Physical Chemistry Assignment **IIT-JAM**

Gaseous State

1. Which one of the following statements is not correct about the three states of matter *i.e.* solid, liquid and gaseous
   (a) Molecules of a solid possess least energy whereas those of a gas possess highest energy
   (b) The density of solid is highest whereas that of gases is lowest
   (c) Gases like liquids possess definite volumes
   (d) Molecules of a solid possess vibratory motion
2. The temperature and pressure at which ice, liquid water and water vapour can exist together are
   (a) $0^\circ C, 1\,atm$ (b) $2^\circ C, 4.7\,atm$ (c) $0^\circ C, 4.7\,mm$ (d) $-2^\circ C, 4.7\,mm$
3. Which of the following is true about gaseous state
   (a) Thermal energy = Molecular attraction (b) Thermal energy >> Molecular attraction
   (c) Thermal energy << Molecular attraction (d) Molecular forces >> Those in liquids
4. Kinetic energy of molecules is highest in
   (a) Gases (b) Solids (c) Liquids (d) Solutions
5. Which of the following statement is correct
   (a) In all the three states the molecules possess random translational motion
   (b) Gases cannot be converted into solids without passing through liquid state
   (c) One of the common property of liquids and gases is viscosity
   (d) According to Boyle's law V/P is constant at constant T
6. A volume of 1 m^3 is equal to
   (a) $1000\,cm^3$ (b) $100\,cm^3$ (c) $10\,dm^3$ (d) $10^6\,cm^3$
7. Which one of the following is not a unit of pressure
   (a) Newton (b) Torr (c) Pascal (d) Bar
8. $1^\circ C$ rise in temperature is equal to a rise of
   (a) $1^\circ F$ (b) $9/5^\circ F$ (c) $5/9^\circ F$ (d) $33^\circ F$
9. Which of the following relations for expressing volume of a sample is not correct
   (a) $1L = 10^3\,ml$ (b) $1\,dm^3 = 1\,L$ (c) $1\,L = 10^3 m^3$ (d) $1L = 10^3 cm^3$
10. The temperature at which Celsius and Fahrenheit scales give the same reading is
    (a) $0^\circ C$ (b) $32^\circ F$ (c) $-40^\circ C$ (d) $40^\circ C$
11. One atmosphere is numerically equal to approximately
    (a) 10^6 dynescm^{-2} (b) 10^2 dynescm^{-2} (c) 10^4 dynescm^{-2} (d) 10^8 dynescm^{-2}
12. Torr is a unit of
    (a) Temperature (b) Volume (c) Pressure (d) Viscosity
13. Pressure of a gas in a vessel can be measured by

(a) Barometer (b) Manometer (c) Stalgometer (d) All the baove

14. A temperature of $-40^{\circ}C$ shall be equal to

(a) 233 K (b) $-40^{\circ}F$ (c) $-32^{\circ}F$ (d) Both (a) and (b)

15. Volume occupied by a gas at one atmospheric pressure and $0^{\circ}C$ is V mL. Its volume at 273 K will be

(a) V ml (b) $V/2$ ml (c) 2 V (d) None of these

16. Which one of the following statements is wrong for gases

(a) Gases do not have a definite shape and volume

(b) Volume of the gas is equal to the volume of the container confining the gas

(c) Confined gas exerts uniform pressure on the walls of its container in all directions

(d) Mass of the gas cannot be determined by weighing a container in which it is enclosed

17. If P, V, T represent pressure, volume and temperature of the gas, the correct representation of Boyle's law is

(a) $V \propto \frac{1}{T}$ (at constant P) (b) $PV = RT$ (c) $V \propto 1/P$ (at constant T) (d) $PV = nRT$

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

(a) The ratio of pressure and volume always remains constant

(b) Volume always remains constant

(c) Pressure always remains constant

(d) The product of pressure and volume always remains constant

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

(a) Boyle's law (b) Charle's law (c) Avogadro's law (d) Dalton's law

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

(a) $20 \times \frac{1}{50}$ (b) $50 \times \frac{1}{20}$ (c) $1 \times \frac{1}{20} \times 50$ (d) None of these

pressure is increased to 10^5 Pa, keeping the temperature constant, then the volume of the gas becomes

(a) 10 cc (b) 100 cc (c) 1 cc (d) 1000 cc

22. Which of the following statement is false

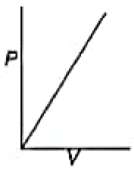
(a) The product of pressure and volume of fixed amount of a gas is independent of temperature

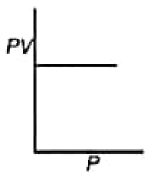
(b) Molecules of different gases have the same K.E. at a given temperature

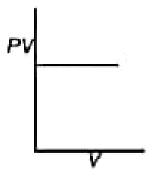
(c) The gas equation is not valid at high pressure and low temperature

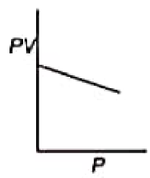
(d) The gas constant per molecule is known as Boltzmann constant

23. Which of the following graphs represent Boyle's law

(a) 

(b) 

(c) 

(d) 

respective pressures is

(a) 1 : 1 (b) 1 : 2 (c) 2 : 1 (d) 4 : 1

25. If pressure becomes double at the same absolute temperature on 2 L CO_2, then the volume of CO_2 becomes

(a) 2 L (b) 4 L (c) 25 L (d) 1 L

(a) Absolute temperature (b) Degree centigrade (c) Degree Fahrenheit (d) None

27. Which of the following expression at constant pressure represents Charle's law

(a) $V \propto \frac{1}{T}$ (b) $V \propto \frac{1}{T^2}$ (c) $V \propto T$ (d) $V \propto d$

