DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

SYLLABUS

B.Sc. (Chemistry)

THIRD YEAR

SEMESTER SYSTEM

FIFTH / SIXTH SEMETER

[Effective from – June- 2011 onwards]

B.Sc. CHEMISTRY

(Three Year Degree Course)

THIRD YEAR

Paper XVII **Physical Chemistry** **Fifth Semester**

(45hrs)
3 **Hrs/ Week**

I. Elementary Quantum Mechanics	10 Hrs.
II. Spectroscopy	10 Hrs.
III. Photochemistry	08 Hrs.
IV. Physical Properties and Molecular Structure	10 Hrs.
V. Nano Material	07 Hrs.

Paper XVIII **Organic Chemistry** **Fifth Semester**

(45hrs)
3 **Hrs/ Week**

I. Spectroscopy	16 Hrs.
II. Organometallic Compounds	08 Hrs.
III. Organic Synthesis via Enolates	13 Hrs.
IV. Fats, Oils and Detergents	08 Hrs.

Paper – XIX Lab. Course IX Organic Chemistry (45 Hrs)

Paper – XX Lab. Course X Inorganic Chemistry (45 Hrs)

B.SC. CHEMISTRY

(Three Year Degree Course)

THIRD YEAR

Paper XXI **Inorganic Chemistry** **Sixth Semester**

(45hrs)
3 **Hrs/ Week**

I. Metal-ligand Bonding in Transition Metal Complexes 12 Hrs.

II. Electron Spectra of Transition Metal Complexes 07 Hrs.

III. Organometallic Chemistry 10 Hrs.

IV. Bioinorganic Chemistry 10 Hrs.

V. Chromatography 06 Hrs.

Paper XXII **Organic Chemistry** **Sixth Semester**

(45hrs)
3 **Hrs/ Week**

I. Heterocyclic Compounds 13 Hrs.

II. Carbohydrates 10 Hrs.

III. Synthetic Polymers 07 Hrs.

IV. Synthetic Dyes and Drugs 15Hrs.

Paper – XXIII Lab. Course XI **Organic Chemistry (45 Hrs)**

Paper – XXIV Lab. Course XII **Physical Chemistry (45 Hrs)**

B. SC. THIRD YEAR

Paper XVII Physical Chemistry [Vth Semester]
45 Hrs. (3 Hrs/week)

I Elementary Quantum Mechanics 10 Hrs.

Black body radiation, Planck's radiation law, photoelectric effect, Bohr's modes of hydrogen atom (no derivation) and its defects. Compton effect. De Broglie Hypothesis, the Heisenberg's uncertainty principles, Harmiltonian operator, Schrödinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics. Schrödinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance.

II Spectroscopy 10 Hrs.

Introduction - Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the born-oppenheimer approximation. Rotational Spectrum - Diatomic molecules, energy levels of a rigid rotor (semi classical principles), selection rule, rotational spectra of rigid diatomic molecule, determination of bond length, numerical problems.

III Photochemistry 08 Hrs.

Introduction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry, Grothus - Drapper law, Stark-Einstein law, Jablonsiki diagram qualitative description of fluorescence, phosphorescence, non-radiative processes (Internal conversion, Intersystem crossing), quantum yield, photosensitized reactions.

IV Physical properties and molecular structure 10 Hrs.

Optical activity and its measurement, dipole moment and its measurement by temperature change method, magnetic property and its measurement by Guoy balance method, Applications of optical activity, dipole moment and magnetic property for determination of structure of molecule.

V Nano Material 07 Hrs.

Introduction to nano-materials Methods of Synthesis - i) High energy ball milling, ii) Physical vapour deposition (PVD) iii) Chemical vapour deposition (CVD) iv) Micro emulsion. Synthesis using micro-organisms and plant extract.

B. SC. THIRD YEAR

Paper XVIII Organic Chemistry [Vth Semester]
45 Hrs. (3 Hrs/week)

I Spectroscopy 16 Hrs.

