

# AE-758

M.Sc. (Previous)  
Term End Examination, 2016-17

# CHEMISTRY

### Paper - III

Physical Chemistry

*Time : Three Hours]                      [Maximum Marks : 100*  
*[Minimum Pass Marks : 36*

**Note** : Answer any **five** questions. The figures in the right-hand margin indicate marks.

1. (a) Derive an expression for energy for the particle in a one-dimensional box. How can you justify ?  

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  - (i) Quantisation of energy ?
  - (ii) Existence of zero-point energy ?
- (b) Show that the normalised wave functions of a particle in one-dimensional box are orthogonal for any pair of different values of  $n$ .  

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- (c) An electron is confined to an infinite one-dimensional box of width  $4\text{\AA}$ . Calculate its energy (in eV) in the 4th energy level. 4

$$\left\{ \begin{array}{l} m = 9.1 \times 10^{-31} \text{ kg} \\ h = 6.62 \times 10^{-34} \text{ Js} \end{array} \right\}$$

2. Write in brief about any **two** of the following : 20
- (a) Spin-orbit coupling and Zeeman splitting
  - (b) Postulates of quantum mechanics
  - (c) Perturbation theory to Helium atom
3. (a) What are the postulates of statistical mechanics ? Using statistical mechanics, derive the Fermi-Dirac distribution law. 12
- (b) Define the terms Partial molar free energy, Fugacity and Fugacity coefficient. 8
4. (a) Discuss about Debye-Huckel theory for activity co-efficient of electrolytic solutions. 12
- (b) Write the expressions for translational and vibrational partition functions. What do the different symbols signify ? 8

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5. Explain any **two** of the following : 20
- (a) Kinetics of dynamic chain reaction between hydrogen and chlorine
  - (b) Kinetics of enzyme reaction
  - (c) Kinetics of steady state reaction
6. (a) Discuss in detail the study of fast reaction by relaxation method. 12
- (b) Explain the kinetics of salt effect. 8
7. Explain any **two** of the following in detail : 20
- (a) Gibbs adsorption isotherm
  - (b) Liquid crystal polymers
  - (c) Thermodynamics of micellization
8. (a) Discuss, in detail, about B.E.T. equation for multimolecular adsorption. Also explain its any two applications. 12
- (b) What is reverse micelles formation ? How do they work ? 8
9. (a) Explain Debye-Huckel-Onsager treatment and also explain its extension. 12
- (b) Discuss about electrochemical theory of corrosion with suitable examples. 8

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10. (a) Give the theory of double layer of semiconductor interface. 12
- (b) Write a short note on neutron diffraction with suitable examples. 8
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