F 6501 (Pages : 2) Reg. No.....

Name.....

M.Sc. DEGREE (CSS) EXAMINATION, JANUARY 2015

Third Semester

Faculty of Science

Branch : III—Chemistry

CH 3C 11—CHEMICAL KINETICS, SURFACE CHEMISTRY AND PHOTOCHEMISTRY

(2012 Admission onwards)

Time : Three Hours Maximum Weight : 30

Section A

Answer any **ten** *questions.*
Each question carries a weight of 1.

1. What are the two basic condition in which the steady state approximation applied to a chemical reaction ?
2. Explain the term Photosensitization and quenching.
3. What is an excimer ? Give one example for an excimer.
4. The quantum yield of H_2- Cl_2 reaction is very high. Explain.
5. Name the protein involved in the cold light emission in glow worms.
6. What is the role of co-catalyst in the cationic polymerization of isobutylene ?
7. How does primary salt effect differ from secondary salt effect ?
8. Differentiate between VantHoff intermediate and Arrhenius intermediate.
9. What happens to the overall reaction rate when iodine is replaced by bromine in the halogenation of acetone in aqueous solution ?
10. What happens when an oil soluble dye is added to code liver oil ?
11. Write down the Hammet Bronsted equation and explain the terms involved.
12. What do you understand the by the term collision cross section ?
13. Explain the term Donnan membrane.

(10 × 1 = 10)

Section B

Answer **five** *questions attempting not more than* 3 *questions from each bunch.*
Each question carries a weight of 2.

BUNCH 1 (Short Essay Type)

14. Derive an expression for the rate constant based on Lindeman -Christiansen hypothesis for unimolecular reaction ? How can you show the experimental result (reciprocal of rate constant) vary from theoretical result ?

Turn over

15. Derive the Michelis-Menton equation for an enzyme catalyzed reaction.

16. Briefly describe the flash photolysis method for studying fast reactions.

17. Explain the Principle of Auger electron spectroscopy in the study of surfaces.

Bunch 2 (Problem Type)

18. Photo bromination of cinnammic acid to dibromo cinnammic acid was carried out in blue light of wave length 440 nm at 35 °c using light intensity of 1.5×10^{-3} J /s. An exposure of 20 minutes produced a decrease of 0.075 mill moles of bromine. The solution absorbed 80 percent of the light passing through it. Calculate the quantum yield of the reaction.

19. Calculate the specific reaction rate k at 556 °C for the reaction :

$$2\,HI \longrightarrow H_2 + I_2$$

The activation energy for the reaction is 44000cals; collision diameter is 3.5×10^{-8}.

20. A monolayer of N_2 molecule (effective area 0.162 nm^2) is adsorbed on the surface of 1 g of an Fe/Al_2O_3 catalyst at 77 K, the boiling point of liquid nitrogen occupies 2.86 cm^{-3} at 0°C and 1 atm pressure .What is the surface area of the catalyst ?

21. A sample of serum globulin is placed in an ultracentrifuge which is operating at 50,000 rotations per minutes (rpm). If the sedimentation coefficient of this protein is 7.1×10^{-13} s, how far will the solution boundary move in 30 minutes at a distance of 6.5 cm from the axis of rotation ?

$(5 \times 2 = 10)$

Section C

Answer any **two** *questions.*
Each question carries a weight of 5.

22. Describe the Semenov-Hinshelwood theory of Branching chain reaction. Explain the lower and upper explosion limits with reference to the kinetic expression.

23. Derive BET adsorption isotherm. Show that it approximates to Langmuir adsorption isotherm under limiting conditions.

24. (a) What are surfactants ? How osmotic pressure does vary with change in critical micelle concentration ?

    (b) What are the applications of colloidal Surfactants ?

25. Explain the principle and working of solar cell.

$(2 \times 5 = 10)$