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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 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. Draw and explain the amperometric titration curve if the analyte is reducible and titrant is not reducible.
2. Write the principle of potentiometric titrations.
3. Write any three applications of atomic absorption spectroscopy (AAS).
4. Explain the three modes of analysis in atomic force microscopy.
5. A solid X is added to a mixture of benzene and water. After shaking well and allowing to stand, 10 ml of the benzene layer was found to contain 0.13 g of X and 100 ml of water layer contain 0.22 g of X. Calculate the value of distribution coefficient.
6. Write any three differences between order and molecularity of a reaction.
7. The volume of nitrogen gas at 1 atm and 273 K required to cover an iron catalyst with a monolayer is 8.15 ml per gram of iron. Calculate surface area of the iron catalyst if molecular area of nitrogen is 16.2×10^{-20} m^2.
8. Define Gold number. What is its significance?
9. The half-life period of a radioactive substance is found to be 5730 years. Find out the decay constant.
10. Distinguish between fluorescence and phosphorescence.

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

MODULE I

11. a) Explain the conductometric titration curves of (i) strong acid against strong base and (ii) mixture of strong acid and weak acid against strong base.   (7)

     b) How will you find the concentration of different types of ions in a solution mixture by polarography?   (7)

OR

12. a) Explain the different steps involved in anodic stripping voltammetry (ASV).   (7)

     b) What are biosensors? Describe the working principle of (i) Glucose biosensor and (ii) Ethanol biosensor.   (7)

MODULE II

13. a) Explain the principle, instrumentation and applications of mass spectrometry.   (7)

 b) Describe the principle, instrumentation and applications of X-ray photoelectron spectroscopy (ESCA).   (7)

OR

14. a) How will you obtain a 3D image of an object by scanning electron microscope (SEM)?   (10)

 b) How KLL Auger emission is occurring?   (4)

MODULE III

15. a) State Nernst distribution law. Derive Nernst distribution equation when the solute enters into chemical combination with any one of the solvents.   (7)

 b) Derive the differential and integrated rate expressions for a second order reaction of the type, $A+B \rightarrow$ Products.   (7)

OR

16. a) Describe any four methods for determining order of a reaction.   (8)

 b) Draw and explain the phase diagrams of (i) Phenol – Water system and (ii) Nicotine – Water system.   (6)

MODULE IV

17. a) Derive Gibbs adsorption isotherm.   (7)

 b) Write the postulates and then derive Langmuir adsorption isotherm.   (7)

OR

18. a) How can you classify colloids based on: (8)
   i. Interaction between dispersed phase and dispersion medium.
   ii. Molecular size.

 b) What are surfactants? How can you classify them into various types?   (6)

MODULE V

19. a) Describe liquid drop model of a nucleus. What are its merits and demerits?   (7)

 b) Distinguish between transient and secular equilibria.   (7)

OR

20. a) Explain the various photochemical processes with the help of a neat labelled Jablonski diagram.   (8)

 b) Derive the expression for the kinetics of the photochemical reaction between hydrogen and chlorine.   (6)

****