Date Planned : __ / __ / __	Daily Tutorial Sheet-4	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level-1	Exact Duration :_________

46. Which pair of molecules has the strongest dipole – dipole interactions ?

(A) NH_3 and CH_4 **(B)** NH_3 and NH_3

(C) CH_4 and CH_4 **(D)** CO_2 and CO_2

47. The ratio of van der Waals constants a and b, $\left(\frac{a}{b}\right)$ has the dimension of :

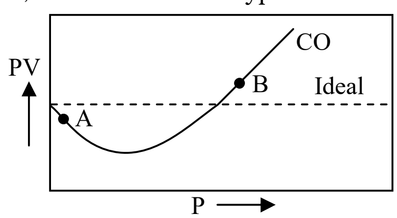
(A) atm L^{-1} **(B)** L atm mol^{-1} **(C)** L mol^{-1} **(D)** atm L mol^{-2}

48. The van der Waals 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

49. For CO, isotherm is of the type as shown:



Near the point A, compressibility factor Z (for 1 mol of CO) is :

(A) $\left(1+\frac{b}{V}\right)$ **(B)** $\left(1-\frac{b}{V}\right)$ **(C)** $\left(1+\frac{a}{RTV}\right)$ **(D)** $\left(1-\frac{a}{RTV}\right)$

50. In the above Question, near the point B, compressibility factor Z is about :

(A) $\left(1-\frac{Pb}{RT}\right)$ **(B)** 1 **(C)** $\left(1+\frac{Pb}{RT}\right)$ **(D)** $\left(1-\frac{a}{RTV}\right)$

51. The van der Waal's equation of state for one mole of CO_2 gas at low pressure will be :

(A) $\left(P+\frac{a}{V^2}\right)V = RT$ **(B)** $P(V-b) = RT - \frac{a}{V^2}$

(C) $P = \frac{RT}{V-b}$ **(D)** $P = \left(\frac{RT}{V-b} - \frac{a}{V^2}\right)$

52. Express the average kinetic energy per mole of a monoatomic gas of molar mass M, at temperature T K in terms of the average speed of the molecules U_{avg} :

(A) $\frac{8M}{3\pi}U_{avg}^2$ **(B)** $\frac{4M}{3\pi}U_{avg}^2$ **(C)** $\left(\frac{2M}{\pi}\right)U_{avg}^2$ **(D)** $\left(\frac{3\pi M}{16}\right)U_{avg}^2$

53. Ice, water and steam can exist simultaneously at:

(A) All temperatures **(B)** All pressures

(C) All temperatures and pressure **(D)** Triple point

54. 1 mole of each of X_1, X_2, X_3 with van der Waal's constants a (in atm L^3 mol^{-2}) 1.0, 3.8, 2.1 respectively is kept separately in three different vessels of equal volume at identical temperature. Their pressures are observed to be P_1, P_2 and P_3 respectively. On the basis of this data alone, select the correct option (neglect the effect of 'b'):

(A) $P_1 < P_2 < P_3$ **(B)** $P_2 < P_1 < P_3$ **(C)** $P_2 < P_3 < P_1$ **(D)** $P_1 = P_2 = P_3$

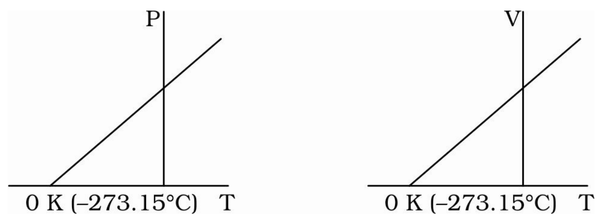
55. At a high pressure, the compressibility factor (Z) of a real gas is usually greater than one. This can be explained from van der Waals equation by neglecting the value of:

(A) b **(B)** a **(C)** Both a and b **(D)** V

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

(A) 10% **(B)** 20% **(C)** 5% **(D)** 50%

57. What conclusion would you draw from the following graphs for an ideal gas?



(A) As the temperature is reduced, the volume as well as the pressure increases

(B) As the temperature is reduced, the volume becomes zero and the pressure reaches infinity

(C) As the temperature is reduced, the pressure decreases

(D) A point is reached where, theoretically, the volume becomes zero

58. Which of the following represents the van der Waal equation for n moles of a real gas ?

(A) $\left(P + \frac{a}{V^2}\right)(V - b) = nRT$ **(B)** $\left(P + \frac{a}{nV^2}\right)(V - nb) = nRT$

(C) $\left(P + \frac{n^2a}{V^2}\right)(V - nb) = nRT$ **(D)** $\left(P + \frac{na}{V^2}\right)(V - nb) = nRT$

59. Which of the following equations represents the compressibility factor for 1 mol of gas.

(A) $Z = \frac{PV}{R}$ **(B)** $Z = \frac{PV}{T}$ **(C)** $Z = \frac{RT}{PV}$ **(D)** $Z = \frac{PV}{RT}$

60. At high pressure, the van der Waals equation is reduced to :

(A) $\left(P + \frac{n^2a}{V^2}\right) = nRT$ **(B)** $P(V - b) = nRT$

(C) $P(V - nb) = nRT$ **(D)** $PV = nRT$