

North Maharashtra University, Jalgaon.

Class:- T.Y.B.Sc. (Semester Pattern)(wef. June 2009)

Faculty chaired by Hon. Dean of Science faculty was held on 05th May 2009, the revised syllabus for T.Y.B.Sc. (Chemistry) is accepted and finalised as per guidelines of Academic Council and with reference to the U.G.C. model curriculum. The nomenclature accepted is as follows.

CH-YSC [Y for year, S for semester and C for course number].

The Course Structure and title of the courses for T.Y.B.Sc. (Chemistry) are as given below:

Course Title Semester Periods Marks

Course Title	Semester	Periods	Marks	
			Ext.	Int.
CH 311: Basic Physical Chemistry	I	52	40	10
CH-312:- Basic Inorganic Chemistry	I	52	40	10
CH-313:- Basic Organic Chemistry	I	52	40	10
CH-314:- Analytical Chemistry[Applied]	I	52	40	10
CH-315:- Industrial Chemistry[Applied]	I	52	40	10
CH-316(A):-Bio-Chemistry	I	52	40	10
CH-316(B):-Environmental Chemistry	I	52	40	10
CH 321: Applied Physical Chemistry	II	52	40	10
CH-322:- Applied Inorganic Chemistry	II	52	40	10
CH-323:- Spectroscopy and Designing organic synthesis.	II	52	40	10
CH-324:- Instrumental Chemistry [Applied]	II	52	40	10
CH-325:- Petrochemical Industrial Chemistry	II	52	40	10
CH-326(C):-Polymer Chemistry	II	52	40	10
CH-326(D):-Drug Chemistry	II	52	40	10
CH-307:- Physical Chemistry Practical	Annual	104	80	20
CH-308:- Inorganic Chemistry Practical	Annual	104	80	20
CH-309:- Organic Chemistry Practical	Annual	104	80	20

Note:-

1. A Study tour is compulsory for the T.Y.B.Sc students. The students should submit their tour reports at the time of practical examination.
2. Each period is of 48 minutes. duration.
3. Each course is having weight-age four periods per week.
4. Each practical course is having weight age four periods per week.
5. Examination of practical course shall be held at the end of the academic year.

Chairman B.O.S.

Dean Sci. Faculty

NORTH MAHARASHTRA UNIVERSITY, JALGAON

T.Y.B.Sc. Chemistry Syllabus
[With effect From June – 2009]
According to Semester System
40-10 Pattern

Course Structure:-

Semester – I (Compulsory Courses)

Course Title	Semester	Periods	Marks
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			Ext.	Int.
CH 311: Basic Physical Chemistry	I	52	40	10
CH-312:-Basic Inorganic Chemistry	I	52	40	10
CH-313:-Basic Organic Chemistry	I	52	40	10
CH-314:-Analytical Chemistry[Applied]	I	52	40	10
CH-315:-Industrial Chemistry[Applied]	I	52	40	10

Semester – I (Optional Courses.)

Course Title	Semester	Periods	Marks	
CH-316(A):-Bio-Chemistry	I	52	40	10
OR				
CH-316(B):-Environmental Chemistry	I	52	40	10

Semester – II (Compulsory Courses)

Course Title	Semester	Periods	Marks	
CH 321: [Applied]Physical Chemistry	II	52	40	10
CH-322:- [Applied]Inorganic Chemistry	II	52	40	10
CH-323:- Spectroscopy and Designing organic synthesis.	II	52	40	10
CH-324:- Instrumental Chemistry [Applied]	II	52	40	10
CH-325:- Petrochemical Industrial Chemistry	II	52	40	10

Semester – II (Optional Courses.)

Course Title	Semester	Periods	Marks	
CH-326(C):-Polymer Chemistry	II	52	40	10
OR				
CH-326(D):-Drug Chemistry	II	52	40	10

Practical Courses(Annual)

Course Title	Semester	Periods	Marks	
CH-307:-Physical Chemistry Practical	Annual	104	80	20
CH-308:-Inorganic Chemistry Practical	Annual	104	80	20
CH-309:-Organic Chemistry Practical	Annual	104	80	20

NOTE:

- There are in all six theory courses for each semester and Three annual practical courses
- Each theory paper carry 50 Marks out of which 10 Marks are allotted for internal assessment. As per the directions given by University, at the end of each semester internal examination will be conducted for 10 marks and University Examination will be conducted for 40 Marks.
- The practical examination will be conducted at the end of Semester -IV . Each practical course will carry 100 Marks out of which 20 Marks will be allotted for internal assessment and University Examination will be conducted for 80 Marks.
- The students has a right to chose any one of the optional paper for Third semester either CH-336(A) OR CH-336(B)

Similarly The students has a right to chose any one of the optional paper for Fourth semester either CH-346(C) OR CH-346(D)

Marks for internal examination of Practical courses will be allotted as follows :

The annual examination for the practical courses CH-307,CH-308,CH-309 will be held at the end of semester II.

The internal examination of 20 Marks for practical courses will be held before the annual practical examination.

A student is expected to submit a journal certified by the Head of the Department / Head of the Institution.

A student will not be permitted to appear at the practical examination unless he / she produce a certified journal. If the journal is lost, the student should produce a certificate from Head of the department / Head of the Institution stating that he /she has satisfactorily completed the practical work.

Rules for personal safety:

- 1) For eye protection, safety goggles must be worn in the laboratory at all times. If the student wears contact lenses, full protection goggles, which provide total seal around eyes, must be worn. All students are expected to wear safety goggles.
- 2) A long sleeved, knee length laboratory coat is recommended. Long pants and closed toed shoes must be worn for individual safety. Loose clothing, open style shoes and sandals are prohibited. Long hair must be tied up. Each student will have to get his / her own necessary protection items.
- 3) Prior to the practical examination, the teacher-in-charge will check all protective equipment to ensure that they are in order.
- 4) Pipetting by mouth should be avoided. Use of pro-pipette bulbs is recommended.
- 5) All laboratories should be equipped with safety chart, adequate first aid requirements and fire extinguishers.

T.Y.B.Sc Chemistry Syllabus

Sem. – I

Course No:- CH-311

Subject: Basic Physical Chemistry.

Chapter-1:-PhotoChemistry

(M-11)(P-14)

Introduction, Laws of Photochemistry- Grothaus Drapper Law, Einstein's Law of Photochemical equivalence, Quantum yield, Consequence of light absorption by atoms and molecules, Jablonski diagram, Experimental Study of Photochemical reactions, Photochemical gas reactions, Primary and secondary processes, Photolysis of ammonia, Combination of H₂ and Br₂, H₂ and Cl₂ reaction, Photosensitized gas reaction, Chemiluminescence, related numerical.

Ref.1:-Page Nos.:- 775-781,784-790,796-797.

Ref.2:-Page Nos.:-1043-1055.

