



TRIPURA UNIVERSITY

**(A Central University)
Suryamaninagar-799022**

Syllabus

OF

**Chemistry
(General & Major)**

Semester – V

2014

B.Sc. Honours, Semester – V

Subject: Chemistry

Paper – H5,

Marks: 100 (80+20)

Time: 3 hours

Group A: Inorganic Chemistry (Marks:40) 60 lectures

Unit I: Inorganic Chemistry (Marks:20) 30 Lectures

d- and f-Block Elements Electronic configuration of d-block elements, general properties of transition metals, relative stability of oxidation states, comparison of properties of first, second and third row transition metals. Electronic configurations of lanthanides and actinides, comparison of their oxidation states; variation in their atomic and ionic radii – lanthanide contraction, difficulty in the separation of lanthanides and ion exchange method of separation. Preparation, important reactions, structures and uses of nickel tetracarbonyl, Sodium nitroprusside, sodium cobaltinitrite, potassium ferrocyanide, potassium ferricyanide, potassium dichromate, potassium permanganate, cupric acetate, uranyl nitrate hexahydrate, uranium hexafluoride and Ziese's salt.

Nuclear and Radio-chemistry: Nuclear particles; neutron-proton ratio and its implications, types of radioactive decay; nuclear binding energy; mass defect and packing fraction; natural and artificial radioactivity; first order rate equation of radioactive disintegration; radioactive equilibrium; radioactive disintegration series; half-life and average life period, group displacement law, unit of radioactivity; carbon-14 dating, types of nuclear reactions, concepts of fusion and fission, spontaneous fission, Q value; nuclear forces: n-n, n-p, p-p.

Unit-II: Inorganic Chemistry: (Marks:20) 30 Lectures

Organometallic Compounds: Definition, classification and nomenclature of organometallic compounds. Alkyls and aryls of lithium, silicon and mercury (preparation and uses). 18 electron rule and its applications to carbonyls (including carbonyl hydrides and carbonylates), nitrosyls, cyanides, sigma- and pi- bonded organometallic compounds of transition metals. Simple examples of metal-metal bonded compounds and metal clusters. Metal – olefin complexes; Zeise's salt (preparation, structure and bonding), ferrocene (preparation, structure and reactions). Hapticity (η)

of organometallic ligands, examples of mono-, tri- and penta hapto cyclopentadienyl complexes. Coordinative unsaturation: oxidative addition and insertion reactions. Homogeneous catalysis by organometallic compounds (examples excluding mechanism): hydrogenation, hydroformylation and polymerization of alkenes (Zigler-Natta catalysis).

Bioinorganic Chemistry: Structure of cell membrane, membrane transport (active and passive transport process); essential and trace elements in biological processes, criteria of essential elements, pH of biological fluid, metalloporphyrins, structure, and functions of haemoglobin, myoglobin and chlorophyll; role of Fe and Mg in haemoglobin and chlorophyll, role of Co in vitamin B₁₂, Carbonic anhydrase, its characteristics and functions,. Non-complexing cations in biochemical processes, Na⁺-K⁺ pump; Toxic effects of metal ions with reference to mercury, lead, beryllium and aluminum; deficiency of Fe, Ca, Mg and iodine; Platinum complexes as anti-cancer drugs.

Statistical treatment of data analysis: Accuracy and precision, classification of errors, detection and correction of determinant and indeterminate errors; the normal law of distribution of indetermination errors; the F and T tests, rejection of data, methods of least squares, propagation of errors in computation, significant figures.

Group B: Organic Chemistry (Marks:40) 60 Lectures

Unit – III (Marks:20) 30 Lectures

A. Heterocyclic compounds:

10 Lectures

Introduction, five and six membered heterocycles, aromatic character, nomenclature, structure, synthesis and chemical reactivity of furan, pyrrole, thiophene, pyridine and basicity of pyrrole and pyridine; Introduction to condensed five and six membered heterocycles, synthesis and reactivity of indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler Napieralsky synthesis.

