

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER B.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022

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 amperometric titration of lead ions using standard sulphate solution.
2. Draw a neat labelled Polarogram.
3. Explain the working of Hollow Cathode Lamp used in AAS.
4. Describe KLL Auger process with a diagram.
5. In the distribution of a solute between water (C_1) and chloroform (C_2), the following results were obtained:

	Set 1	Set 2
C_1	0.0160	0.0237
C_2	0.338	0.753

Show that the solute undergoes association in chloroform.
6. In a first order reaction, initial concentration of the reactant reduces to half in 200s. Find the rate constant for this reaction.
7. Define the terms (i) Zeta potential (ii) Gold number
8. What is an adsorption isotherm? State any two limitations of Freundlich adsorption isotherm.
9. What are the differences between Fluorescence & Phosphorescence?
10. What is nuclear cross section? How is it related to the rate of a nuclear reaction?

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) What is the principle of potentiometric titration, how can it be used for the determination of end point of a titration between Fe^{2+} and Ce^{4+} . (7)
- b) What are biosensors? Explain the working principle of (i) Glucose biosensor (ii) Ethanol biosensor. (7)

OR

12. a) Describe the conductometric titrations of (i) weak acid & weak base (ii) Mixture of acid & strong base. (7)
- b) Explain the principle and instrumentation of Polarography. (7)

13. a) Explain the principle and working of Mass spectrometry with a neat labelled diagram. (7)
- b) How atomic emission spectroscopy is useful in estimating the trace elemental analysis in a sample of alloy? Explain with a schematic diagram of the spectrometer. (7)

OR

14. a) What are the different imaging modes of analysis in SEM? Describe the instrumentation of SEM with a well labelled diagram. (7)
- b) Explain the principle, instrumentation and applications of X-Ray photoelectron spectroscopy. (7)

MODULE III

15. a) State Nernst – distribution law. Deduce the formulae for distribution if the solute undergoes dissociation in one of the solvents. (7)
- b) Define the Critical solution temperature? Explain the Temperature-Composition diagrams of (i) Phenol-water system (ii) Nicotine – water system. (7)

OR

16. a) Explain any four methods for determining order of a reaction. (8)
- b) Derive the Differential and integrated rate expressions for a second order reaction of the type, $A + B \longrightarrow Products$ (6)

MODULE IV

17. a) Write the postulates and derive Langmuir adsorption isotherm. (7)
- b) Derive Gibbs adsorption isotherm. Give the expression for Gibbs surface excess. (7)

OR

18. a) What are surfactants? Explain the different types of surfactants. (7)
- b) How can you classify colloids on the basis of (i) nature of interaction (ii) molecular size? (7)

MODULE V

19. a) Explain Jablonski diagram with a neat sketch. (7)
- b) Explain the kinetics of Hydrogen – chlorine reaction. (7)

OR

20. a) Explain transient and secular equilibrium of nuclear decay with appropriate expressions. (7)
- b) What is liquid drop model of nucleus? How can this be used to explain nuclear fission? (7)
