First Semester B.Sc. Degree Examination, October/November 2019

(CBCS Scheme)

Paper I – CHEMISTRY

Time : 3 Hours]

[Max. Marks : 90

Instructions to Candidates :

1) Question paper has Two Parts Part A and Part B

2) Both the Parts should be answered

PART – A

I. Answer any **TEN** of the following questions. Each question carries **2** marks : **(10 × 2 = 20)**

1. What is diagonal relationship? Give an example.

2. Write the limitations of Bohr's theory.

3. Sketch the radial probability distribution curves for 1S and 2S orbitals.

4. Define lattice energy. List the factors affecting it.

5. Distinguish between sigma and pi bonds.

6. Write the molecular orbital configuration of N_2. Write its magnetic property.

7. Between ammonia and methyl amine, which is more basic and why?

8. Define the term configuration and conformation and give an example for each.

9. Write any two principles of green Chemistry.

10. Define
    (a) Chromatogram and
    (b) Retention time

11. Write the preparation of alkenes by Birch reduction.

12. State Saytzeff's rule with an example.

PART – B

II. Answer any **SEVEN** of the following questions. Each question carries **10** marks :

$(7 \times 10 = 70)$

13. (a) Define ionization energy. How does it vary along a period and down the group? Explain.

    (b) Calculate the bond order of the following : O_2, O_2^+ and O_2^-.

    (c) State Fajan's rules. **(4 + 3 + 3)**

14. (a) What are quantum numbers? Explain different quantum numbers and their significance.

    (b) State and explain Hund's rule with an example.

    (c) Write all the possible values of l and m when $n = 3$ / **(4 + 3 + 3)**

15. (a) (i) Write Schrodinger equation and explain the various terms involved in it.

        (ii) What is the significance of Ψ and Ψ^2.

    (b) Explain $(n + l)$ rule with an example.

    (c) Calculate the de-Broglie wave length of θ particle of mass $10^{-3} kg$ moving with a velocity of $10^5 m/s$. $(h = 6.63 \times 10^{-34} JS)$. **(4 + 3 + 3)**

16. (a) Draw the molecular orbital energy level diagram for NO molecule, determine its bond order and comment on its magnetic properties.

    (b) Predict and explain the geometry of H_2O and X_cF_4 on the basis of VSEPR theory.

    (c) Explain Sp^3d^2 hybridization with an example. **(4 + 3 +3)**

17. (a) Construct the Born-Haber cycle for the formation of M_gO and how the lattice energy is calculated from it?

    (b) The bond angle in Ammonia is $107°$, whereas in water $104.5°$. Justify.

    (c) Calculate the total number of lone pairs and bond pairs in ClF_3, BrF_5 and I_3^-. **(4 + 3 + 3)**

2

18. (a) Define hybridization and explain the hybridization in ethane molecule.

   (b) Write a note on

      (i) Carbocations and

      (ii) Carbanions.

   (c) Which of the following compounds are aromatic? Benzene, cyclohexane, pyrrole and tetrahydrofuran. Give reason. **(4 + 3 + 3)**

19. (a) Write the Newmann projection formulae of

      (i) ethane and

      (ii) glyceraldehyde

   (b) Write the chair and boat conformations of cyclohexane and comment on their relative stabilities.

   (c) Calculate the ring stain in the following molecules

      (i) Cyclobutane

      (ii) cyclopropane and

      (iii) cyclohexane **(4 + 3 + 3)**

20. (a) Write the classification of chromatographic methods based on the nature of stationary phase.

   (b) Write the criteria for the selection of mobile phase and stationary phase in TLC and write its applications.

   (c) Explain the green synthesis of ibuprofen by BHC–method. **(4 + 3 + 3)**

21. (a) Explain the oxymercuration and demercuration reaction of propene.

   (b) Terminal alkynes are acidic in nature, explain with an example.

   (c) Explain ozonolysis of alkines with suitable example and mention its significance in structural elucidation. **(4 + 3 + 3)**

22. (a) Describe the preparation of alkenes by the following methods :

      (i) dehydration

      (ii) dehydrohelogenation

   (b) Explain the mechanism of chlorination of propane.

   (c) Explain why stability of free radicals follows the order $3 > 2 > 1$? **(4 + 3 + 3)**