar respectively then calculate volume weight and number of molecules at STP.

$$\left[R = 8.31 \times 10^{-2}\text{L bar mol}^{-1}K^{-1}\right]$$

23. If the density of gas at sea level is 1.5 mg L^{-1}, find the density of that gas on Mount Abu, having pressure 0.5 bar. (formula $\frac{d_1}{d_2} = \frac{p_1}{p_2}$)

24. Find the pressure of neon gas having density 0.9 gm L^{-1} at 350 K temperature. $\left(R = 8.314 \times 10^{-2} \text{ bar L K}^{-1} mol^{-1}\right)$

25. At $27°C$ temperature in a 2L closed vessel 10 g H_2 and $22gCO_2$ gases are filled. Find the partial pressure and total pressure of a mixture. (formula pV = nRT)

26. At $27°C$ temperature 4 mole Cl_2, 4 mole N_2 and 2 mole O_2 are filled in a 5 litre closed

vessel. Find the total presure of gaseous mixture.

$$\left(R = 8.314 \times 10^{-2}\text{bar L mol}^{-1}K^{-1}\right)$$

27. In a closed vessel at $25°C$ temperature 4 mole O_2, 3 mole Cl_2 and 3 mole N_2 are mixed and the total pressure found is 50 bar. Find the partial pressure of each gas.

28. At 400 K temperature in a closed vessel the % by volume of He, Ne and Ar are 40%, 40% and 20% respectively. If the total pressure is 25 bar, then find the pasrtial pressure of each gas. (Total pressure is 25 bar)

29. At 500 K temperature in 2L vessel 0.32 g O_2 gas is wllected over water., find the partial pressure of dry O_2 gas.

$$\left(R = 8.314 \times 10^{-2} \ \text{L bar mol}^{-1} K^{-1} \right)$$

30. Find the number of molecules, number of atoms and total number of atoms in 5.6 L of CH_4 at STP.

31. Find the volume at STP and mass of 6.022×10^{22} molecules of O_2. (Molar volume = 22.4 L)

32. The % composition by volume of Cl_2, H_2 and N_2 are in 1 : 2 : 7 by proportion. If the total pressure is 40 bar, Find the partial pressures of each gas ?

[Partial pressure

$$= \frac{\text{Volume of } \% \times \text{Total pressure}}{100}]$$

33. At 298 K temperature $4gH_2$ is filled in 500 mL vessel. Due to small hole in vessel, after some time, the pressure in vessel become 50 bar. Find the H_2 of molecules which have escaped from the vessel ?

$$\left(R = 8.314 \times 10^{-2} \ \text{L bar mol}^{-1}K^{-1} \right)$$

(Note : Calculate mole, molecules using of pV = nRT formula).

34. The O_2 gas is collected over water at 400 K temperature in 2 L vessel. If the pressure of dry O_2 gas is 32.20 bar bar then Find the vapour pressure of water under the same conditions ?

$\left(R = 8.314 \times 10^{-2} \quad \text{L bar mol}^{-1} K^{-1} \right)$

35. At 300 K temperature 20 g H_2, 220 g CO_2 and $140g N_2$ are filled in a vessel having

volume 2L. Find the total pressure in bar unit and which gas is removed from the vessel so that pressure can be reduced by 50%. $\left(R = 8.314 \times 10^{-2}\right)$

36. Air contains $79\% \, N_2$, $20\% \, O_2$ and $1\% \, CO_2$ by volume. If the total pressure of air is 1 bar, find the partial pressure of N_2, O_2, CO_2.

37. At $25°C$ temperature and 760 mm Hg pressure volume of gas is 600 mL, Then calculate pressure when volume of this gas becomes 640 mL at $10°C$ temperature.

$$\left(\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2} \right)$$

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38. At $21°C$ temperature volume of $212 g O_2$ gas is $34 dm^3$. If pressure of gas becomes 1.24 bar then how many gram O_2 gas is left from

container ?

$$\left(R = 0.083 dm^3 \text{ bar } K^{-1}mol^{-1}\right)$$

[Note : Calculate intital moles by pV = nRT]

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39. Convert the following pressure in to atmosphere.

(a) 735 torr (b) 985 mL bar (c)

$$1.42 \times 10^5 Nm^{-2}$$

[Note : (a) 1 atm = 760 torr, (b) 1 atm = 1.013 bar

(c) 1 atm $= 1.01325 \times 10^5 Nm^{-2}$

40. At what temperature volume of gas becomes half, initial temperature and volume is $17°C$ and 400 mL` respectively. (Charle.s law)

41. Pressure of gas at $0°C$ temperature is 2 atm and 10 L respectively then at which

temperature pressure becomes 2.5 atm ? (Gay

Lussac.s law)

42. Calculate density of HCl gas having density

$8kg/m^3$ at $-40°C$ temperature.

43. Density of dioxygen gas at STP is $1.43gL^{-1}$

then calculate density at $17°C$ and 800 torr

pressure $\left(\dfrac{d_2 T_2}{p_2} = \dfrac{d_1 T_2}{p_1} \right)$.

44. 10^6 ml balloon contains He gas at $27°C$ temperature and 1 bar then calculate of balloon. Take molecular mass of air is 28.84 gm/mol.

45. How many gm $KClO_3$ dissoviate to obtained $2.4LO_2$ gas at $25°C$ temperature and 740 mm Hg ? (Molecular mass of $KClO_3 = 122.5gmol^{-1}$, Molar volume $=$ 22.4L)

46. A gas heated to $0°C$ to $546°C$ at 5 bar pressure at 5 bar pressure it its volume

becomes the third then calculate final pressure.

47. One container having $0.4gO_2$ and $0.06gH_2$ at $100°C$ then (a) What will be total pressure of container ? (b) This mixture of gas produce water at $100°C$ temperature then which gas will left in container ? Calculate their partial pressure. (R = 6.0821 L atm $mol^{-1}K^{-1}$)

1. What is properties related to single particle of matter ?

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2. What is bulk properties of matter ? Give examples.

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3. One substance exist in three states - Give its example. With physical properties, chemical composition and characteristics.

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4. Why it becomes necessary for a chemist to know the physical laws govern the behaviour of matter in different states ?

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5. Which forces are present between H_2 and HCl molecules ? Why ?

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6. How many main states of matter ?

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7. Which substances having intermolecular (van der Waal) forces ?

8. Which type of attraction present in aqueous

solution of NaCl ?

9. Which force present in Hydrogen bond ?

10. Give order of energy of solid, liquid and gas.

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11. Magnitude of london force is depend upon ?

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12. Give interaction energy of the following :

(i) London forces (ii) Dipole - Dipole forces (iii) Dipole - induce forces.