28. Use of hot air balloons in sports and meteorological obsevations is an application of

(a) Boyle's law (b) Newtonic law (c) Kelvin's law (d) Charle's law

29. A 10 *g* of a gas at atmospheric pressure is cooled from $273^{\circ}C$ to $0^{\circ}C$ keeping the volume constant, its pressure would become

(a) 1/2 *atm* (b) 1/273 *atm* (c) 2 *atm* (d) 273 *atm*

30. At what temperature in the celsius scale, *V* (volume) of a certain mass of gas at $27^{\circ}C$ will be doubled keeping the pressure constant

(a) $54^{\circ}C$ (b) $327^{\circ}C$ (c) $427^{\circ}C$ (d) $527^{\circ}C$

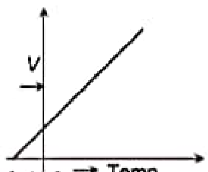
31. Volume of the air that will be expelled from a vessel of 300 cm^3 when it is heated from $27^{\circ}C$ to $37^{\circ}C$ at the same pressure will be

(a) 310 cm^3 (b) 290 cm^3 (c) 10 cm^3 (d) 37 cm^3

centigrade rise in temperature by definite fraction of its volume at

(a) $0^{\circ}C$ (b) Its critical temperature (c) Absolute zero (d) Its Boyle temperature

33. The following graph illustrates



(a) Dalton's law (b) Charle's law (c) Boyle's law (d) Gay-Lussac's law

pressure but at $273^{\circ}C$, its volume will be

(a) 0.4 *litres* (b) 0.8 *litres* (c) 27.8 *litres* (d) 55.6 *litres*

35. 300 *ml* of a gas at $27^{\circ}C$ is cooled to $-3^{\circ}C$ at constant pressure, the final volume is

(a) 540 *ml* (b) 135 *ml* (c) 270 *ml* (d) 350 *ml*

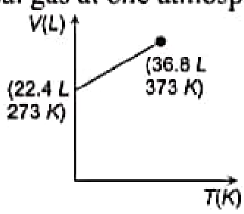
36. 400 cm^3 of oxygen at $27^{\circ}C$ were cooled to $-3^{\circ}C$ without change in pressure. The contraction in volume will be

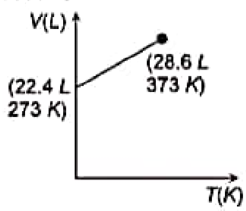
(a) 40 cm^3 (b) 30 cm^3 (c) 44.4 cm^3 (d) 360 cm^3

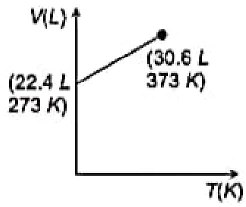
37. The pressure *p* of a gas is plotted against its absolute temperature *T* for two different constant volumes, V_1 and V_2. When $V_1 > V_2$, the

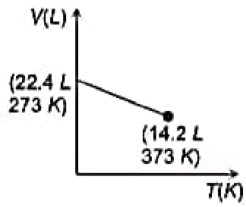
(a) Curves have the same slope and do not intersect (b) Curves must intersect at some point other than $T = 0$ (c) Curve for V_2 has a greater slope than that for V_1 (d) Curve for V_1 has a greater slope than that for V_2

38. Which of the following volume (*V*) – temperature (*T*) plots represents the behaviour of one mole of an ideal gas at one atmospheric pressure

(a)


(b)


(c)


(d)


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

(a) $\frac{2P_1T_1}{T_1+T_2}$ (b) $\frac{T_1}{2P_1T_2}$ (c) $\frac{2P_1T_2}{T_1+T_2}$ (d) $\frac{2P_1}{T_1+T_2}$

40. "One gram molecule of a gas at N.T.P. occupies 22.4 *litres*." This fact was derived from

(a) Dalton's theory (b)Avogadro's hypothesis (c)Berzelius hypothesis (d)Law of gaseous volume

41. In a closed flask of 5 *litres*, 1.0 *g* of H_2 is heated from 300 to 600 *K*. which statement is not correct

(a) Pressure of the gas increases (b)The rate of collision increases

(c) The number of moles of gas increases (d) The energy of gaseous molecules increases

42. Which one of the following statements is false

(a) Avogadro number $= 6.02 \times 10^{21}$

(b) The relationship between average velocity $(\bar{v})$ and root mean square velocity (u) is $\bar{v} = 0.9213u$

(c) The mean kinetic energy of an ideal gas is independent of the pressure of the gas

(d) The root mean square velocity of the gas can be calculated by the formula $(3RT/M)^{1/2}$

43. The compressibility of a gas is less than unity at STP. Therefore

(a) $V_m > 22.4$ *litres* (b) $V_m < 22.4$ *litres* (c) $V_m = 22.4$ *litres* (d) $V_m = 44.8$ *litres*

44. The number of moles of any gas is given by

(a) n/V (b) nN_A (c) N/N_A (d) mnN_A

45. In the ideal gas equation, the gas constant *R* has the dimensions of

(a) *mole-atm* K^{-1} (b) *litre mole* (c) *litre-atm* K^{-1} *mole*$^{-1}$ (d) *erg* K^{-1}

