D5BCH2003 (PAGES 2) Reg.No..........................

Name: ....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022
(Regular/Improvement/Supplementary)
CHEMISTRY
GCHE5B08T: PHYSICAL CHEMISTRY II

Time: 2 Hours   Maximum Marks: 60

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 Marks)

1. What is the order of each of the following reaction (i) radioactive decay (ii) acidic hydrolysis of ethyl acetate?

2. Give one example each for (i) a parallel reaction (ii) a consecutive reaction

3. The rate constant of a first order reaction is 7×10^{-4} s^{-1}. What is the time taken for the reactant to be reduced to one-fourth of the initial concentration?

4. Give the Michaelis-Menten equation and explain the terms.

5. All the four phases of Sulphur cannot coexist in equilibrium under any condition. Why?

6. What is the variance of an equilibrium system of two immiscible liquids in contact with vapour?

7. Which of the following molecules will show a microwave rotational spectrum and why?

   HCl, NH_3, O_2, HCN

8. State the Born-Oppenheimer approximation.

9. What is meant by Fingerprint region in an IR spectrum of organic compound?

10. How many lines does the ESR spectrum of methyl radical contain?

11. What are the reasons for the abnormal quantum yields?

12. What are the applications of phosphorescence?

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 Marks)

13. Explain the important steps of a chain reaction.

14. The activation energy for a reaction is 94.14 kJ/mol and the value of rate constant at 313 K is 1.8×10^{-5} s^{-1}. Calculate the frequency factor A.

15. Explain how BET equation can be used to calculate the surface area of an adsorbent?

16. With the help of phase diagram, explain Pattinson's process of desilverization of lead.

17. Diagrammatically represent different vibrational modes of CO_2 and H_2O. Explain the mutual exclusion principle.

18. Sketch the schematic NMR spectrum of ultrapure ethanol and explain the peaks.

19. Draw the Jablonski diagram and explain the various types of transitions.

(PTO)

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. (a) Briefly discuss the postulates of Langmuir's adsorption theory and derive Langmuir adsorption equation.

    (b) Discuss the quantum mechanical concept of Raman effect and explain Stokes & Anti - stokes lines.

21. (a) Give the thermodynamic derivation of Nernst distribution law.

    (b) Discuss the significance of Frank-Condon principle in explaining the intensities of spectral lines in electronic spectroscopy.

$(1 \times 10 = 10 \text{ Marks})$