

Sri Sankara Arts and Science College
Kancheepuram
Department of Chemistry
ALLIED CHEMISTRY I
(Syllabus for B.Sc Physics and Biochemistry)
(2017 – 2018)

Unit I

NUCLEAR CHEMISTRY

Fundamental particles of Nuclear Isotopes, Isobars, Isotones and Isomers -Differences between chemical reactions and nuclear reactions: Fusion and fission - Radioactive series, group displacement law - Mass defect - Applications of radioisotopes carbon dating, rock dating and medicinal applications.

Unit II

INDUSTRIAL CHEMISTRY

Fuels- Classification-gaseous fuels like water gas, producer gas, liquefied petroleum gas, gobar gas, Compressed natural gas

Fertilizers- Classification - urea, Ammonium sulphate superphosphate, Triple super phosphate, potassium nitrate- manufacture and uses

Silicones - Preparation, properties and applications

Hardness of water: temporary and permanent hardness, disadvantages of hard water - Softening of hard water - Zeolite process, demineralization process and reverse osmosis - Purification of water for domestic use: use of chlorine, Ozone and UV light - Definition and determinations of BOD and COD.

Unit III

FUNDAMENTALS OF ORGANIC CHEMISTRY

Classification of organic compounds - Hybridization in methane, ethane, acetylene, benzene - Classification of reagents - electrophiles, nucleophiles and free radicals - Classification of reactions - addition, substitution, elimination, condensation and polymerisation

Polar Effects-Inductive effect, resonance, hyper-conjugation, steric effect –

Keto-enol tautomerism – electrophilic substitution mechanism in benzene (Nitration and Sulphonation)

Unit IV

THERMODYNAMICS

Terminology of thermodynamics - Types of systems, Reversible, irreversible, isothermal, adiabatic processes, exothermic and endothermic reactions - Spontaneous processes –First law of thermodynamics –Need for the second law - different statements of second law - Carnot cycle – Efficiency – concepts of entropy and its significance. Free energy and its significance - Third law of thermodynamics (statement only).

Unit V

PHOTOCHEMISTRY

Introduction to Photochemistry - statement of Grothus - Draper Law, Stark Einstein's Law, Quantum yield. Hydrogen-Chlorine reaction (Elementary idea only) Photosynthesis, photosensitization, phosphorescence, fluorescence, chemiluminiscence- Definition with examples.

Recommended books

1. Dr .Veeraiyan V., Text book of Ancillary Chemistry, Highmount Publishing house, Chennai-14. Edition-2006. (Both in Tamil and English)
2. Vaithyanathan S. and Others, Textbook of Ancillary Chemistry, Priya Publications, Karur- Edition-2006.
3. R.Gopalan,S.Sundaram Text book of ancillary chemistry, Sultan & Chand and sons Edition -2006.
4. K.K.Rohatgi Mukerjee ,A text book of Fundamental of Photochemistry, Wiley Eastern Ltd New Delhi,Bangalore Edition -1978.
5. Puri B.R., Sharma and Pathania, Text book of Physical Chemistry, Vishal Publishing Co., New Delhi. Edition-2006.
6. Soni P.L. and Others, Textbook of Organic chemistry, Sultan Chand and Company, New Delhi, Edition-2006.
7. Soni P.L. and Others, Text book of Inorganic Chemistry, Sultan Chand and Company, New Delhi, Edition-2006.

Reference books

1. B.S. Bahl., Arun Bahl Text book of Physical chemistry, S.Chand & company ltd Edition 2007.
2. A.K. Barnard ,Textbook of Theoretical basis of Inorganic chemistry, New York McGraw hill Edition -1958.
3. Dr.S.S.Dara, Dr S.S.Umare, A text book of Engineering Chemistry, S.Chand & Company ltd Edition -2014.
4. A.Ravikrishnan, Text book of Engineering chemistry Srikrishnan, 5th edition-2014.
5. Lee, J.D.. Inorganic Chemistry. Blackwell Science., London- 2001.
6. Negi, A.S., and Anand, A text book of physical chemistry. Taj Press, New Delhi – 2001.
7. P.C.Jain and others, Engineering chemistry, Dhanpat Rai publishing company, New Delhi, Edition 2009.