46. In the equation $PV = nRT$, which one cannot be the numerical value of *R*

(a) $8.31 \times 10^7\, erg\, K^{-1} mol^{-1}$ (b) $8.31 \times 10^7\, dyne\, cm\, K^{-1} mol^{-1}$

(c) $8.31\, JK^{-1} mol^{-1}$ (d) $8.31\, atm\, K^{-1} mol^{-1}$

47. Which one of the following indicates the value of the gas constant *R*

(a) 1.987 cal K^{-1} mol^{-1} (b) 8.3 cal K^{-1} mol^{-1} (c) 0.0821 *lit* K^{-1} mol^{-1} (d)1.987 Joules K^{-1} mol^{-1}

48. The constant *R* is

(a) Work done per molecule (b)Work done per degree absolute

(c) Work done per degree per mole (d)Work done per mole

49. Select one correct statement. In the gas equation, $PV = nRT$

(a) *n* is the number of molecules of a gas

(b) *V* denotes volume of one mole of the gas

(c) *n* moles of the gas have a volume *V*

(d) *P* is the pressure of the gas when only one mole of gas is present

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

(a) 0.082 *litre-atmopshere K* (b) 0.082 *litre-atmosphere* $K^{-1}\, mol^{-1}$

(c) 0.082 *litre-*$atmosphere^{-1}\, K\, mole^{-1}$ (d) 0.082 $litre^{-1}\, atmosphere^{-1}\, K\, mol$

51. S.I. unit of gas constant *R* is

(a) 0.0821 *litre atm* K^{-1} *mole*$^{-1}$ (b) 2 *calories* K^{-1} *mole*$^{-1}$

(c) 8.31 *joule* K^{-1} *mole*$^{-1}$ (d) None

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

(a) Only isothermal process (b)Only adiabatic process (c)Both (a) and (b) (d) None of these

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

(a) *PT/R* (b) *PRT* (c) *P/RT* (d) *RT/P*

54. If the pressure and absolute temperature of 2 *litres* of CO_2 are doubled, the volume of CO_2 would become

(a) 2 *litres* (b) 4 *litres* (c) 5 *litres* (d) 7 *litres*

55. If two moles of an ideal gas at 546 *K* occupy a volume of 44.8 *litres*, the pressure must be

(a) 2 *atm* (b) 3 *atm* (c) 4 *atm* (d) 1 *atm*

at 350 *K* and 1 *atm*. What is the volume of butane

(a) 495 cm^3 (b) 600 cm^3 (c) 900 cm^3 (d) 1700 cm^3

57. How many moles of *He* gas occupy 22.4 *litres* at $30°C$ and one atmospheric pressure

(a) 0.90 (b) 1.11 (c) 0.11 (d) 1.0

58. Volume of 0.5 *mole* of a gas at 1 *atm*. pressure and $273K$ is

(a) 22.4 *litres* (b) 11.2 *litres* (c) 44.8 *litres* (d) 5.6 *litres*

59. Pressure of a mixture of 4 *g* of O_2 and 2 *g* of H_2 confined in a bulb of 1 *litre* at $0°C$ is

(a) 25.215 *atm* (b) 31.205 *atm* (c) 45.215 *atm* (d) 15.210 *atm*

temperature is increased by one-third of absolute temperature, then final volume of the gas will be

(a) 80 *cc* (b) 88.9 *cc* (c) 66.7 *cc* (d) 100 *cc*

61. Correct gas equation is

(a) $\frac{V_1T_2}{P_1} = \frac{V_2T_1}{P_2}$ (b) $\frac{P_1V_1}{P_2V_2} = \frac{T_1}{T_2}$ (c) $\frac{P_1T_2}{V_1} = \frac{P_2V_2}{T_2}$ (d) $\frac{V_1V_2}{T_1T_2} = P_1P_2$

that of gas *B* is

(a) 2 (b) 1/2 (c) 4 (d) 1/4

occupied by the mixture will be nearly

(a) 22.4 *litres* (b) 33.6 *litres* (c) 448 *litres* (d) 44800 *ml*

gas will be

(a) 34 *g* (b) 340 *g* (c) 282.4 *g* (d) 28.24 *g*

$273°C$

(a) 391.8 *mL* (b) 380 *ml* (c) 691.6 *ml* (d) 750 *ml*

following temperatures will one *litre* of the same gas weigh one *gram*

(a) 450 *K* (b) 600 *K* (c) 800 *K* (d) 900 *K*

balloon is

(a) 24000 *litres* (b) 20000 *litres* (c) 10000 *litres* (d) 12000 *litres*

temperatures will its density become 0.75 *d*

(a) $20°C$ (b) $30°C$ (c) 400 *K* (d) 300 *K*

740 *mm* pressure, the temperature of the gas will be

(a) $21.6°C$ (b) $240°C$ (c) $-33°C$ (d) $89.5°C$

70. In an experiment during the analysis of a carbon compound, 145 cm^3 of H_2 was collected at 760 *mm Hg* pressure and $27°C$ temperature. The mass of H_2 is nearly

(a) 10 *g* (b) 12 *g* (c) 24 *g* (d) 6 *g* the gases under the same conditions is known as

(a) Boyle's law (b) Charle's law (c) Avogadro's law (d) Dalton's law

statement is a direct consequence of

(a) Avogadro's law (b) Charle's law (c) Ideal gas equation (d) Law of partial pressure

then their total pressure will be

(a) $P = P_A + P_B + P_C$ (b) $P = \frac{P_A + P_B + P_C}{6}$ (c) $P = \frac{\sqrt{P_A + P_B + P_C}}{3}$ (d) None

