

**B. Sc. DEGREE END SEMESTER EXAMINATION : MARCH 2023****SEMESTER 4 : COMPLEMENTARY CHEMISTRY FOR PHYSICS****COURSE : 19U4CPCHE4.1 : ADVANCED PHYSICAL CHEMISTRY - II***(For Regular - 2021 Admission and Improvement / Supplementary - 2020 / 2019 Admissions)*

Time : Three Hours

Max. Marks: 60

**PART A****Answer All (1 mark each)**

1. The yellow emission of turmeric powder under UV irradiation is called -----.
2. Write cell equation for determination of pH using Glass electrode.
3. What is meant by catalyst poisoning?
4. Define a red shift in UV spectroscopy.
5. How many vibrational degrees of freedom are possible for H<sub>2</sub>O?
6. What is an oxidation reaction? Give one example.
7. Determine the oxidation state of P in P<sub>4</sub>O<sub>10</sub>.
8. What is the unit of cell constant?

**(1 x 8 = 8)****PART B****Answer any 6 (2 marks each)**

9. The energy of an electromagnetic radiation is  $50 \times 10^{-20}$  J. Calculate its wavelength.
10. What is a photosensitizer? Give example.
11. What is meant by standard electrode potential?
12. Give the construction of a salt bridge.
13. Point out the reason for the colour change when diphenylamine is used as an indicator in redox titration.
14. State Kohlrausch's law.
15. State Faraday's first law.
16. Explain how a catalyst increases the rate of a reaction.

**(2 x 6 = 12)****PART C****Answer any 4 (5 marks each)**

17. A conductivity cell when filled with an aqueous solution of 0.02 M KCl at 25°C, had a resistance of 250 ohm. Its resistance when filled with  $6 \times 10^{-5}$  M NH<sub>4</sub>OH solution was 105 ohm. The specific conductance of 0.02 M KCl was 0.277 Sm<sup>-1</sup>. The molar conductances at infinite dilution of NH<sub>4</sub><sup>+</sup> and OH<sup>-</sup> ions are  $73.4 \times 10^{-4}$  and  $198.0 \times 10^{-4}$  Sm<sup>2</sup>mol<sup>-1</sup>. Calculate the degree of dissociation of  $6 \times 10^{-5}$  M NH<sub>4</sub>OH solution.
18. Radiation of wavelength 2500 Å was passed through a cell containing 10 mL of a solution which was a mixture of 0.05 molar oxalic acid and 0.01 molar uranyl sulfate. After absorption of 80J of radiation energy, the concentration of oxalic acid was reduced to 0.04 M. Calculate the QY for the decomposition of oxalic acid
19. Discuss the influence of temperature on reaction rates.

20. The force constant of HI molecule is  $283.4 \text{ Nm}^{-1}$ . Calculate the fundamental vibrational frequency in  $\text{cm}^{-1}$ . (Given the atomic mass in amu;  $\text{H}=1.008$  &  $\text{I}=126.9$ ).
21. Name the various types of electrodes giving in each case the reaction and the expression for the electrode potential a) Metal- metal ion electrode b) Oxidation reduction electrode
22. Describe briefly the rules with examples for assigning oxidation state for a polyatomic molecule.

**(5 x 4 = 20)**

**PART D**

**Answer any 2 (10 marks each)**

23. What is conductometric titration? Give the different types of conductometric neutralization titrations.
24. Derive expressions for the integrated rate and half-life period of a first order reaction.
25. Give an account of quantized energy levels and energy transitions in UV-Visible, Infra red and microwave spectroscopy.
26. Describe a)  $\text{H}_2\text{-O}_2$  Fuel Cell b) determination of pH using hydrogen electrode.

**(10 x 2 = 20)**