Ref.3:-Page No.:- 339-341

Chapter-2:-Quantum Chemistry

(M-11)(P-14)

Introduction to quantum Chemistry, Wave particle duality of material, particles and De-Broglie's Hypothesis, Heisenberg' Uncertainly principle, Theory of wave motion, Schrodinger equation for particle wave, The wave function (ψ) and its physical meaning, , Eigen functions and Eigen values, Operator in quantum mechanics-definition ,addition ,subtraction and multiplication of operators, commutative and non commutative operators, linear operators, Hamiltonian operator, Postulate of Quantum Mechanics(only statements), Particle in one dimension box, related numericals.

Ref.3:-Page Nos.:-80-82,84-95

Ref.4:-Page Nos.-16-79

Ref.5:-Page Nos.:- Relevant pages.

Ref.6:-Introduction to Quantum Mechanics by A.K. Chandra

Chapter-3:-Phase Rule

(M-07)(P-10)

Introduction, Homogeneous equilibrium, Heterogeneous Equilibrium, True Equilibrium, Unstable Equilibrium, Meta-stable Equilibrium, Different terms involved in phase rule, The Phase, The number of Components, Degree of Freedom, The Gibbs Phase rule, Derivation of Phase rule related numericals.

One Component System – Water system, Sulphur System,

Two Component System – Pb-Ag System

Ref.1:-Page Nos.:- 344-354.

Ref.2:-Page Nos.:- 706-714 and relevant pages.

Ref.7:-Page Nos.:-Relevant pages.

Ref.8:- Page Nos.:-Relevant pages.

Chapter-4:-Solid State:

(M-11)(P-14)

Introduction, Crystallisation and fusion, Crystallography, Laws of Crystallography, Lattice plane, Unit Cell, Weiss and Miller indices, The Crystal system, Properties of crystal ,Polymorphism, The Crystal structure, Characteristics of Simple Cubic, Face Centred Cubic , & Body Centred Cubic System, Inter Planer distance in Cubic Crystals.

Use of X-ray in determination of Crystal Structure, Bragg's Equation, Powder method and X-ray diffraction Method of Studying Crystal Structure of NaCl, Position of Na an Cl atom in lattice, Calculation of inter-planer distance (d) and wavelength (λ)of X rays, Determination of unit cell constant, Number of molecules in unit cell, Determination Of Avogadro's number, Semiconductors, Liquid Crystals, and applications of liquid structure,related numericals.

Ref 1:-Page Nos.:-67-76,77-87.

Ref.2:-Page Nos.:-471-474 and relevant pages.

Ref.9:-Page Nos.:-Relevant Pages.

Ref.10:- Page Nos.:-Relevant Pages.

Ref.11:- Page Nos.:-Relevant Pages.

Reference Books:-

1. Fundamental of Physical Chemistry - Moron and Prutton-4th edition,Oxford and IBH publishing Co.Pvt.Ltd.
2. Essential of physical chemistry by Arun Bahl,B.S.Bahl,G.D.Tuli, S. Chand Publication

revised edition-2008.

3. Physical chemistry- Puri, Sharma and Pathaniy-41st print.
4. Quantum Chemistry by R.K.Prasad, New Age International Publishers, Third edition.
5. Quantum Chemistry by Ira N Levine, Pearson Prentice Hall, 5th edition.
6. Introduction to Quantum Mechanics by A.K. Chandra
7. Phase rule by F.D.Ferguson and D.K.Jones.
8. The Phase rule and its application by Findlay Alexander edited by Campbell and Smith 9th edition (Dover Publication Inc.)
9. Solid state Chemistry by D.K Chkaravarty, New Age International Ltd. Publisher, New Delhi.
10. Principle of solid state by H.V. Keer (1993), New Age international (P) Ltd., New Delhi.
11. A Basic course in Crystallography by J.A.K. Tareen and T.R.N. Kutty, University press-2001.

Sem. – I

Course No:- CH-312

Subject: Basic Inorganic Chemistry.

Chapter-I:-The Copper Group : Coinage metals. (M-05)(P-07)

Introduction - Electronic structure, abundance, extraction and uses of the elements. Copper, Silver & Gold, oxidation - states, photography, biological role of copper.

Ref.1 :- Pages 816 to 820, 826, 827, 832, 833.

Chapter-II:- The f-block Elements. (M-12)(P-18)

The Lanthanide series :- Electronic structure, oxidation-states, Extraction and uses. Separation of the lanthanide elements - Precipitation, Thermal reaction, Fractional crystallization, complex formation, solvent extraction, valency change & Ion exchange, lanthanide contraction.

The Actinides :- Electronic structure and position in the periodic table ; oxidation - states ; preparation of the actinides, the later actinide elements,

Ref :1 - Pages 859, 860, 862 to 866, 874, 875, 879 to 886, 896 to 898.

Chapter-III:-Corrosion of Metals. (M-05,P-07)

Type of Corrosion -

Atmospheric corrosion, immersed corrosion, microbiological corrosion. theories of corrosion, protection of metals from corrosion or prevention of corrosion.

Ref. 2 :- Pages 609 to 619.

Chapter-IV:-Basic Concepts of Co-ordination Chemistry.(M-18)(P-20)

Double salts and co-ordination compounds, co-ordination complexes and complex ions, co-ordination number, unidentate, bidentate and polydentate ligands, chelating ligands & chelates, physical method used in the study of complexes. Werner's co-ordination theory, Werner's theory and isomerism, nomenclature of co-ordination compounds. EAN, stability of complex ion, factors affecting the stability of complex ion. (Stereochemistry of co-ordination compounds with C.N. 4 & 6), isomerism in co-ordination compounds.

Ref.3 :- Pages 730 to 746, 750 to 751 , 753 to 758.

Reference Books:-

1. Concise Inorganic Chemistry, fifth edition, J.D.Lee.
2. Advanced Inorganic Chemistry, fifth Augmented edition by Dr.S.K.Agrawal & Dr.Keemtila. Pragati Prakashan.
3. Principle of Inorganic chemistry - by Late B.R.Puri, L.R.Sharma & K.C.Kalia. Milestone Publishers and Distributors.

Sem. – I

Course No:- CH-313

Subject: Basic Organic Chemistry.

Chapter-1:-Structure and Reactivity.

(M-08)(P-10)

- a)Inductive effect,
- b)Resonance effect,
- c)Condition necessary for resonance,
- d)Electromeric effect,
- e)Hyperconjugation,
- f)Steric effect,
- g)Tautomerism.

Ref.1:-Page Nos.-21-28

Ref.3:-Relevant Pages.

Chapter-2:-Nucleophilic Substitution at Saturated Carbon.

(M-06)(P-08)

- a)Relation between kinetics and mechanism SN^1 , SN^2 and SN^l mechanism,
- b)Stereochemical implications of mechanism,
 1. SN^2 mechanism:Inversion of configuration.
 2. SN^2 mechanism:Racemisation.
 3. SN^l mechanism:Retention of configuration.

Ref.1:-Page Nos.-77-92 and 95-99.

Ref.3:-Relevant pages.

Chapter-3:-Elimination reactions.

(M-06)(P-08)

- a)Introduction,
- b) E_1 , E_2 , & E_1CB mechanisms,
- c)Stereochemistry of E_2 reaction,
- d)Orientations:Saytzeff and Haffmann elimination.
- e)Elimination Verses substitution.