74. Dalton's law of partial pressure will not apply to which of the following mixture of gases

(a) H_2 and SO_2 (b) H_2 and Cl_2 (c) H_2 and CO_2 (d) CO_2 and Cl_2

75. Which of the following mixtures of gases does not obey Dalton's law of partial pressure

(a) O_2 and CO_2 (b) N_2 and O_2 (c) Cl_2 and O_2 (d) NH_3 and HCl

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

(a) 21 *mm Hg* (b) 751 *mm Hg* (c) 0.96 *atm* (d) 1.02 *atm*

of the resulting mixture (temperature remaining constant)

(a) 125 *mm* (b) 500 *mm* (c) 1000 *mm* (d) 250 *mm*

78. To which of the following gaseous mixtures is Dalton's law not applicable

(a) $Ne + He + SO_2$ (b) $NH_3 + HCl + HBr$ (c) $O_2 + N_2 + CO_2$ (d) $N_2 + H_2 + O_2$

79. Same mass of CH_4 and H_2 is taken in container. The partial pressure caused by H_2 is

(a) $\frac{8}{9}$ (b) $\frac{1}{9}$ (c) $\frac{1}{2}$ (d) 1

atm. The partial pressure of the light gas in this mixture is

(a) 0.55 *atm* (b) 0.11 *atm* (c) 1 *atm* (d) 0.12 *atm*

81. Rate of diffusion of a gas is

(a) Directly proportional to its density

(b) Directly proportional to its molecular mass

(c) Directly proportional to the square root of its molecular mass

(d) Inversely proportional to the square root of its molecular mass

82. Which of the following gas will have highest rate of diffusion

(a) NH_3 (b) N_2 (c) CO_2 (d) O_2

83. Which of the following relationship is correct, where *r* is the rate of diffusion of a gas and *d* is its density

(a) $r \propto \sqrt{1/d}$ (b) $r \propto \sqrt{d}$ (c) $r = d$ (d) $r \propto d$

is given by

(a) $(P_A / P_B)(M_A / M_B)^{1/2}$ (b) $(M_A / M_B)(P_A / P_B)^{1/2}$ (c) $(P_A / P_B)(M_B / M_A)^{1/2}$ (d) $(M_A / M_B)(P_B / P_A)^{1/2}$

(where *P* and *M* are the pressures and molecular weights of gases *A* and *B* respectively)

85. The ratio of the rate of diffusion of a given element to that of helium is 1.4. The molecular weight of the element is

(a) 2 (b) 4 (c) 8 (d) 16

86. The rate of diffusion of SO_2 and O_2 are in the ratio

(a) $1 : \sqrt{2}$ (b) 1 : 32 (c) 1 : 2 (d) 1 : 4

(a) 50 (b) 25 (c) $25\sqrt{2}$ (d) $50\sqrt{2}$

identical conditions is

(a) 27 (b) 72 (c) 36 (d) 48

89. Molecular weight of a gas that diffuses twice as rapidly as the gas with molecular weight 64 is

(a) 16 (b) 8 (c) 64 (d) 6.4

then that of oxygen in the same units will be

(a) 4 (b) 1/4 (c) 16 (d) 1/16

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

(a) 1/25 (b) 1/5 (c) 25 (d) 4

92. 50 *ml* of hydrogen diffuses out through a small hole from a vessel in 20 *minutes*. The time needed for 40 *ml* of oxygen to diffuse out is

(a) 12 *min* (b) 64 *min* (c) 8 *min* (d) 32 *min*

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

(a) 16 : 1 (b) 4 : 1 (c) 1 : 4 (d) 1 : 16

densities ρ_A and ρ_B are related by the expression

(a) $D_A = \left[D_B \cdot \frac{\rho_A}{\rho_B}\right]^{1/2}$ (b) $D_A = \left[D_B \cdot \frac{\rho_B}{\rho_A}\right]^{1/2}$ (c) $D_A = D_B\left(\frac{\rho_A}{\rho_B}\right)^{1/2}$ (d) $D_A = D_B\left(\frac{\rho_B}{\rho_A}\right)^{1/2}$

95. Atmolysis is a process of

(a) Atomising gas molecules (b) The breaking of atoms to sub-atomic particles

(c) Separation of gases from their gaseous mixture (d) Changing of liquids to their vapour state

simultaneously at both ends, the white ammonium chloride ring first formed will be

(a) At the centre of the tube (b) Near the hydrogen chloride bottle

(c) Near the ammonia bottle (d) Throughout the length of the tube

97. Which of the following pairs will diffuse at the same rate through a porous plug

(a) CO, NO_2 (b) NO_2, CO_2 (c) NH_3, PH_3 (d) NO C_2H_6

identical conditions

(a) 16 *g* (b) 1 *g* (c) 1/4 *g* (d) 64 *g*

99. A gas diffuse at a rate which is twice that of another gas *B*. The ratio of molecular weights of *A* to *B* is

(a) 1.0 (b) 0.75 (c) 0.50 (d) 0.25

diffuse through the same container in the same time under similar conditions

(a) 0.5 *g* (b) 4 *g* (c) 6 *g* (d) 8 *g*

molecular weight of the unknown gas

(a) $\frac{45^2}{18^2}\times 32$ (b) $\frac{18^2}{45^2}\times 32$ (c) $\frac{18^2}{45^2\times 32}$ (d) $\frac{45^2}{18^2\times 32}$

