

Q.P. Code : 60763

Second Semester M.Sc. Degree Examination, July 2019

(CBCS Scheme)

Chemistry

Paper C 203 – PHYSICAL CHEMISTRY – II

Time : 3 Hours

(Max. Marks : 70)

Instructions to Candidates : Answer Question Number 1 and any FIVE of the remaining.

1. Answer any **TEN** of the following **(10 × 2 = 20)**
- (a) Give the classification of ensembles with a sketch to each.
 - (b) Define the terms "activity" and "fugacity".
 - (c) State the phase rule and define the terms.
 - (d) Write the Sackur-Tetrode equation and mention its significance.
 - (e) What is uncompensated heat?
 - (f) Differentiate between coupled and non-coupled reactions.
 - (g) What is meant by surface excess?
 - (h) Write the Debye-Huckel-Onsager conduction equation and expand the terms.
 - (i) Calculate the double layer capacitance when the thickness of the double layer is 1.99×10^{-6} cm and the value of $\epsilon = 79$.
 - (j) Outline the structure of electrified interface.
 - (k) Mention the advantages of dropping mercury electrode.
 - (l) Give the Ilkovic equation and mention its importance.
2. (a) Derive Gibbs-Duhem-Margules equation.
(b) What are excess thermodynamic functions? Obtain the equation for any two of them. **(5 + 5)**
3. (a) Derive equation for rotation partition function. Calculate the rotation partition function for N_2 at 25 °C when the moment of inertia of N_2 is 1.45×10^{-39} gcm².
(b) Give a comparison of Bose-Einstein and Fermi-Dirac statistics. **(6 + 4)**

Q.P. Code : 60763

4. (a) What are phenomenological laws? Mention their importance.
(b) Give an account of the following:
(i) de-Donder's inequality and
(ii) Onsager's reciprocity relations.
(c) How is the rate of entropy production measured? (3 + 4 + 3)
5. (a) Derive Debye-Huckel-Onsager equation.
(b) Give an account of the Debye-Huckel limiting law and explain why it is called limiting law. (6 + 4)
6. (a) What are triple ions? Explain their conductivity and conductivity minima.
(b) State and explain the Lippmann capillary equation. Discuss the experimental determination of interfacial tension. (4 + 6)
7. (a) What is over potential? Explain the significance of concentration over potential.
(b) Discuss the Stern model for structure of electrified interface and mention its failures. (4 + 6)
8. (a) Give the procedural steps of polarography and explain the polarogram.
(b) Explain how the quantitative analysis is made using polarography technique.
(c) What is electrocatalysis? Differentiate between electrocatalysis and chemical catalysis. (4 + 3 + 3)