(i) **Printed Pages : 4** **Roll No. .....**

(ii) **Questions : 8** **Sub. Code : 1 1 7 0 8**

Exam. Code : 5 0 1 1

Bachelor of Science (FYUP) 1st Semester

(2125)

CHEMISTRY

Paper : General Chemistry-I

Time Allowed : Three Hours] **[Maximum Marks : 67**

Note :— (1) Question No. **1** consists of Multiple Choice Questions (MCQs) and is a compulsory question.

(2) Question No. **2** consists of short-answer type questions and is also compulsory.

(3) Units I–III each contain *two* questions with an internal choice. Attempt *one* question from each Unit.

(4) Attempt a total of *five* questions — *two* compulsory questions (Q.1 and 2) and *three* questions from Units I–III.

Compulsory (19 Marks)

1. Attempt the following multiple-choice questions.

(a) The magnetic quantum number specifies :

(i) Size of orbitals (ii) Shape of orbitals

(iii) Orientation of orbitals (iv) Nuclear stability

(b) Among the following groups, which represent the collection of isoelectronic species?

(i) NO^+, C_2^{2-}, O_2^-, CO (ii) N_2, C_2^{2-}, CO, NO

(iii) CO, NO^+, CN^-, C_2^{2-} (iv) NO, CN^-, N_2, O_2^-

(c) The d-orbital with the orientation along the x and y axes is called :

(i) d_{xy} (ii) d_{zx}

(iii) d_{yz} (iv) $d_{x^2-y^2}$

(d) Which of the following carbocations is least stable?

(i) tertiary-alkyl (ii) secondary-alkyl

(iii) primary-alkyl (iv) methyl

(e) The bond angle in the sp^2 hybrid orbital is :

(i) 109°28' (ii) 120°

(iii) 180° (iv) 105°

(f) The most stable conformation of butane is :

(i) skew (ii) anti

(iii) gauche (iv) partially eclipsed

(g) The indeterminate errors are also called :

(i) operative errors (ii) accidental errors

(iii) methodic errors (iv) instrumental errors

(h) Radioactive decay :

(i) Follows zero-order kinetics

(ii) Follows first-order kinetics

(iii) Follows second-order kinetics

(iv) Follows third-order kinetics

(i) For an endothermic reaction, ΔS is positive. The reaction is :

(i) Feasible when $T\Delta S > \Delta H$

(ii) Feasible when $\Delta H > T\Delta S$

(iii) Feasible at all temperatures

(iv) Not feasible at all. 1×9

2. Answer the following short-answer questions :

(a) What is the significance of the de Broglie relationship?

(b) Calculate the number of nodes in 4s and 3d.

(c) Differentiate between conformation and configuration.

(d) What is the law of mass action?

(e) Write an equation comparing collision theory and transition state theory. 2×5

UNIT—I

3. (a) Explain the formulation of the Schrodinger wave equation, giving its solutions.

(b) What is the concept of orbital? Differentiate between orbit and orbital.

(c) What are radial and angular wave functions? Draw the probability distribution curves for 2s and 2p.

(d) Discuss the Aufbau principle. Write electronic configurations for Sc and Fe. 4,4,4,4

4. (a) What is the covalent radius? Discuss the effect of hybridization and bond order on covalent radius.

(b) Calculate the effective nuclear charge on the last electron in the S atom.

(c) What is ionization energy? Discuss the factors affecting ionization energy.

(d) Write a note on the oxidizing and reducing character of elements. 4,4,4,4

UNIT—II

5. (a) What is Hybridization? Discuss the formation of methane on the basis of hybridization.
   (b) What is an Inductive Effect? Discuss various types and applications of the inductive effect.
   (c) What are Carbanions? Explain the factors affecting the stability of carbanions.
   (d) Differentiate between addition and elimination reactions. 4,4,4,4

6. (a) What is Geometrical Isomerism? Discuss various conditions for geometrical isomerism.
   (b) Draw the isomers of dimethylcyclopropane and aldoxime.
   (c) Draw the Sawhorse and Newman projection formulae for ethane.
   (d) Discuss various factors that influence conformational stability. 4,4,4,4

UNIT—III

7. (a) Write a note on Quotient law and Power law.
   (b) Discuss the concept of activation energy and the effect of a catalyst on the rate of a reaction.
   (c) Discuss zero-order reactions, giving two examples.
   (d) Discuss the rate equation for the reactions involving only one type of reactant. 4,4,4,4

8. (a) What is Accuracy? How is it different from precision?
   (b) Discuss the kinetics of thermal decomposition of acetaldehyde.
   (c) Write a note on the half-life period of a radioactive element.
   (d) What is the collision theory of bimolecular reactions? 4,4,4,4