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13. What is energy of Hydrogen bond ?

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14. Which type of forces are present in given molecules ? HF-HF, O2-O2, H2-H2, CH4-CH4, CO, NO, H20

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15. Explain attraction forces of two molecules.

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16. Three states of matter are results ?

17. What is relation between compressibility and temperature an liquifaction of gas ?

18. What is order of thermal energy of liquid, solid and gas.

19. What is order of intermolecular interaction in solid, liquid and gas ?

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20. What is Troposphere ?

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21. What is important of troposphere in our life ?

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22. What is present in troposphere ?

23. How many elements in periodic table in gaseous from ? Give its place in periodic table ?

24. Which group of elements in gases state in normal condition ?

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25. Give magnitude of energy of force and value of interaction process with example.

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26. Arrange increasing order of energy of interaction forces London force, Covalent

bond, Hydrogen bond, Dipole - Dipole forces.

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27. Which properties of gas can be measured ?

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28. Give units of properties of gases ? (i) Mass

(ii) Volume (iii) Temperature (iv) Pressure

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29. Give different unit of pressure of gas.

30. Give relation between different units of pressure.

31. Which instrument can be use to measurement of pressure and temperature ?

32. Give order of kinetic energy of solid, liquid, gas.

33. Which state of Matter having definite volume but not definite shape ?

34. When the graph of $p\alpha\dfrac{1}{V}$ is not obtained straight line ?

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35. Which are two isotherm graph according to Boyle.s Law.

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36. Which effect is observed in Isothermal graph with temperature ?

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37. When pressure of 0.09 mole will become half then calculate volume at 300 K ?

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38. What is proved by Boyle.s law in a quantitative manner ? Why ?

39. What effect on density when pressure pressure at 0.09 mole gas increases at 300 K ?

40. 300 K temperature at 2.0×10^4 Pa pressure volume of 0.09 mole CO_2 gas is $112.0 \times 10^{-3} m^3$ then calculate volume at 4.0×10^4 Pa ?

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41. The graphs given under is obtained by Boyle.s law at constant volume and temperature mention the types of each graph

and state that what it indicates ?

42. Draw graph of volume (V) against Temperature (T) n^+ constant pressure (P) and explain.

43. Give ideal gas equation & combined gas equation.

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44. What is another name of ideal gas equation ? Why ?

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45. Give calculation of gas constant R for unit of bar Lit $mol^{-1}K^{-1}$ in ideal gas equation.

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46. What is molar volume of gas ? What is its value.

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47. If value of R = 8.314 then, Given its unit.

48. 22.71 Lit means .... meter ?

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49. Give unit of gas constant R if its value is

0.082.

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50. 1 bar means .... Pa ?

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51. What is the pressure at Kolkata, Chennai and Mumbai at $0°C$ temperature ?

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52. What is difference between STP or NTP and SATP ?

53. What is the molecular mass or molar volume at STP or NTP and SATP ?

54. What is volume of different gas of n mole different gases at constant temperature and pressure ?

55. Which type of attraction force pressure in ideal gas ?

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56. When the real gas is behave like an ideal gas ?

▶ **Watch Video Solution**

57. Give relation between molecular mass density and volume.

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58. Give Avogadro.s Law.

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59. Explain Gay Lussac Law.

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60. Give Charle.s Law.

▶ **Watch Video Solution**

61. When temperature of any gas at constant pressure increase by $1°C$ then what effect occur on volume ?

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62. It temperature of gas increases $1°C$ and pressure and mass will be constant then what will be change in volume ?

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63. What is the Kelvin temperature or Absolute temperature ?

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64. Value of R is depend upon ? What is its unit ?

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65. Density of Neon gas at 350 K temperature is $0.9gL^{-1}$ then calculate its pressure ?

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66. What is value of Z of ideal gas or real gas ?

67. What is Mathematical representation of partial gas of Dalton ?

68. What is formula of calculation of Dry gas ?

69. Mathematical form of Dalton.s Law of Partial Pressure.

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70. Derive relation between density of gases and molecular mass by using of Avogadro.s law.

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71. What is relation between vapour pressure and temperature ? What is vapour pressure at 373 K temperature ?

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72. What is the value of Avogadro number ?

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73. When density of ideal gas is maximum ?

74. Calculate moles of 0.224 L at STP of ideal gas ? Calculate moles of Ideal H_2 gas. (Molar volume = 22.4 L acceptable).

75. One gas having ratio of density is 1 : 2 and temperature ratio is 2 : 1 then what is ratio of pressure ?

76. What is relation between gas constant R and work ?

77. Different value of R and its units.

78. Boyle, Charle.s Law indicates ?

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79. Explain Assumptions (postulates) of the kinetic molecular theory.

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80. How many moles H_2 obtained from 54 gm Al. Give its reaction.

81. Total pressure of mixture of CO_2 and CH_4 is 8.3×10^4 Pa then partial pressure of CO_2 gas is 2.8×10^4 Pa. Then calculate partial pressure of CH_4.

82. Give relation between u_{rms}, u_{mp} and u_{av}

83. In gaseous mixture contain $20\% \dfrac{W}{W} H_2$ gas then calculate moles ?

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84. Why gases are more compressible ?

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85. What volume gain by gas at STP ?

86. Why gas having pressure ?

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87. What changes observed when gas is heated ?

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88. Explain following terms :

(i) u_{mp}

(ii) u_{av}

(iii) u^2

(iv) u_{rms}

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89. Give relation between u_{rms}, u_{mp} and u_{av}

▶ **Watch Video Solution**

90. What is called elastic collision ?

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91. Give four properties of gas.

▶ **Watch Video Solution**

92. Velocity distribution is depend upon ?

▶ **Watch Video Solution**

93. Which effect is observed on velocity distribution if temperature increases.

▶ **Watch Video Solution**

94. Which gas has high speed between H_2 and O_2 ? Why ?

▶ **Watch Video Solution**

95. H_2S and NH_3 gas evolved at same time form factory of cylinder than which gas can expand fast ?

▶ Watch Video Solution

96. What is Average rotational Kinetic energy ?

▶ Watch Video Solution

97. What is maxwell Boltzman distribution curve ?

98. What is difference between real gas and ideal gas is graph of $pV \rightarrow p$ at constant temperature.

99. Which type of graph is obtained when we plotted $pV \rightarrow p$ of ideal gas ?

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100. What is positive and negative deviation of real gas at constant pressure for pV $\rightarrow$ p ?

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101. Which type of deviation shows by gas from graph pV $\rightarrow$ V ?

H_2, He, CO, CH_4

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102. Why real gas shows deviation of ideal gas at fixed temperature in geaph of pV $\rightarrow$ p and $p \rightarrow V$.

