

2016

CHEMISTRY

Paper : 201

PHYSICAL CHEMISTRY

Full Marks : 80

Time : 3 hours

The figures in the margin indicate full marks for the questions

Section: A (For Old & New Course)

1. What is chain reaction? Explain different steps involve in a chainreaction 4
2. Show the three explosion limits and explain the cause of explosions. 6
3. Discuss the Belousov-Zhabotinskii reaction. 4
4. What are the different types of enzyme catalysts known? Write their role in chemical reaction? 6
5. Inert ionic species alter the rate of a reaction in solution. Explain. 4
6. Derive the rate of a bimolecular reaction by transition state theory. 4
7. Discuss the Hinshelwood treatment for unimolecular reaction and its difficulties 6
8. Show that the rate constant of fully diffusion controlled reaction

- varies inversely with viscosity of the solvent. 6
9. Derive an expression for Langmuir isotherm. 4
10. How selectivity of a metal catalyst varies with its valance states? Explain with example. 4
11. Write short note on (any four) 12
- Colloidal stability
 - Micelle formation
 - Eley-Rideal mechanism
 - Phase transfer catalysis
 - Selectivity of catalyst

Section: B (For New Course)

12. What are the compatible observables? 1
13. What is radial distribution function? Draw radial distribution function for 1s orbital. 2
14. Show that operators having common set of Eigen functions commute. 2
15. Prove that the non-degenerate Eigen functions of a Hermitian operator are orthogonal to each other. 3
16. Write down the conditions to be satisfied to call ψ as well behaved well function. 3
17. The wave function $\Psi = c_1\Psi_1 + c_2\Psi_2$ is a combination of the normalized stationary state wave function Ψ . For Ψ to be normalized, show that c_1 and c_2 must satisfy $|c_1|^2 + |c_2|^2 = 1$. Calculate the expectation values of L^2 and L_z . 6
18. Write down the expression for angular momentum operators in the spherical polar coordinates? 3

Section: C (For Old Course)

19. What is the degree of polymerization? How it is used to calculate molar mass? Explain the osmotic pressure method for determination of molecular weight. 5
20. What is molecular weight distribution? Show the position of number average, weight average and viscosity average molecular weight on the distribution curve. Find an expression for number average molecular weight for a polymer sample of N_i segments of mass M_i . 5
21. Write down the steps of free radical polymerization? Name two initiators used in free radical polymerization. 5
22. What are the basic ingredients of bulk polymerization? Write down the advantages of bulk polymerization. 3
23. Schematically show the difference of different types of copolymer. 2

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