D 10129 (Pages : 3) Name.....

Reg. No.....

FIFTH SEMESTER U.G. DEGREE EXAMINATION, NOVEMBER 2021

(CUCBCSS—UG)

Chemistry

CHE 5B 08—PHYSICAL CHEMISTRY—II

Time : Three Hours Maximum : 80 Marks

Section A (One Word)

Answer **all** *questions.*

Each question carries 1 *mark.*

1. The unit for rate constant for a first order reaction is ————.
2. The point group of water molecule (H_2O) is ————.
3. How many numbers of signals would be expected in ^{13}C NMR spectra of Glycol and ethanol ?
4. In a reaction if the concentration of reactant A is tripled, the rate of reaction becomes twenty seven times. What is the order of the reaction ?
5. The selection rule for rotational spectroscopy considering atoms as rigid rotor is ————.
6. As per Stark-Einstein law, the number of photons absorbed for a molecule to react is ————.
7. In adsorption, if the concentration of a substance in the interface is high, it is called ————.
8. In a single - component condensed system, if degree of freedom is zero, maximum number of phases that can co-exist is ————.
9. Fluorescence arises from the ———— vibrational level of the first excited electronic state to one of the vibrational levels in the electronic ground state.
10. The ratio of distance travelled by a substance to distance travelled by a solvent front in thin layer chromatography is ————.

(10 × 1 = 10 marks)

Turn over

Section B (Short Answer)

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

11. What is molecularity of a reaction ? Order higher than three is very rare ? Why ?
12. Draw the miscibility temperature verses percentage composition graph for phenol water system and define CST.
13. Absolute ethanol cannot be prepared by simple distillation of ethanol water mixture. Why ?
14. How does the percent transmittance of a solution vary with : (a) Increasing concentration ; and (b) Increasing path length ?
15. What are the Stokes lines and antistokes lines ?
16. What is Chemiluminescence ? Write an example.
17. How force constant is related to bond length and bond order ?
18. What is TMS ? Why is it used as a standard reference in NMR spectroscopy ?
19. List all the symmetry operations for trans–1, 2-dichloroethylene of C2h symmetry.
20. Write the important characteristics of enzyme catalysis.
21. Write the principle of gel permeation chromatography.
22. Distinguish proper and improper axis of rotation.

(10 × 2 = 20 marks)

Section C (Paragraph)

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

23. Derive an expression for rate constant of a first order reaction. If a first-order reaction is 29.6% complete after 18.4 seconds, how long will it take to complete four half-life periods ?
24. How does IR spectroscopy differ from Raman spectroscopy ?
25. Explain Freundlich adsorption isotherm. What are its limitations ?
26. Explain the principle of fractional distillation using temperature composition diagrams.

27. Briefly explain Donnan membrane equilibrium.

28. Discuss the working principle of gas chromatography.

29. How will you determine the bond length from rotational spectral data ?

30. What is multiplication table in molecular symmetry ? Construct the multiplication table for C3v point group.

(5 × 6 = 30 marks)

Section D (Essay)

Answer any **two** *questions.*

Each question carries 10 *marks.*

31. Differentiate order and molecularity of a reaction and briefly discuss the different methods used for the determination of order of a reaction.

32. (a) What are surfactants, explain its role in daily life ?

(b) Briefly explain the phase diagram of water.

33. (a) Explain the importance of Frank-Condon principle in the electronic transitions.

(b) How the concept of Simple harmonic oscillator is used for the explanation of ir spectra.

34. (a) Briefly explain the principle of thin layer chromatography and explain its importance as a supplementary system in column chromatography.

(b) With the help of Jablonski diagram explain Fluorescence and Phosphorescence.

(2 × 10 = 20 marks)