▶ Watch Video Solution

103. What change is observed in real gas than ideal gas in pressure and volume ?

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104. What is ideal pressure and volume of real gas ?

▶ **Watch Video Solution**

105. Derive van der Waal.s equations.

106. Explain compressibility factor (Z).

107. What is compressibility factor (Z) ?

(i) deviation factor (Z = 1) (ii) $Z > 1$ (iii) $Z < 1$

(iv) deviation graph and (v) relation between

molar volume and Z.

108. What is Boyle.s temperature ? Give its relation with value of Z.

109. When real gas shows ideal behaviour ? Why ?

110. Statement-1: A real gas behaves as an ideal gas at high temperature and low pressure .

Statement-2: Liquid state of an ideal gas is impossible.

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111. What is value of Z at 200 bar pressure for CO_2, CH_4 and O_2 ?

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112. What is relation between compressibility factor and molar volume.

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113. Why Andrews Graph required ?

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114. Which are critical constant ?

115. What is critical temperature ? What is value of critical temperature for CO_2 gas ?

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116. If temperature of CO_2 will be increased or decreased to $30.98°C$ then what changes can be observed ?

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117. At P_C pressure, $13.1°C$, $31.5°C$, $50°C$, and $30.98°C$. What phase obtained by CO_2 gas ?

118. What happens if we compressed and expand CO_2 at $30.98°C$ is taken constant ?

119. What is vapour of CO_2 ?

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120. Critical temperature of O_2 and N_2 are 154.3 K and 126.0 K respectively then during liquification of air, which gas liquified fast ?

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121. From the NH_3 and N_2 which gas having high attraction force and volume ? (Van der Waals constant)

▶ **Watch Video Solution**

122. What is formula of V_C, $P_C T_C$?

▶ **Watch Video Solution**

123. What is Boyle.s temperature ? Give its relation with value of Z.

124. What is difference between vapour and gas ?

125. Which has maximum density between Dry or air containing moisture ? Why ?

126. Which mixture do not follow Dalton.s law ? Why ?

(i) $CO_2 + O_2 + N_2$

(ii) $CO + O_2$

(iii) $NH_3 + HCl$

(iv) $HCl + O_2$
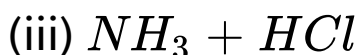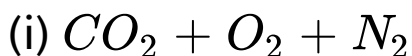
127. Explain : Why real gases behave deviation than ideal gas ?

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128. Which effect occurs on pressure if gas do not collide elastically ?

▶ **Watch Video Solution**

129. From which of the following having maximum and minimum vapour pressure ? Acetone, ether and ethanol ?

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130. At 300 K temperature, liquid of small test tube is pour in large beaker then what change obsered in vapour pressure ?

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131. Which has maximum viscosity between ethanol and H_2O ?

▶ View Text Solution

132. Which gas has maximum kinetic energy between N_2 and O_2 at 300 K ?

▶ Watch Video Solution

133. What is relation between kinetic energy and temperature ?

▶ **Watch Video Solution**

134. What is difference between viscosity and density ?

▶ **Watch Video Solution**

135. What is relation between viscosity and pressure ?

▶ **Watch Video Solution**

136. What is surface tension of critical temperature ?

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137. What happened if we mix oil in H_2O ? Why ?

138. Two graph if ideal gas are given then decide which value from m_1 and m_2 more ?

139. Liquid can poured one container to another at fixed temperature what is its reason.

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140. Give important physical properties of liquid ?

▶ **Watch Video Solution**

141. What is saturated vapour pressure ?

▶ Watch Video Solution

142. Vapour Pressure is depend upon ?

▶ Watch Video Solution

143. What is Boiling point ?

▶ Watch Video Solution

144. Which Boiling Point is greater ? Give example.

▶ **Watch Video Solution**

145. From which of the places the boiling point will be less ? Why sea and mountain ?

▶ **Watch Video Solution**

146. Why surgical instruments of hospital are sterilized in autoclaves ?

▶ **Watch Video Solution**

147. What is critical temperature ?

▶ **Watch Video Solution**

148. Give common boiling point order of $H_2O, COCl_4$ Ethanol and Ether.

149. How can we predict about order of boiling point ?

150. Give definition, dimensions and SI unit of surface tension.

151. Which shape of liquid observe at lowest energy state ?

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152. Explain force polishing of glass ?

▶ View Text Solution

153. What happened when we heating glass ?

▶ View Text Solution

154. Magnitude of surface tension is depend upon ?

▶ **Watch Video Solution**

155. What is Visocity ?

▶ **Watch Video Solution**

156. Force is required to maintain the flow of layers of liquid depend upon ?

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157. What is coefficient of Viscosity ?

▶ View Text Solution

158. What is units of co-efficient of viscosity.

▶ View Text Solution

159. Viscosity is depend upon ? Why ?

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160. Glass is an extremely viscous liquid. Why ?

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161. Which solution having more surface tension form the following ? (i) H_2O (ii) NaCl

162. Which has more surface tension from the following ? (i) H_2O (ii) Soap

163. Why painter added oil in paint to paint walls ?

164. What is molar molecular volume at STP, if compressibility factor $Z < 1$?

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165. Which type of kinetic energy having He, Ne gas ?

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Section C Muliple Choice Questions Mcqs

1. London Force is which type of force ?

A. Ionic

B. Covalent

C. van der Waal

D. Hydrogen Bond

Answer: C

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2. Which type of force present between HCl and O_2 molecules ?

    A. London

    B. Dipole - Dipole

    C. Dipole - Induce dipole

    D. Polar - Polar

Answer: C

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3. Which law shows density and pressure ?

A. Boyle.s

B. Charle.s

C. Avogadro.s

D. Dalton.s

Answer: A

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4. Calculate the volume of O_2 gas, when temperature increases $25^\circ C$ to $50^\circ C$?

A. Half

B. Double

C. More than double

D. Less than double

Answer: D

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5. What is value of Z of ideal gas or real gas ?

A. 1

B. 0

C. > 1

D. < 1

Answer: C

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6. Which temperature shows liquification of gas ?

A. T_C

B. $> T_C$

C. $< T_C$

D. T_C or $< T_C$

Answer: D

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7. Which changes can be done due to vaporization of H_2O in atmosphere ?

A. Cooling increases

B. Heat increases

C. (A) and (B) both

D. None of these

Answer: A

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8. If gas having more critical temperature, then its liquification will be ....

A. slow

B. fast

C. first

D. (B) and (C) both

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

9. Which changes observed with temperature to viscosity ?

A. Increases

B. Decreases

C. Zero

D. Increases or Decreases

Answer: B

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10. Which liquid interact each other ?