Ref.1:-Page Nos.-240-255.

Ref.2 and 3:-Relevant pages.

Chapter-4:-Electrophilic addition to $>C=C<$

(M-06)(P-08)

- a)Addition of halogen,
- b)Effect of substitution on rate of addition,

c)Orientation of addition,

d)Other addition reactions-Hydration,Hydroxylation,Hydrogenation and Ozonolysis.

Ref.1.:- Page Nos.-175-190.

Ref.2 and 3 :-Revelant pages.

Chapter-5:-Nucleophilic addition to $>C=O$ group (M-08)(P-10)

a)Structure and reactivity.

b)Addition of water,alcohol,thiol,hydride ion,derivative of ammonia

c)Carbon nucleophilic addition –i)Carbanium formation and stability,

ii)Aldol condensation,

iii)Perkin reaction,

iv)Claisen ester condensation.

Ref.1:-Page Nos.-202-226.

Ref.2 and 3 :-Revelant pages.

Chapter-6:-Name reactions.

(M-06)(P-08)

i)Reformatsky reaction,

ii)Knoevengel's reaction,

iii)Michael addition,

iv)Wittig reaction,

v)Benzoin condensation,

vi)Vilsmeier-Haack reaction.

Ref.2 ,3 and 4 :-Revelant pages.

Reference Books:-

1. A guide book to reaction mechanism in organic chemistry by Peter and Sykes.5th edition.
2. Organic Chemistry by S.H.Pine. 5th edition.
3. Organic chemistry by Morrison and Boyd. 6th edition.
4. Advanced organic chemistry by Jerry Marsh. 3rd edition.

Sem. – I

Course No:- CH-314

Subject: Analytical Chemistry [Applied].

Chapter-1:- Introduction.

(M-02)(P-03)

What is Analytical Chemistry ?What is analytical Chemist ? Information from Chemical analysis, Use of analytical Chemistry, Methods used in quantitative analysis.

Ref.1:-Pages 1 to 6.

Chapter-2:-Solvent Extraction.

(M-10)(P-13)

The distribution co-efficient, Distribution ratio, Percent extracted, Solvent extraction of metals ion association complex and metal chelates. The Extraction process, Separation process, The separation efficiency of metal chelates, Analytical separation, multiple batch extraction, counter current distribution, simple numerical problems on percent extracted and multiple extraction

Ref.3:-Pages 484 to 498.

Chapter-3:-Gravimetric analysis.

(M-12)(P-15)

Unit operation in gravimetric analysis, steps in gravimetric analysis, preparation of solutions, conditions of analytical precipitation, digestion of precipitate Impurities in precipitate, washing and filtering of precipitate, Drying and ignition of precipitate, Precipitation from homogeneous solution, Gravimetric calculations.

Ref.3:-Pages 145 to 158.

Ref. 1: Pages Relevant Pages.

Chapter-4:-Water analysis.

(M-12)(P-16)

Quality of natural water, odour, Test, Suspended solid, oxygen demand, Chemical oxygen demand, Chlorine demand, Bio-Chemical Oxygen demand, Total hardness of water, definition and units of total hardness. Acidity, total acidity, Alkalinity

Ref. 4:-Pages 10 to 46.

Ref. 5,7,8,9:- Relevant Pages.

Chapter-5:-Clinical Chemistry.

(M-04)(P-05)

Introduction, Composition of blood, Collection and preservation of samples, Clinical analysis common determination, Immunoassay, Principles of immunoassay, specificity of immunoassay, Preparation of antibody, incubation period for the assay, separation of the bound and free antigen, fluorescence and Enzyme immunoassay.

Ref. 3:-Pages 678 to 691.

Reference Books:-

1. Quantitative analytical chemistry, 5 th Edition, by James S. Fritz, George H.Schenk
2. Chemical analysis by A.K.Shriwastawa, P.C.Jain, S.chand and company.
3. Analytical chemistry, by G.D. Christian, 5 th Edition
4. Introduction to Industrial Chemistry, First Edition by B.K.Sharma, Goel Publication
5. Standard methods of chemical analysis 6 th Edition Volume-2,Part B. by F.J. Welcher, Robert E. Krieng
6. Analytical Chemistry, by G.D. Christian, 6 th Edition
- *7. Standard methods for examination of water and waste water(APHA), Washington Dc(2005).
- *8. Physico-Chemical examination of water sewage and industrial effluent by N. Manivaskun, (2005)
Pragati-Prakashan Meerut.

* Suggested for further reading

Subject: Industrial Chemistry [Applied]**Chapter-1:-Sugar Industry.****(M-08,P-10)**

Introduction, Manufacture of Cane Sugar, Extraction of Juice, Purification of Juice, Sulphitation & Carbonation, Concentration / Evaporation, Crystallisation Separation of crystals, Refining (with flow sheet), grades, Baggase, Celotex, Sugar Industry in India.

Ref.1:-Pages.- 893-898,903.**Chapter-2:-Fermentation Industry.****(M-08,P-10)**

Introduction, alcohol Fermentation, Uses of alcohol, Theory underlying process of making alcohols beverages, Manufacture of Beer, Manufacture of Spirit, alcohol from Cane Sugar Mollasses, theory of Fractional distillation – Coffey's still, rectified spirit, absolute alcohol, fusel oil, proof spirit, denatured alcohol.

Ref.2:-Pages.- 578-596.**Chapter-3:-Fertilizers.****(M-09,P-13)**

Plant Nutrients, Nutrient Functions, Fertilizer types, Need for Fertilizers, Essential requirements, classification of Fertilizers, Natural inorganic Fertilizers, Artificial-Fertilizers,- Nitrogenous Fertilizers- Ammonium Sulphate, Urea.(Manufacture of Urea & Ammonium Sulphate),Action of Ammonium Sulphate & Urea as Fertilizer, Phosphatic Fertilizers- triple Super Phosphate (Manufacturing Process Only),potassium fertilizer.

Ref. 3:-Pages.- 762-795, 800-801.**Chapter-4:-Cement Industry.****(M-07,P-09)**

Portland Cement, Types of Portland Cement, Chemical specifications of Portland Cement, Raw-Materials, Manufacture of Cement-Dry and Wet Process, Clinker Compounds, and reactions during formation of Clinker, Setting & Hardening of Cement.

Ref.-2:-Pages.- 170-181.**Chapter-5:-Dyes.****(M-08,P-10)**

Introduction, Sensation of Colour, Colour and Constitution, Classification of dyes according to their mode of application and Chemical Constitution.

Synthesis and Uses of dyes:- Methyl Orange, Congo red, Crystal Violet, Phenolphthalein, Erichrome Black-T, Indigotin.

Ref.-3:-1545-1594.**Ref.-4:-Relevant Pages.****Reference Books:-**

1. Industrial Chemistry by B.K.Sharma (GOEL Publishing house, Meerut),11 th Edition,2000
2. Shreve's Chemical Process Industries 5 th Edition by George T. Austin,1984.
3. Industrial Chemistry by B.K.Sharma,14 th Edition, 2004.