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

(a) $1:\sqrt{2}:2$ (b) 1 : 2 : 4 (c) $2:\sqrt{2}:1$ (d) $1:2:\sqrt{2}$

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

(a) 64.0 (b) 32.0 (c) 40.0 (d) 80.0

same volume of the gas specified below under identical condition is

(a) 10 *seconds* : *He* (b) 20 *seconds* : O_2 (c) 25 *seconds* : *CO* (d) 55 *seconds* : CO_2

105. At what temperature, the rate of effusion of N_2 would be 1.625 times that of SO_2 at $50°C$

(a) 110 K (b) 173 K (c) 373 K (d) 273 K

106. Given the reaction $C(s)+H_2O(l) \rightarrow CO(g)+H_2(g)$ calculate the volume of the gases produced at STP from 48.0 g of carbon

(a) 179.2 L (b) 89.6 L (c) 44.8 L (d) 22.4 L

107. Postulate of kinetic theory is

(a) Atom is indivisible (b) Gases combine in a simple ratio

(c) There is no influence of gravity on the molecules of a gas (d)None of the above

108. According to kinetic theory of gases,

(a) There are intermolecular attractions (b) Molecules have considerable volume

(c) No intermolecular attractions

(d)The velocity of molecules decreases after each collision

because it is

(a) The average velocity of the molecules

(b) The most probable velocity of the molecules

(c) The square root of the average square velocity of the molecules

(d) The most accurate form in which velocity can be used in these calculations

110. Kinetic energy of a gas depends upon its

(a) Molecular mass (b) Atomic mass (c) Equivalent mass (d) None of these

111. The kinetic theory of gases perdicts that total kinetic energy of a gaseous assembly depends on

(a) Pressure of the gas (b) Temperature of the gas

(c) Volume of the gas (d) Pressure, volume and temperature of the gas

112. According to kinetic theory of gases, the energy per mole of a gas is equal to

(a) 1.5 RT (b) RT (c) 0.5 RT (d) 2.5 RT

113. Internal energy and pressure of a gas per unit volume are related as

(a) $P=\frac{2}{3}E$ (b) $P=\frac{3}{2}E$ (c) $P=\frac{1}{2}E$ (d) $P=2E$

114. At what temperature will the average speed of CH_4 molecules have the same value as O_2 has at 300 K

(a) 1200 K (b) 150 K (c) 600 K (d) 300 K

115. The translational kinetic energy of an ideal gas depends only on its

(a) Pressure (b) Force (c) Temperature (d) Molar mass

helium is

(a) Two times that of a hydrogen molecule (b) Same as that of a hydrogen molecule

(c) Four times that of a hydrogen molecule (d) Half that of a hydrogen molecule

117. Which of the following is valid at absolute zero

(a) Kinetic energy of the gas becomes zero but the molecular motion does not become zero

(b) Kinetic energy of the gas becomes zero and molecular motion also becomes zero

(c) Kinetic energy of the gas decreases but does not become zero

(d) None of the above

118. If a gas is expanded at constant temperature

(a) The pressure increases

(b)The kinetic energy of the molecules remains the same

(c) The kinetic energy of the molecules decreases (d) The number of molecules of the gas increases

119. The average *K.E.* of an ideal gas in *calories* per mole is approximately equal to

(a) Three times the absolute temperature (b) Absolute temperature

(c) Two times the absolute temperature (d) 1.5 times the absolute temperature

120. According to kinetic theory of gases, for a diatomic molecule

(a) The pressure exerted by the gas is proportional to the mean velocity of the molecules

(b) The pressure exerted by the gas is proportional to the root mean square velocity of the molecules

(c) The root mean square velocity is inversely proportional to the temperature

(d) The mean translational kinetic energy of the molecules is proportional to the absolute temperature

121. At STP, 0.50 *mol* H_2 gas and 1.0 *mol He* gas

(a) Have equal average kinetic energies (b) Have equal molecular speeds

(c) Occupy equal volumes (d) Have equal effusion rates

kinetic energy, $\overline{K.E.}$, of *CO* and N_2 molecules at the same temperature

(a) $\overline{KE}_{CO} = \overline{KE}_{N_2}$

(b) $\overline{KE}_{CO} > \overline{KE}_{N_2}$

(c) $\overline{KE}_{CO} < \overline{KE}_{N_2}$

(d) Cannot be predicted unless the volumes of the gases are given

123. Indicate the correct statement for a 1-*L* sample of $N_2(g)$ and $CO_2(g)$ at 298 *K* and 1 *atm* pressure

(a) The average translational *KE* per molecule is the same in N_2 and CO_2

(b) The *rms* speed remains constant for both N_2 and CO_2

(c) The density of N_2 is less than that of CO_2

(d) The total translational *KE* of both N_2 and CO_2 is the same

124. With increase of pressure, the mean free path

(a) Decreases (b) Increases (c) Does not change (d) Becomes zero

125. Consider the following statements

The mean free path of gas molecules

(1) Decreases with increase in concentration

(2) Increases with decrease in pressure at constant temperature

(3) Decreases with increase in molecular size

(a) 1 and 2 (b) 1 and 3 (c) 2 and 3 (d) 1, 2 and 3

126. The ratio of root mean square velocity to average velocity of gas molecules at a particular temperature is

(a) 1.086 : 1 (b) 1 : 1.086 (c) 2 : 1.086 (d) 1.086 : 2

127. Which is not true in case of an ideal gas

(a) It cannot be converted into a liquid

(b) There is no interaction between the molecules

(c) All molecules of the gas move with same speed

(d) At a given temperature, PV is proportional to the amount of the gas

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

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

(c) $\frac{(n_1C_1^2)^{1/2}}{n_1}+\frac{(n_2C_2^2)^{1/2}}{n_2}+\frac{(n_3C_3^2)^{1/2}}{n_3}+......$ (d) $\left[\frac{(n_1C_1+n_2C_2+n_3C_3+....)^2}{(n_1+n_2+n_3+....)}\right]^{1/2}$