A. Water - Oil

B. H_2O - ethanol

C. Water - Petrol

D. Water Kerosene

Answer: B

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11. At which distance observed for van der Waal.s force ?

A. 8Å

B. 5Å

C. 4.5Å

D. Not decided

Answer: C

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12. Give types of van der Waals forces and explain any one.

A. London forces

B. Dipole - Dipole forces

C. Dipole induce dipole forces

D. All of these

Answer: D

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13. What is energy of Hydrogen bond ?

A. 5 kJ

B. 10 to 100 KJ

C. 500 KJ

D. 0

Answer: B

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14. Which one is not the properly of gas ?

A. Gases are mixed with each other.

B. Gases are compressible.

C. Gases having fixed volume.

D. Molecules of gases are free in motion.

Answer: C

15. Which one is not Boyle.s formula ?

A. $p \propto \dfrac{1}{V}$

B. PV = K

C. $p \propto T$

D. $p_1 V_1 = p_2 V_2$

Answer: C

▶ **View Text Solution**

16. Which equation follows Boyle.s Law ?

A. $\dfrac{p_1}{p_2} = \dfrac{V_1}{V_2}$

B. $d = \dfrac{Kp}{m}$

C. $\dfrac{d_1}{d_2} = \dfrac{p_1}{p_2}$

D. $\dfrac{d_1}{d_2} = \dfrac{p_2}{p_1}$

Answer: C

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17. Which of the following is true according to

Charle.s Law ?

A. Pressure - Volume

B. Pressure - Temperature

C. Volume - Temperature

D. Pressure - Mole

Answer: C

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18. Which one is Charle.s formula ?

A. $V_1 T_2 = T_2 V_1$

B. $V_1 T_1 = V_2 T_2$

C. V = kp

D. $V_1 T_2^{-1} = V_2 T_2$

Answer: B

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19. Explain : Gay Lussac.s Law.

A. $p \propto T$

B. $pT^{-1} = K$

C. $p_1 T_2 = p_2 T_1$

D. All of these

Answer: D

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20. What is the value of pressure at STP ?

A. 10^5 Pa

B. 10^2 Pa

C. 100 atm

D. 760 dyr

Answer: A

▶ **View Text Solution**

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21. Explain compressibility factor (Z).

A. $\dfrac{pV}{nRT}$

B. $\dfrac{RT}{pV}$

C. $\dfrac{2}{3}RT$

D. $\dfrac{RT}{nPV}$

Answer: A

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22. Identify True and False.

(i) For ideal gas $Z \neq 1$

(ii) For real gas Z = 1

(iii) Z = 0 for both gases

(iv) Value of Z for ideal gas is always greater than real gas.

A. FFFF

B. TTFF

C. TFTF

D. FTFF

Answer: D

23. At which condition density becomes maximum ?

A. p = 0.5 atm and T = 600 K

B. p = 2 atm and T = 150 K

C. p = 1 atm and T = 500 K

D. p = 1.5 atm and T = 400 K

Answer: B

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24. Which one is true from the following ?

A. $\dfrac{p_1 T_1}{V_1} = \dfrac{p_2 T_2}{V_2}$

B. $\dfrac{p_1 V_1}{V_1 p_1} = \dfrac{T_1}{T_2}$

C. $\dfrac{p_1 V_1}{p_2 V_2} = \dfrac{T_1}{T_2}$

D. $\dfrac{V_1 V_2}{p_1 p_2} = \dfrac{T_2}{T_1}$

Answer: C

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25. The graph .... is known as isothermal.

A. $p \rightarrow V$

B. $pV \rightarrow V$

C. $V \rightarrow \dfrac{1}{p}$

D. $p \rightarrow \dfrac{1}{V}$

Answer: C

▶ **View Text Solution**

26. Why there are three states of matter ?

A. Attraction forces keep molecules together.

B. Intermolecular forces and thermal energy of molecules is result of balance.

C. Molecules of gases are compressible.

D. Thermal energy increases with temperature.

Answer: B

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27. What is London force ? Give its characteristics ?

A. directly proportional to $\dfrac{1}{r^6}$.

B. directly proportional to r^6.

C. Inversely proportional to pressure of barometer.

D. All of these

Answer: A

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28. What is true order of average speed μ_{av}, maximum possible speed u_{mp} and root mean square speed u_{rms} for any gas ?

A. $u_{mp} > u_{av} > u_{rms}$

B. $u_{rms} > u_{av} > u_{mp}$

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

D. $u_{mp} > u_{rms} > u_{av}$

Answer: B

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29. What is standard boiling point of H_2O ?

A. At 1 atm pressure

B. At 1 bar pressure

C. $100^\circ C$

D. All of these

Answer: A

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30. Magnitude of surface tension is depend upon ?

A. Presure

B. Temperature

C. Both

D. None of these

Answer: B

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31. The ratio of cationic radius to anionic radius in an ionic crystals is greater than 0.732. Its coordination number is

A. 1

B. 4

C. 6

D. 8

Answer: D

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32. Which of the following statements about amorphous solid is incorrect ?

A. They melt over a range of temperature

B. They are anisotropic

C. There is no orderly arrangement of particles

D. They are rigid asnd incompressible

Answer: B

33. If the distance between Na^+ and Cl^- ions in sodium chloride crystal is X pm, the length of the edge of the unit cell is
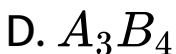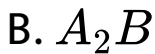
A. 4X pm

B. X/4 pm

C. X/2 pm

D. 2X pm

Answer: D

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34. In a solid .AB. hasving the NaCl structure, .A. atoms occupy the corners of the cubic unit cell. If the face - centrad atoms along one of the axis are removed, then the resultant stoichiometry of ther solid is

A. AB_2

B. A_2B

C. A_4B_3

D. A_3B_4

Answer: D

35. Which of the following fcc structure contains cation in alternate tetrahedral voids ?

A. NaCl

B. ZnS

C. Na_2O

D. CaF_2

Answer: B

36. Which of the following crystal does not exhibit Frenkel defect ?

    A. AgBr

    B. AgCl

    C. KBr

    D. ZnS

Answer: C

37. Which of the following metal oxide is antiferromagnetic in nature ?

A. MnO_2

B. TiO_2

C. NO_2

D. CrO_2
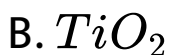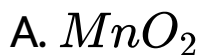
Answer: A

38. A semiconductor of Ge can be made p - type by adding

    A. Trivalent impurity

    B. Tetravalent

    C. Pentavalent

    D. Divalent impurity

Answer: A

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39. To get n-type doped semiconductor, impurity to be added to silicon should have the following number of valence electrons

