Class / d {kk  %M.Sc.  
Semester / | øëëVj  %IV  
Subject / fo"k  %Chemistry  
Title of Subject Group  %APPLICATION OF SPECTROSCOPY- II  
fo"k lewg dk 'kh"kZd  
Paper No. / iz'ui = dzekad  %I (Code- MCH-511)  
Compulsory / vfuok; Z; k  Optional / oØfyd vfuok; Z  %Compulsory  
Max. Marks vfl/derevd  %75  

Hrs: 60 Hrs

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<thead>
<tr>
<th>Particulars/f00j.k</th>
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<tbody>
<tr>
<td>Unit-1</td>
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<td>Unit-2</td>
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<td>Unit - 3</td>
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<td>Unit-4</td>
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<tr>
<td>Unit-5</td>
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Suggested Readings:

7. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, V. Parish, Ellis Haywood.
Unit-1 | **Solid State Reactions** | 10 Hrs
---|---|---
General principles, experimental procedure, co-precipitation as a precursory to solid state reactions, kinetics of solid state reactions.

Unit-2 | **Crystal Defects and Non-Stoichiometry** | 12 Hrs
---|---|---
Perfect and imperfect crystals, intrinsic and extrinsic defects-point defects, line and plane defects, vacancies-Schottky detects and Frenkel defects. Thermodynamics of Schottky and Frenkel defect formation, colour centres, non-stoichiometry and defects.

Unit-3 | **Electronic Properties and Band Theory** | 18 Hrs
---|---|---

Unit-4 | **Organic Solids** | 10 Hrs
---|---|---
Electrically conducting solids. organic charge transfer complex, organic metals, new superconductors.

Unit-5 | **Liquid Crystals** | 10 Hrs
---|---|---
Types of liquid crystals: Nematic, Smectic, Ferroelectric, Antiferroelectric, Various theories of LC, Liquid crystal display, New materials.

Books Suggested.

### Unit-1: Metal Ions in Biological Systems

<table>
<thead>
<tr>
<th>Hrs: 12</th>
<th>Metal Ions in Biological Systems</th>
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<tbody>
<tr>
<td></td>
<td>Bulk and trace metals with special reference to Na, K, Mg, Ca, Fe, Cu, Zn, Co, and K+/Na+ pump.</td>
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<tr>
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<td><strong>Bioenergetics and ATP Cycle.</strong></td>
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<td>DNA polymerisation, glucose storage, metal complexes in transmission of energy; chlorophyll's, photosystem I and photosystem II in cleavage of water.</td>
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<td><strong>Transport and Storage of Dioxygen</strong></td>
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<td>Heme proteins and oxygen uptake structure and function of haemoglobin's, myoglobin, haemocyanins and hemerythrin, model synthetic complexes of iron, cobalt and copper.</td>
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### Unit-2: Electron Transfer in Biology

<table>
<thead>
<tr>
<th>Hrs: 10</th>
<th>Electron Transfer in Biology</th>
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<tbody>
<tr>
<td></td>
<td>Structure and function of metal of proteins in electron transport processes cytochrome's and ion-sulphure proteins, synthetic models.</td>
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<tr>
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<td><strong>Nitrogen fixation</strong></td>
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<td>Biological nitrogen fixation, and its mechanism, nitrogenase, Chemical nitrogen fixation.</td>
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### Unit-3: Enzymes

<table>
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<tr>
<th>Hrs: 14</th>
<th>Enzymes</th>
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<tbody>
<tr>
<td></td>
<td>Introduction and historical perspective, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification, extraction and purification. Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labeling and enzyme modification by site-directed mutagenesis. Enzyme kinetics, Michael's-Menten and Lineweaver Burk plots, reversible and irreversible inhibition.</td>
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<td><strong>Mechanism of Enzyme Action</strong></td>
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<td>Transition-state theory, orientation and Steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms for chemotrypsin, ribonuclease, lysozyme and carboxypeptidase.</td>
</tr>
<tr>
<td></td>
<td><strong>Kinds of Reactions Catalysed by Enzymes</strong></td>
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</tbody>
</table>
|        | Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic processes. Transfer of sulphate, addition and elimination reactions, enolic intermediates in Isomerisations reactions, b-Cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed
carboxylation and decarboxylation.