Sem. – I

Course No:- CH-316(A)

Subject: Bio-Chemistry

Chapter -1 :- Study of Biological Molecules.

Unit -1:-Carbohydrates. (M-03,P-04)

Introduction, polysaccharides, Storage Polysaccharides, Structural polysaccharides.

Ref.-1:-Page Nos.-25,26,49-52.

Ref.-2:-Relevant pages.

Ref.-3:-Relevant pages.

Unit-2:-Amino Acids and Proteins. (M-06,P-09)

Introduction, Structure of amino acids with zwitterion structure, classification based on nature of R group, amphoteric nature of amino acids, reactions of amino acids with FDNB, Dansyl chloride and ninhydrin. Formation of peptide bond, classification of proteins based on functions, based on shape.

Proteins Structure - Primary, secondary Tertiary and Quaternary structure, study of proteins -Alpha Keratins, Haemoglobin.

Ref.-1:- Page Nos.-3-77,79,84,88,89,97-102,106-110.

Ref.-2:-Relevant pages.

Ref.-3:-Relevant pages.

Unit-3:-Enzymes. (M-04,P-05)

Introduction, classification, Role of enzymes in biochemical reaction, Michaelis Menten equation (No derivation). Effect of substrate concentration, pH and temperature on enzyme catalyzed reaction.

Ref.-1:- Page Nos.-57-159,158-171,173.

Ref.-2:- Relevant pages.

Ref.-3:-Relevant pages.

Unit- 4 : - Lipids. (M-03,P-03)

Introduction, Fatty Acids, Nomenclature of Fatty Acids, Triacyl Glycerol, Waxes, Phospholipids, Sphingolipids.

Ref.-1:- Page Nos.-57,58,62-66.

Ref.-2:-Relevant pages.

Ref.-3:-Relevant pages.

Chapter-2:-Nucleic Acids. (M-05,P-06)

Introduction, Components of nucleic acids-sugars, bases, nucleosides, nucleotides, Watson and Crick model of DNA, Types of RNA. (Structure not expected)

Ref.-1:- Page Nos.-111-117,124-131.

Ref.-2:-Relevant pages.

Ref.-3:-Relevant pages.

Chapter-3:-Biochemical energetics. (M-04,P-06)

Energy rich compounds-pyrophosphates, acyl phosphates, enolic phosphates, thiol esters.

Ref.-1:- Page Nos.-138,139,142-147.

Ref.-2:-Relevant pages

Ref.-3:-Relevant pages.

Chapter-4:- Metabolism.

Unit-1:-Carbohydrate metabolism.

(M-06,P-08)

Definition of metabolism, Glucolysis and alcoholic fermentation, Glucolysis-reactions involved and energetics TCA cycle (kreb cycle) - Reactions involved and energetics

Ref.-1:- Page Nos.-280 - 294, 329 - 335.

Ref.-2:-Relevant pages.

Ref.-3:- Relevant pages.

Unit -2:-Lipid Metabolism

(M-03,P-04)

β -oxidation - Reactions involved in β –oxidation, energetics of palmitic acid,

Ref- Page Nos.-1:-353-357,

Ref - 2:-Relevant pages.

Ref-3:-Relevant pages.

Unit-3:-Amino acid Metabolism.

(M-03,P-04)

Transamination, Deamination by glutamic dehydrogenase, ammonia lyases, deaminases and deaminases, decarboxylation.

Ref-1:- Page Nos.-462-464,466-468.

Ref - 2 :-Relevant pages,

Ref - 3 :-Relevant pages.

Chapter-5:- Biochemical Techniques.

(M-03,P-03)

Paper electrophoresis, dialysis, gel filtration.

Ref.-1:- Page Nos.-594-595, 598,605.

Ref.-2:-Relevant pages.

Ref.-3:-Relevant pages.

Reference Books:-

1. Outlines of Biochemistry - Conn and Stumpf (4th Edition)
2. Principles of Biochemistry - A L Lehninger (2nd Edition)
3. Outlines of Biochemistry - { 5rd Edition) By conn, stumpf, Bruening, Doi

Sem. – I

Course No:- CH-316(B)

Subject: Environmental Chemistry.

Chapter-1:-Introduction of Environmental Chemistry.(M-03,P-04)

Concept and scope of Environmental chemistry, nomenclature, Environmental system.

Ref.-1:- Page Nos.-1 -5.

Chapter-2:-Atmosphere and Air pollution. (M-14,P-18)

Atmosphere composition, Atmospheric structure, Air pollution,- Air pollutants, primary pollutants, carbon monoxide, source & control of CO pollution, NO_x -sources & sinks, control of NO_x, SO_x - Sources & sinks, control of hydrocarbon & photochemical smog, Particulates - sources, effect on human & materials.

Ref.-2:-Page Nos-6-12, 95-101&104-113.

Chapter-3:-Lithosphere. (M-04,P-04)

Composition of lithosphere / soil, inorganic & organic components in soil, micro & macro nutrients in soil, Nitrogen pathway & NPK - in soil, waste & pollutants in soil.

Ref.-1:-Page Nos:-60-65.

Chapter-4:-Water pollution. (M-11,P-16)

Hydrological cycle, completion in natural & waste water, aquatic environment, water pollutants, organic pollutants, inorganic- pollutants & sediments.

Ref.-2:-Page Nos.-33,34,44to46,50-58,165-169&182.

Chapter-5:-Natural Resources, Energy & Environment. (M-08,P-10)

Mineral Resources metals & Non-metals, wood as a major renewable resource, fuel & energy resources -coal, petroleum, Nuclear fission / fusion, solar energy, hydrogen, miscellaneous gasohol, world energy resources-consumption & conservation.

Ref.-1:-Page Nos.-313-329.

Ref.2:- Page No. – 307.

Reference Books:-

- 1.Environmental Chemistry by A.K. De.3rd Edition –by A,K.De.
- 2.Environmental Chemistry by A.K. De.2nd Edition –by A,K.De.

Sem. – II

Course No:- CH-321

Subject: Applied Physical Chemistry.

Chapter-1:-Chemical Kinetics. (M-10,P-13)

Introduction, Second order reaction, Derivation of integrated rate law for Second Order reaction with equal and unequal initial concentration. Characteristics of Second order reaction, example of second order reaction. Derivation of integrated rate law for third order reaction with equal initial concentration, characteristics of third order reaction, examples of third order reaction, Effect of

temperature on reaction rate, Arrhenius equation, Collision theory of Bimolecular reaction and unimolecular reaction, Limitation of Collision theory and transition state theory of reaction rates (derivation is not expected), Catalysis- Introduction, enzyme catalysis, Characteristic of enzyme catalysis, Mechanism of enzyme catalysis, related numerical.

Ref.-1:-Page Nos.-557-565,571-574,575-580.

Ref.-2:-Page Nos.-764-768 and relevant pages.

Ref.-3:-Page Nos.-23-25,33-46,981-985.

Ref.-4:-Relevant pages.

