Reg. No. | | | | | | | | | |

CHH 553

IV Semester M.Sc. Degree Examination, September/October 2022
(CBCS : 2016 – 17 Syllabus) (Freshers and Repeaters)
CHEMISTRY
Electrochemistry and Reaction Dynamics

Time : 3 Hours Max. Marks : 70

***Note** : 1) Answer Part – **A** and **any four** questions from Part – **B**.*
*2) Figures to the **right** indicate **marks**.*

PART – A

Answer **all** the following sub-divisions. **(9×2=18)**

1. a) Explain the 'volcano' phenomenon encountered in electrocatalysis.
   b) Enumerate the importance of hydrogen over-voltage in the deposition of metals from acidic solutions.
   c) What are photogalvanic cells ? Give an example.
   d) What is an electrical double layer ? Explain.
   e) Mention the basic differences between LEED and XPS techniques.
   f) State and explain Goldfinger-Letort-Niclause rules.
   g) Differentiate between activation energy and threshold energy.
   h) Outline the limitations of conventional transition state theory.
   i) The half life ($t_{1/2}$) of a reaction is halved as the initial concentration of the reactant is doubled. What is the order of the reaction ?

PART – B

Answer **any four** of the following. **(4×13=52)**

2. a) What is an electrogrowth ? Discuss in detail the mechanism of electrogrowth on the surface of an electrode.
   b) What is photocatalysis ? With diagram, discuss the effect of light on semiconductor interface. **(6+7=13)**

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3. a) Write a note on Mott-Schottky plot for determination of capacity of a space charge.

   b) Discuss the Hole Model for liquid electrolytes.

   c) Discuss the mechanism of electronic conductance of alkali metals dissolved in alkali halides. **(5+4+4=13)**

4. a) Cyclic voltammetric technique is a powerful tool in studying electrodic process. Comment.

   b) Describe the salient features of Gouy-Chapman and Stern models of electrified interfaces.

   c) Deduce Tafel equations from Butler-Volmer equation under limiting conditions. **(5+4+4=13)**

5. a) Discuss the thermodynamic treatment of electrified interfaces and derive Lippmann equation for electrode-electrolyte interface.

   b) Discuss the mechanism involved in the decomposition of :

      i) Phosgene and

      ii) Acetaldehyde. **(7+6=13)**

6. a) List out the limitations of Hinshelwood theory. Explain how they are overcome by RRK theory of unimolecular reactions.

   b) Discuss the activated complex theory of bimolecular reactions. Explain how this theory is helpful for evaluating standard enthalpy and standard entropy of activation. **(6+7=13)**

7. a) Derive equation for rate constant of a bimolecular reaction using statistical mechanical approach of transition state theory.

   b) What are potential energy surfaces ? With a suitable example, discuss the salient features and construction of potential energy surfaces. **(6+7=13)**
