D5BCH2103 (PAGES 2) **Reg.No.....**

Name: .....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023

(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. Differentiate between bathochromic shift and hypsochromic shift.
2. A reaction $2A(g) + B(g) \longrightarrow A,B(g)$ has an order 2 with respect to A and an order 1 with respect to B. If the volume is reduced to 1/4 of the initial value by application of pressure, what will be the rate of the reaction now?
3. What is meant by chemisorption?
4. Give example for an enzyme-catalyzed reaction.
5. Mention the conditions that a liquid must satisfy if it is to be purified by the process of steam distillation.
6. What are the relationships between the frequency of a radiation and its (a) wavelength and (b) energy? Calculate the energy of a radiation that has a wave number 0.005 nm.
7. Explain the phenomenon of photosensitization.
8. Explain overtones.
9. Among N_2 O_2 and F_2 which of the molecules will give ESR signal. Explain.
10. Explain the differences between thermal and photochemical processes.
11. Explain what is meant by Raman shift. Write the mathematical expression of Raman shift.
12. What is the quantum yield of the hydrogen-chlorine reaction? Discuss any two reasons for the observed quantum yield of the hydrogen-chlorine reaction.

(PTO)

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

13. State Franck-Condon principle and explain it with regard to electronic transitions in a diatomic molecule.

14. Benzenediazonium chloride undergoes first order thermal decomposition at 323 K with a rate constant 0.071 min^{-1}. How long will it take for the reaction to be 80% complete?

15. The volume of nitrogen required at STP to cover the surface of a sample of iron catalyst with a monolayer as determined from the BET plot was found to be 8.15cm^3g^{-1} of the adsorbent. The area occupied by one nitrogen molecule is 16.2 x$10^{-20}m^2$. Calculate the surface area per gram of the iron catalyst.

16. Sketch the schematic NMR spectrum of butanone. Label the signals and explain their multiplicities.

17. In the rotational spectrum of HF, the lines are 41.9 cm^{-1} apart. Calculate the moment of inertia and bond length in HF. [H = 1.008; F = 19.0].

18. An aqueous solution of an organic substance absorbs 10% of the incident radiation in path length of 2 cm. The molar absorption coefficient of the substance is 1.2 L mol-1cm-1. Calculate the concentration of the solution.

19. Derive Gibb's phase rule.

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

20. Derive an expression for the rate constant of a bimolecular second order reaction using collision theory.

21. (a) Draw the phase diagram of the water system and discuss the application of phase rule to the system.

    (b) Distinguish between the terms triple point and eutectic point.

(1 x 10 =10 Marks)