Chapter-2:-Investigation of Molecular Structure. (M-10,P-13)

Molar refraction, Dipole Moment, induced dipole moment, Electrical polarisation of molecules. Orientation of dipole in an electric field, Debye equation.

Molecular Spectroscopy – Introduction. Electromagnetic radiation, types of spectra, Rotational, Vibrational and Electronic energy Level; Region of Spectra, Fluctuation in dipole moment due to rotational, Vibrational and electronic excitation.

Rotational Spectra of a rigid diatomic molecule, non rigid diatomic molecule-Moment of inertia, Energy Levels, Selection Rules, Nature of Spectrum, Determination of Bond Length, Isotopic Substitution effect on rotational Spectra.

Mathematical interpretation of rotational spectra in terms of bond length, reduced mass and moment of inertia of HCl, CO.

Ref.-1:-Page Nos.:-691-697.

Ref.-5.:-Page Nos.:-5-9,34-41.

Chapter-3:-Electrochemical Cell. (M-10,P-13)

Classification of electrochemical cell, Chemical cell with and without transference, concentration cell, electrode concentration cell without transference, electrolyte concentration cell with transference, electrolyte concentration cell without transference, Liquid junction potential.

Application of emf measurement – Determination of solubility product; Measurement of P^H by using hydrogen electrode, Quinhydrone electrode, and glass electrode, Potentiometric titration. Related numericals.

Ref.-1:-Page Nos.-497-519.

Ref.-6:-Relevant pages.

Ref.-7:-Relevant pages.

Chapter-4:-Nuclear Chemistry. (M-10,P-13)

Introduction, Radioactive elements, types of radioactive decay, decay schemes, General characteristic of radioactive decay, Decay kinetics-Decay constant, half life period, mean life, Units of radioactivity, α decay-The range and ionising power of α decay, The α particle energy spectrum, Geiger-Nuttals law, β decay-Types of β decay.

Detection and measurement of nuclear radiation, G.M.Counter.

Application of radioactivity – Radiochemical principle of tracer technique; application of tracer technique – Chemical investigation reaction mechanism-esterification, hydrolysis, oxidation

and Friedel-Craft reaction, structure determination- PCl_5 molecules, Thiosulphate ion, Physico-chemical research - determination of solubility of sparingly soluble substance, Surface area of powder precipitate

Agricultural application – Optimum use of Fertilizer, genetic engineering of crop improvement, Control of Predatory insects.

Ref.-8:-Page Nos.- 119-125,139-142,148-150,302-303,308-311,371-378, 381-383,412-414.

Reference Books:-

1. Fundamental of Physical Chemistry - Moron and Prutton-4th edition, Oxford and IBH publishing Co.Pvt.Ltd.
2. Essential of physical chemistry by Arun Bahl, B.S.Bahl, G.D.Tuli, S. Chand Publication revised edition-2008.
3. Chemical Kinetics-K.J.Laidler
4. Basic Chemical Kinetics by G.L.Agrawal (1990), Tata McGraw Hill Publishing Co.Ltd., New Delhi.
5. Fundamental of molecular spectroscopy by C.N. Banwell and McCash, 4th edition/5th edition, Tata McGraw Hill Publishing Co.Ltd.
6. Electrochemistry by C.H.Hanman, John Wiley (1998)
7. An introduction to Electrochemistry by Samuel Glasstone, Affiliated to East-west press.
8. Essentials of Nuclear Chemistry – H.J.Arnikaar 4th Edition.

Sem. – IV

Course No:- CH-322

Subject: Applied Inorganic Chemistry

Chapter-1:-Features of Solids.

(M-08,P-10)

Stoichiometric defects - Schottky defects and Frenkel defects, Nonstoichiometric defects.

Metal excess : F centers and Interstitial ions and electrons.

Metal deficiency :- positive ions absent and extra interstitial negative ions.

Semiconductors and transistors, rectifiers, photovoltaic cell, transistors.

Ref. 1 :- Pages-58 to 67.

Chapter-2:-Some Transition & Inner transition Metals. (M-10,P-14)

Occurrence, extraction, properties & uses of transition elements

- i) Titanium
- ii) Vanadium
- iii) Chromium

Ref. 2 :-Pages -305 to 313.

Occurrence, extraction, properties & uses of inner transition elements

- i) Thorium,
- ii) Uranium
- iii) Plutonium,

Ref.2 :-Pages-466 to 472.

Chapter-3:-Nature of metal ligand bonding in Complex compounds.

Modern theories of metal - ligand bond.

(M-18,P-22)

The valence bond theory. The main points of the valence bond theory. Examples of square planar and tetrahedral complexes, examples of octahedral complexes, shortcomings of valence bond theory.

The crystal field theory (C.F.T.) - Crystal field splitting of energy levels, crystal field stabilization energy, Magnetic properties of metal complexes factors influencing the magnitude of crystal field splitting. Colour of transition metal complexes, the ligand field theory, evidences of covalent bonding in Metal-ligand bonding.

Molecular orbital theory of co-ordination complexes, sigma bonding in octahedral complexes and pi bonding in octahedral complexes.

Ref.-3:-Page Nos.-760 - 779.

Chapter - 4 - Bioinorganic Chemistry.

(M-04,P-06)

Myoglobin and Hemoglobin, metallo-enzymes, Inhibition and poisoning of enzymes. Biological functions and toxicity of some elements.

Ref.-3:-Page Nos.-1007,1008, 1011 to 1014, 1015, 1016.

Reference Books:-

1. Concise Inorganic Chemistry, Fifth edition, J.D.Lee.
2. Advanced Inorganic chemistry - Volume - II, Satya Prakash, G.D.Tuli, S.K.Basu, R.D.Madan.
3. Principle of Inorganic chemistry - By Late B.R.Puri, L.R.Sharma & K.C.Kalia. Milestone Publishers and Distributors.

Sem. – IV

Course No:- CH-323

Subject: Spectroscopy and Designing organic synthesis.

Chapter-1:-Spectroscopic methods.

A)Introduction:-

(M-03,P-04)

- a)Meaning of spectroscopy, nature of electromagnetic radiations, wavelength, frequency, energy, amplitude, wave number and their relationship, units of measurement, Different region of electromagnetic radiations.
- b)Interaction of radiation with matter, excitation of molecules to different energy levels i.e. rotational,vibrational and electronic.

Ref.-1,2 & 3:-Relevant pages.

B)Ultraviolet spectroscopy:-

(M-06,P-08)

- a)Introduction,Nature of UV Curve,Beers law,absorption of UV by organic molecule leading to the different electronic excitation.
- b)Effect of solvent on electronic transition,terms used in UV spectroscopy,Chromophore, auxochrome,bathochromic shift,hypsochromic shift,hyperchromic shift and hypochromic shift.
- c)Effect of conjugation on UV bands ,calculation of λ_{\max} by using Woodward Fieser rules for

diene and enone system.

d) Applications of Ultraviolet spectroscopy.

Ref.-1,2 & 3:-Relevant pages.

