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 ? 12

(*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*. 4

(*c*) An electron is confined to an infinite one-dimensional box of width 4Å. Calculate its energy (in eV) in the 4th energy level. 4

$$\left.\begin{array}{l} m = 9.1\times10^{-3}\text{kg} \\ h = 6.62\times10^{-34}\text{Js} \end{array}\right\}$$

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

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

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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