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<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Hours</th>
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<tr>
<td>4</td>
<td>Co-Enzyme Chemistry</td>
<td>12 Hrs</td>
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<td></td>
<td>Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD+, NADP+, FMN, FAD, lipoic acid, vitamin B12. Mechanisms of reactions catalyzed by the above cofactors. <strong>Enzyme Models</strong> Host-guest chemistry, chiral recognition and catalysis, molecular recognition, molecular asymmetry and prochirality Biometric chemistry, crown ether, cryptates. Cyclodextrins, cyclodextrion-based enzyme models, clixarenes, ionospheres, micelles synthetic enzymes or synzymes. <strong>Biotechnological Applications of Enzymes</strong> large-scale production and purification of enzymes, techniques and methods of immobilization of enzymes, effect of immobilization on enzyme activity, application of immobilized enzymes, use of enzymes in food and drink industry-brewing and cheese-making, syrups from corn starch, enzymes as targets for drug design. Clinical uses of enzymes, enzyme therapy, enzymes and recombinant DNA Technology.</td>
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<tr>
<td>5</td>
<td>Biological Cell and its Constituents</td>
<td>12 Hrs</td>
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</tbody>
</table>

**Book Suggested**

10. Immobilized Enzymes : An Introduction and Applications in Biotechnology, Michael ID. Trevan, Hohn Wiley.
12. Enzyme Structure and Mechanism, A Fersht, W.H. Freeman
Class / d {kk %M.Sc.
Semester / l a tVj %IV
Subject / f0"k %Chemistry
Title of Subject Group %Analytical Chemistry
fo"k l e w d k 'wHw@ %
Paper No. / izi= d e l %OPT-3 (Code- MCH-516)
Compulsory / v fuok Z; k Optional / o$ fyi d v fuok Z %Optional
Max. Marks v f/ld r e v d %75

Particulars / fooj.k

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<thead>
<tr>
<th>Unit</th>
<th>(A) Introduction</th>
<th>14 Hrs</th>
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| Unit | (B) Safety in the analytical laboratory. |

| Unit | (C) Errors and Evaluation | Definition of terms in mean and median. Precision-standard deviation, relative standard deviation. Accuracy-absolute error, relative error. Types of error in experimental data determinate (systematic), indeterminate (or random) and gross. Sources of error and the effects upon the analytical results. Methods for reporting analytical data. Statistical evaluation of data-indeterminate errors. The uses of statistics. |

<table>
<thead>
<tr>
<th>Unit-2</th>
<th>Food analysis</th>
<th>10 Hrs</th>
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<tr>
<th>Unit-3</th>
<th>Analysis of Water Pollution</th>
<th>12 Hrs</th>
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</table>
## Unit-4 Analysis of soil and Fuel 12 Hrs

(a) Analysis of Soil, moisture pH total nitrogen, phosphorus, silica, lime, magnesia, manganese, sulphur and alkali salts.


## Unit-5 Analysis of Body Fluids and Drugs 12 Hrs

(a) **Clinical Chemistry**: Composition of blood-collection and preservation of samples. Clinical analysis. Serum electrolytes, blood glucose, blood urea nitrogen, uric acid, albumin, globulins, barbiturates, acid and alkaline phosphatase Immunoassay: principles of radio immunoassay (RIA) and applications. The blood gas analysis, trace elements in the body.

(b) **Drug analysis**: Narcotics and dangerous drug. Classification of drugs. Screening by gas and thin-layer chromatography and spectrophotometric measurements.

### Suggested Readings:

6. Principles of Instrumental Analysis D.A. Skoog W.B. Saunders.
Unit I
Disconnection Approach
An introduction to synthons and synthetic equivalents. Disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections, chemoselectivity, reversal of polarity, cyclisation reaction, amine synthesis.

Unit II
One Group C-C Disconnections
Alcohols and carbonyl compounds, regioselectivity, alkene synthesis, use of acetylenes and aliphatic Nitro compounds in organic synthesis.

Two Group C-C Disconnections
Diels-Alder Reaction, 1,3-difunctionalised compounds, a-b- unsaturated carbonyl compounds, control in carbonyl condensations, 1,5-difunctionalised compounds. Micheal addition and Robinson annelation.

