Reg. No ..... Name ..... **26P438-S**

**M.Sc. DEGREE END SEMESTER EXAMINATION- MARCH 2026**

**SEMESTER 4 : CHEMISTRY**

COURSE : **21P4CHET15EL : ADVANCED PHYSICAL CHEMISTRY**

*(For Supplementary 2023/2022/2021 Admissions)*

Time : Three Hours Max. Weights: 30

**PART A**

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

| | | |
|---|---|---|
| 1. | "The analyte is to be deaerated prior to polarographic analysis". Explain | (An, CO 4) |
| 2. | What do you meant by oxidative phosphorylation? Name the important electron carriers involved in the process. | (A) |
| 3. | How cold neutrons are produced by neutron diffraction? | (U) |
| 4. | Estimations by amperometric titrations are superior to polarographic estimations. Explain. | (An, CO 4) |
| 5. | With the help of an energy diagram, explain how the solvent polarity favors the exciplex formation and subsequent emission? | (An, CO 1) |
| 6. | Obtain an expression for fluorescence intensity and conecntration of substance. | (A, CO 2) |
| 7. | State the principle of microscopic reversibility. Mention its application in non-equilibrium thermodynamics. | (R, CO 5) |
| 8. | Explain glycolysis. | (E, CO 5) |
| 9. | What are fluorescent indicators? Give examples. | (U, CO 2) |
| 10. | Describe the principles of actinometry. | (U, CO 1) |

**(1 x 8 = 8)**

**PART B**

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

| | | |
|---|---|---|
| 11. | Give a short account of various excitation sources used in AES. | (U, CO 2) |
| 12. | Write a note on fluorescence sensing techniques based on colllisional quenching. | (A, CO 2) |
| 13. | Explain<br>(a) Helmohltz model and<br>(b) Stern models of electrical double layer | (E, CO 3) |
| 14. | Explain primary and secondary coulometric analyses using suitable examples. | (U, CO 4) |
| 15. | Calculate the ionic strength of the following solutions at 298 K. a) 0.10 m Aluminium sulphate b) 0.25 m Potassium sulphate c) 0.02 m Calcium chloride and 0.1 m KCl | (A, CO 3) |
| 16. | Give a comparative account of various diffraction techniques XRD, electron and neutron diffraction. | (R) |
| 17. | In a photochemical reaction A → 2B+C the quantum efficiency with 500nm light is $2.1X10^{2}$mol $Einstein^{-1}$. After exposure of 300 m mol of A to the light2.28 m mol of B was formed. How many photons were absorbed by A? | (A, CO 1) |
| 18. | Give a brief account of thermoelectric phenomena. | (U, CO 5) |

**(2 x 6 = 12)**

**PART C**

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

| | | |
|---|---|---|
| 19. | (a) The effect of temperature on emissions<br>(b)Two photon absorption spectroscopy | (U, CO 1) |
| 20. | (a) Explain the principle, procedure, merits and demerits of amperometric titrations.<br>(b) Briefly discuss the principle and applications of Coulmetric titrations in<br>(i) Neutralisation titration<br>(ii) Complex formation titrations<br>(iii) Redox titrations | (U, CO 4) |
| 21. | Taking Lead Cells as an example, describe the chemistry in working of storage cells. | (E, CO 3) |
| 22. | (a) What are the deviations observed from Debye Huckel Onsager equation<br>(b)Explain the extension of DHO equation to ion solvent interaction<br>(c) Explain Debye-Huckel Limiting law | (U, 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 | 5, 10, 17, 19 | 9 |
| CO 2 | Explain the methods of fluorescence spectroscopy, electron diffraction and atomic spectroscopic techniques. | A | 6, 9, 11, 12 | 6 |
| CO 3 | Describe the principles of electrochemistry and applications of electromotive force. | A | 13, 15, 21, 22 | 14 |
| CO 4 | Describe the principles of electrochemistry and applications of electromotive force. | A | 1, 4, 14, 20 | 9 |
| CO 5 | Describe the principles of electrochemistry and applications of electromotive force. | U | 7, 8, 18 | 4 |

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