

Gondwana University, Gadchiroli
Semester Pattern Syllabus for
B. Sc. III year, Semester V
CHEMISTRY

GONDWANA UNIVERSITY, GADCHIROLI
CHEMISTRY SYLLABUS
B.Sc. Part III (Semester-V)
(Effective from 2014-15)

Paper –I (Organic Chemistry)

Total Lectures : 48

Marks : 50

Note:- Figure to right hand side indicates number of lectures.

UNIT- I

Spectroscopy

Nuclear Magnetic Resonance (NMR) spectroscopy. Proton Magnetic Resonance spectroscopy. Basic idea about Instrumentation. Solvent used. Nuclear shielding and deshielding, Chemical shift, Spin-spin splitting and Coupling constant. Areas of signals. Interpretation of NMR spectra of organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,2 dibromo ethane, ethyl acetate, toluene, acetophenone, acetyl acetone. Problem pertaining to the structure elucidation of simple organic molecules by NMR technique. [12 L]

UNIT- II

A) Heterocyclic Compounds :

Molecular orbital picture and aromaticity of furan, thiophene, pyrrole and pyridine. Methods of synthesis of pyridine. Mechanism of electrophilic and nucleophilic substitution reaction of pyridine. Chemical reaction of pyridine. Structure of pyridine. Comparison of basicity of pyrrole and pyridine. Introduction to condensed five and six membered heterocycles. Preparation and reactions of Indole, Quinoline and Isoquinoline with special reference to Fischer Indole synthesis, Skraup synthesis and Bischler Napieralski synthesis. [8 L]

B) Reagents :

Method of preparation and chemical reactions of

- i) 1,3 Dithiane Anionon – umpolung
- ii) Sulphur Ylides.
- iii) LDA (Lithium diisopropyl amide)
- iv) Woodward and Prevost Hydroxylation [4 L]

UNIT- III

A) Carbohydrates : Definition, classification and reaction of glucose, Determination of structure of glucose. Determination of ring size of glucose by Haworth methylation process.

Epimerisation, mutarotation, conversion of glucose into fructose and vice-versa. Chain lengthening of aldose by Killiani's synthesis, and chain shortening of aldoses (Wohl's degradation). [6 L]

B) Amino Acids, Peptides & Proteins :

Classification, structure and stereochemistry of amino acids. Acids base behavior, isoelectric point and electrophoresis.

Structure and nomenclature of peptides and protein. Classification of proteins. Denaturation of Protein. Structure determination of proteins (primary and secondary). [4 L]

C) Fats, Oils & Detergents : Natural fats, edible and industrial oils of vegetable origin, Glycerides, hydrogenation of unsaturated oils, Definition of Saponification value. Iodine value. Acid value, Soaps, Synthetic detergents, Alkyl and aryl sulfonates.

[2 L]

UNIT- IV

A) Synthetic Dyes : Colour and constitution (Witt's theory, electronic concept) Classification of Dyes based on chemical constitution. Synthesis and uses of methyl orange Congored, Crystal violet, Phenolphthalein and Alizarin, indigo dye.

[6 L]

B) Drugs :- Definitions, qualities of ideal drugs. Basic terminology of drugs (i) Analgesic (ii) Antipyretic (iii) Antibiotics (iv) Tranquilizer (v) Anaesthetic (vi) Antihistaminic (vii) Hormones (viii) Vitamins (ix) Narcotics and Non-Narcotics (Only Definitions).

Synthesis and Applications of (i) Aspirin (ii) Paracetamol (iii) Chloroquine (iv) Chloramphenicol (v) Phenobarbital, and their side effects.

Uses of detol, Chloramin-T, Calmpose, Classification of antibiotics with examples.

