



# ARSD College, University of Delhi

## Model Course Handout/Lesson Plan

Course Name : B.Sc. (Hons) Chemistry						
Semester	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
VI	CHEMISTRY –DSE-6	Polymer Chemistry	0	0	4	2
Teacher/Instructor(s)		Dr. Anjali Verma; Mr. Vishnu Kumawat				
Session		2022				

### Course Description:

**Objectives:** The primary objective of this paper is to help the student to know about the synthesis, properties and applications of polymers.

**Learning Outcomes:** By the end of this course, students will be able to:

- Know about history of polymeric materials and their classification
- Learn about different mechanisms of polymerization and polymerization techniques
- Evaluate kinetic chain length of polymers based on their mechanism
- Differentiate between polymers and copolymers
- Learn about different methods of finding out average molecular weight of polymers
- Differentiate between glass transition temperature ( $T_g$ ) and crystalline melting point ( $T_m$ )
- Determine  $T_g$  and  $T_m$  • Know about solid and solution properties of polymers
- Learn properties and applications of various useful polymers in our daily life.

### List of Experiments:

#### Polymer Synthesis

1. Free radical solution polymerization of styrene (St) / Methyl Methacrylate (MMA)/MethylAcrylate (MA).
2. Preparation of nylon 6,6
3. Redox polymerization of acrylamide
4. Precipitation polymerization of acrylonitrile
5. Preparation of urea-formaldehyde resin
6. Preparations of novalac resin/resold resin.
7. Microscale Emulsion Polymerization of Poly(methylacrylate).

#### Polymer characterization

1. Determination of molecular weight of polyvinyl propylidene in water by viscometry:
2. Determination of the viscosity-average molecular weight of poly(vinyl alcohol) (PVOH) and the fraction of head-to-head monomer linkages in the polymer.
3. Determination of molecular weight by end group analysis of polymethacrylic acid.

## Polymer analysis

1. Estimation of the amount of HCHO in the given solution by sodium sulphite method
2. IR studies of polymers
3. DSC (Differential Scanning Calorimetry) analysis of polymers
4. TG-DTA (Thermo-Gravimetry-Differential Thermal Analysis) of polymers.

<b>Details of the Lab Course</b>		
<b>Session</b>	<b>Name of Experiment</b>	<b>Contact Hours</b>
1	Issue of Apparatus	4
2	Preparation of urea-formaldehyde resin	4
3	Preparations of Phenol-formaldehyde resin	4
4	Free radical solution polymerization of Methyl Methacrylate (MMA)	4
5	Preparation of nylon 6,6 via interfacial polymerization	4
6	Redox polymerization of acrylamide	4
7	Precipitation polymerization of acrylonitrile	4
8	Microscale Emulsion Polymerization of Poly(methylacrylate).	4
9	Determination of the viscosity-average molecular weight of poly(vinyl alcohol) (PVOH) and the fraction of head-to-head monomer linkages in the polymer.	4
10	Determination of molecular weight by end group analysis of polymethacrylic acid.	4
11	Estimation of the amount of HCHO in the given solution by sodium sulphite method.	4
12.	IR studies of polymers	4
13	DSC (Differential Scanning Calorimetry) analysis of polymers	4
14.	TG-DTA (Thermo-Gravimetry-Differential Thermal Analysis) of polymers.	4
15	Mock Test for internal Assessment	4
	<b>Total</b>	<b>60</b>
<b>Suggested Books:</b>		
<b>Sl. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/ Reprint</b>
1.	Fried, J.R. Polymer Science and Technology, Prentice-Hall..	2003
2.	Munk, P.; Aminabhavi, T. M.; Introduction to Macromolecular Science, John Wiley & Sons.	2002

3.	Sperling, L.H.; Introduction to Physical Polymer Science, John Wiley & Sons	2005
4.	Allcock, H.R.;Lampe, F. W.; Mark, J. E,Contemporary Polymer Chemistry, Prentice Hall.	2003

**Evaluation Scheme:**

No.	Component	Duration	Marks
1.	Internal Assessment		25
	• Quiz/Viva		
	• Observation & Record		
	• Attendance		
	• Model Exam		
2.	End Semester Examination	5 hrs	25

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