Bachelor level/ B. Sc. / 2nd Semester   Full Marks: 60
Time: 3 hours   Pass Marks: 30
Subject: Fundamentals of Chemistry II (CHE425/325)

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Inorganic Chemistry
Short answer questions (Attempt any five)   **[5x2=10]**
1. What is lattice energy? Draw Born-Haber cycle.
2. Define dipole moment. What is the effect of electronegativity difference of atoms in the molecule?
3. Write about 2e-3C bond with an example.
4. Define VSEPR theory. Draw ammonia and xenon tetrafluoride molecules to support this theory.
5. Differentiate between bonding and anti-bonding molecular orbitals. Draw Helium molecular ion's energy diagram to prove molecular orbital theory.
6. What is hydrogen bonding? Write the types of hydrogen bonding.
7. What are hard and soft acids and bases? State Pearson's HSAB principle.

Long answer questions (any two)   **[2x5=10]**
8. Write the characteristics of ionic compounds. Draw sodium chloride to show the crystal structure. **(4+1)**
9. Define hybridization. Describe sp^3 and dsp^3 hybridization with example. **(1+4)**
10. How are metals bonded in solid state? Differentiate conductor, semi- conductor and insulator according to band theory. **(2+3)**

Organic Chemistry
Short answer questions (Any five)   **[2x5=10]**
1. Distinguish laevorotatory and dextrorotatory rotation.
2. Write the limitations of biological and mechanical method of separation of racemic mixture.
3. Justify the order of relative reactivity of alkyl halide ($1^0, 2^0, 3^0$) towards SN^1 reaction.
4. How can you prepare alkyl halide in lab? Explain any two.
5. Racemic mixture is optically inactive, why?
6. What happens to the nucleophilic character when move from left to right in the period and top to bottom in the group in the periodic table? Give reason.
7. What is meso compound? Write an example.

long answer questions (Any two)   **[2x5=10]**
8. What is meant by SN1 reaction? Explain it regarding the mechanism and kinetics. Account for the fact that "SN1 reaction is inversion with racemization" **(1+2+2=5)**
9. Write short notes on resolution of racemic mixture.
10. What are R and S configuration? Illustrate the sequence rules for assigning the absolute configuration.

Physical Chemistry

Short answer question (Attempt any five)   **[2x5=10]**

1. Define p^H. Which indicator will you prefer for titration of strong acid with weak base and why?
2. The solubility product of $BaSO_4$ is $1.7x10^{-10}$ at 25^0C. Find its solubility at this temperature.
3. Ostwald's dilution law is valid for weak electrolytes only, why?
4. State Le-chatelier's principle. How does it explain the effect of pressure on chemical equilibrium?
5. Define Tyndall effect. What type of colloids show such type of effect?
6. What is colligative property?
7. Explain how soap cleans a dirty cloth.

Long answer questions (Attempt any two)   **[5x2=10]**

8. State law of mass action. Derive a relationship between K_p and K_c. In which condition K_p becomes equal to K_c?
9. State and explain Raoult's law for relative lowering of vapor pressure of a solution. Discuss how it can be used to determine the molecular weight of dissolved solid.
10. What is an indicator? Mentioned the types of theories of indicators and explain the Ostwald's theory.

The End