

Register No.: ..... Name: .....

**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**THIRD SEMESTER B.TECH DEGREE EXAMINATION (R,S), DECEMBER 2023****CHEMICAL ENGINEERING****(2020 SCHEME)****Course Code: 20CHT201****Course Name: Chemistry for Process Engineering****Max. Marks: 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. Explain the titration curve of conductometric titration in case of weak acid & strong base.
2. What is half wave potential in polarography?
3. Give the principle of scanning tunneling electron microscopy.
4. What is the principle of Auger electron spectroscopy?
5. Explain Parke's process of desilverization of lead.
6. Distinguish between order and molecularity of a reaction.
7. Explain critical micelle concentration (CMC) and factors affecting critical micelle concentration.
8. What is meant by HLB of a surfactant?
9. Differentiate between fluorescence and phosphorescence.
10. Define the following:
  - (i) Binding energy of a nucleus.
  - (ii) Magic numbers.

**PART B*****(Answer one full question from each module, each question carries 14marks)*****MODULE I**

11. a) How is potentiometry useful for the neutralization titration? (7)  
Explain with example.
- b) Explain anodic stripping voltammetry with an example. (7)

**OR**

12. a) Explain various currents involved in polarography. Give the expression for the relation between diffusion current and concentration of electrolytes. (7)
- b) Give the principle and applications of amperometric titration. (7)

**MODULE II**

13. a) Give the principle, instrumentation and application of XPS. (10)  
Why is it impossible to detect H and He by XPS?
- b) What is the principle of atomic absorption spectroscopy? (4)

**OR**

14. a) Discuss the principle, instrumentation and applications of mass spectrometry. (10)
- b) First order diffraction was observed for X-rays of wavelength 0.0576 nm at an angle  $6^{\circ}54'$  for a single crystal of certain solid. Calculate the distance apart of consecutive planes. (4)

**MODULE III**

15. a) State Nernst Distribution law and derive the thermodynamic expression for Nernst distribution law. (10)
- b) Derive the rate expression for first order reaction. (4)

**OR**

16. a) Define critical solution temperature. Explain the critical solution temperature of Nicotine - Water system with a diagram. (10)
- b) From the following data show that the decomposition of hydrogen peroxide in aqueous solution is a first order reaction. What is the value of rate constant? N is the volume in ml of  $\text{KMnO}_4$  required to decompose a definite volume of  $\text{H}_2\text{O}_2$  solution. (4)

Time in minutes	0	10	20	30	40
N	25	20	15.7	12.5	9.6

**MODULE IV**

17. a) Derive an expression for Gibbs absorption isotherm and explain Gibbs surface excess. (10)
- b) Explain (1) Gold number (2) Zeta potential and its determination (4)

**OR**

18. a) Explain the postulates and derive Langmuir adsorption isotherm. (9)
- b) Write a note on protective colloids. (5)

**MODULE V**

19. a) What are radioactive tracers? Explain carbon dating & rock dating. (6)
- b) Discuss the liquid drop model of a nucleus. (8)

**OR**

20. a) Illustrate the principle of neutron activation analysis. Write any three applications of it. (7)
- b) For a certain first order radioactive decay,  $t_{1/2}$  is 100 sec. How long will it take for 75% completion of the decay? (7)

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