| Course Code | Course Title | C | H | I | E | T |
|---|---|---|---|---|---|---|
| **17U3CSA1** | **APPLIED CHEMISTRY** *(For II Mic Bio)* | 2 | 2 | 25 | 75 | 100 |

**OBJECTIVES**

To empower the students to

(i) study about the hardness of water and their removal,
(ii) know the need of plant growth using fertilizers,
(iii) study about polymers and their properties
(iv) study aout the day today application of polymers and resins
(v) understand the ideas of corrosion and its prevention methods.

**LEARING OUTCOME**

- Understanding need of plant growth using fertilizers,
- Useful in metallurgical, polymer and water purifying industries.

**UNIT I WATER TREATMENT** 6 Hrs

Hardness of water: Degree of hardness - Temporary and permanent hardness - disadvantages of hard water- softening of hard water using Zeolite process, demineralization process and reverse osmosis.

**UNIT II FERTILIZERS** 6 Hrs

Definition**:** role of various elements in plant growth-classification i) natural and chemical ii) According to nature of the elements present-functions of the following: ammonium Sulphate, urea, calcium cyanmide, super phosphate of lime, triple super phosphate, potassium Sulphate, potassium chloride, potassium nitrate.

**UNIT III CHEMISTRY OF POLYMERS** 6 Hrs

Introduction: Definition of monomer and polymers - classification of polymers based on micro structures (Chemical and Geometrical). General mechanism of polymerization- mechanism of radical polymerization

**UNIT IV INDIVIDUAL POLYMERS** 6 Hrs

General methods of preparation, properties and uses of the following polymers: polyethylene, polystyrene, polyacrylonitrile, polyesters (Kevlar), polyurethanes, poly vinyl chloride and phenol-formaldehyde resins.

**UNIT V CORROSION AND PREVENTION** 6 Hrs

Definition – Types of corrosion – Factors affecting corrosion process - Corrosion control - cathodic protection – anodic protection - Corrosion inhibitors – electroplating and passivity.

**Reference books**:


1. Sharma, B.K., 1989, Polymer Chemistry, Goel Publishing House, Meerut.
2. Mukhopathyay. R and Datta. S, Engineering Chemistry, New Age international PVL, Publishers, New Delhi.
3. Sharma, B. K., Industrial chemistry, GoelPuplisihing House, 1994.

| Course Code | Course Title | C | H | I | E | T |
|---|---|---|---|---|---|---|
| **17U4CAC4** | **ANCILLARY CHEMISTRY – IV** *(For II Mic Bio)* | 2 | 2 | 25 | 75 | 100 |

**OBJECTIVES**

To empower the students to

(i) study about the purification methods of organic compounds,
(ii) know the separation techniques for identification of compounds,
(iii) study the basic concepts of bio-inorganic chemistry,
(iv) study aout the types of colloids and their properties
(v) understand the ideas of emulsion

**LEARING OUTCOME**

- Understanding the concepts of separation and purification of organic compounds,
- Useful in pharma industries in analytical division.

**UNIT I PURIFICATION OF ORGANIC COMPOUNDS** 6 Hrs

Purification techniques of organic compounds- Distillation – fractional distillation – distillation under reduced pressure – crystallization – sublimation.

**UNIT II SEPARATION OF ORGANIC COMPOUNDS** 6 Hrs

Chromatography: Definition, principles-Adsorption and partition- applications of chromatography.

A brief study of thin layer chromatography (TLC) and column chromatography.

**UNIT III BIOINORGANIC CHEMISTRY** 6 Hrs

Biological functions and toxicity of elements – chromium, copper and Arsenic - Role of alkali and alkaline earth metal ions in biological systems: Role of $Na^+$ and $K^+$ ions – Sodium pumping – Role of $Mg^{2+}$ and $Ca^{2+}$ ions.

**UNIT IV COLLOIDS** 6 Hrs

Colloidal state of matter – various types properties of colloids- Tyndall effect-Brownian movement-Lyophpbic and Lyophilic sols, difference between them – Purification of colloids - dialysis – electro osmosis – electrophoresis.

**UNIT V EMULSION** 6 Hrs

Emulsion – types of emulsions with examples: oil in water and water in oil - Gels: classificationand preparation by cooling of sols, double decomposition and by change of solvents. Application of colloids in the following fields: foods, medicine, industrial goods, rubber plating, chrome tanning, Cottrell precipitator and detergent action of soap.