C) Infrared Spectroscopy:- (M-06,P-08)

a) Introduction, principle of IR spectroscopy, fundamental modes of vibrations, type of vibration, condition for absorption of radiation, fundamental group region, fingerprint region.

b) Characteristic of IR absorption of following groups.

i) Alkanes, alkenes, alkynes.

ii) Alcohol and ethers

iii) Alkyl halide Amines, amide.

iv) Carbonyl compound (-CHO, >C=O, -COOH, -COOR)

v) Amines and amides

vi) Aromatic compound and their substitution pattern.

vii) Effect of following factors on IR spectroscopy.

a) Inductive effect, b) Resonance effect, c) Hydrogen bonding.

vi) Application of IR spectroscopy.

a) Structure determination, b) Study of chemical reaction,

c) hydrogen bonding.

Ref. 1,2 & 3:-Relevant pages.

D) NMR Spectroscopy:- (M-06,P-08)

a) Introduction, principle of NMR spectroscopy, magnetic and nonmagnetic nuclei without mathematical detail.

b) Nuclear resonance, chemical shift, molecular structure, shielding and deshielding, measurement of chemical shift, δ scale and T scale, TMS as reference and its advantages.

c) Peak area, spin-spin coupling, coupling constant, J values (only first order coupling to be discussed)

d) Applications of NMR spectroscopy.

Ref.-1,2 & 3:-Relevant pages.

E) Spectral problems based on UV, IR and NMR data:- (M-06,P-08)

Spectral data such as λ_{max} , values, IR frequencies, chemical shift (δ values) and coupling constant should be provided to students.

Ref.-1,2 & 3:-Relevant pages.

F) Designing of organic synthesis:- (M-05,P-06)

a) Introduction to disconnection.

b) One group disconnection.

c) Disconnection of simple alcohols.

Ref.-4:-Relevant pages.

G) Heterocyclic compounds:- (M-08,P-10)

a) Preparation and reactions of Indole with special reference to Fischer Indole synthesis.

b) Preparation and reactions of quinoline and isoquinoline with special reference to Skraup synthesis and Bischler-Napieralski synthesis.

Ref.-5:-Relevant pages.

Reference Books:-

1. Spectroscopic methods in Organic chemistry by Willams Fleming, 4th edition.
2. Spectroscopy of organic compounds by P.S.Kalsi,Wiley Estern Publication.
3. Spectrometric identification of organic compound by Silverstein,Bassler and Morrill 4th edition.
4. Desiging organic synthesis by S.Warren.
5. Heterocyclic compounds by Leo Packet.

Sem. – IV

Course No:- CH-324

Subject: Instrumental Chemistry

[Applied]

Chapter-1:-Potentiometry.

(M-16,P-20)

Potentiometry and PH meter, cell for potential measurement, the glass pH,electrode-principle, combination electrode, Theory of glass membrane, Potential, alkaline error, acid error, standard buffers, accuracy of PH-measurements, Measurements with PH-meter, Ion-selective electrodes, Glass membrane electrodes, Precipitate electrodes, Solid-State electrodes, Liquid-Liquid electrode, Plastic membrane/Ionophore electrode, coated wire electrode, Enzyme electrode, Potentiometric titration (Indirect Potentiometry),PH titrations, precipitation titrations, Redox titrations

Ref.-1:-Page Nos.-312,313,316-325,327-333.

Ref.-2:-Relevant Pages.

Chapter-2:-Polarography.

(M-06,P-08)

Polarography, Polarization of electrodes, Voltage-Current Characteristics, Characteristics of micro-electrodes, Supporting electrolyte, Residual Current, Limiting Current, Diffusion Current, Ilkovic equation, Polarographic maxima, Half Wave potential, (Derivation of expression for half wave potential is not excepted). Ancillary equipment for polarography, Mercury Dropping electrode, Polarographic cells, Maxima Suppressors, Application, determination of half wave potential and concentration of Cd, Zn and Mn ion in KCL solution.

Ref.-3:-Pages 632-656.

Ref.-4:-Pages 478-489.

Chapter-3:-Spectrometry.

(M-12,P-16)

Interaction of electro-magnetic radiation with matter, Electro-magnetic Spectrum, the absorption of radiation, The concept of absorption, Absorption by inorganic compounds, solvents for spectrometry, Quantitative calculations, Beer's Law, Mixtures, Principles of instruments, Sources, Mono chromators, prism, diffraction grattings, Optical filters, Cells, detectors, Slits width, types of instruments, single beam and double beam spectrophotometer. Spectrometric errors, Deviation from Beer's Law, Chemical deviation, Instrumental deviation.

Ref.-1:-Pages 398-401, 410, 413-420, 422-427, 429, 435, 439-443.

Ref. 2:-Relevant Pages.

Chapter-4:-Nephelometry and Turbidimetry:- (M-06,P-08)

Introduction, Turbidimetry, Colourimetry, Nephelometry and Fluometry, Choice between turbidimetry and Nephelometry, Theory Instrumentation and applications of Nephelometry and Turbidimetry

Ref.-4:-Pages 380-390.

Reference Books:-

1. Analytical Chemistry by G.D. Christian, 5 th Edition.
2. Analytical Chemistry, An Introduction: Skoog, West and Holler, 6 th Edition
3. Vogel's Text Book of Quantitative Inorganic Analysis by Bassett, Denney, Jeffery and Mandham, 4 th Edition
4. Instrumental method of Chemical Analysis by Chaitwal and Anand, 7 th Edition.

Sem. – IV

Course No:- CH-325

Subject: Petrochemical Industrial Information.

Chapter-1:-Petroleum Industry.

(M-10,P-13)

- a) Occurrence, Petroleum producer countries in the world,
- b) Exploration Methods
- c) Composition of Petroleum
- d) Refining or Distillation of Petroleum
- e) Anti-Knock Compounds, Octane number, Cetane number, petrohol,power petrol.
- f) Manufacture of Petrol or Gasoline
- g) Cracking process- Thermal, Catalytic, Hydrocracking

Ref.5: 340-352,356-358,363-368.

Chapter-2:-Petroleum Products:-

(M-10,P-13)

- a) Introduction
- b) Classification of petroleum products
- c) Fuels, Lubricating oils, Miscellaneous petroleum products, Chemical & Petrochemical products.
- d) Products of Petrochemical and basic Organic Synthesis
- e) Dye Intermediates
- f) Lacquers, Solvents, and Thinners.

Ref.-3:-343-361 & (Relevant pages.)

Chapter-3:-Hydrocarbons from petroleum.

(M-10,P-13)

- a) Introduction
- b) Saturated Hydrocarbons from natural gas
- c) Unsaturated Hydrocarbons –preparation of –Acetylene and ethylene (with flow sheet)
- d) Aromatic hydrocarbons- Preparation of toluene and xylene(with flow sheet)

Ref.-3:- 439-451 & (Relevant pages.)

Chapter-4:-Industrial organic synthesis.

(M-10,P-13)

- a) Introduction
- b) Petrochemicals
- c) Manufacture of methanol from CO and H₂ , isopropanol, Glycerol, Acetone, Phenol (from Raschig process) (with flow sheet diagram)

Ref.-3:-493-514.

Ref.-5:-394-417.