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

(a) 1 : 2 : 3 (b) $1:\sqrt{2}:\sqrt{3}$ (c) $\sqrt{2}:\sqrt{3}:\sqrt{8/\pi}$ (d) $\sqrt{2}:\sqrt{8/\pi}:\sqrt{3}$

velocity (a)

(a) $\alpha:v:u:1:1.128:1.224$ (b) $\alpha:v:u::1.128:1:1.224$ (c) $\alpha:v:u::1.128:1.224:1$ (d) $\alpha:v:u::1.124:1.228:1$

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

(a) SO_2 (b) CO_2 (c) O_2 (d) H_2

132. The temperature at which RMS velocity of SO_2 molecules is half that of He molecules at 300 K is

(a) 150 K (b) 600 K (c) 900 K (d) 1200 K

133. At $27°C$, the ratio of rms velocities of ozone to oxygen is

(a) $\sqrt{3/5}$ (b) $\sqrt{4/3}$ (c) $\sqrt{2/3}$ (d) 0.25

134. The average kinetic energy of an ideal gas per molecule in SI units at $25°C$ will be

(a) $6.17\times10^{-21}\ kJ$ (b) $6.17\times10^{-21}\ J$ (c) $6.17\times10^{-20}\ J$ (d) $7.16\times10^{-20}\ J$

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

(a) 273 K (b) 606 K (c) 303 K (d) 403 K

136. Among the following gases which one has the lowest root mean square velocity at $25°C$

(a) SO_2 (b) N_2 (c) O_2 (d) Cl_2

accomplished

(a) By heating the gas, the temperature is doubled

(b) By heating the gas, the pressure is quadrupled (*i.e.* made four times)

(c) By heating the gas, the temperature is quadrupled

(d) By heating the gas, the pressure is doubled

138. The rms velocity at NTP of the species can be calculated from the expression

(a) $\sqrt{\frac{3P}{d}}$ (b) $\sqrt{\frac{3PV}{M}}$ (c) $\sqrt{\frac{3RT}{M}}$ (d) All the above

139. Root mean square velocity of a gas molecule is proportional to

(a) $m^{1/2}$ (b) m^0 (c) $m^{-1/2}$ (d) m

in temperature due to

(a) Increase in the average molecular speed (b)Increased rate of collision amongst molecules

(c) Increase in molecular attraction (d) Decrease in mean free path

141. The root mean square speeds at STP for the gases H_2, N_2, O_2 and HBr are in the order

(a) $H_2<N_2<O_2<HBr$ (b) $HBr<O_2<N_2<H_2$ (c) $H_2<N_2=O_2<HBr$ (d) $HBr<O_2<H_2<N_2$

142. Molecular velocities of the two gases at the same temperature are u_1 and u_2. Their masses are m_1 and m_2 respectively. Which of the following expressions is correct

(a) $\frac{m_1}{u_1^2} = \frac{m_2}{u_2^2}$ (b) $m_1u_1 = m_2u_2$ (c) $\frac{m_1}{u_1} = \frac{m_2}{u_2}$ (d) $m_1u_1^2 = m_2u_2^2$

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

(a) $\sqrt{927/27}$ times the earlier value (b) Same as before

(c) Halved (d) Doubled

144. The ratio between the root mean square velocity of H_2 at 50 *K* and that of O_2 at 800 *K* is

(a) 4 (b) 2 (c) 1 (d) 1/4

145. The root mean square velocity of an ideal gas at constant pressure varies density (*d*) as

(a) d^2 (b) d (c) $\sqrt{d}$ (d) $1/\sqrt{d}$

146. Consider a mixture of SO_2 and O_2 kept at room temperature. Compared to the oxygen molecule, the SO_2 molecule will hit the wall with

(a) Smaller average speed (b) Greater average speed (c) Greater kinetic energy (d) Greater mass

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

(a) $u/2$ (b) 2*u* (c) 4*u* (d) 14*u*

148. Choose the correct arrangement, where the symbols have their usual meanings

(a) $\overline{u} > u_p > u_{rms}$ (b) $u_{rms} > \overline{u} > u_p$ (c) $u_p > \overline{u} > u_{rms}$ (d) $u_p > u_{rms} > \overline{u}$

