19U513S (Pages: 2) Name: ……..

Reg. No……

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2021

(CUCBCSS-UG)

CC15U CHE5 B08 - PHYSICAL CHEMISTRY - II

(Chemistry - Core Course)

(2015 to 2018 Admissions – Supplementary/Improvement)

Time: Three Hours Maximum: 80 Marks

Section A

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

1. Unit of rate constant for a first order reaction is ……. whereas for second order reaction is …….
2. The proton has spin quantum number …….
3. The energy of Avogadro number of quanta is called a/an…….
4. The enthalpy change for adsorption is …….
5. When a substance is distributed between two immiscible liquids and its molecule associates in one of them, the distribution constant is given by

   a) $\frac{c_1}{\sqrt[n]{c_2}}$ b) $\frac{c_1}{c_2}$ c) $\sqrt{\frac{c_1}{c_2}}$ d) $\frac{c_1}{2c_2}$
6. The principle of column chromatography is …….
7. The ESR spectrum of methy radical contains ……. lines
8. The interaction between magnetic moments arising from the spins of neighboring nuclear spins is called …….
9. Among the following; the one having lowest energy is ……. ($\sigma \rightarrow \pi^*$, $n \rightarrow \pi^*$, $\pi \rightarrow \pi^*$)
10. The point group of Cl_2 molecule is …….

(10 × 1 = 10 Marks)

Section B

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

11. Derive Michaelis Menten constant K_M for enzyme catalysis.
12. Determine the unit of rate constant for a reaction having order $\frac{1}{2}$
13. Depict pictorially a plot of $1/C_t$ against t for a second order reaction.
14. State Grothus Draper law.
15. What is meant by photosensitization?
16. State Hardy Schulze law.
17. Define the term flocculation value.

18. State the Nernst distribution law.
19. Discuss the principle of paper chromatography.
20. Define bathochromic shift and hyperchromic shift.
21. Sketch the high resolution ^{1}H NMR spectrum of ethyl acetate.
22. The point group to which 1,3,5 tribromo benzene belongs to is …….

(10 × 2 = 20 Marks)

Section C

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

23. Sketch the different vibrational modes of H_2O. Which of them are IR active?
24. What is a group multiplication table? Give the GMT for C_{2v} point group.
25. Explain the difference between vertical, horizontal and dihedral mirror planes.
26. Discuss the phase diagram of water system.
27. Derive the van't Hoff osmotic pressure equation.
28. Derive the thermodynamic derivation of phase rule.
29. State Frank-Condon principle.
30. Discuss the quantum mechanical concept of Raman scattering.

(5 × 6 = 30 Marks)

Section D

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

31. Derive the integrated rate equation for second order reaction when the two reactants have different initial concentrations.
32. Discuss the various applications of electronic spectroscopy.
33. Explain fluorescence and phosphorescence. Differentiate between them using Jablonski diagram.
34. Discuss the principle and various applications of IR spectroscopy.

(2 × 10 = 20 Marks)

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