15133

M.Sc. DEGREE EXAMINATION, NOVEMBER 2016.

FIRST SEMESTER

Material Sciences & Nano Technology

Paper III — FUNDAMENTALS OF CHEMISTRY

Time : Three hours | Maximum : 75 marks

(No additional sheet will be supplied)

PART A — (5 × 3 = 15 marks)

Answer any FIVE questions.

Each question carries 3 marks.

Each answer should not exceed 1 page.

1. What is meant by Inert - pair effect?
2. Explain the structure of N2 by molecular orbital theory.
3. Write notes on types of isomerism in coordination compounds.
4. Describe the salient features of Werner's theory?
5. What is meant by inert and labile complexes?
6. Describe about Marcus theory?
7. Write notes on preparation and nucleophilic substitution reactions of Grignard reagent?
8. Explain about ease of hydrolysis in aryl halides and alkyl halides.

PART B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. (a) Explain the term lattice energy of ionic crystals?

   (b) What is ion deformation? Explain the factors affecting ion deformation by Fajan's rule.

Or

10. (a) What is meant by hybridization of atomic orbital's and explain types of hybridization?

    (b) Discuss in detail about the structure and bonding in diborane.

11. What is Crystal field theory? Calculate CFSE value for $[Fe(CN)_6]^{4-}$ and $[Cr(H_2O)_6]^{+3}$?

Or

12. What is Valence bond theory? Explain the magnetic properties of the following complexes.

    (a) $[CO(NO_2)_6]^{3-}$

    (b) $[Fe(H_2O)_5(NO)]$

13. Discuss about kinetics and mechanism of substitution reactions in octahedral complexes.

Or

14. Explain the trans effect and its mechanism with examples.

15. Explain in detail about the energy profile diagrams of S_N1 and S_N2 reactions.

Or

16. (a) Write the stability and reactivity order of allyl, vinyl and benzyl halides.

    (b) Illustrate about Walden inversion and Racemisation by taking 2-bromobutane as an example.