Reference Books:-

1. Industrial Chemistry – B.K.Sharma (11th edition)
(Goel publishing house, Meerut)
2. Shreve's Chemical Process industries (5th edition)
(Gorqe T.Austin)
3. Industrial Chemistry – B.K.Sharma (11th edition)
(Goel publishing house, Meerut)
4. Synthetic organic chemistry – by Gurudeep Chitawl (2nd Edition)
(Himalaya publishing house)
5. Industrial Chemistry – (Reprint2004) (M.G.Arora, M.Singh)
(Anmol publication pvt. Ltd.,New Delhi)

Subject: : Polymer Chemistry**Chapter-1:-Basic concepts of polymers. (M-06,P-07)**

Brief history, definition, functionality and reactivity, degree of polymerisation, monomers, polymers, homopolymers copolymers, types of copolymers, classification of polymers based on origin, native backbone chain (organic and inorganic), thermal response, applications and physical properties.(Plastics, elastomers, fibres and liquid resins)

Ref.-1:-1-14,142,143.

Ref.-2:-Relevant pages.

Chapter-2:-Chemistry of polymerisation. (M-08,P-09)

Introduction, chain polymerisation, free radical polymerisation, ionic polymerisation, step polymerisation, ring opening polymerisation.

Ref.-1:-15-44,52-64.

Ref.- 2:- Relevant pages.

Chapter-3:-Polymerisation techniques. (M-06,P-08)

Bulk polymerisation, solution polymerisation, suspension polymerisation, emulsion polymerisation, interfacial condensation polymerisation.

Ref.-1:-71 -79.

Ref.- 2:-Relevant pages.

Chapter-4:-Polymer degradation. (M-04,P-06)

Introduction, types of degradation, thermal degradation, mechanical degradation photo degradation.

Ref.-1:-263-268,271 -275.

Ref.-2 :-Relevant pages.

Chapter-5:-Study of some important polymers. (M-06,P-08)

Preparation, properties and uses of following polymers-Polypropylene, Polystyrene,Polyacrylonitrile, Polycarbonates, Polyvinyl alcohol, Phenol-formaldehyde resins.

Ref.-1:217-256.

Ref.-2:-Relevant pages.

Chapter-6:-General properties of polymers. (M-06,P-08)

Glass transition temperature - Definition and explanation, factors affecting glass transition temperature, effect of molecular weight on glass transition temperature, importance of glass transition temperature, molecular weight- number average molecular weight, weight average molecular weight (No derivations)

Ref.-1:-150-172,86-91.

Ref.-2:-Relevant pages.

Chapter -7:-Polymer processing techniques. (M-04,P-06)

Calendaring, die casting, film casting, compression moulding.

Ref-1:-451 -457,

Ref -2:Relevant pages.

Reference Books:-

- 1.Polymer Science - V. R. Govarikar.
- 2.Text books of Polymer Science - F W Billmeyer.

Sem. – IV

Course No:- CH-326(D)

Subject: Drug Chemistry

Chapter-I:-

(M-04,P-05)

Introduction to pharmaceutical science, its scope & pharmacopoeias with special reference to Indian pharmacopoeia.

Ref.-1:-page no. 3 & 4.

Ref.-2:-page no.35 to 42.

Chapter -II.

(M-04,P-04)

Definition of drugs, sources of drugs, & development of new drugs.

Ref.-3:-page no.- 1-76.

Chapter-III.

(M-02,P-03)

Common daily terminology used in the practice of medicine.

Ref:-4:-page no. 170 to 180.

Chapter-IV:-

(M-25,P-30)

Chemistry of following classes of drugs covering their nomenclature, chemical structure synthesis & uses.

Sr.No.	Type of Drug	Example
1	Antibiotics	Ampicilline *
2	Anti material	Chloroquine *
3	Sulfonamides	Sulfanilamide *
4	Non steroidal anti in flamatory Agents *	
5	Hypnotics	phenobarbitone sodium. *
6	Antileprotic Drugs	Dapsone *
7	Analgelics & Antipyretics	paracetamol *
8	Antiseptics & isinfectants	
9	Coagulants S Anticoagulants.	

(* Synthesis of marked drug needed)

Ref. : 5 -

P - 243 to 270

P - 221 to 226

P - 236 to 242

P - 119 to 133

P - 31 to 39

P - 274 to 280

P - 119 to 133

P - 317 to 327

P - 162 to 167

Quality control of drugs & pharmaceutical importance of quality control, significant error, methods used for quality control, sources of impurities in pharmaceuticals.

Ref.- 7:-Page No.1- 44.

Reference Books:-

1. The science & practice of pharmacy - Remington 20th edition, Vol. -1.
2. Pharmaceutics -1 . R. M. Mehta. 3rd edition. Vallabh Prakashan.
3. Pharmacology & pharmacotherapeutics. 20th edition. Popular Prakashan. (Satoskar, Bhandarkar)
4. Hospital & clinical Pharmacy.
5. Organic Pharmaceutical chemistry by Harkishan Singh & V.K.Kapoor., Vallabh Prakashan, 5th edition.
6. Principles of Medicinal Chemistry Vol. I & II S.S. Kadam, K.R.Mahalik, K.G.Bothara. Nirali Prakashan, 8th edition.
7. Practical pharmaceutical chemistry . Vol. I A.H.Beckett & J.B.Stenlake. CBS Prakashan Delhi.

Annual

Course No:- CH-307

Subject: Physical Chemistry Practicals

Each student has to perform minimum 16 experiments with at least One experiment from each technique

1] Potentiometry:-

- 1) Determination of E_{cal} and p^H of buffer solutions using quinhydrone electrode.
- 2) Estimation of amount of KCl/NaCl by titration with silver nitrate.
- 3) Determination of P^{Ka} of weak monobasic acid.
- 4) Determination of formal redox potential of Fe^{++}/Fe^{+++} .

2] Conductometry:-

- 1) To determine the composition of a mixture of HCl and Acetic acid by conductometric titration.
- 2) Determination of relative strength of monochloro acetic acid.
- 3) To study the kinetics of saponification of ethyl acetate by NaOH conductometrically.

3] P^H Metry:-

- 1) To determine pka and ka values of given weak acid by pH metric titration.
- 2) To determine hydrolysis constant of aniline hydrochloride.
- 3) Determination of pH values of various mixtures of sodium acetate and acetic acid in aqueous solution and hence find out Ka of the acid.

4] Radioactivity:-

- 1) Determination of plateau voltage and resolving time of G.M. counter.
- 2) Determination of E_{max} of B^- particles.

5] Colorimetry:-

- 1) Verification of Beer's law and determination of concentration of given solution of Cu^{2+} ions.
- 2) To titrate Cu^{2+} ion with EDTA colorimetrically.
- 3) To obtain the calibration curve for KMnO_4 using colorimeter or spectrophotometer determine λ_{max} for KMnO_4 and hence verify the Beer-Lambert law and determine the unknown concentration of the compound.

