(b) State and explain the Stern-Geary equation. **6**

Unit III

6. (a) Define galvanic corrosion. Discuss the factors that determine its severity such as the area ratio of anode to cathode and the distance between them. **10**

(b) Discuss Intergranular Corrosion in detail. **6**

7. (a) How do bacteria create corrosive environments ? **10**

(b) Explain the mechanism of hydrogen embrittlement and compare it with Erosion Corrosion. **6**

Unit IV

8. Discuss the specific corrosion challenges faced by the oil and gas refinery and fertilizer industries. **16**

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M. Sc. Chemistry EXAMINATION, 2026

(Fourth Semester)

(2023-24 Onwards)

(Re-appear Only)

PHYSICAL CHEMISTRY SPECIAL-VI

ELECTROCHEMISTRY AND CORROSION

Time : 3 Hours] [*Maximum Marks :* 80

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.

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) Define transport number.

(b) Define current density.

(c) Define Corrosion.

(d) What is electrochemical cell ?

(e) What is fillform corrosion ?

(f) What is fretting corrosion ?

(g) Define atmospheric corrosion.

(h) What is galvanic cell ? **8×2=16**

Unit I

2. (a) Define the total driving force for ionic transport. Derive the Nernest-Planck flux equation by considering both the concentration gradient and the electric potential gradient. **10**

(b) Explain the concept of Onsagar's phenomenological equation. **6**

3. (a) Derive the Einstein relation between absolute and the diffusion coefficient. **10**

(b) Define ionic drift velocity. Establish the mathematical relatonship between drift velocity, ionic mobility and current density. **6**

Unit II

4. (a) Discuss the formation of electrochemical cells (anodic and cathodic areas) and the electrode reaction invovled. **10**

(b) Explain the significance of Pourbaix diagrams in predicting the stability and corrosion behaviour of metals in aqueous solutions. **6**

5. (a) Explain the Tafel extrapolation method in detail for the measurement of corrosion potential E_{Corr} and corrosion current density (i_{Corr}). **10**

9. Analyze the causes of corrosion in chemical industries specifically during acid cleaning and descaling operations. **16**

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