



# ST. XAVIER'S COLLEGE (AUTONOMOUS)

Re-accredited with 'A+' by NAAC (4<sup>th</sup> Cycle) | Affiliated to Gujarat University

## DEPARTMENT OF CHEMISTRY MULTIDISCIPLINARY COURSE SYLLABUS

### Multidisciplinary Course: Integrated Chemistry - I

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
CH-1201 Integrated Chemistry – I	4	0	0	10 + 2 from a recognized board in any stream	Nil

#### I. Learning Objectives

On completion of this course, the student will be able

- LO-1. To understand the use and applications 12 principles of Green Chemistry, identify greener solvents and use of renewable energy sources of sustainable chemistry. To define the importance of inorganic elements in vital systems. To understand the importance of minerals and essentially trace elements and beneficial elements of living system.
- LO-2. Understanding water's unique properties helps explain a lot about water's behavior. Student's working knowledge of water quality and characteristics of water sources. Students understand the terms: micelle, hard water, soft water, temporary hardness, and permanent hardness. Students acquire knowledge of the cleaning capacity of soap in hard and soft water. Based on the acquired skill, students will be able to classify the given water as hard water or soft water. Students acquire skills to perform the experiment in the real lab.
- LO-3. To get basic understanding of Food additives sugar substitutes, sweeteners, food colors, antioxidants, stabilizers, Biomaterial etc. used in food industry.
- LO-4. To get knowledge of classes of adhesives, their preparation and bonding mechanisms.

## II. Course Outcomes

On Completion of this course, the student has been able to

- CO-1 To understand environmental impact and sustainability of chemical processes and products, through the use of green chemistry principle. To define the importance of inorganic elements in vital systems. Explain the importance of minerals and essentially trace elements and beneficial elements of living system.
- CO-2 To understand the general properties of water and develop awareness about water quality criteria and standards, Knowledge of basic concepts and techniques of soap and detergent industry and their relation to public health and environment.
- CO-3 It will help to Remember and identify the additives in food and their functions.
- CO-4 To understand and remembers the classes of adhesives, their preparation and bonding mechanisms.

## III. Course Content

### UNIT – 1: Green and Sustainable Chemistry

#### 1. Green and Sustainable Chemistry

Twelve principle of green chemistry with their explanation and examples, Use and examples of sustainable chemistry based on the principles, Green solvents –Super critical fluid, SC CO<sub>2</sub> and water as solvent, Energy requirement for reactions-renewable sources of energy, Use of microwave and Ultrasonic energy.

#### 2. Bio inorganic Chemistry

Essential and trace elements and bioinorganic chemistry, periodic survey of essential and trace elements: biological importance and relative abundance of the elements, the cell and distribution of the elements in the cell, The role of metal ions in the life process with special reference metal-protein systems and metalloenzymes, Communication and Sensing Roles of Metal ions, The role of metal ions in the basic biological reactions, Biological functions of bio-metals.

### UNIT – 2:

#### 1. Water chemistry

Physical and chemical properties of water, temporary and permanent hardness of water and its removal process, Drawbacks of Acidity, alkalinity and turbidity in water, C.O.D. and B.O.D., Chlorination of water.

#### 2. Soap and detergents

Soaps - Types of soaps. Cleansing action of soaps. Synthetic detergents - Classification.

Detergent additives. Comparison between soaps and detergents, Classification of detergents Anionic detergents, Cationic detergents, Non – ionic detergents; Amphoteric detergents. Soaps, Alkyl Sulphate; Alkyl Sulphonates; Alkyl Aryl Sulphonates, Amide Sulphonates, Ecofriendly Detergents.

### UNIT – 3: Food chemistry

Food additives: Enhancers, sugar substitutes, sweeteners, food colors, antioxidants, acids and bases used in food.

Food chelating agents, emulsifiers, thickening agents, gel builders, stabilizers, common food toxicants, flavors, Biomaterial: Uses of bacteria, yeasts and moulds in food industry

#### **UNIT – 4: Introduction to Polymers & Adhesives**

##### **1. Polymers**

Definition: Monomer, Polymer, Polymerization, Classification of Polymers

##### **2. Adhesives**

Types of Bonding, Classification of adhesive, Preparation of adhesive, Starch adhesive, Protein adhesive. Synthetic resin adhesive, Use of Adhesive.

#### **IV. Suggestive Readings**

1. Environmental Chemistry – II Edition by A.K. De
2. Environmental Science by Turk A., Turk, J. Wittes J.T. and Wittes, R.E. (1978)
3. Ecology & Environment by P.D. Sharma.
4. Environmental Science: An Introduction by G. T. Miller-1991
5. Ajay Kr. Gupta, Handbook on Soaps, Detergents & Acid Slurry, 3rd revised edition; NIIR Board publication. ISBN: 9789381039472
6. P. K. Chattopadhyay, Modern Technology of Soaps, Detergents & Toiletries (with Formulae & Project Profiles) 4th Revised Edition, NIIR Board publication; ISBN: 9789381039700
7. H. Panda, Herbal Soaps & Detergents Handbook, NIIR Board publication; ISBN: 9789381039007
8. V.K. Ahluwalia, Green Chemistry: Environmentally Benign Reactions, CRC, 2008.
9. Food Chemistry Meyer L.H., 2006 publication
10. Fundamentals of Polymers - Raw Materials to Finish Products, Niranjana Karak
11. Adhesive Technology and Formulations Handbook.

#### **V. Suggestive Online Links / Readings**

1. <https://swayam.gov.in>
2. [https://www.iscnagpur.ac.in/knowledge\\_learning\\_files/5.7\\_General\\_Open\\_Access\\_e-Resources.pdf](https://www.iscnagpur.ac.in/knowledge_learning_files/5.7_General_Open_Access_e-Resources.pdf)
3. <https://ndl.iitkgp.ac.in>
4. <https://nptel.ac.in/course.html>