6] Refractometry:-

- 1) To determine the molar Refractivity's of given liquids A,B,C and D.
- 2) To determine specific refractivity's of given liquids A and B and their mixtures and hence determination of composition of unknown mixtures.
- 3) Determination of refractive indices of series of solutions of KCl and concentration of given unknown solution of KCl.

7] Chemical Kinetics:-

- 1) Investigation of the kinetics of decomposition of H_2O_2 by volume measurement of O_2 (2 set)
- 2) Investigate reaction between H_2O_2 and KI kinetically.
- 3) To compare the relative strengths of HCl and H_2SO_4 by studying the kinetics of hydrolysis of an ester.
- 4) To determine the energy of activation of the reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI.
- 5) To study the rate of reaction between ethyl bromo acetate and Sodium thiosulphate kinetically.

8] Non – Instrumental:-

- 1) Determination of molecular weight of polystyrene /polyvinyl alcohol by viscosity measurement.
- 2) Determination of radius of glycerol/Sucrose molecule by viscosity measurement.
- 3) To determine the freezing point curve of mixture of Naphthalene and diphenyl (or O-nitrophenol and P- Toluidine).
- 4) To study the distribution of iodine between water and carbon tetrachloride.

Reference Books:-

1. Advanced Practical Physical Chemistry by J.B.Yadav (Goel publishing House Meerut)
2. Systematic experimental Physical Chemistry by Rajboj & Chondekar (Anjali publication.)
3. Experimental Physical Chemistry by R.C. Das & B.Behra (Tata Mc Graw Hill)
4. Experiments in Physical Chemistry by Wilson, New Combe, Denaro Pergaman press Rickett.
5. Findlay's Practical Physical Chemistry. Revised By J.A.Kitchener and B.P.Lavitt.

Scheme for Practical Examination .-

- | | |
|-------------------------|----------|
| Q. 1 :- Experiment No-1 | (M- 35) |
| Q. 2 :- Experiment No-2 | (M-35) |
| Q. 3 :-Journal - | (M-10) |

Annual

Course No:- CH-308

Subject: Inorganic Chemistry Practicals

1) **Inorganic qualitative analysis:-** (Six mixtures) Separation of binary mixture containing two basic and two acidic radicals (Excluding phosphate and borates)

2) **Gravimetric estimation (Any two)**

- i) Iron as Fe_2O_3
- ii) Copper as CuO
- iii) Zinc as $\text{Zn}_2\text{P}_2\text{O}_7$.
- iv) Lead as PbSO_4 .

3) **Volumetric estimation (Any two)**

- i) To determine calcium in a given CaCl_2 solution by EDTA method
- ii) Manganese by Volhard's method,
- iii) Cobalt by complex metric method.
- iv) To determine the strength of NaOH and Na_2CO_3 present together in solution.

4) **Alloy ore analysis (Any two)**

- i) Estimation of zinc from brass alloy by EDTA method.
- ii) Estimation of iron from Haematite ore by volumetric method.
- iii) Estimation of tin gravimetrically by oxide method from solder alloy,
- iv) Estimation of Antimony volumetrically from type metal.

5) **Colorimetric analysis (Any two)**

- i) Estimation of Titanium using H_2O_2 .
- ii) Spectrophotometric titration of Cu(II) against EDTA.
- iii) Estimation of iron using thiocyanate method.

6) **Preparation and determination of its purity. (Any two)**

- i) Tris (ethylene diamine) nickel (II) Thiosulphate.
 - ii) Bis (acetyl - acetonato) copper (II)
 - iii) Chloropentammine cobalt (III) chloride.
- 7) Paper chromatography (Any two mixtures)

Separation and identification of binary mixture of cations

(Fe^{3+} , Co^{+2} , Ni^{+2} , Cu^{+2})

*Students can make use of double burette method in volumetric analysis

Practical Reference Books:-

- 1) **A text book of a quantitative Inorganic Analysis by A.I.Vogel.**
- 2) **A qualitative Inorganic analysis by A.I.Vogel.**
- 3) **Practical Chemistry - by O.P.Pandey, D.N.Bajpai, S.Giri, S.Chand & Company Ltd. Ramnagar New-Delhi.**
- 4) **Post Graduate Practical Chemistry. H.N.Patel, S.P.Turakhia, S.S.Kelkar, S.R.Puniyani. Third & fourth revised edition 2005, Himalaya Publishing House.**

5) College Practical Chemistry, H.N.Patel, S.P.Turakhia, S.S.Kelkar, N.S.Is Raney, S.R.Puniyani, Himalaya Publishing House.

Practical Examination .- (CH - 308)

Q. 1 :- Qualitative analysis / Gravimetric analysis / preparation & its purity. (M-35)

Q. 2 :- Volumetric analysis / alloy - ore analysis / colourimetric /

Paperchromatography (M-25)

Q. 3 :-Journal - (M - 10)

Q. 4:-Oral- (M-10)

Annual

Course No:- CH-309

Subject: Organic Chemistry Practicals

1. Qualitative analysis of binary mixtures(8 mixtures)

a) Solid-solid mixtures- (04)

b) Solid-liquid mixtures- (02)

c) liquid-liquid mixtures- (02)

At least one mixture from each of the following-Acid-Base, Acid-phenol, Acid-Neutral, Phenol-Base, Phenol-Neutral, Base-Neutral and Neutral-Neutral. (Name and Structure of the compound is not expected) .No ether separation ,Solid-solid mixture should not be included for Neutral-Neutral type. Nitrophenols should not be given in the mixture.

2. Estimation of (any two)

a) Amide by Hydrolysis.

b) Ester by Hydrolysis.

c) Sugar by alkaline Cu-reagent.

3. Determination of (any two)

a) Saponification value of an oil.

b) Molecular weight of mono/dibasic acid by volumetric method.

c) Iodine value of an oil.

4. Single stage preparation (any five)

a) P-nitroacetanilide to P-nitro aniline.

b) Nitrobenzene to m-dinitrobenzene.

c) Acetanilide to P-bromoacetanilide.

d) Aniline to Sudan-I

e) Hydroquinone to quinine.

f) m-dinitrobenzene to m-nitroaniline.

g) Phthalic anhydride to phthamide.

h) P-nitroaniline to P-nitroiodobenzene.

5. Derivatives. (any one)

a) Oxime of aldehyde /ketone.

b) Benzoyl of phenolic -OH group/ -NH₂ group.

c)Anilide derivative of carboxylic acid.

Practical Reference Books:-

- 1)Practical Organic chemistry by G.L.Vogel.
- 2)Advanced practical chemistry by R.Mukhopadhyay and P.Chatterjee. 2nd edition, Books and allied (p) Ltd.
- 3) Laboratory manual of organic chemistry by R.K.Bansal 2nd edition.

Practical Examination .- (CH - 308)

- | | |
|---|-----------------|
| Q. 1 :- Qualitative analysis / Gravimetric analysis / preparation & its purity - | (M-35) |
| Q. 2 :- Volumetric analysis / alloy - ore analysis / colourimetric / | |
| Paperchromatography | (M-25) |
| Q. 3 :-Journal - | (M -10) |
| Q. 4:-Oral- | (M-10) |