

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER B.TECH DEGREE EXAMINATION (S), MAY 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. What are the advantages and disadvantages of conductometric titration?
2. Give the principle and advantages of amperometric titration.
3. Differentiate between Atomic Absorption Spectroscopy and Atomic Emission spectroscopy.
4. Explain the working of Hollow cathode lamp.
5. What do you mean by rate of a reaction? Show graphically how the rate of a first order reaction varies with concentration of reactant.
6. When 0.83g of succinic acid was shaken with 100ml of water and ether, the ether layer was found to contain 0.70g of the acid. Calculate the distribution co-efficient of acid in ether and water.
7. How can you express protective power of protective colloids?
8. The volume of N₂ gas required to cover a sample of silica gel with a mono-molecular layer is 0.129g/L of gel. Calculate the surface area per gram of the silica gel if each N₂ molecule occupies $16.2 \times 10^{-20} \text{m}^2$.
9. Give the principle and application of Neutron Activation Analysis.
10. A radioactive nucleus decays with a half life of 5.27 years. Calculate decay constant for the radioactive disintegration.

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

11. a) Explain the instrumentation and procedure of polarography. (7)
b) Give the working principles of ethanol and urea bio sensors. (7)

OR

12. a) Explain the theory, principle and applications of Anodic Stripping Voltammetry. (8)
b) Write a note on electrogravimetry. (6)

MODULE II

13. a) Explain the principle and instrumentation of mass spectrometry. (10)
b) Describe the working principle of Scanning Tunneling Microscope. (4)

OR

14. a) Differentiate between the principle of XPS and Auger electron spectroscopy. (8)
b) How does XRD work? Explain Bragg's equation for X-ray diffraction. (6)

MODULE III

15. a) Derive the integrated rate equation for the second order reaction $2A \rightarrow P$ (7)
b) The decomposition of the Hydrogen peroxide in sodium hydroxide solution is as given $2H_2O_2 \rightarrow 2H_2O(l) + O_2(g)$. The reaction is first order in H_2O_2 , the initial concentration of H_2O_2 is 0.30M and the rate constant for the decomposition of H_2O_2 at $20^\circ C$ is $1.8 \times 10^{-5} s^{-1}$. (7)
1. Calculate the concentration of H_2O_2 after 4 hours.
 2. How long will it take 90% of the H_2O_2 to decompose?

OR

16. a) State and derive the Nernst Distribution Law from thermodynamic considerations. Under what conditions the law is valid? (8)
b) What is meant by Critical Solution Temperature? Draw and explain the phase diagram of phenol-water system (6)

MODULE IV

17. a) Classify colloids based on physical state, affinity towards the solvent medium and particle size. (8)
b) What is zeta potential? How it is determined? (6)

OR

18. a) Explain the following (9)
1. Micelles based on their shape and structure
2. Critical micelle concentration
3. Factors affecting CMC
b) Derive Langmuir Isotherm. (5)

MODULE V

19. a) Discuss the stability of nucleus in terms of n/p ratio. How do α , β emission and K-capture process take place during a nuclear reaction? (10)
b) What is the change in mass in grams when 2 moles of hydrogen atoms combine to form 1 mole of hydrogen molecule? (4)
 $2H \rightarrow H_2 \quad \Delta E = -436KJ \quad (1J = 1kgm^2s^{-2})$

OR

20. a) Distinguish between radiative and non-radiative transitions. Explain fluorescence and phosphorescence using Jablonski diagram. (8)
b) Write a note on chemiluminescence and bioluminescence with examples. (6)
