

**M.Sc. DEGREE END SEMESTER EXAMINATION- MARCH 2026****SEMESTER 4 : CHEMISTRY****COURSE : 24P4CHET15EL : ADVANCED PHYSICAL CHEMISTRY***(For Regular - 2024 Admission)*

Time : Three Hours

Max. Weights: 30

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

1. Write a note on amorphous silicon solar cell. (U, CO 1)
  2. What are the symmetry operations to be performed on a polyhedral crystalline solid that leads to a screw axis and glide plane? (U, CO 5)
  3. Define the term uncompensated heat and explain its significance. (U, CO 5)
  4. Comment on the efficiency of H<sub>2</sub>-O<sub>2</sub> fuel cells (E, CO 3)
  5. What is meant by electrocapillary curve and potential of electrocapillary maximum? Give the significance of electrocapillary curve. (E, CO 3)
  6. Give an expression relating wavelength of electron and applied potential. What is the significance of this equation? (A, CO 2)
  7. Give the diagrammatic representation of a mirror plane and glide plane in crystallography. (U, CO 5)
  8. Write the Bragg's equation and explain the terms. (R, CO 5)
  9. What is Stern-Volmer equation? Explain. (U, CO 1)
  10. Write a note on green fluorescent proteins as fluorophores. (A, CO 2)
- (1 x 8 = 8)**

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

11. Account for the breakdown of ATP and show that it is an exergonic reaction that drives many endergonic reactions in cells. (A, CO 5)
  12. Briefly discuss the application of amperometry in qualitative analysis of anions and cations in solution. (U, CO 4)
  13. Write a note on fluorescence sensing techniques based on collisional quenching. (A, CO 1, CO 2)
  14. In the photochemical combination of H<sub>2</sub> (g) and Cl<sub>2</sub> (g), a quantum yield of 10<sup>6</sup> is obtained when a wavelength of 480 nm is used. Determine the number of moles of HCl produced. (A, CO 1)
  15. a) What are the advantages of the powder method over the rotating crystal method of crystal analysis  
b) The powder pattern of a crystalline material is said to its finger print. Explain (U, CO 5)
  16. The density of potassium chloride (FCC) is 1.9893gcm<sup>-3</sup> and the length of a side of the unit cell is 6.2908Å, as determined by x-ray diffraction. Calculate the Avogadro constant. (A, CO 5)
  17. Explain the hydrogen and oxygen overvoltage. How does overvoltage affect the applied potential on electrolysis? (U, CO 3)
  18. Write a note on dropping mercury electrode. Give its merits and demerits. (U, CO 4)
- (2 x 6 = 12)**

**PART C**  
**Answer any 2 questions**

**Weights: 5**

19. (a) Explain the principle, procedure, merits and demerits of amperometric titrations.  
(b) Briefly discuss the principle and applications of Coulmetric titrations in  
(i) Neutralisation titration (U, CO 4)  
(ii) Complex formation titrations  
(iii) Redox titrations
20. Explain the terms a) transfer coefficient b) exchange current density c) rate constants (d) over voltage (U, CO 3)
21. Explain (a) The effect of temperature on emissions (U, CO 1)  
(b) Two photon absorption spectroscopy
22. Discuss the principle, instrumentation and interferences of atomic absorption spectroscopy. (U, CO 2)
- (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	1, 9, 13, 14, 21	11
CO 2	Explain the methods of fluorescence spectroscopy, electron diffraction and atomic spectroscopic techniques.	U	6, 10, 13, 22	9
CO 3	Describe the principles of electrochemistry and applications of electromotive force.	U	4, 5, 17, 20	9
CO 4	Apply various electro-analytical techniques in qualitative and quantitative analysis.	A	12, 18, 19	9
CO 5	Explain the principles of irreversible thermodynamics and bioenergetics.	U	2, 3, 7, 8, 11, 15, 16	10

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