**Reference books**:


1. Bhal, B.S. andArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
2. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41$^{st}$Edn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
3. Madan, R.D., 2005, Modern Inorganic Chemistry, S. Chand and Co. Ltd., New Delhi.
4. Soni, P.L., 1998, Text book of Organic Chemistry, Sultan Chand and Sons, New Delhi.

| Course Code | Course Title | C | H | I | E | T |
|---|---|---|---|---|---|---|
| **18U3CAC1** | **ANCILLARY CHEMISTRY – I** *(For II Mat, II Phy and II Bio Tech)* | 2 | 2 | 25 | 75 | 100 |

**OBJECTIVES**

To empower the students to

(vi) study the models of an atom, electronic configuration, shapes of orbitals,
(vii) know the classification, importance and types of organic reactions,
(viii) study the types of bonds and hybridization,
(ix) understand the types of adsorption, process and factors affecting it,
(x) study the types of catalysis and applications.

**LEARING OUTCOME**

- Understanding the basics of organic, inorganic and physical chemistry.
- Skill and applicability of knowledge in pharma and analytical industries.

**UNIT I ATOMIC STRUCTURE – I** 6 Hrs

Brief introduction to structure of atom - Rutherford and Niels Bohr's model of an atom and their defects - Sommerfeld's modification of atomic structure and quantum numbers – Hydrogen spectra.

**UNIT II ATOMIC STRUCTURE – II** 6 Hrs

Electronic configuration and Orbitals-shapes of s, p and d orbitals. - Pauli's exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle - Heisenberg's uncertainty principle.

**UNIT III INTRODUCTION TO ORGANIC CHEMISTRY** 6 Hrs

Classification of organic compounds. Functional groups – definition – various functional groups - General formula and examples for following: Alcohols, Alkyl Halide, Carbonyl compounds, Carboxylic acids and Amines. Types of organic reactions – Substitution, Addition and Elimination reactions (examples only, not mechanism)

**UNIT IV CHEMICAL BONDING** 6 Hrs

Types of Bonds – electrovalent, ionic, covalent, co-ordinate covalent, metallic and H-bonding. Characteristics of electrovalent and covalent compounds.Hybridisation- Introduction, $sp^3$, $sp^2$, and *sp*hybridisation in methane, ethylene & acetylene only.

**UNIT V SURFACE CHEMISTRY** 6 Hrs

Definition of adsorption, occlusion, absorption, adsorbent, adsorbate – Types of adsorption: Physisorption and chemisorption – differences between physisorption and chemisorption – applications of adsorptions – factors influencing adsorption process.

**Referencebooks:**


1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41$^{st}$Edn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
3. Madan, R.D., 2005, Modern Inorganic Chemistry, Sultan Chand and Co. Ltd., New Delhi.
4. SathyaPrakash, Tuli, Basu& Madan, 1999, Advanced Inorganic Chemistry. Vol. II , 17$^{th}$ Revised Edition, S. Chand and Co. Ltd., Ram Nagar., New Delhi.
5. Puri. B.R., Sharma. L.R., 1989, Principles of Inorganic Chemistry, ShobhanLal Nagin Chand and Co., Jalandar.

| Course Code | Course Title | C | H | I | E | T |
|---|---|---|---|---|---|---|
| **18U4CAC2** | **ANCILLARY CHEMISTRY – II** *(For II Mat, II Phy and II Bio Tech)* | 4 | 4 | 25 | 75 | 100 |

**OBJECTIVES**

To empower the students to

(vi) study the classification of elements and their periodic properties,
(vii) understand the modern concepts of acids and bases,
(viii) study the types of organic compounds,
(ix) understand ideas of monosachharides,
(x) study the types and properties of polysaccharides.

**LEARING OUTCOME**

- Understanding concepts of periodicity and classification of elements.
- Skill and applicability of knowledge in sugar and pharma industries.

**UNIT I PERIODIC TABLE AND ATOMIC PROPERTIES** 12 Hrs

Modern periodic law - Long form of periodic table –classification of elements based on valence shell electronic configuration - s, p, d,& f blocks – Periodic properties – Atomic and ionic radii – Ionization energy – Electron affinity – Electro negativity.

**UNIT II ACIDS AND BASES** 12 Hrs

Modern concepts of acids and bases – strong and weak acids and bases – acidity and basicity. Concept of pH – common ion effect – applications - buffer solutions – definition - theory of buffer action and applications – Henderson's Equation - Strength of solutions - calculation of equivalent weights – normality- molarity – molality – mole fraction – ppm – preparation of standard solutions.

**UNIT III STUDY OF ORGANIC COMPOUNDS** 12 Hrs

Alkane: Introduction – preparation and properties of ethane. Alkene: Introduction – preparation and properties of ethylene. Alkyne: Introduction – preparation and properties of acetylene. Alcohol: Introduction – preparation properties of methanol and ethanol. Ethers: Introduction – preparation and properties of dimethyl ether.

**UNITIV CARBOHYDRATES – I** 12 Hrs

Monosaccharides: Definition – classification of carbohydrate – monosaccharides – properties and uses of glucose and fructose – configuration of glucose – Mutarotation - conversion of glucose to fructose and viceversa.

**UNIT V CARBOHYDRATES – II** 12 Hrs

Colour reactions of carbohydrates - Disaccharides: Sucrose – manufacture – properties and uses – distinction between sucrose, glucose and fructose.

