CHEMISTRY

BOOKS - OMEGA PUBLICATION

STATES OF MATTER

Questions

1. What can you say about inter molecular forces between the molecules ?

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2. What are dispersion or London forces ?

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3. What are dipole-dipole forces ?

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4. What are the dipole induced dipole forces ?

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5. Define hydrogen bond.

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6. State Boyle's law.

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7. State Boyle's law.

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8. What is isotherm ?

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9. Why liquid ammonia bottle is cooled before opening the seal ?

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10. The mountainers carry oxygen with them because: At analtitude of more than 5km there is no air.

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11. A vessel of 120 mL capacity is containing a certain mass of gas at $20^{\circ}C$ and 750 mm pressure. The gas was transferred to a vessel, whose volume is 180 ml. Calculate the pressure of the gas at $20^{\circ}C$.

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

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13. What will be the minimum pressure required to compress 500 dm^3 of air at 1 bar

to 200 dm^3 at $30^\circ C$?

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14. State Charles' law.

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15. Give mathematical representation of Charles' law.

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16. Justify the statement that volume of a gas at constant pressure decreases if its temperature is decreased.

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17. 20 mL of hydrogen measured at $15^{\circ}C$ is heated to $35^{\circ}C$. What is the new volume of gas at the same pressure ?

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18. In terms of Charles' law explain why $-273^{\circ} C$ is the lowest possible temperature?

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19. What would be the SI unit for the quantity $\frac{pV^2T}{n}$?

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20. A sample of gas occupies 1.50L at 25 o C. If the temperature is raised to 60 o C, what is the new volume of the gas if pressure remains constant?

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21. State and explain Gay Lussac's law with an example

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22. What is isochore?

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23. State Avogadro's law

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24. What is an ideal gas ?

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25. Derive ideal gas equation.

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

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

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28. 34.05 mL of phosphorus vapour weighs 0.0625 g at 546 ∘ C and 0.1 bar pressure. What is the molar mass of phosphorus?

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29. At $0^{\circ}C$, the density of certain oxide of a gas at 2 bar is same as that of dinitrogen at 5 bar. What is molecular mass of the oxide ?

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30. 2.9 g of a gas at $95^{\circ}C$ occupied the same volume as 0.184 g of dihydrogen at $17^{\circ}C$ at the same pressure. What is the molar mass of the gas ?

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

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32. A sample of nitrogen gas occupies a volume of 1.0L at a pressure of 0.5 bar and at 40∘C. Calculate the pressure the gas if compressed to 0.225ml at −6∘C

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33. A gas occupies 200mL at a pressure of 0.820 bar at 20 o C. How much volume will it occupy when it is subjected to external pressure of 1.025 bar at the same temperature?

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34. What will be the pressure of the gaseous mixture when 0.5 L of H_2 at 0.8 bar and 2.01 of

dioxygen at 0.7 bar are introduced in a 1L vessel at $27^{\circ} C$?

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35. At $27^{\circ} C$ a gas under a pressure of 750 mm Hg occupies a volume of 76 ml. Calculate the volume of the gas at N.T.P.

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36. Using the equation of state PV = nRT, show that at given temperature density of gas is directly proportional to gas pressure.

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37. Derive a relationship between vapour density and molecular mass of gas.

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38. Explain Dalton's law of partial pressures and Charles' law.

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39. Express partial pressure in terms of mole fraction.

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40. A gascous mixture contains 56 g N_2, 44 g CO_2 and 16 g CH_4. The total pressure of mixture is 720 mm. What is partial pressure of CH_4?

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41. Calculate the volume occupied by 8.8 g of CO_2 at $31.1^\circ C$ and 1 bar pressure. R = 0.083 bar $LK^{-1}mol^{-1}$.

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42. The drain cleaner "Drainex" contains small bits of aluminum which reacts with caustic soda to produce hydrogen, What volume of hydrogen at $20^{\circ} C$ and 1 bar will be released when 0.15 g of aluminum reacts?

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43. Pressure of 1 g ideal gas X at 300 K is 2 atm. When 2 g of another gas Y is introduced in the same vessel at same temperature, the

pressure become 3 atm. The correct relationship between molar mass of X and Y is :

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

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45. What is kinetic gas equation? Give the significance of the terms used in the equation.

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46. What is the relation between kinetic energy and temperature ?

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47. Prove that kinetic energy of gas is proportional to absolute temperature.

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48. Define the terms: most probable speed, average speed and root mean square speed. How are these speeds related to each other?

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49. What are real gases ?

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50. Explain the deviations of real gases from ideal gases.

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51. Differentiate between ideal and real gases.

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52. What is meant by the term compressibility factor ?

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53. What is the value of compressibility factor for ideal gases and real gases?

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54. What is meant by Boyle's temperature or Boyle's point?

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55. A gas behaves like an ideal gas at :

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56. Comment on the statement that all gases behave in ideal manner at low pressure and

high temperature.

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57. Define the following terms:

Critical temperature

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58. Define the following terms:

Critical pressure

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59. Define the following terms:

Critical volume

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

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61. Derive van der Waals' equation of State for n moles of gas.'

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62. A gas can be very easily liquefied at low temperature and under low pressure. (True/False)

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63. If the value of Vander Waal's constant 'a' for a gas is zero, can it be liquefied ?

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64. What do you mean by liquid state of a substance ?

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65. (a) Define vapour pressure

(b) Explain why vapour pressure of a solvent

lowered by the addition of non-volatile solute ?

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66. Define boiling point and find out expression for the molecular mass of non - volatile solute from the elevation of boiling point.

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67. What is the effect of temperature on vapour pressure of a liquid ?

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68. Give one example of evaporation.

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69. Give two differences between boiling and evaporation.

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70. How does the rate of evaporation related to the nature of the liquid ?

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71. Evaporation causes cooling. Explain why?

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72. What is normal boiling point and standard boiling point ?

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73. What is the effect of pressure on the boiling point of a liquid ?

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74. Explain why temperature of a boiling liquid remains constant.

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75. What is surface tension? What is the effect of temperature on surface tension ?

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76. What is the S.I. unit of surface tension ?

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77. Explain why A drop of liquid under no external forces is always spherical in shape.

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78. What is capillary action ?

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79. How kerosene rises in the wick of an oil lamp ?

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80. What affects the magnitude of surface tension of a liquid ?

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81. Why surface tension decreases with increase in temperature ?

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82. Define viscosity.

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83. How does the viscosity of a liquid vary with temperature?

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84. What is the effect of pressure on the viscosity of liquid?

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85. How does the viscosity of a liquid vary with the followings ?

Nature of the liquid

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Multiple Choice Questions Mcqs

1. Gas equation PV = nRT is obeyed by

A. only isothermal processes

B. only adiabatic processes

C. both (A) and (B)

D. none of these.

Answer: C

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2. The root mean square velocity of an ideal gas at 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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3. A gas will approach ideal behaviour at

A. low temperature and low pressure

B. low temperature and high pressure

C. high temperature and low pressure

D. high temperature and high pressure.

Answer: C

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4. (True/False) The compressibility factor (z) for ideal gases is 1,.

A. 1.5

B. 0

C. 2.0

D. ∞

Answer: B

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5. van der Waal equation is true for :

A. ideal gas

B. real gas

C. gaseous substance

D. none of the above.

Answer: B

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6. The van der Waal's equation of state 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 and high temperature.

Answer: C

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7. When the temperature is raised, the viscosity of the liquid decreases. This is because

A. of decreased volume of solution

B. increase in temperature increases the average kinetic energy of molecules which overcomes the attractive force between them.

C. of decrease covalent and hydrogen bond forces

D. of increased attraction between molecules.

Answer: B

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

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

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

C. $\eta = ET/R$

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

Answer: B

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9. Which of the following statement(s) is/are correct, if intermolecular forces in liquids A, B and C are in the order of A > B > C ?

A. B evaporates more readily than A

B. B evaporates less readily than A

C. A and B evaporates at the same rate

D. A evaporates more readily than C.

Answer: D

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

A. $3/2RT$

B. $\frac{1}{2}kT$

C. $1/2RT$

D. $3/2kT$

Answer: A

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

A. its temperature is more than critical temperature T_C

B. its pressure is more than critical pressure P_C

C. its pressure is more than P_C at a temperature less than T_C

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

Answer: D

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12. The number of moles of a substance are given by

A. number of moles $= \frac{\text{molar mass of substance}}{\text{mass of substance}}$

B. number of moles $= \frac{\text{mass of substance}}{\text{molar mass of substance}}$

C. number of moles = mass of substance $\times$ molar mass.

D. None of above.

Answer: B

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13. According to Boyle's law

A. at constant T, $V \propto P$

B. at constant T, $V \propto \frac{1}{P}$

C. at constant P, $V \propto T$

D. at constant V, P, $\propto T$

Answer: B

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14. The relation, volume of gas (V) $\propto$ no. of moles (n), is

A. Graham's law

B. Boyle's law

C. Charle's law

D. Avogadro's law

Answer: D

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15. Which one is correct?

A. PR=nVT

B. PT=nRV

C. PR=VR

D. PV=nRT

Answer: D

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16. The unit of R does not depend on

A. pressure

B. energy

C. volume

D. temperature

Answer: B

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17. Dalton's law of partial pressure is related-with

A. reacting gases

B. non-reacting gases

C. reacting as well as non-reacting gases

D. none of above.

Answer: B

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18. The spherical shape of liquid drops is due to

A. vapour pressure

B. evaporation

C. vaporisation

D. surface tension

Answer: D

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

A. Planck's constant

B. Rydberg constant

C. Boltzmann constant

D. van der Waal's constant

Answer: C

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21. The density of the ideal gas is given by

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

B. $d = \frac{RT}{PM}$

C. $d = \frac{PR}{TM}$

D. $d = \frac{PT}{RM}$

Answer: A

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22. During evaporation of liquid

A. the temperature of the liquid rises

B. the temperature of the liquid falls

C. the temperature of the liquid remains unaffected

D. none of the above is correct.

Answer: B

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23. Surface tension 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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24. Capillary action of the liquid can be explained on the basis of its

A. resistance to flow

B. surface tension

C. heat of vaporisation

D. refractive index

Answer: B

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25. One atmosphere is numerically equal to approximately

A. 10^6 dynes cm^{-2}

B. 10^2 dynes cm^2

C. 10^4 dynes cm^{-2}

D. 10^8 dynes cm^{-2}

Answer: A

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26. The rate of diffusion of a gas is proportional to:

A. $\frac{P}{\sqrt{d}}$

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

C. $\sqrt{\frac{P}{d}}$

D. $\frac{\sqrt{P}}{d}$

Answer: A

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27. The temperature at which real gases obey the ideal gas laws over a wide range of low pressure is called:

A. Critical temperature

B. Inversion temperature

C. Boyle temperature

D. Reduced temperature

Answer: A

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28. A gas behaves like an ideal gas at :

A. High temperature low pressure

B. Low temperature, high pressure

C. High temperature, high pressure

D. Low temperature, low pressure

Answer: A

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29. When the temperature is increased, surface tension of water

A. increases

B. decreases

C. remain constant

D. Shows irregular behaviour

Answer: B

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