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Unit I

CO-ORDINATION CHEMISTRY

Definition of terms - Classification of Ligands - Nomenclature - Chelation - EDTA and the application – Werner's Theory - Effective Atomic Number - Pauling's theory- Postulates - Applications to $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{NiCl}_4]^{2-}$, $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{Co}(\text{CN})_6]^{3-}$ $[\text{Ni}(\text{CO})_4]$ and $[\text{CoF}_6]^{3-}$. Merits and Demerits of Werner's and Pauling's theory - Biological Role of haemoglobin and Chlorophyll (elementary idea only) - Applications of coordination compounds in qualitative analysis and Quantitative analysis like Separation of copper and cadmium ions; Nickel and cobalt ion; Identification of metal ions like Cu, Fe and Ni. Estimation of Ni using DMG and Al using Oxine.

Unit II

BIOMOLECULES

Classifications of carbohydrates – Preparation and properties of Glucose and Fructose - Discussion of open and ring structure of glucose. Mutarotation. Inter conversion of glucose into fructose and vice versa – Preparation and properties of sucrose. Properties of starch, cellulose and uses of cellulose derivatives.

Classification of amino acids - preparation and properties of glycine – peptide bond- preparation of dipeptide using Bergman method. Proteins –classification, properties and its biological functions. RNA and DNA (elementary idea only)

Unit III

CHEMOTHERAPY

Preparation, uses and mode of action of sulpha drugs - Prontosil, Sulphadiazine and Sulphafurazole. Uses of Pencillin, chloramphenicol and streptomycin - Definition with one example for analgesics, antipyretics, tranquilisers, sedatives, hypnotics, local and general anaesthetics. Cause and treatment of diabetes, cancer and AIDS.

Unit IV

ELECTROCHEMISTRY

Galvanic cells – emf - standard electrode potential - reference electrodes -electrochemical series and its applications - Definition of pH and its determination by colorimetric method and electrometric method - Electroplating process -Nickel and Chrome plating - Different type of cells - primary cell, Secondary cell and fuel cells -Corrosion and methods of prevention, Conductometric titrations - hydrolysis of salts. Derivation of K_h -. Buffer solution - Henderson's equation. Applications of pH and buffer in biological processes and industries.

Unit V

ANALYTICAL CHEMISTRY

Introduction to Qualitative and Quantitative Analysis - Principle of volumetric analysis - Separation techniques - extraction - distillation - crystallization— Chromatographic separations - Principles and applications of column, paper, thin layer, gas-liquid and ion-exchange.

Recommended books

1. Dr .Veeraiyan V., Text book of Ancillary Chemistry, Highmount Publishing house, Chennai-Edition-2006. (Both in Tamil and English)
2. Vaithyanathan S. and Others, Textbook of Ancillary Chemistry, Priya Publications, Karur-2006.
3. R.Gopalan, S.Sundaram Text book of ancillary chemistry, Sultan & Chand and sons Edition -2006.
- 4.B.R.Puri &L.R.Sharma Text book of principle of Inorganic chemistry, Milestone publishing and distributorEdition-2016.
5. Puri B.R., Sharma and Pathania, Text book of Physical Chemistry, Vishal Publishing Co., New Delhi. Edition-2006.
6. Soni P.L. and Others, Textbook of Organic chemistry, Sultan Chand and Company, New Delhi, Edition-2006.
7. Soni P.L. and Others, Text book of Inorganic Chemistry, Sultan Chand and Company, New Delhi, Edition-2006.

