

# SHREE H.N. SHUKLA GROUP OF COLLEGES

(AFFILIATED TO SAURASHTRA UNIVERSITY & GTU)



2-vaishali nagar, Near  
Amrapali railway  
crossing,  
Raiya road, Rajkot-  
360001. Ph.No.-  
(0281)2440478, 2472590

3-vaishali nagar, Near  
Amrapali railway  
crossing,  
Raiya road, Rajkot-  
360001. Ph.No.-  
(0281)2471645

Behind marketing yard,  
Near Lalpari lake,  
Between Amargadh-  
Bhichri, Rajkot-360002.  
Ph.No.-90990 63150

## M. Sc. SEMESTER-II

### C-203: MACROMOLECULAR PHYSICAL CHEMISTRY

#### 1. Basic Concept of Polymer Chemistry

Classification of polymers. Types of polymer chains. Stereo regular polymers. Polymer nomenclature. Functionality and polymerization concept.

#### 2. Chain Polymerization

Free Radical Polymerization: Methods of initiating free radical polymerization. Chain transfer reactions. Kinetics of free radical polymerization and chain transfer reactions. Factors affecting radical polymerization and properties of the resulting polymers.

Ionic (Catalytic) Polymerization: Kinetics of cationic and anionic polymerization. Coordination polymerization. Copolymerization and its kinetics. Evaluation of reactivity ratios.

Methods of Free Radical Polymerization: Bulk polymerization, solution polymerization, emulsion polymerization and solid phase polymerization. Problems.

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### 3. Polycondensation

Reaction route of poly functional compounds. Kinetics of polycondensation reaction. Molecular weight control in polycondensation. Nonlinear polycondensation. Statistics of linear polycondensation. Effect of monomer concentration and temperature on direction of polycondensation reaction. Polycondensation equilibrium and molecular weight of polymer. Factors affecting the rate of polycondensation and molecular weight of the polymer.

Methods of Polycondensation, Melt, interfacial, solution and solid phase polycondensation. Problems.

### 4. Stepwise Polymerization and Ring scission Polymerization

Thermodynamics of ring transformation to a linear polymer. Effect of temperature and monomer concentration on ring-polymer equilibrium. Kinetics and mechanism of ring scission polymerization. Effect of activator concentration and temperature on ring scission polymerization and molecular weight of the polymer.

### 5. Physico-chemical Transformation Reactions

Types of reactions in polymer chemistry. Degradation and its classification. Crosslinking, addition and substitution reactions. Reactions of functional groups.

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## 6. Fractionation of Polymers

Isolation and purification of polymers. fractionation of polymers. Methods polymer fractionation: Fractional precipitation, partial dissolution or extraction method, Gradient elution method and gel permeation chromatography method.

### Reference Books

1. A First Course in Polymer Chemistry, Mir Publishers, Moscow.
2. Physical Chemistry of Polymers, A Tager, Mir Publishers, Moscow.
3. Text-book of Polymer Science, F. W. Billmeyer, Willey Interscience.
4. Polymer Chemistry, Bruno Vollmert. Springer, New York.
5. Principles of Polymer Systems, F. Rodriguez, McGraw Hill.
6. Polymer Science, V. R. Gowariker, N. V. Vishwanathan and J. Shreedhar, Wiley Eastern Ltd., New Delhi.
7. Physical Chemistry of Macromolecules, D. D. Deshpande, IIT, Bombay
8. Polymer Chemistry An Introduction, Malcolm P. Stevens, Addition-Wesley Publishing Company, Inc.
9. Principles of Polymer Chemistry, A. Ravve, Kluwer Academic/Plenum Publisher, New York.

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10. Organic Polymer Chemistry, K. J. Saundars .

11. Macromolecular Physical Chemistry, P. H. Parsania

12. Polymer Materials Science, Technology and Developments, Vol.I,  
SukumarMaity, AnusandhanPrakasan, Midnapore