Nuclear magnetic resonance (NMR) spectroscopy. Proton magnetic resonance (1H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 2, 2 tribromoethane, ethyl acetate, toluene and Acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques. (Combine and single λ max using woodwordfischer rule)

II Organometallic Compounds 08 Hrs.

Organomagnesium compounds: The Grignard reagent formation, structure and chemical reactions. Organozinc compound, formation and chemical reactions, organolithium compound, formation and chemical reactions.

III Organic Synthesis via Enolates. 13 Hrs.

Defination, Active methylene compounds, Preparation of Aceto acetic ester, (Claisen condensation with Mechanism), Acidity of alpha hydrogen, properties and

reactions involving formation of mono, di and unsaturated carboxylic acids, also synthesis of ketone, di ketone, 4-methyl uracil from acetoacetic ester, keto-enol tautomerism. Preparation of diethyl malonate, properties and reactions involved in alkylation, formation of mono, di and unsaturated carboxylic acids, and also synthesis of glycine and barbutric acids from diethyl malonate.

IV Fats, oils and detergents 08 Hrs.

Natural fats, edible and industrial oils of vegetable origin, manufacture of soyabean oil by solvent extraction method and isolation and uses of essential oils. Types of animals fats and oils and defination of saponification value, iodine value, and acid value. Detergents: Defination, Introduction and preparation of sodium alkyl sulphonate, alkyl benzene sulphonate, and amide sulphonate, (one example each), Cleansing action of detergent.

B. SC. THIRD YEAR

Semester V **Paper XIX**

Organic Chemistry

Lab Course: IX **Marks: 50**

Binary Mixture:

Separation and Identification of both components

i) Benzoic Acid + β-naphthol

ii) Salicylic Acid + P- nitro aniline

iii) β-naphthol + Acetanilide

iv) p-toluidine + Naphthalene

v) α-naphthol + diphenyl amine

vi) Cinnamic Acid + Naphthalene

vii) Salicylic Acid + Naphthalene

viii) β-naphthol + m-dinitrobenzene

ix) Cinnamic Acid + P- nitro aniline

x) Salicylic Acid + β-naphthol

B. SC. THIRD YEAR

Semester V **Paper XX**

Inorganic Chemistry

Lab Course: X **Marks : 50**

1 Inorganic Qualitative Analysis (Semi-Micro Analysis)
(Atleast five mixtures)

2. Separation of calcium and Barium and estimation of Ca-volumetrically or Ba-gravimetically

3. Separation of Cu and Ni from binary mixture solution and estimation of Cu-volumetrically and Ni-gravimetrically

4. Estimation of oxalic acid and H_2SO_4 in a given mixture Solution using NaOH and $KMnO_4$ solution.

5. Estimation of Fe by potassium dichromate using diphenyl ammine indicator.

6. Estimation of available chlorine in the given sample of bleaching powder.

B. SC. THIRD YEAR

Paper XXI Inorganic Chemistry [VIth Semester]
45 Hrs. (3 Hrs/week)

1. Metal-Ligand Bonding in Transition Metal Complexes 12 Hrs

Limitations of Valence Bond Theory

An Elementary idea of Crystal Field Theory

Crystal Field Splitting in Octahedral, Tetrahedral and Square Planar Complexes

Factors affecting Crystal Field Parameters

2. Electronic Spectra of Transition Metal Complexes 7 Hrs

Types of Electronic Transitions

Selection rules for d -d transitions

Spectro -chemical series

Orgel Energy level diagram for d^1, d^5 and d^9

Electronic Spectrum of $[Ti(H_2O)6]^{3+}$ complex ion.

3. Organometallic Compounds 10 Hrs

Definition, Nomenclature and classification of Organometallic Compounds

Preparation, Properties, Bonding and Applications of alkyls and aryls of - Li,

Al, Hg, Sn and Ti.

A Brief account of metal - ethylenic Complexes

Nature of bonding in metal carbonyls.