149. The Vander Waal's equation explains the behaviour of

(a) Ideal gases (b) Real gases (c) Vapour (d) Non-real gases

150. Gases deviate from the ideal gas behaviour because their molecule

(a) Possess negligible volume (b) Have forces of attraction between them

(c) Are polyatomic (d) Are not attracted to one another

151. The compressibility factor of a gas is defined as $Z = PV/RT$. The compressibility factor of ideal gas is

(a) 0 (b) Infinity (c) 1 (d) –1

152. In Vander Waal's equation of state for a non-ideal gas, the term that accounts for intermolecular forces

(a) $(V-b)$ (b) $(RT)^{-1}$ (c) $\left(P+\frac{a}{V^2}\right)$ (d) *RT*

153. Vander Waal's equation of state is obeyed by real gases. For *n* moles of a real gas, the expression will be

(a) $\left(\frac{P}{n}+\frac{na}{V^2}\right)\left(\frac{V}{n-b}\right) = RT$ (b) $\left(P+\frac{a}{V^2}\right)(V-b) = nRT$ (c) $\left(P+\frac{na}{V^2}\right)(nV-b) = nRT$ (d) $\left(P+\frac{n^2a}{V^2}\right)(V-nb) = nRT$

154. Any gas shows maximum deviation from ideal gas at

(a) $0°C$ and 1 atmospheric pressure (b) $100°C$ and 2 atmospheric pressure

(c) $-100°C$ and 5 atmospheric pressure (d) $500°C$ and 1 atmospheric pressure

155. The temperature at which the second virial coefficient of real gas is zero is called

(a) Critical temperature (b) Eutetic point (c) Boiling point (d) Boyle's temperature

156. When is deviation more in the behaviour of a gas from the ideal gas equation $PV = nRT$

(a) At high temperature and low pressure
(b) At low temperature and high pressure
(c) At high temperature and high pressure
(d) At low temperature and low high pressure

157. Vander Waal's constants 'a' and 'b' are related with respectively

(a) Attractive force and bond energy of molecules
(b) Volume and repulsive force of molecules
(c) Shape and repulsive forces of molecules
(d) Attractive force and volume of the molecules

158. Gas deviates from ideal gas nature because molecules

(a) Are colourless
(b)Attract each other
(c) Contain covalent bond
(d)Show Brownian movement

159. The Vander Waal's equation reduces itself to the ideal gas equation at

(a) High pressure and low temperature
(b) Low pressure and low temperature
(c) Low pressure and high temperature
(d) High pressure and high temperature

160. The compressibility factor for an ideal gas is

(a) 1.5
(b) 1.0
(c) 2.0
(d) ∞

161. When an ideal gas undergoes unrestrained expansion, no cooling occurs because the molecules

(a) Are above the inversion temperature
(b) Exert no attractive force on each other
(c) Do work equal to loss in kinetic energy
(d) Collide without loss of energy

to behave like an ideal gas

(a) When the temperature is low
(b)When both the temperature and pressure are low
(c) When both the temperature and pressure are high
(d) When the temperature is high and pressure is low

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

(a) 15 *atm* and 200 *K*
(b) 1 *atm* and 273 *K*
(c) 0.5 *atm* and 500 *K*
(d) 15 *atm* and 500 *K*

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

(a) Critical temperature
(b) Boyle temperature
(c) Inversion temperature
(d) Reduced temperature

165. At low pressure, the Vander Waal's equation is reduced to

(a) $Z = \frac{pV_m}{RT} = 1 - \frac{ap}{RT}$
(b) $Z = \frac{pV_m}{RT} = 1 + \frac{b}{RT}p$
(c) $pV_m = RT$
(d) $Z = \frac{pV_m}{RT} = 1 - \frac{a}{RT}$

166. At high temperature and low pressure, the Vander Waal's equation is reduced to

(a) $\left(p + \frac{a}{V_m^2}\right)(V_m) = RT$
(b) $pV_m = RT$
(c) $p(V_m - b) = RT$
(d) $\left(p + \frac{a}{V_m^2}\right)(V_m - b) = RT$

167. Which set of conditions represents easiest way to liquefy a gas

(a) Low temperature and high pressure
(b) High temperature and low pressure
(c) Low temperature and low pressure
(d) High temperature and high pressure

168. Adiabatic demagnetisation is a technique used for

(a) Adiabatic expansion of a gas
(b) Production of low temperature
(c) Production of high temperature
(d) None

169. An ideal gas can't be liquefied because
(a) Its critical temperature is always above $0°C$ (b) Its molecules are relatively smaller in size
(c) It solidifies before becoming a liquid
(d) Forces operative between its molecules are negligible
170. However great the pressure, a gas cannot be liquefied above its
(a) Boyle temperature (b) Inversion temperature (c) Critical temperature (d) Room temperature
171. 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 cannot be liquefied at any value of *P* and *T*
172. The Vander Waal's parameters for gases *W*, *X*, Y and *Z* are

Gas	*a* (*atm* L^2 mol^{-2})	*b* (*L* mol^{-1})
W	4.0	0.027
X	8.0	0.030
Y	6.0	0.032
Z	12.0	0.027

Which one of these gases has the highest critical temperature
(a) *W* (b) *X* (c) *Y* (d) *Z*
$L^2\ atm mol^{-2}$ respectively. The gas which can be most easily liquefied is
(a) O_2 (b) N_2 (c) NH_3 (d) CH_4
174. A gas can be easily liquefied
(a) When its inversion temperature equals the Boyle temperature
(b) Under adiabatic expansion
(c) Under pressure when it is cooled to below the critical temperature
(d) At low pressure and above the critical temperature
175. Which of the following is correct for critical temperature
(a) It is the highest temperature at which liquid and vapour can coexist
(b) Beyond the critical temperature, there is no distinction between the two phases and a gas cannot be liquefied by compression
(c) At critical temperature (T_c) the surface tension of the system is zero
(d) At critical temperature the gas and the liquid phases have different critical densities
176. A gas has a density of 2.68 g/L at stp. Identify the gas
(a) NO_2 (b) *Kr* (c) *COS* (d) SO_2
177. Who among the following scientists has not done any important work on gases
(a) Boyle (b) Charles (c) Avogadro (d) Faraday
178. The ratio γ for inert gases is
(a) 1.33 (b) 1.66 (c) 2.13 (d) 1.99
179. The density of neon will be highest at
(a) S.T.P. (b) $0°C, 2\,atm$ (c) $273°C, 1\,atm$ (d) $273°C, 2\,atm$