A. 2

B. 5

C. 3

D. 1

Answer: B

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40. Metallic lusture is explained by

A. Diffusion of metal ions

B. Oscillations of loose electrons

C. Excitation of free protons

D. Existence of bcc lattice

Answer: B

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41. Monoclinic crystal has dimension

  A. $a \neq b \neq c, \alpha \neq \beta \neq \gamma 90°$

  B. $a = b \neq c, \alpha = \beta = \gamma = 90°$

  C. $a = b = c, \alpha = \beta = \gamma = 90°$

  D. $a \neq b \neq c, \alpha = \gamma = 90°, \beta \neq 90°$

Answer: D

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42. A crystalline solid have

A. Disordered arrangement

B. Long range order

C. Short range order

D. None of these

Answer: B

43. Which of the following statement is not true about NaCl structure ?

A. Each unit cell contains 4 NaCl molecules

B. Cl^- ions has coordination number six

C. Na^+ ions has coordination number four

D. Cl^- ions are in fcc arrangement

Answer: C

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44. In a solid lattice, cation is absent from lattice site and present at an interstitial posiotion, the lattice defect is

A. Schottky

B. Frenkel

C. Interstitial

D. None of these

Answer: B

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45. The ability of a given substance to assume two or more crystalline structure is called

A. Polymorphism

B. Isomorphism

C. Amorphism

D. Isomerism

Answer: A

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46. Schottky defect generally appears in

A. CsCl

B. KCl

C. NaCl

D. All

Answer: D

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47. How many number of atoms are present in fcc unit cell ?

A. 4

B. 3

C. 2

D. 1

Answer: A

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48. In an antifluorite structure, cations occupy

A. Octahedral voids

B. Centre of cube

C. Tetrahedral voids

D. Corners of cube

Answer: C

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49. Empty space in ccp lattice is

A. 26 %

B. 45 %

C. 90 %

D. 30 %

Answer: A

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50. The pyknometer density of NaCl crystal is $2.165 \times 10^3 kgm^{-3}$ while its X - rays density is

$2.178 \times 10^3 \, kgm^{-3}$. The fraction of the unoccupied sites in NaCl crystal is

A. 5.968

B. 5.96×10^{-2}

C. 5.96×10^{-3}

D. 5.96×10^{-4}

Answer: C

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51. The correct statement(s) regarding defects in solids is (are)

A. Frenkel defect in usually favoured by a very small difference in the sizes of cation and anion.

B. Frenkel efect is a disocation defect.

C. Trapping of an electron in the lattice leads to the formation of F - center

D. Schottky defects have no effect on the

physical properties of solids.

Answer: B::C

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52. If a gas expands at constant temperature,

it indicates that :

A. Kinetic energy of molecules decreases

B. Pressure of the gas increases

C. Kinetic energy of molecules remains the

same

D. Number of the molecules of gas

increases

Answer: C

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53. The pressure exerted by 6.0 g of methane

gas in a $0.03m^3$ vessel at $129°C$ is (Atomic

masses : C = 12.01, H = 1.01 and R = 8.314 $JK^{-1}mol^{-1}$)

A. 31684 Pa

B. 215216 Pa

C. 13409 Pa

D. 41648 Pa

Answer: D

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

A. zero

B. infinite

C. 3 Joules

D. 9 Joules

Answer: A

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

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

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

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

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

Answer: C

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56. An ionic compound has a unit cell consisting of A ions at the corners of a cube and B ions on the centres of the faces of the cube. The empirical formula for this compound would be

A. AB

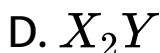B. A_2B

C. AB_3
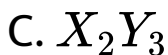
D. A_3B

Answer: C

57. In a compound, atoms of element Y form ccp lattice and those of element X occupy $2/3^{rd}$ of tetrahedral voids. The formula of the compound will be

A. X_3Y_4

B. X_4Y_3

C. X_2Y_3

D. X_2Y
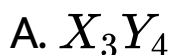
Answer: B

58. 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

---

59. Lithium forms body centred cubic structure. The length of the side of its unit cell is 351 pm. Atomic radius of the lithium will be.

A. 300 pm

B. 240 pm

C. 152 pm

D. 75 pm

Answer: C

60. If Z is a compressibility factor, Ven der Waals equation at low pressure can be written as :

A. $Z = 1 - \dfrac{Pb}{RT}$

B. $Z = 1 + \dfrac{Pb}{RT}$

C. $Z = 1 + \dfrac{RT}{Pb}$

D. $Z = 1 - \dfrac{a}{VRT}$

Answer: D

61. The correct statement for the molecule, CsI_3 is

A. It contains Cs^{3+} and I^- ions.

B. It contains Cs^+, I^- and lattice I_2 molecule.

C. It is covalent molecule.

D. It contaisn Cs^+ and I_3^- ions.

Answer: D

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62. For which of the following molecule

significant $\mu \neq 0$?

A. Only (c)

B. (c) and (d)

C. Only (a)

D. (a) and (b)

Answer: B

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63. The intermolecular interaction that is dependent on the inverse cube of distance between the molecules is :

A. ion - ion interaction

B. ion - dipole interaction

C. London force

D. Hydrogen Bond

Answer: D

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64. The vapour pressure of acetone at $20°C$ is

185 torr. When $1.2g$ of non-volatile substance

was dissolved in $100g$ of acetone at $20°C$ its

vapour pressure was 183 torr. The moalr mass $\left(gmol^{-1}\right)$ of the substance is:

A. 32

B. 64

C. 128

D. 488

Answer: B

65. Higher order (> 3) reactions are rare due to :

A. low probability of simultaneous collision of all the reacting species

B. increase in entropy and activation energy as more molecules are involved

C. Shifting of equilibrium towards reactants due to elastic collisions

D. loss of active species on collision

Answer: A

66. 3 g of activated chasrcoal was added to 50 mL of acetic acid solution (0.06N) in a flask. After an hour it was filtered and the strength of the filtrate was found to be 0.042 N. The amount of acetic acid adsorbed (per gram of charcoal) is :

A. 18 mg

B. 36 mg

C. 42 mg

D. 54 mg

Answer: A

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67. Two closed bulbs of equal volume (V) containing an ideal gas initially at pressure p_i and temperature T_1 are connected through a narrow tube of negligible volume as shown in

the figure below. The temperature of one of the bulbs is then raised to T_2. The final pressure p_f is :

A. $2p_i \left(\dfrac{T_1 T_2}{T_1 + T_2} \right)$

B. $p_i \left(\dfrac{T_1 T_2}{T_1 + T_2} \right)$

C. $2p_i \left(\dfrac{T_1}{T_1 + T_2} \right)$

D. $2p_i \left(\dfrac{T_2}{T_1 + T_2} \right)$

Answer: D

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68. The number of water molecules is maximum in :

A. 18 gram of water

B. 18 moles of water

C. 18 molecules of water

D. 1.8 gram of water

Answer: B

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

A. high temperatures and high pressures

B. low temperatures and low pressures

C. high temperatures and low pressures

D. low temperatures and high pressures

Answer: C

70. Equal moles of hydrogen and oxygen gases are placed in a container with a pin - hole through which both can escape. What fraction of the oxygen escapes in the time required for one - half of the hydrogen to escape ?