Polysaccharides: Starch: Structure, properties and uses.

**Reference books**:


1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41$^{st}$Edn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Puri. B.R., Sharma. L.R., 1989, Principles of Inorganic Chemistry, ShobhanLal
3. Nagin Chand and Co., Jalandar.
4. Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
5. Soni, P.L., 1998, Text book of Organic Chemistry, Sultan Chand and Co. Ltd.,New Delhi.
6. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.

| Course Code | Course Title | C | H | I | E | T |
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| **18U5CAC3** | **ANCILLARY CHEMISTRY – III** *(For III Mat, III Phy and III Bio Tech)* | 2 | 2 | 25 | 75 | 100 |

**OBJECTIVES**

To empower the students to

i. study about vitamins and its classification,
ii. understand the structure and sources of harmones,
iii. know about basic ideas of aminoacids and proteins,
iv. study the concept of nuclear chemistry and applications of radioactivity,
v. understand the ideas of photochemistry and its applications.

**LEARING OUTCOME**

- Understanding concepts and sequence of DNA in protein molecules.
- Skill and awareness of radioactive treatments in various field.
- Applicability of phosphorescence and fluorescence.

**UNIT I VITAMINS** 6 Hrs

**Vitamins:** Definition, classification, sources, function and deficiency of vitamins A, B-complex, C, D, E and K (structure and synthesis not expected).

**UNIT II HARMONES** 6 Hrs

Structure, Source and importance of Androsterone, Estrosterone, Estrone,Testosterone, Progesterone-thyroxin.

**UNIT III AMINO ACIDS AND PROTEINS** 6 Hrs

Amino acids – Definition, general methods of preparation, properties and uses – Glycine and Alanine.

Proteins – Definition, Classification, general properties – colour reactions and relationship of aminoacidwith proteins.

**UNIT IV NUCLEAR CHEMISTRY** 6 Hrs

Fundamental particles: Nuclear isotopes, Isobars, Isotones and Isomers- Difference between chemical reactions and nuclear reactions - Group displacement law -Concept and applications of nuclear fission and fusion - Applications of radioactivity in medicine, agriculture and industry - as tracer elements in the investigation of reaction mechanism - carbon dating.

**UNIT V PHOTOCHEMISTRY** 6 Hrs

Introduction to photochemistry- Difference between thermal and photo chemical reaction statement of Grothuss-Draper Law, Stark-Einstein's Law, Quantum yield, Jablonski diagram-Phosphorescence, Fluorescence, Chemiluminescence-Definition with examples. Photosynthesis, Photosensitization.

**Reference books**:


1. Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
2. I.L. Finar, "Organic Chemistry", Vol. I and II, 6$^{th}$edn., ELBS, Singapore, 1994.
3. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41$^{st}$Edn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
4. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.

| Course Code | Course Title | C | H | I | E | T |
|---|---|---|---|---|---|---|
| **18U5CSA1** | **APPLIED CHEMISTRY** *(For III Mat, III Phy and III Bio Tech)* | 2 | 2 | 25 | 75 | 100 |

**OBJECTIVES**

To empower the students to

i. study about the hardness of water and their removal,
ii. know the need of plant growth using fertilizers,
iii. study about polymers and their properties
iv. study aout the day today application of polymers and resins
v. understand the ideas of corrosion and its prevention methods.

**LEARING OUTCOME**

- Understanding need of plant growth using fertilizers,
- Useful in metallurgical, polymer and water purifying industries.

**UNIT I WATER TREATMENT** 6 Hrs

Hardness of water: Degree of hardness - Temporary and permanent hardness - disadvantages of hard water- softening of hard water using Zeolite process, demineralization process and reverse osmosis.

**UNIT II FERTILIZERS** 6 Hrs

Definition**:** role of various elements in plant growth-classification i) natural and chemical ii) According to nature of the elements present-functions of the following: ammonium Sulphate, urea, calcium cyanmide, super phosphate of lime, triple super phosphate, potassium Sulphate, potassium chloride, potassium nitrate.

**UNIT III CHEMISTRY OF POLYMERS** 6 Hrs

Introduction: Definition of monomer and polymers - classification of polymers based on micro structures (Chemical and Geometrical). General mechanism of polymerization- mechanism of radical polymerization

**UNIT IV INDIVIDUAL POLYMERS** 6 Hrs

General methods of preparation, properties and uses of the following polymers: polyethylene, polystyrene, polyacrylonitrile, polyesters (Kevlar), polyurethanes, poly vinyl chloride and phenol-formaldehyde resins.

**UNIT V CORROSION AND PREVENTION** 6 Hrs

Definition – Types of corrosion – Factors affecting corrosion process - Corrosion control - cathodic protection – anodic protection - Corrosion inhibitors – electroplating and passivity.

**Reference books**:


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