

2. Balaram Sahoo, NimaiCharan Nayak, AsutoshSamantaray, & Prafulla Kumar Pujapanda. (2012). *Inorganic chemistry*. Prentice-Hall of India Pvt Ltd.

**Practical:**

- Jeffery, G.H., Bassett, J., Mendham, J., & Denney, R.C. (1989). Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons.

**Note:** Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

**GENERIC ELECTIVE (GE-02)**

**Credit distribution, Eligibility and Pre-requisites of the Course**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
<b>Chemistry of Carbohydrates, Nucleic Acids and Lipids ALS CHEM GE 02</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>2</b>	NIL	NIL

**Objectives:**

This course aims to introduce the learner to the fascinating chemistry of some molecules, *i.e.*, carbohydrates, nucleic acids and lipids that work within biological systems. The basic concept of heredity, which is imparted through replication, transcription and translation processes will be discussed.

**Learning outcomes:**

On completion of this course, the students will be able to:

Understand and demonstrate how structure of biomolecules (carbohydrates, nucleic acids and lipids) determine their reactivity and biological functions.

Understand the concept of heredity through replication, transcription, and translation processes.

## **Theory:**

### **Unit 1. Chemistry of Carbohydrates: Hours: 10**

Classification of carbohydrates, reducing and non-reducing sugars, biological functions, general properties and reactions of glucose and fructose, their open chain structure, epimers, mutarotation and anomers, reactions of monosaccharides, determination of the configuration of glucose (Fischer proof), the cyclic structure of glucose. Haworth projections. The cyclic structure of fructose. The linkage between monosaccharides: structure of disaccharides (sucrose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.

### **Unit 2. Nucleosides, Nucleotides and Nucleic Acids: Hours: 10**

Components of Nucleic acids: Adenine, guanine, thymine, cytosine and uracil (structure only), other components of nucleic acids, nucleosides and nucleotides (nomenclature), structure of polynucleotides; structure of DNA (Watson-Crick model) and RNA (types of RNA), difference between DNA and RNA, genetic code, biological roles of DNA and RNA: replication, transcription and translation.

### **Unit 3. Lipids: Hours: 10**

Introduction to oils and fats; common fatty acids present in oils and fats, Hydrogenation of fats and oils, Saponification value, acid value, iodine number. Reversion and rancidity.

Lipids: Classification. Biological importance of triglycerides and phosphoglycerides and cholesterol; Lipid membrane, Liposomes and their biological functions and underlying applications. Lipoproteins. Properties, functions and biochemical functions of steroid hormones.

## **Practical:**

1. Preparation of osazone of glucose, fructose and Maltose (Comparing the time of formation of the two and the shape of crystals using microscope).
2. Identification of given carbohydrates as
  - a) Reducing and Non-reducing
  - b) Monosaccharide and Disaccharide
  - c) Aldose and Ketose
3. Estimation of glucose by Fehling's solution.

4. Determination of acid value of fats and oils.
5. Determination of the iodine number of oils.
6. Determination of the saponification number of oils.
7. Identification and separation of mixture of sugars by paper chromatography.
8. Isolation of DNA from cauliflower/ onion.
9. Estimation of DNA by diphenylamine reaction.
10. Determination of total sugar content by ferricyanide method (volumetric/colorimetric method).

### Essential/recommended readings

#### Theory

- Vogel, A., Jeffery, G., Bassett, J., & Mendham, J. (1989). *Vogel's textbook of quantitative chemical analysis*. John Wiley and Sons.
- Finar, I. L. (2002). *Organic Chemistry* (Volume 1 & 2). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Morrison, R. N., & Boyd, R. N. (2016). *Organic Chemistry*. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Mehta, B., & Mehta, M. (2015). *Organic Chemistry* (2nd ed.). PHI Learning Pvt. Ltd.
- Satyanarayana, U., & Chakrapani, U. (2017). *Fundamentals of Biochemistry*. Books and Allied (P) Ltd.

#### Suggestive readings

- Lehninger, A. L., & Nelson, D. L. (2009). *Principles of biochemistry*. W. H. Freeman.
- T. W. Graham Solomons, Craig B. Fryhle, & Scott A. Snyder. (2013). *Solomons's Organic Chemistry 7th edition*. Pearson Education India.
- Jr. Leroy G. Wade, Jan William Simek, & Maya Shankar Singh. (2019). *Organic Chemistry*. Pearson Education India.
- Ghatak, K. L. (2014). *A textbook of organic chemistry and problem analysis*. PHI Learning.

#### Practical: