



**II Semester M.Sc. Degree Examination, June/July 2014**  
**(NS) (2010-11 & Onwards)**  
**CHEMISTRY**  
**C-203 : Physical Chemistry – II**

Time : 3 Hours

Max. Marks : 80

***Instruction : Answer question no. 1 and any five of the remaining.***

1. Answer **any ten** of the following : **(10×2=20)**
- a) Write the phase rule equation and define the terms phase, component and degree of freedom.
  - b) Explain the term activity. How is it related to fugacity ?
  - c) Give the significance of partial molar volume.
  - d) Differentiate between canonical and micro-canonical ensembler.
  - e) What do you mean by partition function ? Define molar partition function.
  - f) Calculate the number of ways of distributing distinguishable molecules x, y and z between three energy levels. Each energy level is occupied by one molecule.
  - g) Write the Lippmann capillary equation and how do you determine charge density from it ?
  - h) Write the Tafel equation and give its significance.
  - i) Justify the statement that the thickness of the ionic atmosphere decreases with increase in concentration of the electrolyte.
  - j) Calculate the capacitance of the double layer when the thickness of the double layer is  $1.5 \times 10^{-8}$  cm and dielectric constant of the medium is 80.
  - k) Describe the Gouy-Chapmann model and give its significance.
  - l) Define the terms “Concentration overpotential” and “activation overpotential”.



2. a) Obtain Gibbs- Duhem- Margules Equation and give its significance.  
b) Write the definition of activity coefficient. How do you determine the activity coefficient using EMF method ? **(6+6=12)**
3. a) Write the assumptions made by Dulong-Petit, Einstein and Debye for explaining heat capacity of solids. Write the limitation of Einstein's equation.  
b) Derive the equation for Fermi-Dirac statistics. **(5+7=12)**
4. a) Obtain an expression for translational partition function and give the expression for internal energy E and entropy in terms of partition function.  
b) What are irreversible processes ? Obtain the expressions for entropy production and entropy balance for irreversible processes.  
c) Calculate the rotational partition function of  $H_2$  at 273 K. ( $\sigma = 2$  and  $I = 4.0 \times 10^{-41} \text{ g.cm}^2$ ) **(5+4+3=12)**
5. a) Describe the Bjerrum's concept for ion association and explain the formation of triple ions.  
b) Write the Ilkovic equation and explain how polarographic technique is useful in both qualitative and quantitative estimation ? **(6+6=12)**
6. a) Describe the process of electrocatalysis and give the various factors affecting it.  
b) Describe the experimental technique to measure the interfacial tension as a function of applied potential difference across the interface. **(7+5=12)**
7. a) Under what conditions do electrons tunnel between the electrode and ions in a solution ?  
b) Describe the homogeneous theory of corrosion and give any two methods of prevention of corrosion. **(7+5=12)**
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