

M. Sc DEGREE END SEMESTER EXAMINATION - APRIL 2021**SEMESTER 4 : CHEMISTRY****COURSE : 16P4CHET15EL ; ADVANCED PHYSICAL CHEMISTRY***(For Regular - 2019 Admission and Supplementary - 2018/2017/2016 Admissions)*

Time : Three Hours

Max. Marks: 75

PART A**Answer any 10 (2 marks each)**

1. Give the diagrammatic representation of a mirror plane and glide plane in crystallography.
2. Give the structure factor equation for the amplitude of x-rays reflected from the 110 plane of a BCC unit cell.
3. What are storage cells? Give examples.
4. What is meant by electrocapillary curve and potential of electrocapillary maximum? Give the significance of electrocapillary curve.
5. What are the factors that contribute to the background scattering in neutron scattering studies?
6. Explain the interpretation of scattering behaviour using the Wierl equation
7. List out the advantages of neutron diffraction techniques
8. Compare the neutron diffraction technique with that of the X-ray diffraction technique.
9. What are the functions of inert gases in the hollow cathode lamp?
10. Explain the terms half wave potential and limiting current density
11. Estimations by amperometric titrations are superior to polarographic estimations. Explain.
12. What are the two characteristics of polarography and give their significance.
13. What is meant by half wave potential? Give its graphical representation.

(2 x 10 = 20)**PART B****Answer any 5 (5 marks each)**

14. The first order diffraction from (200) planes of NaCl using X-rays of wavelength 58pm occurs at an angle of 5.90° . Calculate a) Edge length of the unit cell, b) Volume of the unit cell, c) Molar volume
15. The density of NaCl at 25°C is $2.163 \times 10^3 \text{ kgm}^{-3}$. When X- rays from a palladium target having a wave length of 58.1 pm are used, the 200 reflection of NaCl occurs at an angle of 5.91° . Calculate the number of Na^+ and Cl^- ions in the unit cell.
16. How are fuel cell classified based on working temperature?
17. Discuss the different theories of over voltage.
18. At 25°C the exchange current density of a $\text{Pt}|\text{H}_2(\text{g})|\text{H}^+(\text{aq})$ electrode is 0.79 mA cm^{-2} . Calculate the current flowing through a standard electrode of area 5.0 cm^2 when the overpotential is $+5.0 \text{ mV}$.
19. Give a short account of types and structure of flames used in atomic spectroscopy.
20. Describe the application of coulometric titrations in the case of (a) complex formation (b) neutralisation reactions
21. Write briefly on the role of supporting electrolytes in Polarography.

(5 x 5 = 25)

PART C

Answer any 2 (15 marks each)

22. a) Derive the Braggs equation b) Silver is known to be crystallized in cubic form. The Bragg angles using X-rays of wavelength 154.10pm for the first six diffraction lines are as follows

Angle-degree	19.08	22.17	32.26	38.74	40.82	49.00
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- i. What is the type of the cubic crystal formed by silver?
 - ii. What is the length of a side of the unit cell?
 - iii. What is the interplanar distance of the (111) plane
23. Derive Tafel equation. Give the diagram of Tafel's plot. Explain the significance of Tafel's plot.
24. Give an account of atomization techniques and interferences in atomic absorption spectroscopy.
25. What is the principle of amperometric titration? Explain the application of amperometric titration in qualitative and quantitative analysis. What are the advantages of amperometric titrations?

(15 x 2 = 30)