MSc DEGREE END SEMESTER EXAMINATION- NOVEMBER 2017
SEMESTER 1 : CHEMISTRY / PHARMACEUTICAL CHEMISTRY
COURSE : **16P1CHET03 / 16P1CPHT03 - PHYSICAL CHEMISTRY - I**
(Common for Regular - 2017 / Supplementary - 2016 Admissions)

Time : Three Hours   Max. Marks: 75

Section A
Answer any 10 (2 marks each)

1. What is the mean relative speed of hydrogen molecules with respect to oxygen molecules at 298 K?

2. What is effusion? Can this be used in enrichment of isotopes?

3. Write the expression for average velocity?

4. What is the effect of pressure on collision frequency

5. What is the significance for Maxwell's Law?

6. Define Fermi energy and give the equation to calculate Fermi energy.

7. Give a brief explanation of Bose-Einstein condensation.

8. What is meant by Fermi energy?

9. Briefly explain the need of quantum statistics.

10. What are transport processes? Give examples.

11. Define the term uncompensated heat and explain its significance.

12. Draw the phase diagram of a ternary liquid system A-B-C, where all the three are partially miscible pairs.

13. Applying the concept of chemical potential, prove that gases spontaneously mixes into each other.

                                                                            (2 x 10 = 20)

Section B
(Answer any 5 questions by attempting not more than 3 questions from each of the following bunches) **(5 marks each)**

Bunch I (Short Essay Type)

14. Define (i) RMS (ii) Average and (iii) Most probable velocities. Give the formula to calculate each of them.

15. Obtain an expression for the most probable distribution of Bosons.

16. Derive the expression for the rotational partition function of a molecule at a condition of characteristic rotational temperature (Θr) smaller compared to 'T'.

17. Briefly explain a method for the detemination of absolute entropy of a perfectly crystalline substance.

Bunch II (Problem Type)

18. A gas diffuses through an opening at a rate one third as fast that of Helium gas. What is the molar mass of the unknown gas?

19. Calculate the translational partition function of the hydrogen molecule confined to a vessel of volume $1000cm^3$ at 27^0C.

20. O_2 molecule in the ground state has 2 unpaired electron. Calculate the statistical weight factor of the state. Also calculate the partition function of O_2 molecule in the ground state.

21. The emf of a thermocouple, one junction of which is at $0\ ^0C$ is given by;

    $E = 1600t - 4t^2$

    where, t is the temperature of the hot junction expressed in ^0C. Calculate Peltier coefficient at $27\ ^0C$.

    (5 x 5 = 25)

Section C
Answer any 2 (15 marks each)

22. Explain the postulates and derive the distribution law for Bose-Einstein and Fermi-Dirac statistics.

23. Compare the classical statistical mechanics and quantum statistics in terms of the nature of particles and distribution laws. Comment on the limit of applicability of the three distribution laws.

24. Give a detailed account of thermoelectric and electrokinetic phenomena.

25. Give a brief account of thermodynamic functions of mixing and excess thermodynamic functions.

(15 x 2 = 30)