BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: IMSC   SEMESTER: I
BRANCH: CHEMISTRY   SESSION: MO/2018

SUBJECT: CH104 PHYSICAL CHEMISTRY-I: STATES OF MATTER & IONIC EQUILIBRIUM

TIME: 2 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates may attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.

Q1. (a) Estimate the heat capacity 'C_V' of HCN at high temperature.   [2]
Q1. (b) Calculate the most probable velocities of O_2 at 25 °C.   [3]

Q2. (a) What are the two types of intermolecular interactions responsible for deviations from   [2]
          ideal gas behaviour, and indicate their effect on the pressure?
Q2. (b) The collision diameter for He is 207 pm and for CH_4, 414 pm. How does the mean free   [3]
          path for He compare with that for CH_4 under same conditions?

Q3. (a) What is critical temperature 'T_C' and mention its physical significance?   [2]
Q3. (b) The critical temperature of ethane is 32.3 °C, and the critical pressure is 48.2 atm.   [3]
          Compute the critical volume and the van der Waals constant 'b'.

Q4. (a) Why does the viscosity of a gas increase with increasing temperature?   [2]
Q4. (b) The van der Waals constant 'b' of N_2O is 0.044 $dm^3 mol^{-1}$. Estimate the viscosity at 25°   [3]
          C.

Q5. (a) The viscosity of a fluid in motion is 1Poise. What will be its viscosity (in Poise) when the   [2]
          fluid is at rest?-Explain
Q5. (b) The enthalpy of vaporization of cyclohexane (C_6H_{12}) at its boiling point 80.75 ^{0}C is 385.15   [3]
          J g^{-1}. The densities of liquid and vapour at this temperature are 0.719 g cm^{-3} and 0.0029
          g cm^{-3} respectively. (a) Calculate the value of dp/dT. (b) Estimate the boiling point at
          740 mmHg.

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