18U513 (Pages: 2) Name: ……..

Reg. No……

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2020

(CUCBCSS-UG)

(Regular/Supplementary/Improvement)

CC15U CHE5 B08 - PHYSICAL CHEMISTRY - II

(Chemistry - Core Course)

(2015 Admission onwards)

Time: Three Hours Maximum: 80 Marks

Section A

Answer ***all*** questions. Each question carries 1 mark.

1. The equivalent symmetry operation for S_2 is ----------
2. For a first order reaction the half life period is a ----------
3. ESR spectroscopy uses ---------- region of the electromagnetic radation.
4. The selection rule for fundamental vibrational transition is ----------
5. What is quantum yield of a photochemical reaction?
6. In chromatography the separation of components are based on ----------
7. At the triple point both the ---------- and ---------- are fixed.
8. Define degree of freedom.
9. The modified distribution law for the solute undergoing dissociation in one of the solvents is K_D = ----------
10. The lyophilic colloids which stabilizes a lyophobic sol, are known as ----------

(10 x 1 = 10 Marks)

Section B

Answer any ***ten*** questions Each question carries 2 marks.

11. Write down Michaelis-Menten equation in enzyme catalysis.
12. Give two methods for determining the order of a reaction.
13. Define the terms fluorescence and phosphorescence.
14. Write the expression for Gibb's phase rule and explain the terms.
15. What are Bathochromic and hypsochromic shifts in electronic spectroscopy?
16. How does chemical shift arises in NMR spectroscopy?
17. What is Zeta potential in colloids?
18. Predict the NMR spectrum of ethyl acetate.
19. What is Born-Oppenheimer approximation?
20. Define point group of a molecule.
21. What are fundamentals and overtones in IR spectroscopy?
22. Differentiate between order and molecularity of a reaction.

(10 x 2 = 20 Marks)

Section C

Answer any ***five*** questions. Each question carries 6 marks.

23. Derive the expression for the rate constant of a second order reaction.
24. Distinguish between primary and secondary process in a photochemical reaction. How does it control the quantum yield of photochemical reaction?
25. Derive Nernst distribution law and explain its applications.
26. Discuss the principle and application ion exchange chromatography.
27. Briefly describe the chemistry of vision.
28. Explain the hyperfine coupling in ESR spectroscopy.
29. Write down the group multiplication table for C_{2v} point group.
30. Sate and explain the rule of mutual exclusion principle. How this rule can be use for structure determination of molecules?

(5 x 6 = 30 Marks)

Section D

Answer any ***two*** questions. Each question carries 10 marks.

31. a) Discuss the determination and significance of Arrhenius parameters (5 marks)

    b) An acid solution of sucrose was hydrolysed to the extend of 57% after 66 minutes. Assuming the reaction to follow first order calculate the time taken for 75% hydrolysis. (5 marks)

32. Briefly explain the kinetic, optical and electrical properties of colloids. (10 marks)
33. a) Briefly explain the phase diagram of lead-silver system and its applications. (6 marks)

    b) The fundamental vibrational frequency of HCl is 2890 cm^{-1}. Calculate the force constant of this molecule. (The atomic masses of H and Cl are 1.008 and 35.5 g/mol) (4 marks)

34. Write short note on:

    a) Parallel reactions. (3 marks)

    b) Opposing reactions. (3 marks)

    c) Photosensitization. (4 marks)

(2 x 10 = 20 Marks)

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