D-1388
M. Sc. (Sem. II) (Reg. & Eve. Course & Self Finance) Examination
March / April - 2016
Chemistry : Paper - III
(Physical Chemistry)

Time : 3 Hours] [Total Marks : 70
Instructions :
(1)
Fill up strictly the details of signs on your answer book.
Name of the Examination :
M. Sc. (Sem. II) (Reg. & Eve. Course & Self Finance)
Name of the Subject :
Chemistry : Paper - III (Physical Chemistry)

(2) Attempt all four questions.
(3) Figures to the right indicate full marks.

1  Attempt any three questions:
   (a) Describe Debye Huckel theory of inter-ionic attraction including relaxation and electrophoretic effect.
   (b) Explain the conductance method to determine dissociation constant of monobasic acid.
   (c) Explain solubility method to determine activity coefficient.
   (d) Calculate the ionic strength of a mixture containing 30 ml 0.03M H₂SO₄ and 50 ml 0.02 M AlCl₃ solution.

2  Attempt any three questions:
   (a) Derive the equation \( v = \frac{1}{2\pi} \sqrt{\frac{k}{\mu}} \)
   (b) Derive the equation for fundamental band, first overtone and second overtone band and discuss them in detail.
   (c) Explain the use of tracer technique in ester hydrolysis and oxidation of fumaric acid.
   (d) The rotational lines of \(^1\text{H}^7\text{Br}\) are separated by 16.90 cm\(^{-1}\). Calculate the moment of inertia and the internuclear distance of HBr in SI units.
      (given \( m_H = 1.66 \times 10^{-27} \text{ kg} \), \( m_{Br} = 131.16 \times 10^{-27} \text{ kg} \),
      \( h = 6.626 \times 10^{-34} \text{ Js} \), \( c = 3 \times 10^8 \text{ ms}^{-1} \))
3 Attempt any three questions:  
(a) Explain the factors affecting CMC of surfactants.  
(b) Discuss electrical double layer theory with figure indicating Stern layer and Gouy-Chapman layer.  
(c) Explain the solubilization, microemulsion and reverse micelle.  
(d) Explain Gibbs adsorption isotherms.

4 Attempt any four questions:  
(a) Explain method to measure overvoltage.  
(b) Discuss Isotopic dilution analysis.  
(c) Write a note on Proportional Counter.  
(d) Explain the counter ion binding to micelle.  
(e) The rotational spectrum in the far IR region of HCl consists of a series of equidistant lines with spacing of 20.7 cm\(^{-1}\). Calculate Bond Length of the HCl in cm.  
   [At. wt. H = 1.01, Cl = 35.45, N = 6.023 \times 10^{23},  
   h = 6.626 \times 10^{-27} \text{ erg sec}]