[6 L]

Semester V
Paper –II (Physical Chemistry)

UNIT- I

Electrochemistry – I :

Electrical transport : Conductance in metals (electronic) & in electrolyte solutions (ionic conductance), conductivity of electrodes, specific, equivalent and molar conductance, measurement of equivalent

conductance, variation of equivalent & specific conductance with dilution, mobility of ions & Kohlrausch's law, Arrhenius theory of electrolyte dissociation & its limitation, Debye-Huckel theory (elementary treatment). Relaxation effect, Electrophoretic effect and Onsager equation.

B) Migration of ions, velocity of ions & change in concentration around electrode, transport number : definition & determination by Hittorf's method & moving boundary method, factors affecting transport number of ions, relation between transport number & ionic conductance. Application of Kohlrausch's law & conductance for the determination of degree of dissociation, dissociation constant of acids, solubility of sparingly soluble salt, conductometric titrations (Acid-base & precipitation titrations) . [12 L]

UNIT-II

Electrochemistry – II :

(A) Galvanic cells, irreversible & reversible cells, emf of cells & its measurement, calculation of thermodynamic quantities of a cell reactions (ΔG , ΔH & ΔS & equilibrium constant)

[4 L]

(B) Types of reversible electrodes : gas electrode, metal-metal ion electrode, amalgam electrode, metal insoluble salt-anion, redox electrodes, Half cell reactions, Nernst equation, calculation of cell emf from single electrode potential, reference electrodes, standard electrode potential. Concentration cells with & without transference, liquid-junction potential, salt bridge & its functions, Applications of emf measurements in : (i) pH-determination using hydrogen electrode,

quinhydrone electrode & glass electrode (ii) potentiometric titration(Acid –Base and Redox titrations). [8 L]

UNIT-III

Quantum Mechanics

A) Failure of classical mechanics : Explanation on the basis of Black body radiation, Photoelectric effect, heat capacity of solids and Bohr's model of Hydrogen atom (No derivation). Plank's quantum theory. De Broglie's hypothesis (Derivation and experimental proof). Heisenberg's uncertainty principle (Explanation and experimental proof).

B) Introduction to wave functions (Ψ), well behaved wave functions. Interpretation of wave function (Ψ) and its square (Ψ^2). Schrodinger wave equation. Normalized and orthogonal wave functions (only qualitative idea no problems). Introduction to operators. Postulates of quantum mechanics, Derivation of Schrodinger wave equation from postulates of quantum mechanics. Particle in a one dimensional box : derivation of energy and normalized wave function. Graphical representation of Ψ and its square Ψ^2 . Applications of particle in a one dimensional box. Numerical problems. [12 L]

UNIT-IV

A) Solutions And Colligative Properties :

Methods of expressing concentration of solutions, Raoult's law of relative lowering of vapour pressure, molecular mass determination from relative lowering of vapour pressure. Osmosis, osmotic pressure and its measurement by Barkeley and Hartley method. Determination of molecular mass from osmotic pressure. Elevation of boiling point, determination of molecular mass from elevation of boiling point. Depression of freezing point. Determination of molecular mass from depression of freezing point. Van't Hoff factor, degree of dissociation and association of solute. [8 L]

B) Magnetic Properties :

Electron spin angular momentum, spin quantum number, electron as magnetic dipole, magnetic moment of electron, Bohr magneton, relation between magnetic moment and number of unpaired electrons. Magnetic properties of substances. Diamagnetism, paramagnetism, ferromagnetism,

determination of magnetic susceptibility using Gouy method. Determination of magnetic moment of paramagnetic substances. Applications of magnetic susceptibility measurements.

[4 L]

Semister - V
Chemistry Practicals

Time 4-5 hrs

Total Marks 30

➤ **Organic Chemistry**

- A) Separation and identification of organic compounds from the given binary mixture.
- B) 1. Estimation of glucose.
2. Estimation of amide.
3. Saponification value of oil.
- C) 1. Preparation of aspirin.
2. Preparation of paracetamol.