A. $\dfrac{1}{4}$

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

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

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

Answer: D

71. The correct geometry and hybridization for XeF_4 are :

    A. planar triangle, sp^3d^3

    B. square planar, sp^3d^2

    C. octahedral, sp^3d^2

    D. trigonal bipyramidal, sp^3d

Answer: C

72. Among the following which one is a wrong statement ?

A. SeF_4 and CH_4 have same shape

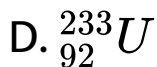B. I_3^+ has bent geometry

C. PH_5 and $BiCl_5$ do not exist

D. $p\pi - d\pi$ bonds are present in SO_2

Answer: A

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73. Which of the following isotope of uranium is useful in producing nuclear energy ?

A. $^{238}_{92}U$

B. $^{235}_{92}U$

C. $^{236}_{92}U$

D. $^{233}_{92}U$
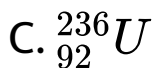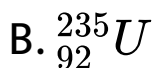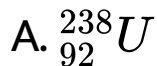
Answer: B

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74. The temperature of O_2 gas is changed from $25°C$ to $50°C$ then change in volume is .... (definite quantity of gas and constant pressure).

    A. less than twice

    B. more than twice

    C. Half

    D. Twice

Answer: A

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75. The rate of diffusion of two gases at same volume are 8 and 12 sec. respectively. If gas A.s molecular weiht is 81 g/mol so what will be the molecular weight of gas B ?

    A. 48.50 g/mol

    B. 182.25 g/mol

    C. 36 g/mol

    D. 72.0 g/mol

Answer: B

76. Which of the following graph is related to

Boyle.s law ?

A.

B.

C.

D.

Answer: C

77. What will be the unit of R if the unit of pressure and volume are dyne cm^{-2} and cm^3 respectively ?

    A. bar. lit $k^{-1}mol^{-1}$

    B. atm. $cm^3 mol^{-1}k^{-1}$

    C. erg. $k^{-1}mol^{-1}$

    D. lit - atm $k^{-1}mol^{-1}$

Answer: C

78. Derive van der Waal.s equations.

A. $\dfrac{PV}{K} = nRT$

B. $\left(P + \dfrac{an^2}{v}\right)(v + nb) = nRT$

C. $\left(P - \dfrac{an^2}{v}\right)(v - nb) = nRT$

D. $\left(P + \dfrac{an^2}{v^2}\right)(v - nb) = nRT$

Answer: D

79. On which factor does vapour pressure of liquid at fixed temperature depend upon ?

A. Nature of liquid

B. Boiling point of liquid

C. Number of moles of liquid

D. All of the given

Answer: B

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80. The time taken for diffusion of $CO_{2(g)}$ is twice than that of unknown gas of same volume under identical condition. Calculate the molecular weight of unknown gas. (C = 12, O = 16).

A. 11 gm/mol

B. 176 gm/mol

C. 88 gm/mol

D. 22 gm/mol

Answer: A

81. Which type of force of atraction exist in HF ?

A. London force

B. Dipole - Dipole force

C. Intermolecular H - bond attraction

D. All the given

Answer: D

82. Calculate the number of N atoms in 5.6 gm of Nitrogen gas. (N = 14 gm/mol)

A. 1.2044×10^{23}

B. 2.4088×10^{23}

C. 1.2044×10^{22}

D. 2.4088×10^{22}

Answer: B

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83. Which type of Van der Waals attractive forces exists in a vessel filled with N_2 molecules ?

    A. Dispersion Forces and Dipole - Dipole

       Forces

    B. Dipole - Dipole Forces

    C. Dispersion Forces

    D. Dispersion Forces

Answer: D

84. What will be the pressure of 10 gram of a gas kept under atmospheric pressure, if its temperature is changed from 546 K to 273 K ?

A. $\dfrac{1}{2}$ bar

B. 273 bar

C. 2 bar

D. $\dfrac{1}{273}$ bar

Answer: A

85. A bottle of NH_3 gas and a bottle of dry HCl gas are connected through a long tube. The tube is opened simultaneously at both the ends. White fume of NH_4Cl is formed ....

A. throughout the length of the tube

B. near HCl bottle

C. near NH_3 bottle

D. at the centre of tube

Answer: B

86. Density of a given quantity of gas will be maximum at .... conditions.

A. $273°C$, 2 bar

B. $0°C$, 2 bar

C. $273°C$, 1 bar

D. S T P

Answer: B

87. Lower the critical temperature of a gas .... is its rate of liquefation.

  A. There is no relation between critical temperature and rate of liquefaction.

  B. Faster

  C. Moderate

D. Slower

Answer: D

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88. If pressure is P, temperature is T and gas constant is R. For an ideal gas, then the moles per litre of gas will be

A. $\dfrac{RT}{P}$

B. P R T

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

D. $\dfrac{PT}{R}$

Answer: A

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89. Gases SO_2, NH_3 and C_2H_6 are filled in a closed container at 298 K temperature. If a small hole is made in the container, what will be the correct order of partial pressure of

gases after 2 hours. (Atomic weight of S = 32 g,

N = 14 g , C = 12 g , H = 1 g)

A. $P_{NH_3} < P_{C_2H_6} < P_{SO_2}$

B. $P_{C_2H_6} > P_{SO_2} > P_{NH_3}$

C. $P_{SO_2} > P_{C_2H_6} > P_{NH_3}$

D. $P_{SO_2} < P_{C_2H_6} < P_{NH_3}$

Answer: A::D

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90. If compressibility factor of a gas is less than one at STP, then its ....

    A. $V > 22.4$ litres

    B. $V < 22.4$ litres

    C. V = 22.4 litres

    D. V = 44.8 litres

Answer: B

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91. Which of the following statement is not correct ?

