Reg. No ..... Name .....

MSc DEGREE END SEMESTER EXAMINATION - MARCH 2020

SEMESTER 4 : CHEMISTRY

COURSE : **16P4CHET15EL : ADVANCED PHYSICAL CHEMISTRY**

(For Regular - 2018 Admission and Supplementary - 2017, 2016 Admissions)

Time : Three Hours Max. Marks: 75

Section A
Answer any 10 (2 marks each)

1. What is the Fourier synthesis 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. Define exchange current density
4. How are monochromatic neutrons produced in neutron diffraction technique?
5. What are the factors that contribute to the background scattering in neutron scattering studies?
6. Name the relations connecting total electron diffraction intensity and scattering factors as well as scattering angle. Write down the equation and explain the terms involved.
7. Explain the interpretation of scattering behaviour using the Wierl equation
8. Mention any two merits of premix burner over total consumption burner.
9. Give the significance of migration current in Polarography.
10. Represent the amperometric titration graphs of lead ion against sulphate ion and sulphate ion against lead ion (precipitation titration).
11. What is meant by dead stop end point in amperometric titrations?
12. What are the advantages of coulometric methods of analysis?

(2 x 10 = 20)

Section B
Answer any 5 (5 marks each)

13. Give an account of the molecular arrangements which exist in different states of liquid crystals.
14. The density of NaCl at 25^0C is 2.163 x 10^3 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 5.91^0. Calculate the number of Na^+ and Cl^- ions in the unit cell.
15. How decomposition potential is experimentally measured?
16. Highlight briefly the contribution of Tafel and Butler-Volmer to the development of electrochemistry. In what way did Butler-Volmer improve Tafel equation?
17. How will you determine the activity coefficient from concentration cells?
18. Briefly discuss the instrumentation of FES.
19. Evaluate the magnitude of the diffusion current constant of lead from following data: i_d = 4.2mA, m = 1.41 mg/ sec, t = 1.85 sec, C = 1 mol/l.
20. Briefly discuss the application of amperometry in qualitative analysis of anions and cations in solution.

(5 x 5 = 25)

Section C
Answer any 2 (15 marks each)

21. Explain the basic principle involved in (a) X-ray, (b) neutron and (c) electron diffraction methods.

22. Explain how can you estimate Tafel constant for anodic and cathodic polarization, given that exchange current density, anodic current and cathodic current are provided. Draw suitable diagram to support your explanation. Extend your discussion using Evans diagram.

23. Discuss the principle and instrumentation of atomic absorption spectroscopy.

24. (i) How Polarography is useful in the analysis. Draw the polarogram and give its applications. (ii) Evaluate the magnitude of the half wave potential for a solution of the zinc in 0.005 M solution of ammonium oxalate (as complexing ligand) in the absence of complexing ligand the $E_{1/2}$ = - 0.60 V, and $K_{ins} = 4.2 \times 10^{-6}$ where K_{ins} instability constant for zinc oxalate complex.

(15 x 2 = 30)