

- (b) Explain  $\text{H}_2\text{-O}_2$  fuel cell in detail.  
Give its advantages and disadvantages too.  $8 \times 2 = 16$

5. (a) How does a battery store energy and define the following terms related to battery :  
(i) Electricity storage density  
(ii) Maximum intrinsic efficiency
- (b) What do you mean by charging and discharging of battery ? Give characteristics of good energy storer.  $8 \times 2 = 16$

### Unit III

6. (a) What corrections were made by Koutecky for spherical in the Ilkovic equation and hence obtain a formula for the instantaneous current.

**31548**

### M. Sc. EXAMINATION, 2025

(Fourth Semester)

(2023-24 Onwards)

(Regular & Re-appear)

CHEMISTRY

Physical Chemistry Special-IV

Applications of Electrochemistry

*Time : 3 Hours]*

*[Maximum Marks : 80*

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Before answering the question-paper, candidates must ensure that they have been supplied with correct and complete question-paper. No complaint, in this regard will be entertained after the examination.

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**Note :** Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

### Compulsory Question

1. (a) How can we minimize migration current in polarography ?
- (b) What do you mean by inhibition efficiency ?
- (c) Define limiting current.
- (d) How does change of metal control corrosion rate ?
- (e) Define actual efficiency for batteries.
- (f) What do you mean by dropping mercury electrode ?
- (g) Write the cell reaction for silver-zinc cell.
- (h) What is the difference between coulometry and polarography ?  $2 \times 8 = 16$

### Unit I

2. How can you control the corrosion of metals ?  
Give in detail at least five method of its control. **16**
3. (a) Define flade potential and explain the electrochemical behaviour of active and passive metals.
- (b) Briefly classify the corrosion inhibitors along with the mechanism involved. What is the basis of selection of corrosion inhibitors ?  **$8 \times 2 = 16$**

### Unit II

4. (a) Explain reactions of charging and discharging, construction, working, advantages and disadvantages of lead-acid battery.

9. (a) Explain in detail the rigorous treatment of slow electrode process in polarography.
- (b) Derive the expression for irreversible reduction of complexes. **8×2=16**



- (b) Derive the equation for reversible anodic wave in polarography. **8×2=16**
7. (a) Obtain expression for relating diffusion current with the concentration of the electroactive metal and hence write the consequences for Ilkovic equation.
- (b) Derive equation for reversible cathodic wave and hence interpret the result.
- 8×2=16**

#### Unit IV

8. (a) Describe the instrumentation of polarographic coulometry at constant potential.
- (b) Derive the expression for the number of electrons,  $n$ ; of the solution by decrease in the limiting current in polarography. **8×2=16**