A. At STP, 1 mole of a gas contains 6.022×10^{23} molecules.

B. At STP, weight in grams of n moles of gas is Gram Molecular Mass.

C. At STP, volume of 1 mole of gas is 22.4 litres.

D. At STP, weight of 6.022×10^{23} molecules is equal to Gram Molar Mass.

Answer: B

92. To decrease the volume of a gas by 5 tiumes at constant temperature, pressure should be ....

   A. decreased by 5 times

   B. increased by 5 times

   C. kept constant

   D. increased by 50%

Answer: B

93. What is the value of Gas constant R in Joule Kelvin$^{-1}mol^{-1}$?

A. 0.0821

B. 82.1

C. 1.987

D. 8.3144

Answer: D

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1. A person living in Shimla observed that cooking food without using pressure cooker takes more time. The reason for this observation is that at high altitude :

A. pressure increases

B. temperature decreases

C. temperature increases

D. pressure decreases

Answer: C

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2. Which of the following property of water can be used to explain the sperical shape of rain droplets ?

A. Viscosity

B. Surface tension

C. Criticasl phenomena

D. Pressure

Answer: B

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3. A plot of volume (V) versus temperature (T) for a gas at constant pressure is as straight line passing through the origin. The plots at

different values of pressure are shown in Fig. Which of the following order of pressure is correct for this gas ?

A. $P_1 > P_2 > P_3 > P_4$

B. $P_1 = P_2 = P_3 = P_4$

C. $P_1 < P_2 < P_3 < P_4$

D. $P_1 < P_2 = P_3 < P_4$

Answer: C

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4. The interaction energy of London force is inversely proportional to sixth power of the distance between two interacting particles but their magnitude depends upon

A. charge of interacting particles.

B. mass of interacting particles.

C. polarisability of interacting particles.

D. strength of permanent dipoles in the particles.

Answer: C

5. Dipole - dipole forces act between the molecules possessing permanent dipole. Ends of dipoles possess .partial charges.. The partial charge is

    A. more than unit electronic charge.

    B. equal to unit electronic charge.

    C. less than unit electronic charge.

D. double the unit electronic charge.

Answer: C

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6. The pressure of a 1 : 4 mixture of dihydrogen and dioxygen enclosed in a vessel is one atmoshpere. What would be the partial pressure of dioxygen ?

A. 0.8×10^5 atm

B. $0.008 Nm^{-2}$

C. $8 \times 10^4 Nm^{-2}$

D. 0.25 atm

Answer: C

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7. As the temperature increases, average kinetic energy of molecules increases. What would be the effect of increase of temperature on pressure provided the volume is constant ?

A. Increases

B. Decreases

C. Remains same

D. Becomes half

Answer: A

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8. Gases possess characteristic critical temperature which depends upon the magnitude of intermolecular forces between

the particles. Following are the critical temperatures of some gases.

From the above data what would be the order of liquefaction of these gases ? Start writing the order the gas liquefying first.

A. H_2, He, O_2, N_2

B. He, O_2, H_2, N_2

C. N_2, O_2, He, H_2

D. O_2, N_2, H_2, He

Answer: D

9. What is the unit of viscosity?

A. Pascal

B. Nsm^{-2}

C. $Km^{-2}s$

D. Nm^{-2}

Answer: B

10. Atmospheric pressures recorded in different cities are as follows :

Consider the above data and mark the place at which liquid will boil first.

A. Shimla

B. Bangalore

C. Delhi

D. Mumbai

Answer: A

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11. Which curve in Fig. represents the curve of ideal gas ?

A. only B

B. C and D

C. E and F

D. A and B

Answer: A

12. Increase in kinetic energy can overcome intermolecular forces of attraction. How will the viscosity of liquid be affected by the increase in temperature ?

A. Increase

B. No effect

C. Decrease

D. No regular pattern will be followed

Answer: C

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13. How does the surface tension of a liquid vary with increase in temperature ?

A. Remains same

B. Decreases

C. Increases

D. No regular pattern is followed

Answer: B

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14. With regard to the gaseous state of matter which of the following statements are correct ?

A. Complete order of molecules

B. Complete disorder of molecules

C. Random motion of molecules

D. Fixed position of molecules

Answer: B::C

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15. Which of the following figures does not represent 1 mole of dioxygen gas at STP ?

A. 16 g of gas

B. 22.7 L of gas

C. 6.022×10^{23} dioxygen molecules

D. 11.2 L of gas

Answer: A::B::D

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16. Under which of the following two conditions applied together, a gas deviates most from the ideal behaviour ?

A. Low pressure

B. High pressure

C. Low temperature

D. High temperature

Answer: B::C

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17. Which of the following changes decrease the vapour pressure of water kept in a sealed vessel ?

A. Decreasing the quantity of water

B. Adding salt to water

C. Decreasing the volume of the vessel to

one half

D. Decreasing the temperature of water

Answer: B::D

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Section D Solution Of Ncert Exemplar Problems Short Answer Type Questions

1. If 1 g of each of the following gases are taken at STP, which of the gases will occupy (a) greatest volume and (b) smallest volume ?

CO, H_2O, CH_4, NO

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2. Physical properties of ice, water and steam are very different. What is the chemical composition of water in all the three states ?

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3. The behaviour of matter in different states is governed by various physical laws. According to you what are he factors that determine the state of matter ?

4. Use the information and data given below to answer the questions (a) to (c), Stronger intermolecular forces result in higher boiling point. Strength of Lonson forces increases

with the number of electrons in the molecule.

Boiling point of HF, HCl, HBr and HI are 293 K, 189 K, 206 K and 238 K respectively ?

Which type of intermolecular forces are present in the molecules HF, HCl, HBr and HI ?

(b) Looking at the trend of boiling points of HCl, HBr and HI, explain out of dipole - dipole interaction and London interaction, which one is predominant here.

Why is boiling point of hydrogen fluoride highest while that of hydrogen chloride lowest ?

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5. What will be the molar volume of nitrogen and argon at 273.15 K and 1 atm ?

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6. A gas that follows Boyle.s law, Charle.s law and Avogadro.s law is called an ideal gas. Under what conditions a real gas would behave ideally ?

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7. Two different gases .A. and .B. are filled in separate containers of equal capacity under tha same conditions of temperature and pressure. On increasing the pressure slightly the gas .A. liquefies but gas B does not liquefy even on applying high pressure until it is cooled. Explain this phenomenon.

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8. Value of universal gas constant (R) is same for all gases. What is its physical significance ?

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9. One of the assumptions of kinetic theory of gases states that ..there is no force of attraction between the molecules of a gas... How far is this statement correct ? Is it possible to liquefy an ideal gas ? Explain.

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10. The magnitude of surface tension of liquid depends on the attractive forces between the molecules. Arrange the following in increasing order of surface tension : Water, alcohol (C_2H_5OH) and hexane $[CH_3(CH_2)_4CH_3)]$.

