61. The Boltzmann constant (k_B) is :

(A) RN_A (B) $\dfrac{N_A}{R}$ (C) $\dfrac{R}{N_A}$ (D) $\dfrac{R}{N_A} \times T$

62. The dimensions of Van der Waals constants a and b are respectively,

(A) $bar\ L^2\ mol^{-2}\ and\ L\ mol^{-1}$ (B) $bar\ L^2\ mol^{-1}\ and\ L^{-1}mol^{-1}$

(C) $bar\ L^2\ mol^2\ and\ L^{-1}\ mol^{-1}$ (D) $bar^{-1}\ L^2\ mol^{-2}\ and\ L^{-2}\ mol^{-1}$

63. Which of the following gases has the highest value of the van der Waals constant a ?

(A) $CCl_4(g)$ (B) $NH_3(g)$ (C) $CO_2(g)$ (D) $H_2O(g)$

64. The Boyle temperature for real gases is given by :

(A) a / R (B) a / bR (C) $2a / bR$ (D) None of these

65. A 4.40 g piece of solid CO_2 (dry ice) is allowed to sublime in a balloon. The final volume of the balloon is 1.00 L at 300 K. What is the pressure (atm) of the gas?

(A) 0.122   (B) 2.46   (C) 122   (D) 24.6

66. A He atom at 300 K is released from the surface of the earth to travel upwards. Assuming that it undergoes no collision with other molecules, how high will it be before coming to rest?
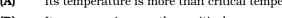
(A) 9.53 m   (B) 95.3 m   (C) 953 m   (D) 9.53×10^4 m

67. An ideal gas obeying kinetic gas equation can be liquefied if :

(A) Its temperature is more than critical temperature

(B) Its pressure is more than critical pressure

(C) Its pressure is more than critical pressure but temperature is less than critical temperature
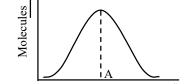
(D) It cannot be liquefied at any value of P and T

68. The pressure of real gas is less than the pressure of an ideal gas because of :

(A) Increase in collisions   (B) Increase in intermolecular forces

(C) Finite size of molecules   (D) Statement is incorrect

69. Distribution of molecules with velocity is represented by the curve as shown; velocity at point A is :

(A) $\sqrt{\dfrac{3RT}{M}}$ (B) $\sqrt{\dfrac{2RT}{M}}$

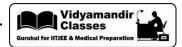(C) $\sqrt{\dfrac{8RT}{\pi M}}$ (D) $\sqrt{\dfrac{RT}{M}}$

70. A balloon filled with ethyne is pricked with a sharp point and quickly dropped in a tank of H_2 gas under identical conditions. After a while the balloon will have

(A) Shrunk   (B) Enlarged

(C) Completely collapsed   (D) Remained unchanged in size

71. If X_m, X_p and X_v represent mole fraction, pressure fraction and volume fraction respectively then: ▶

    (A) $X_m = X_p = X_v$ **(B)** $X_m = \dfrac{1}{X_p} = \dfrac{1}{X_v}$ **(C)** $X_m = X_p = \dfrac{1}{X_v}$ **(D)** $\dfrac{1}{X_m} = \dfrac{1}{X_p} = X_v$

72. A 100 mL flask contained H_2 at 200 Torr, and a 200 mL flask contained He at 100 Torr. The two flask were then connected so that each gas filled their combined volume. Assuming no change in temperature, total pressure is:

    (A)   300 Torr   **(B)**   66.66 Torr   **(C)**   150 Torr   **(D)**   133.33 Torr

73. Ratio of the rate of diffusion of He to H_2 at $0°C$ is same in the case :

    (A)   When temperature is changed to 100°C

    (B)   When O_2 and CH_4 are taken instead of He and H_2

    (C)   When volume of the flask is doubled

    (D)   All the above are correct

74. Which of the following statements is not true about the effect of an increase in temperature on the distribution of molecular velocities in a gas? ▶

    (A)   The most probable velocity increases

    (B)   The fraction of the molecules with the most probable speed increases

    (C)   The distribution becomes broader

    (D)   The area under the curve remains unaffected

75. Which of the following comparisons of the average kinetic energy and the average molecular speeds of H_2 and N_2 gases at 300 K is CORRECT?

	List 1 [Average kinetic energy]	List 2 [Average molecular speed]
(A)	$H_2 = N_2$	$H_2 = N_2$
(B)	$H_2 < N_2$	$H_2 > N_2$
(C)	$H_2 = N_2$	$H_2 < N_2$
(D)	$H_2 = N_2$	$H_2 > N_2$