4. Bioinorganic Chemistry 10 Hrs

Essential and trace elements in biological processes

Metalloporphyrins with special reference to hemoglobin and myoglobin

Biological role of alkali (Na^+, K^+) and alkaline earth metal ions(Mg^{2+}, Ca^{2+}).

Nitrogen fixation

5. Chromatography 06 Hrs

Definition and classification of chromatography

Paper and Thin Layer Chromatography

Method of Development (Ascending, Descending Chromatography)

Locating Technique (UV-light / Chemicals)

R f value

Comparison between paper and TLC

Applications.

B. SC. THIRD YEAR

Paper XXII Organic Chemistry [VIth Semester]
45 Hrs. (3 Hrs/week)

1. Heterocyclic Compounds 13 Hrs.

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine, Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine. Comparison of basicity of pyridine, piperidine and pyrrole. Condensed Heterocyles: Introduction, Preparation of Quinoline (Skraups Synthesis), Isoquinoline (Bischler - Napirlaski) and Indole (Fischer indole Synthesis).

2. Carbohydrates 10 Hrs.

Defination, Introduction and Classification.

Monsaccharides-Interconversion of Glucose and Fructose, chain lengthening, chain shortening of aldoses. Conversion of Glucose in to mannose. Determination of ring size of Monosaccharide, Mechanism of Mutarotation and Introduction to disaccharides (maltose, sucrose and lactose) and

Polysaccharides (Starch and cellulose) without involving structure determination.

3. Synthetic Polymers. 07 Hrs.

Introduction, Classification based on nature of synthesis (without mechanism) with examples. (Addition and condensation polymers). Properties, uses and synthesis of polyvinyl chloride, polyvinyl acetate, polystyrene, polyacrylonitrile, Nylon 6, Nylon 66. Introduction to synthetic and natural rubber, properties, uses and synthesis of Buna N., Neoprene and silicon rubber.

4. Synthetic Dyes and Drugs 15 Hrs.

Definition, colour and constitution (electronic concept) of dye, classification based on chemical constitution, synthesis of methyl orange, Congo red, malachite green, crystal violet, Alizarin and indigo dyes. Synthetic Drugs, Defination, introduction, classification of drugs. Properties of ideal drug. Synthesis of chloromycetien, paracetamol, phenacetien, sulphaguainidine.

B. SC. THIRD YEAR

Semester VI **Paper XXIII**

Organic Chemistry

Lab Course: XI **Marks: 50**

Organic Estimation

i) Estimation of Carbonyl group by hydrazone formation method

ii) Estimation of vitamin C in commercial soft drink / Glucon D

iii) Estimation of ascorbic acid

iv) Estimation of Saponification value of oil

Organic Preparation and its purity by TLC

i) Preparation of Hydrazobenzene from azobenzene.

ii) Preparation of Phthalic anhydride from phthalic acid.

iii) Preparation of 2, 4 dinitrophenyl hydrazone of acetone.

iv) To prepare picrate of Naphthalene.

v) To prepare picrate of Anthracene**.**

B. SC. THIRD YEAR

Semester VI **Paper XXIV**

Physical Chemistry

Lab Course: XII **Marks: 50**

Instrumental

1. Determine the % composition of HCl and CH_3COOH in a given mixture by titrating against strong base conductometrically.
2. Determine the strength of oxalic acid conductometrically using sodium hydroxide solution.
3. To determine empirical formula of ferric -5-sulphosalicylate
4. Determine the amount of Fe2+ in the given solution potentiometrically
5. To determine the refractive indices of series of salt solutions and to find out concentration of the salt in given unknown solution.

Non-Instrumental

1. To determine the interfacial tension between two immiscible liquids.
2. To study the effect of addition of an electrolyte NaCl / KCl on the solubility of benzoic acid at room temperature.
3. To determine the standard free energy change ΔG^0 and equilibrium constant for the reaction.

   $Cu + 2\ Ag+ = Cu^{+2} + 2\ Ag$

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