MSc DEGREE END SEMESTER EXAMINATION - MARCH/APRIL 2019
SEMESTER 4 : CHEMISTRY
COURSE : **16P4CHET15EL : ADVANCED PHYSICAL CHEMISTRY**
(For Regular - 2017 Admission and Supplementary - 2016 Admission)

Time : Three Hours   Max. Marks: 75

Section A
Answer any 10 (2 marks each)

1. What are screw axis and glide planes?

2. Give the structure factor equation for the amplitude of x-rays reflected from the 100 plane of a BCC unit cell.

3. How polarization is eliminated?

4. What is the difference between polarization of a single electrode and polarization of a two electrode system?

5. What is LEED? Why electron diffraction techniques are not suitable to study solids and surfaces?

6. Neutron diffraction techniques are not suitable to analyse biomacromolecules. Explain.

7. Give any two differences between X-ray diffraction and neutron diffraction.

8. Explain the interpretation of scattering behaviour using the Wierl equation

9. Briefly explain the principle of AAS.

10. How many seconds are required to reduce 0.0158 g of Ag^+ with an 18.2 mA current?

11. Draw the schematic of a current- time plot for a potentiostatic coulometric experiment. How will you calculate the number of coulombs consumed during the experiment?

12. What are the advantages of controlled current coulometry over controlled potential coulometry?

13. Write down Ilkovic equation and explain the terms involved.

(2 x 10 = 20)

Section B
Answer any 5 (5 marks each)

14. Describe the structure of Sodium Chloride. The powder pattern of KCl resembles to that of a simple cubic lattice. Explain

15. Discuss briefly the Fourier synthesis of electron density in crystal structure analysis. What is its significances?

16. Discuss the different theories of over voltage.

17. Write a note on concentration cell with transference?

18. Explain the expressions that relates cathodic over-potential to the cathodic current (i_c) and the limiting current (i_L). From the expression, state what will happened to the overpotential if (a) $i_c > i_L$ (b) $i_c < i_L$ (c) $i_c = i_L$

19. Discuss the origin of AES citing the advantages and disadvantages.

20. Compare and contrast the experimental arrangements required for potentiostatic and amperostatic coulometry.

21. Write briefly on the classification of ion selective electrodes.

(5 x 5 = 25)

Section C
Answer any 2 (15 marks each)

22. a) Derive the Braggs equation, b) Copper forms cubic crystals. When an x-ray powder pattern of crystalline copper is taken using X-rays of wavelength $1.5405A^0$, reflections were found at angles 21.65^0, 25.21^0, 37.06^0, 44.96^0, 47.58^0 and other large angles.
    i) What type of lattice is formed by copper?
    ii) What is the length of the side if the unit cell.
    iii) What is the density of copper?

23. Derive the expressions for emf of following concentration cells
    (a) Electrode concentration cells
    (b) Electrolyte concentration cells with tranference and
    (c) Electrolyte concentration cells without transference

24. Discuss the principle, instrumentation and interferences of flame emission spectroscopy.

25. (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 $D = 7.2 \times 10^{-6}$ cm^2 S^{-1}m = 3 mg/ sec, t = 4 seconds and n = 2 ?

(15 x 2 = 30)