

Assignment Topics

IV SEMESTER

COORDINATION CHEMISTRY II

SCHM41

Assignment

1. Analyze the influence of polymer molecular weight and its distribution (M_n , M_w , PDI) on the physical properties such as tensile strength, glass transition temperature (T_g), and solubility of polymers. Justify how molecular weight determination techniques like osmometry, viscometry, and light scattering differ in sensitivity and application.

or

2. Design a comparative experiment to study the mechanism and kinetics of cationic, anionic, and free radical polymerization for a vinyl monomer. Include the effect of initiators, temperature, and solvent polarity. Evaluate which mechanism provides better control over molecular weight distribution and why.
3. Evaluate the processing techniques such as injection moulding, compression moulding, and blow moulding in terms of energy efficiency, dimensional control, and suitability for different polymer types. Propose an optimized processing strategy for manufacturing high-strength, lightweight plastic components for automotive use.

or

4. Analyze the structural requirements and conjugation necessary for conductivity in polymers. Apply this understanding to propose how chemical doping modifies their electronic properties and enhances conductivity?

PHYSICAL CHEMISTRY – II - SCHM42

1. (a) Explain the concept of wave-particle duality. How do the experiments of black body radiation and photoelectric effect support the need for quantum mechanics?

(Or)

- (b) Explain the concept of a particle on a ring. Derive the wave function and energy expression. How is this model useful in understanding circular or cyclic conjugated systems?
2. (a) Discuss the quantum mechanical treatment of the hydrogen atom. Derive the Schrödinger equation and explain the significance of radial and angular parts of the wave function. Describe the radial distribution function.

(Or)

- (b) Explain the concepts of matrix representation and symmetry operation classes. Distinguish between reducible and irreducible representations. How are direct Product representations used?

POLYMER CHEMISTRY

SCHE41

Assignment

1. Propose a synthetic route and justify the choice of reagents and conditions for preparing a stable cyclopentadienyl-metal carbonyl complex. Analyze its structure and bonding using both MO theory and IR spectral characteristics. Correlate its stability with the 18-electron rule?

or

2. Using a comparative approach, analyze the catalytic efficiency of Wilkinson's catalyst, Rh-based oxo process, and Wacker process in olefin transformations. How do ligand electronic effects influence these reactions mechanistically?
3. Interpret the ^1H and ^{31}P NMR spectral features of the following complexes: $[\text{HNi}(\text{PPh}_3)_4]^+$, $\text{mer-}[\text{Rh}(\text{PPh}_3)_3\text{Cl}_3]$, and PF_5 . Discuss how fluxional behavior, anisotropy, and symmetry affect their spectral characteristics?

or

4. Discuss the zero-field splitting and hyperfine interactions in the EPR spectrum of $[\text{Cu}(\text{bpy})_3]^{2+}$ and $\text{VO}(\text{acac})_2$. How can EPR help distinguish between covalent and ionic bonding characters in such complexes?

SCIENTIFIC REASERCH METHODOLOGY

SCHS41 Assignment

1. Discuss in detail the criteria or characteristics of a good research problem. What are the common errors researchers make while selecting a research problem? Illustrate your answer with suitable examples?
or
2. Explain the importance of a literature survey in the research process. Discuss the steps involved in conducting an effective literature survey and highlight the challenges researchers may face. Support your answer with relevant examples
3. What are the essential components of a well-structured research report? Describe the process of writing a research report, highlighting the key elements, formatting guidelines, and common pitfalls to avoid. Provide examples where appropriate?
or
4. Explain the principle, working, and applications of any three advanced instrumental techniques used in scientific research. Discuss their advantages, limitations, and relevance in modern analytical studies