

MSc DEGREE END SEMESTER EXAMINATION- MARCH 2025**SEMESTER 4 : CHEMISTRY****COURSE : 21P4CHET15EL : ADVANCED PHYSICAL CHEMISTRY***(For Regular - 2023 Admission and Supplementary 2022/2021 Admissions)*

Duration : Three Hours

Max. Weights: 30

PART A**Answer any 8 questions****Weight: 1**

1. What is sensitized fluorescence? Give example. (R, CO 2)
 2. Explain the term 'concentration quenching'. (R, CO 1)
 3. What is an actinometer? Describe how a uranyl oxalate actinometer may be used. (U, CO 1)
 4. Comment on the significance of flame absorption profiles. (A, CO 2)
 5. What do you mean by phosphate group transfer potential? (U, CO 5)
 6. Define Seebeck effect. Give the expression for thermoelectric power (ϵ) of a thermocouple. (U, CO 5)
 7. What is fluorescence resonance energy transfer (FRET)? (R, CO 2)
 8. What are the limitations of dropping mercury electrode? (A, CO 4)
 9. Give the meaning of limiting current density. (U, CO 4)
 10. Explain the bioenergetics of coupled reactions. (U, CO 5)
- (1 x 8 = 8)**

PART B**Answer any 6 questions****Weights: 2**

11. Define Evans diagram. Briefly discuss process of corrosion using Evans diagram. (E, CO 3)
 12. Explain the applications of neutron diffraction technique. (U, CO 2)
 13. What are the applications of coulometric titrations? (U, CO 4)
 14. The Peltier co-efficient (π) and thermoelectric power (ϵ) of Fe-Ni thermocouple at two different temperatures are:
 $\pi = 9565.9 \text{ J A}^{-1}$ $\epsilon = 31.2 \text{ V K}^{-1}$ at 289 K and
 $\pi = 8500.0 \text{ J A}^{-1}$ $\epsilon = 41.5 \text{ V K}^{-1}$ at 273 K
 Predict the temperature at which Onsager reciprocal relationship is verified. (A, CO 5)
 15. Describe the working of a flame atomizer. (A, CO 2)
 16. Explain the working principles of Solar cells (U, CO 1)
 17. Derive Debye Huckel Limiting law (U, CO 3)
 18. Describe the different types of optical filters and polarizers and their functions in fluorescence spectroscopy. (U, CO 2)
- (2 x 6 = 12)**

PART C**Answer any 2 questions****Weights: 5**

19. (a) Discuss different types of luminescence. (An, CO 1)
- (b) Explain E - type and P-type fluorescence

20. There are evidences to support the formation of ion pairs and triple ions in more concentrated solutions of electrolytes. Give all details of Bjerrum theory of ion association (R, CO 3)
21. (i) What is half wave potential? Give the significance of Polarography in the analysis. Describe the advantages of Polarography. (ii) Calculate the value of the diffusion current (i_d) if $C = 3 \times 10^{-3}$ moles/ liter $D = 7.2 \times 10^{-6}$ $\text{cm}^2 \text{S}^{-1}$ $m = 3 \text{ mg/ sec}$, $t = 4$ seconds and $n = 2$? (A, CO 4)
22. Describe in details the theories of the electrode double layer. (An, CO 3)
(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.
CO 1	Describe the physical principles of photochemistry.	U	2, 3, 16, 19	9
CO 2	Explain the methods of fluorescence spectroscopy, electron diffraction and atomic spectroscopic techniques.	A	1, 4, 7, 12, 15, 18	9
CO 3	Describe the principles of electrochemistry and applications of electromotive force.	A	11, 17, 20, 22	14
CO 4	Describe the principles of electrochemistry and applications of electromotive force.	A	8, 9, 13, 21	9
CO 5	Describe the principles of electrochemistry and applications of electromotive force.	U	5, 6, 10, 14	5

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;