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1. B.S. Bahl., Arun Bahl Text book of Physical chemistry, S.Chand & company LTD Edition 2007.
2. A.K. Barnard ,Textbook of theoretical basis of Inorganic chemistry, New York McGraw hill Edition -1958.
3. Dr.S.S.Dara, Dr S.S.Umare, A text book of Engineering Chemistry, S.Chand & Company Ltd Edition -2014.
4. A.Ravikrishnan, Text book of Engineering chemistry, Srikrishnan 5th edition-2014.
5. Lee, J.D. Inorganic Chemistry. Blackwell Science., London - 2001.
6. Negi, A.S., and Anand. 2001. A text book of physical chemistry. Taj Press, New Delhi.
7. P.C. Jain and others, Engineering chemistry, Dhanpat Rai publishing company, New Delhi, Edition 2009.
8. G.H. Jeffery, J. Bassett, J. Mendham, R.C. Denny Text book of Vogel's Quantitative Analysis, John Wiley & Sons inc New York Edition- 1989.

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ALLIED CHEMISTRY

(Syllabus for B.Sc Biotechnology)

(2017 – 2018)

UNIT- I

Structure of Atoms

Dalton's Atomic theory- Subatomic particles- concepts of atoms and molecules- symbols for elements- electronic configuration of atoms- isotopes- shapes of atomic orbitals periodic table- periodic classification- periodicity- valency- chemical bond.

UNIT- II

Acids-Bases and Solutions:

Arrhenius concept of acid and bases - proton transfer theory of acid and bases - Lewis concept of acids and bases - concentration of solution - ways of expressing concentrations of solutions – per cent by weight, normality, molarity, molality, mole fraction - pH of solution, pH scale, measurement of pH - buffer solutions, mechanism of buffer action of acid buffer and basic buffer,

UNIT- III

Changes around us

Slow and fast changes- reversible and irreversible reactions- exothermic and endothermic reactions- condition of chemical reactions- types of chemical reactions- stoichiometry in chemical reaction- order of chemical reaction- technique used to determine chemical reactions.

UNIT- IV

Organic chemistry and energy

Organic compounds – classification- functional groups- aromatic, aliphatic, hetero cyclic compounds- alkanes in gasoline- fuel from biogas, coal, hydrogen.

UNIT- V

Chemistry in living world

Physical and chemical properties of amino acids and proteins- properties and kinetics of enzymes- thermodynamics.

Recommended books

- 1 Dr.Veeraiyan V., Text book of Ancillary Chemistry, Highmount Publishing house, Chennai Edition-2006. (Both in Tamil and English)
- 2 Vaithyanathan S. and Others, Textbook of Ancillary Chemistry, Priya Publications, Karur- Edition-2006.
3. R.Gopalan, S.Sundaram Text book of ancillary chemistry, Sultan & Chand and sons Edition -2006.
- 4 Puri B.R., Sharma and Pathania, Text book of Physical Chemistry, Vishal Publishing Co., New Delhi. Edition-2006.
- 5 Soni P.L. and Others, Textbook of Organic chemistry, Sultan Chand and Company, New Delhi, Edition-2006.
- 6 Soni P.L. and Others, Text book of Inorganic Chemistry, Sultan Chand and Company, New Delhi, Edition-2006
7. Lee, J.D. Inorganic Chemistry. Blackwell Science., London -2001.
8. Negi, A.S., and Anand, A text book of physical chemistry. Taj Press. New Delhi -2001.

Reference books

1. Voet, D. and Voet, J.G., Biochemistry, John Wiley and Sons, Inc., New York -1995.
2. Lehninger, A.L., Nelson D.L., and Cox, M.M. Principles of Biochemistry, CBS Publishers & Distributors, Delhi -1993.
3. Amend, J.R., Mundy, B.P. and Armlid, M.T. General Organic & Biological Chemistry. Saunders College Publishing., London -1990.
4. Greenwood, N.N. and Earnshaw, A. Chemistry of the Elements. Maxwell Macmillan intl. Ed., London -1989.
5. Cotton, F.A and Wilkinson, G. Inorganic Chemistry. John Wiley and Sons, Inc., New York -1989.
6. Finar, I.L. Organic Chemistry. Volume 1 & 2, ELBS., London -1986.
7. O.P. Tauton, Text book of Inorganic Chemistry, G.R. Bathla publications pvt ltd New Delhi Edition- 2014.