Distribution Of Marks :-

- 1) Binary mixture + estimation. [A + B ; 8M + 4M]

Or

- 2) Binary mixture + preparation [A + C; 8M + 4M]

➤ **Physical Chemistry**

- 1) To determine the strength of strong acid and a weak acid in a given mixture conductometrically by titrating it with standard alkali solution.
- 2) To determine the solubility and solubility product of a sparingly soluble salt conductometrically.
- 3) To titrate potentiometrically ferrous ammonium sulphate solution using potassium dichromate solution as titrate and calculate the redox potential of $\text{Fe}^{2+}/\text{Fe}^{3+}$ system on hydrogen scale.
- 4) To determine the dissociation constant of weak acid potentiometrically by titrating it against alkali.
- 5) To study the saponification of ethyl acetate conductometrically.

- 6) Determination of apparent degree of dissociation of an electrolyte (NaCl) in aqueous solution at different concentration by Ebullioscopy.

Distribution Of Marks For Practical Examination

Time 4-5 hours (One Day Examination)	Marks 30
Organic Chemistry (Experiment)	12
Physical Chemistry (Experiment)	12
Viva-Voce	03
Record	03

Total : 30 marks	

References :

- 1) Chemistry for Degree Student, Dr. R. L. Madan, S. Chand and Co. New Delhi.
- 2) Organic Chemistry by R. T. Morrison and R. T. Boyd, 6th edition, PHI.
- 3) Organic Chemistry by Pine, 5th edition.
- 4) Inorganic Chemistry Vol. I, II and III by Mukharjee, Singh and Kapoor – Willey Eastern.
- 5) Organic Chemistry by S. K. Ghosh.
- 6) Reaction Mechanism in Organic Chemistry by S. M. Mukharjee and S. P. Singh.
- 7) Spectroscopy of Organic Compounds by P. S. Kalsi.
- 8) Stereochemistry and Mechanism through solved problems by P.S. Kalsi.
- 9) Organic Chemistry by TWG Solomons, 4th edition, John Wiley.
- 10) Hand book of Organic Analysis by H. J. Clarke, Arnold Heinmen.
- 11) Text book of Practical Organic Chemistry by A. I. Vogel.
- 12) Text book of Organic Chemistry by Jamode, Ganar, Makode, Waghmare, Mahaja, Toshinwal.
- 13) Text book of Organic Chemistry by P.S. Kalsi published by Macmillian India Ltd. 1999, Delhi.
- 14) Practical Organic Chemistry by F. G. Mann. B. C. saunders, Orient Longman.
- 15) Comparative Practical Organic Chemistry (Qualitative Analysis) by V. K. Ahluwalia and Sunita Dhingra, Orient Longman.
- 16) Comprehensiv Practical Organic Chemistry (Preparation and Qualitative Analysis) by V. K. Ahluwalia and Renu Agrawal. Orient Longman.
- 17) Physical Chemistry : Walter J. Moore, 5th edn. New Delhi.
- 18) Physical Chemistry : G. M. Barrow, McGraw Hill, Indian Edn.
- 19) Principle of Physical Chemistry : Maron and Prutton.
- 20) Principles of Physicial Chemistry : Puri and Sharma
- 21) Physical Chemistry : P. W. Atkins, 4th Edn.
- 22) Text book of Physical Chemistry : P. L. Sony O. R. Dhrma.
- 23) Physical Chemistry : Levine

- 24) Practical Physical Chemistry : Palit and De.
- 25) Practical Physical Chemistry : Yadao
- 26) Practical Physical Chemical : Khosla.
- 27) An introduction to synthetic drugs, Himalaya publishing house by Sing and Rangnekar.
- 28) Spectroscopy, Goel Publusing house by B. K. Sharma.
- 29) T.Y. B.Sc. Organic Chemistry : Semester-V by – *Shell Publication, Nagpur.(Proposed)*
- 30) T.Y. B.Sc. Physical Chemistry : Semester-V by – *Shell Publication, Nagpur.(Proposed)*
- 31) T.Y. B.Sc. Practical Chemistry : Semester-V by – *Shell Publication, Nagpur.(Proposed)*