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11. Pressure exerted by saturated water vapour is called aqueous tension. What correction

term will you apply to the total pressure to obtain pressure of dry gas ?

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12. Name the energy which arises due to motion of atoms or molecules in a body. How is this energy affected when the temperature is increased ?

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13. Name two intermolecular forces that exist between HF molecules in liquid state.

14. One of the assumptions of kinetic theory of gases states that ..there is no force of attraction between the molecules of a gas... How far is this statement correct ? Is it possible to liquefy an ideal gas ? Explain.

15. Compressibility factor, Z, of a gas is given as

$$Z = \frac{pV}{nRT}$$

(i) What is the value of Z for an ideal gas ?

For real gas what will be the effect on value of

Z above Boyle.s temperature ?

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16. The critical temperature (T_C) and critical

pressure (P_C) of CO_2 are $30.98°C$ and 73

atm respectively. Can $CO_2(g)$ be liquefied at $32°C$ and 80 atm pressure ?

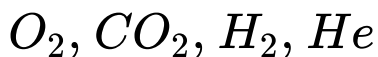**17.** For real gases the relation between p, V and T is given by van der Waals equation :

$$\left(p + \frac{an^2}{V^2}\right)(V - nb) = nRT$$

Where .a. and .b. are vasn der Waals constants, .nb. is approximately equal to the total volume of the molecules of a gas. .a. is the measure of magnitude of intermolecular attraction.

(i) Arrange the following gases in the increasing order of .b.. Give reason.

O_2, CO_2, H_2, He

(ii) Arrange the following gases in the decreasing order of magnitude of .a.. Give reason.

CH_4, O_2, H_2

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18. The relation between pressure exerted by an ideal gas (p_{ideal}) and observed pressure

(p_{real}) is given by the equation

$$P_{\text{ideal}} = P_{\text{real}} + \frac{an^2}{V^2}$$

(i) If pressure is taken in Nm^{-2}, number of moles in mol and volume in m^3, Calculate the unit of .a..

(ii) What will be the unit of .a. when pressure is in atmosphere and volume in dm^3 ?

19. Name two phenomena that can be explained on the basis of surface tension.

20. Viscosity of a liuquid arises due to strong intermolecular forces existing between the molecules. Stronger the intermolecular forces, greater is the viscosity. Name the intermolecular forces existing in the following liquids and arrange them in the increasing order of their viscosities. Also given reason for the assigned order in one line.

Water, hexane $(CH_3CH_2CH_2CH_2CH_2CH_3)$, glycerine $(CH_2OHCH(OH)CH_2OH)$

21. Explain the effect of increasing the temperature of a liquid, on intermolecular forces operating between its particles, what will happen to the viscosity of a liquid if its temperature is increased ?

22. The variation of pressure with volume of the gas at different temperatures can be graphically represented as shown in Fig. On the basis of this graph answer the following questions.

(i) How will the volume of a gas change if its pressure is increased at constant temperature ?

(ii) At a constant pressure, how will the volume of a gas change if the temperature is increased from 200 K to 400 K ?

23. Pressure versus volume graph for a real gas and an ideal gas are shown in Fig. Answer the following questions on the basis of this graph

(i) Interpret the behaviour of real gas with respect to ieal gas at low pressure.

(ii) Interpret the behaviour of real gas with respect to ideal gas at high pressure.

(iii) Mark the pressure and volume by drawing

a line at the point where real gas behaves as an ideal gas.

1. Match the graphs between the following variables with their names :

2. Match the following gas laws with the equation representing them,

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3. Match the following graphs of ideal gas with heir co-ordinates :

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1. Assertion (A) : Three states of matter are the result of balance between intermolecular forces and thermal energy of the molecules.

Reason (R) : Intermolecular forces tend to keep the molecules together but thermal energy of molecules tends to keep them apart.

    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 the

   correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

Answer: A

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2. Assertion : $-$ At constant temperature PV

vs V plot for real gas is not a straight line.

Reason : $-$ At high pressure, all gases have

$Z > 1$ but at low pressure most gases have

$Z < 1$

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 the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

Answer: B

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3. Boiling point of water at normal atmospheric pressure is

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 the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

Answer: C

4. Assertion (A) : Gases do not liquefy above their critical temperature, even on applying high pressure.

Reason (R) : Above critical temperature, the molecular speed is high and intermolecular attractions cannot hold the molecules together because they escape because of high speed.

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 the correct explanation of A

C. A is true but R is false.

D. A is false but R is true.

Answer: A

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5. Assertion (A) : At critical temperature liquid passes into gaseous state imperceptibly and continuously.

Reason (R) : The density of liquid and gaseous phase is equal to critical 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 the 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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6. Assertion (A) : Liquids tend to have maximum number of molecules at their surface.

Reason (R) : Small liquid drops have spherical shape.

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 the 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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1. Isotherms of carbon dioxide at various temperatures are represented in Fig. Answer the following questions based on this figure.

(i) In which state will CO_2 exist between the points a and b at temperature T_1 ?

(ii) At what point will CO_2 start liquefying when temperature is T_1 ?

(iii) At what point will CO_2 be completely

liquefied when temperature is T_2 ?

(iv) Will condensation take place when the temperature is T_3 ?

(v) What portion of the isotherm at T_1 represent liquid and gaseous CO_2 at equilibrium ?

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2. The variation of vapour pressure of different liquids with temperature is shown in Fig.

(i) Calculate graphically boiling points of liquids A and B.

(ii) If we take liquid C in a closed vessel and heat it continuously. At what temperature will it boil ?

(iii) At high altitude, atmospheric pressure is low (say 60 mm Hg). At what temperature liquid D boils ?

(iv) Pressure cooker is used for cooking food at hill station. Explain in term of vapour pressure why is it so ?

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3. Why does the boundary between liquid phase and gaseous phase disappear on heating a liquid upto critical temperature in a closed vessel ? In this situation what will be the state of the substance ?

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4. Why does sharp glass become smooth on heating it upto its melting point in as flame ?

Explain which property of liquids is responsible for this phenomenon.

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5. Explain the term .laminar flow.. Is the velocity of molecules same in all the layers in laminar flow ? Explain your answer.

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6. Isotherms of carbon dioxide gas are shown in Fig. Mark a path for changing gas into liquid such that only one phase (i.e., either a gas or a liquid) exists at any time during the change. Explain how the temperature, volume and pressure should be change to carry out the change.

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Question Paper From Module Section A

1. Given Dalton.s Law of partial Pressure, its mathematical formula and explain aqueous tension.

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2. Explain : Avogadro.s Law.

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3. Explain : Surface tension

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4. Calculate mass of 0.05 mole of O_2 gas.