Unit III
Oxidation

Reduction

Unit IV
Organometallic Reagents
Principle, preparations, properties and applications of the following in organic synthesis with mechanistic details. Group I and II metal organic compounds Li, Mg, Hg, Cd, Zn and Ce Compounds.
Unit V

Synthesis of some complex molecules:

Application of the above in the synthesis of following compounds:
Canphor, longifoline, cartisone, reserpine, vitamin D, juvabion, aphidicolin and fredericamycin. A

Books Suggested

# Post Graduate Semester wise Syllabus

**Department of Higher Education, Govt. of M.P.**

Post Graduate  Semester wise Syllabus

as recommended by Central Board of Studies and approved by the Governor of M.P.

Class / d {kk %M.Sc.
Semester / l e $Vj %IV
Subject / fo"% %Chemistry
Title of Subject Group %Medicinal Chemistry
fo"k l e w d k 'Hlv l %
Paper No. / iz'ui= d e k %OPT-5 (Code- MCH-518)
Compulsory / v fuok Z ; k Optional / o $f l d v fuok Z %Optional
Max. Marks v f l d r e v d %75

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<th>Particulars / fooj.k</th>
<th>Hrs: 60 Hrs</th>
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## Unit-1
**Structure and activity :** 12 Hrs

## Unit-2
**Pharmacodynamics:** 12 Hrs
Introduction, elementary treatment of enzymes stimulation, enzyme inhibition, sulfonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation, significance of drug metabolism in medicinal chemistry.

## Unit-3
**Antibiotics and antibacterials** 12 Hrs
Introduction, Antibiotic β-Lactam type - Penicillins, Cephalosporins, Antitubercular – Streptomycin, Broad spectrum antibiotics – Tetracyclines, Anticancer - Dactinomycin (Actinomycin D)

## Unit-4
**Antifungal –** 12 Hrs
Polyenes, Antibacterial – Ciprofloxacin, Norfloxacin, Antiviral – Acyclovir
**Antimalarials :** Chemotherapy of malaria. SAR. Chloroquine, Chloroguanide and Mefloquine

## Unit-5
**Non-steroidal Anti-inflammatory Drugs :** 12 Hrs
Diclofenac Sodium, Ibuprofen and Netopam
**Antihistaminic and antiasthmatic agents :**
Terfenadine, Cinnarizine, Salbutamol and Beclomethasone dipropionate.

Books recommended:
1. Introduction to medicinal chemistry, A. Gringuage, Wiley-VCH.
5. Goodman and Gilman’s Pharmacological Basis of Therapeutics, Mc GRaw-Hill.
8. Principles of Medicinal Chemistry W.O.Foye
Unit I


Electrochemical Energy Storage:

Unit II

Corrosion and Stability of Metals:

Inhibiting Corrosion: Cathodic and Anodic Protection. (i) Inhibition by addition of substrates to the electrolyte environment, (ii) by charging the corroding method from external source, anodic Protection, Organic inhibitors, The fuller Story Green inhibitors.


Unit III

Bioelectrochemistry:
bioelectrodes, Membrane Potentials, Simplistic theory, Modern theory, Electrical conductance in biological organism: Electronic, Protonic electrochemical mechanism of nervous systems, enzymes as electrodes.

Kinetic of Electrode Process:
Essentials of Electrode reaction. Current Density, Overpotential, Tafel Equation, Butler Volmer equation. Standard rate constant (K0) and Transfer coefficient (a), Exchange Current.

Irreversible Electrode processes: Criteria of irreversibility, informatino from irreversible wave.
Unit IV

Methods of determining kinetic parameters for quasi-reversible and irreversible waves: Koutecky’s methods, Meits Israel Method, Gellings method.

Electrocatalysis:

Unit V

Potential Sweep Method:
Linear sweep Voltammetry, Cyclic Voltammetry, theory and applications. Diagnostic criteria of cyclic voltammetry. Controlled current microelectrode techniques: comparison with controlled potentials methods, chronopotentiometry, theory and applications.

Bulk Electrolysis Methods:
Controlled potential coulometry, Controlled Coulometry, Electroorganic synthesis and its important applications. Stripping analysis: anodic and Cathodic modes, Pre electrolysis and Stripping steps, applications of Stripping Analysis.

Books Suggested
7. Electroanalytical Chemistry by Basil H. Vessor & alen w. ; Wiley Interscience.
8. Topics in pure and Applied Chemistry, Ed. S. K. Rangrajan, SAEST Publication, Karaikudi (India)