180. Absolute zero is defined as the temperature

(a) At which all molecular motion ceases (b) At which liquid helium boils

(c) At which ether boils (d) All of the above

the least volume

(a) *HF* (b) *HCl* (c) *HBr* (d) *HI*

182. Which of the following is most polarised among noble gases

(a) *He* (b) *Xe* (c) *Kr* (d) *Rn*

183. Dimensions of pressure are the same as that of

(a) Energy (b) Force (c)Energy per unit volume (d) Force per unit volume

184. Which of the following exhibits the weakest intermolecular forces

(a) NH_3 (b) *HCl* (c) *He* (d) H_2O

will be filled first

(a) N_2 (b) O_2 (c) H_2 (d) *Ne*

186. Weight of 112 *ml* of oxygen at NTP on liquefaction would be

(a) 0.32 *g* (b) 0.64 *g* (c) 0.16 *g* (d) 0.96 *g*

of *B* is

(a) 3 *M* (b) $\sqrt{3}\,M$ (c) $M/3$ (d) $M/\sqrt{3}$

SO_2 at the same temperature and pressure, and again weighted. The weight of oxygen will be

(a) The same as that of SO_2 (b) $\frac{1}{2}$ that of SO_2 (c) Twice that of SO_2 (d) One fourth that of SO_2

189. The vapour density of a gas is 11.2. The volume occupied by 11.2 *g* of this gas at N.T.P. is

(a) 1 *L* (b) 11.2 *L* (c) 22.4 *L* (d) 20 *L*

mass of the mixture in grams is

(a) 6.2 (b) 4.12 (c) 3.09 (d) 7

191. Volume of 4.4 *g* of CO_2 at NTP is

(a) 22.4 *L* (b) 44.8 *L* (c) 2.24 *L* (d) 4.48 *L*

192. The energy of an ideal gas depends only on its

(a) Pressure (b) Volume (c) Number of moles (d) Temperature

193. Ratio of C_p and C_v of a gas '*X*' is 1.4. The number of atoms of the gas '*X*' present in 11.2 *litres* of it at N.T.P. is

(a) 6.02×10^{23} (b) 1.2×10^{24} (c) 3.01×10^{23} (d) 2.01×10^{23}

194. The density of air is 0.00130 *g/ml*. The vapour density of air will be

(a) 0.00065 (b) 0.65 (c) 14.4816 (d) 14.56

then the volume occupied by water molecules in 1 *litre* of steam at that temperature is

(a) 6 cm^3 (b) 60 cm^3 (c) 0.6 cm^3 (d) 0.06 cm^3

of temperature and pressure will be

(a) $N/2$ (b) *N* (c) 2*N* (d) 4*N*

197. Consider the following statements :

(1) Joule-Thomson experiment is isoenthalpic as well as adiabatic.

(2) A negative value of μ_{JT} (Joule Thomson coefficient corresponds to warming of a gas on expansion.

(3) The temperature at which neither cooling nor heating effect is observed is known as inversion temperature.

Which of the above statements are correct

(a) 1 and 2 (b) 1 and 3 (c) 2 and 3 (d) 1, 2 and 3

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

$(R = 0.082\, litre\, atm\, mol^{-1}\, deg^{-1})$

(a) At STP (b) When $V = 22.4\, litres$

(c) When $T = 12\, K$ (d) Impossible under any conditions

an ideal gas, the density is given by

(a) $\frac{RT}{PM}$ (b) $\frac{P}{RT}$ (c) $\frac{M}{V}$ (d) $\frac{PM}{RT}$

200. An ideal gas will have maximum density when

(a) $P = 0.5\, atm, T = 600\, K$ (b) $P = 2\, atm, T = 150\, K$ (c) $P = 1\, atm, T = 300\, K$ (d) $P = 1.0\, atm, T = 500\, K$

ANSWER KEY GASEOUS STATE 200 QUESTION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
c	c	b	a	c	d	a	b	c	c	a	c	b	d	a	d	c	d	a	a
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
a	a	c	a	b	a	c	d	a	b	c	a	b	a	c	a	d	c	a	b
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
c	a	b	c	c	d	a	c	c	b	c	c	c	a	a	a	a	a	a	b
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
b	c	d	c	c	a	b	c	c	b	d	a	a	b	d	c	d	b	a	c
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
d	a	a	c	a	a	a	b	a	b	a	b	b	d	c	b	d	b	d	d
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120

a	a	a	b	c	a	d	c	d	d	b	a	a	b	c	b	b	b	a	d
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
a	a	a,c,d	a	d	a	c	a	d	a	d	d	c	b	b	d	b	d	c	a
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
b	d	d	c	d	d	b	b	b	b	c	c	d	c	d	b	d	b	c	b
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
b	d	c	b	a	b	a	b	d	c	d	d	c	b	a,b,c	c	d	b	b	a
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
d	d	c	c	c	c	c	b	b	a	c	d	a	d	c	c	d	c	d	b