

Register Number :

Name of the Candidate :

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M.Sc. DEGREE EXAMINATION, 2011

(CHEMISTRY)

(SECOND YEAR)

(PAPER - IX)

230. PHYSICAL CHEMISTRY - II

(Including Lateral Entry)

December] [Time : 3 Hours

Maximum : 125 Marks

Answer ALL questions from Section-A and Section-B.

Answer any THREE questions from Section -C.

ALL questions carry equal marks.

SECTION - A (5×3=15)

1. Predict the number of ^1H NMR signals for acetaldehyde and sketch the splitting pattern.
2. What is hyperfine splitting? Predict the ESR spectrum of naphthalene radical anion.

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3. Heat supplied to a engine is 1897.8 kJ. How much useful work can be done by the engine which works between 0°C and 100°C?
4. Write Butler-Volmer equation and explain the terms.
5. Explain the significance of linear free energy relationship.

SECTION - B (3× 20=60)

6. (a) Describe the theory of ^{13}C NMR spectroscopy.

(OR)

- (b) Write notes on NOESY and HSQC techniques.

7. (a) Explain Mc Lafferty rearrangement with examples.

(OR)

- (b) Discuss the applications of ESR spectroscopy in the study of transition metal complexes.

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- (b) Derive BET equation. Show that under certain conditions, it reduces to Langmuir isotherm.
15. (a) Explain the significance of Hammett and Taft equations.
- (b) Describe the Lindemann-Hinshelwood theory of unimolecular reactions.

SECTION - C (3 × 20=60)

11. (a) What is chemical shift? Explain the factors that affect the chemical shift values in ^1H NMR spectroscopy.
- (b) Write notes on :
- (i) Nuclear overhauser effect
and (ii) Chemical exchange reactions in NMR.
12. (a) Describe the theory, instrumentation and applications of NQR spectroscopy.
- (b) Write short notes on:
- (i) Retro-Diels-Alder fragmentation.
and (ii) SIMS technique.
13. (a) Derive an expression for Bose-Einstein statistics.
- (b) Deduce an expression for the molecular translational partition function of an ideal gas.
14. (a) Discuss the mechanism and kinetics of cationic polymerization.

8. (a) Discuss the expression for Maxwell-Boltzmann statistics.
- (OR)
- (b) Discuss the Einstein's theory of heat capacity of solids.
9. (a) Describe the determination of molecular weight of polymers by viscosity method in detail.
- (OR)
- (b) Discuss Guoy-Chapman and Perrin models of electrical double layer formed between electrode-electrolyte interface.
10. (a) Explain Huckel π - electron theory and apply this theory to benzene molecule.
- (OR)
- (b) Describe how nuclear magnetic resonance method can be used for the study of fast reactions.

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