Allied Chemistry Practical
(For B.Sc Biochemistry, Biotechnology and Physics)

VOLUMETRIC ANALYSIS

1. Estimation of Sodium hydroxide by HCl using standard Sodium Carbonate.
2. Estimation of Hydrochloric acid by NaOH using standard Oxalic acid.
3. Estimation of Ferrous sulphate by KMnO_4 using standard Mohr's salt.
4. Estimation oxalic acid by oxalic acid using standard Ferrous Sulphate.
5. Estimation of Potassium permanganate by oxalic acid using standard NaOH.
6. Estimation of Magnesium using EDTA.
7. Estimation of Ferrous iron by $\text{K}_2\text{Cr}_2\text{O}_7$ using diphenylamine as internal indicator.
8. Estimation of hardness of water using EDTA.

ORGANIC ANALYSIS

Detection of Elements (Nitrogen, Sulphur, Halogens)

To distinguish between aliphatic and aromatic Saturated and unsaturated compounds. Functional group tests for phenol, acids (mono, di) aromatic primary amine, amide (mono, di), aldehyde & Carbohydrate - Glucose. Systematic analysis of organic compounds containing one functional group and characterization by confirmatory test. (Phenol/cresol, cinnamic acid, benzoic acid, phthalic acid, benzamide, urea, glucose, benzaldehyde & aniline).

REFERENCE

Basic Principles of practical Chemistry: Venkateswaran, Veerasamy &
Kulandaivel, S.Chand &Co

Suggestions relevant to Allied Chemistry syllabus for B.Sc Biochemistry

Paper I

THERMODYNAMICS

Thermodynamics is introduced and chemistry of some useful organic compounds is removed
Terminology of thermodynamics - Types of systems, Reversible, irreversible, isothermal, adiabatic processes, exothermic and endothermic reactions - Spontaneous processes –First law of thermodynamics –Need for the second law - different statements of second law - Carnot cycle – Efficiency – concepts of entropy and its significance. Free energy and its significance - Third law of thermodynamics(statement only).

Paper II

Unit 2 and 3 is merged into one unit (Biomolecules) and Chemotherapy unit is introduced as III unit.

CHEMOTHERAPY

Preparation, uses and mode of action of sulpha drugs - Prontosil, Sulphadiazine and Sulphafurazole. Uses of Pencillin, chloramphenicol and streptomycin - Definition with one example for analgesics, antipyretics, tranquilisers, sedatives, hypnotics, local and general anaesthetics. Cause and treatment of diabetes, cancer and AIDS.

Suggestions relevant to Allied Chemistry syllabus for B.Sc Biotechnology

Acids-Bases and Solutions (Unit II) is introduced and materials on earth is removed.

Acids-Bases and Solutions:

Arrhenius concept of acid and bases, proton transfer theory of acid and bases, Lewis concept of acids and bases, concentration of solution, ways of expressing concentrations of solutions – per cent by weight, normality, molarity, molality, mole fraction, pH of solution, pH scale, measurement of pH, buffer solutions, mechanism of buffer action of acid buffer and basic buffer.

Suggestions relevant to Allied Chemistry syllabus for B.Sc Physics

Paper I

In unit V Kinetics topic is removed.

Paper II

Chemotherapy is introduced and Phase diagram (Unit III) is removed.

CHEMOTHERAPY

Preparation, uses and mode of action of sulpha drugs - Prontosil, Sulphadiazine and Sulphafurazole. Uses of Pencillin, chloramphenicol and streptomycin - Definition with one example for analgesics, antipyretics, tranquilisers, sedatives, hypnotics, local and general anaesthetics. Cause and treatment of diabetes, cancer and AIDS.