B. Carbohydrates:**10 Lectures**

Introduction, occurrence, classification, nomenclature, inter-relationship amongst monosaccharides, constitution of glucose and fructose, ribose and arabinose, reactions of glucose and fructose, osazone formation, mutarotation and its mechanism, cyclic structures, pyranose and furanose forms, determination of ring size. Haworth projection formula, configurations and conformational analysis of monosaccharides, epimerisation, ascending and descending of sugars, interconversion of aldoses and ketoses.

C. Amino acids and Proteins:**10 Lectures**

Introduction, alpha-amino acids – synthesis, physical and chemical properties, iso-electric points, peptide synthesis, protection and de-protection strategies involved in peptide synthesis; determination of C and N terminal amino acid residues; proteins classification, primary, secondary, tertiary and quaternary structure of proteins (definitions only) and chemical test of proteins.

Unit – IV**(Marks:20)****30 Lectures****A. Pericyclic & Photochemical Reactions:****10 lectures**

Definition and classification, electrocyclic reactions: FMO approach, example of electrocyclic reactions (thermal and photochemical) involving 4π and 6π electrons and corresponding cycloreversion reaction, cycloaddition reactions: FMO approach, DA reaction, photochemical [2+2] reactions. Sigmatropic shifts and their orders, [1,3] and [1,5] hydrogen shifts and [3,3] shifts with reference to Claisen and Cope rearrangement.

B: SPECTROSCOPY**10 lectures**

Ultraviolet and Visible spectroscopy: Introduction, theory, instrumentation and solvent effects, characteristic absorption of organic compounds, application of rules for calculation of λ_{max} polyenes and dienones.

Infrared Spectroscopy: Introduction, theory, instrumentation, characteristic group frequencies of organic molecules, factors affecting group frequencies.

Proton NMR spectroscopy: Introduction, theory, deuterated solvents, chemical shift and factors influencing it, spin-spin coupling, characteristic chemical values of different kind of protons, application of UV, IR and NMR in structure elucidation of organic molecules.

B. Chemistry in applications:

10 lectures

Dyes: Relation between colour and constitution, chromophore, auxochrome, valence bond theory of colour (ultraviolet visible absorption spectrum), classification of dyes, preparation and uses of phenolphthalein, methyl orange, congo red, malachite green, alizarin and indigo.

Drugs and pesticides: Introduction, classification of drugs, preparation and uses of aspirin, phenacetin, sulphanilamide, sulphaguanidine, diazepam. Introduction and Classification of pesticides, natural and synthetic pesticides, preparation and uses of DDT, endrin, melathion, parathion and baygon,

B.Sc. Honours, Semester – V
Subject: Chemistry (Practical)
Paper – H6,
Marks:100 (80+20)

A. Inorganic Chemistry Practical (40 Marks) Time: 3 hours

Volumetric titrations:	Marks 12
Quantitative analysis:	Marks: 12
Inorganic preparation & Crystallization:	Marks: 06
Laboratory note book :	Marks:05
Viva Voce :	Marks:05

(a) Volumetric titrations:

- i) Estimation of $\text{Fe}^{+2}/\text{Ca}^{+2}$ by EDTA
- ii) Estimation of $\text{Cu}^{+2}/\text{Fe}^{+2}$ by iodometric method
- iii) Estimation of $\text{CO}_3^{-2} + \text{HCO}_3^{-1}$ in a mixture
- iv) Estimation of total hardness of water samples

(b) Quantitative analysis

- i) Estimation of Nickel(II) using DMG
- ii) Estimation of SO_4^{-2} by using BaCl_2 method
- iii) Estimation of percentage of mixed oxide in an ore Hematite, dolomite, limestone.

(c) Inorganic preparation & Crystallization:

- i) Tris (thiourea) Copper (I) Sulphate
- ii) Hexamine Cobalt (III) Chloride
- iii) Chloro pentaamine Cobalt (III) Chloride
- iv) Potassium tris(oxalato) Chromate (III)
- vi) Potassium tris(oxalato) Ferrate (III)
- vii) Sodium peroxoborate
- viii) Tris(acetylacetonato) Iron(III)
- ix) Sodium cobaltinitrite

B. Organic Chemistry Practical (40 Marks) Time: 3 hours

Organic quantitative analysis:	Marks: 20
Organic compound preparation:	Marks: 10
Laboratory note book :	Marks: 05
Viva Voce :	Marks: 05

- i) Organic quantitative analysis:
 - a) Estimation of glycine (Sorenson's method)
 - b) Estimation of aniline (bromate-bromide method)
 - c) Estimation of oxalic acid (titrimetric method)
- ii) Organic Preparation
 - a) 7-Hydroxy-4-methyl coumarin
 - b) P-Benzoquinone
 - c) Benzimidazole
 - d) Phthalimide
 - e) Benzilic acid from benzil

B.Sc. Pass, Semester – V

Subject – Chemistry

Paper – C1P5 (A)

Full Marks: 50 (40+10)

Time: 2 hours

Unit-I General Chemistry (Marks:20)

30 Lectures

A. Acid-Base Concept:

(18 Lectures)

Arrhenius concept, Bronsted-Lowry concept, Lewis concept, Solvent dependence of acidity and basicity, Ionic product of water, The pH scale, Buffer solutions, Hard and Soft acids and bases and their classifications, Acid-base strength and hardness and softness, symbiosis.

B. i) Solid state:

(8 Lectures)

Nature of solid state, laws of crystallography, Weiss and Miller indices, unit cell, crystal systems, Bravais lattice, symmetry elements, types of crystals, crystal forces. X-ray diffraction of crystals, Bragg's law,

ii) Theory of indicators :

(4 Lectures)

Detailed concept of acid base indicators; types criteria and selection of indicators.

Unit-II Inorganic Chemistry (Marks:20)

30 Lectures

A. s- and p-Block Elements: The oxides and hydroxides of alkali and alkaline earth elements, Boron hydrides, Silicates, Silicones, oxyacids of sulphur.

B. d-Block Elements: First row Transition Series: (3d) electronic configuration, Oxidation states, Reactivities, colour and Magnetic properties.

C. Preparation, properties and structure in the following compounds:

Potassium ferrous and ferricyanide, Lithium aluminium hydride, Sodium cobaltinitrite, Nessler's reagent, Sodium borohydride, Ferrocene, Sodium nitroprusside.

B.Sc. Pass, Semester – V
Subject – Chemistry (Practical)
Paper – C1P5 (B)
Full Marks: 50 (40+10)
Time: 6 hours

A. Inorganic Chemistry; Marks : 20 Time :2 hours

Experiment:	12 marks
Laboratory note book:	03 marks
Viva-voce:	05 marks

Inorganic estimation

- i) Estimation of Na_2CO_3 & NaHCO_3 present in a mixture
- ii) Estimation of Fe (II) by KMnO_4
- iii) Estimation of Cu (II) by iodometric titration
- iv) Estimation of Fe (III) by standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution

B. Physical Chemistry; Marks : 20 Time :4 hours

Experiment:	12 marks
Laboratory note book:	03 marks
Viva-voce:	05 marks

List of the experiments which are to be performed by the students (at least three experiments are to be set in the examination and students are to be performed only one experiment):

1. Determination of pH of a buffer solution by colour matching method.
2. Determination of concentration of HCl/NaOH by Conductometric Titration
3. Determination of concentration of supplied BaCl_2 by standard $\text{Na}_2\text{SO}_4/\text{K}_2\text{SO}_4$ conductometrically.
4. Determination of Order of a Reaction – Hydrolysis of Ester.

C. Internal assessment: Marks : 10