

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
I	Inorganic, Organic and Physical Chemistry-I		Core I	90	5
Units	Learning Objectives				
1	To acquire knowledge about the types, effects and properties of bonds.				
2	To develop the skill of drawing the geometry of molecules and recognizes the organic reactions.				
3	To recollect IUPAC names of alkanes, alkenes and alkynes and to study the processes and importance of petrol.				
4	To study the significance of Parachor & Molecular Velocities and their application.				
5	To understand the definition, properties and application of colloids & macromolecules.				

UNIT 1 (18 Hrs)	
1.1.	Principles of volumetric analysis – primary and secondary standards – acid - base and redox titrations – theory of indicators – determination of end point in precipitation and complex formation reaction – metal ion and adsorption indicators.
1.2	Principles of Gravimetric Analysis – Co precipitation – Post precipitation – conditions of precipitation – precipitation from homogeneous solution – Thermal analysis – TGA and DTA.
UNIT 2 (18 Hrs)	
2.1	Basic concepts in organic chemistry – orbital overlap – sigma and pi bonds – hybridization and geometry of molecules – methane, ethane, ethylene and acetylene –Reaction intermediates – Free radicals, Carbocations, Carbanions – type of organic reactions – substitution , addition , elimination reactions – rearrangements – polymerization (definitions only).
2.2	Electron displacement effects- inductive – resonance – hyper conjugation – steric effect.
UNIT 3 (18 Hrs)	
3.1	IUPAC names of alkanes , alkenes , alkynes – nomenclature of mono-functional aliphatic compounds – alcohols [monohydric, dihydric and trihydric] , ether, carboxylic acids [mono and di], esters, aldehyde , ketone , amines [Primary, secondary and tertiary].
3.2	Alkanes – Preparation–By Wurtz Reaction and Kolbe’s method– Free radical substitution in alkanes – Mechanism.
3.3	Thermal and Catalytic processes of cracking – synthetic petrol – Fischer-Tropsch’s process – Bergius process – Flash Point – Fire Point – Cetane number – Octane number – Anti knocking reagents – Power alcohol.
UNIT 4 (18 Hrs)	
4.1	Physical properties and Chemical constitution–Parachor unit, physical significance of Parachor–application to structural problems.
4.2	Molecular velocities – Maxwell distribution law – molecular velocity – types of molecular velocities – RMS-MPV- Average velocity – Collision number – collision diameter – mean free path.
UNIT 5 (18 Hrs)	
5.1	Colloids–Classification of Colloids–dialysis–Ultrafiltration–Ultracentrifuge–electrical properties of colloids-cataphoresis–electroosmosis–desalination of sea water–protective colloids – gold number – Hardy Schulz law – gels – definition and classification - application of colloids – micelles.
5.2	Macromolecules–Number average and weight average molecular weights of macromolecule –Determination of molecular weight by sedimentation, equilibrium method, osmotic pressure method and viscosity method.

References

- Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rdedition), New Delhi, Shoban Lal Nagin Chand & Co.,(1993).
- Bahi B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
- Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, 23rd edition, New Delhi, Shoban Lal, Nagin Chand & Co., (1993).
- Lee J.D., Concise Inorganic Chemistry, UK, Blackwell science (2006).
- Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
- Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
I	Laboratory Hygiene & Safety		Skill Based Elective-I	30	4

Units	Learning Objectives
I	To know the Laboratory safety measures, lab discipline and maintenance of lab materials.
II	To know the storage and handling of common, carcinogenic and poisonous chemicals.
III	To know the precautions for avoiding and how to respond to accidents and also to know safe limits of vapour concentrations, cleaning the apparatus and instruments.
IV	To understand First-Aid techniques.
V	To know the universal antidote-treatments for specific poisons and harmful effects of X-rays, lasers and UV.

UNIT 1: (6 hrs)	
1.1	Laboratory safety measures: Lab discipline-Cleanliness and watchfulness. Maintenance of worktable, washing sink, fume hoods, fuel gas systems, instruments and equipments-Requirements for a safe laboratory. Use of apron, goggles and gloves.
UNIT 2: (6 hrs)	
2.1	Storage and handling of chemicals-Carcinogenic chemicals- Handling of ethers-toxic and poisonous chemicals, acids, alkalis, sodium, and bromine.
UNIT 3: (6 hrs)	
3.1	Safe limits of vapour concentrations-Waste disposal and fume disposal-Precautions for avoiding accidents-How to respond to accidents-cleansing agents-cleaning the apparatus and Instruments.
UNIT 4: (6 hrs)	
4.1	First-Aid techniques: Burns and Damages due to organic substances, acids, alkalis and hot objects- burns in the eye- Inhalation of toxic vapours, hazardous chemicals, bromine and phenol – First aid box
UNIT 5: (6 hrs)	
5.1	Poisons and antidotes-Rules to avoid poisoning-emetics - Detection of Hallucinogens and poisons – antidotes for common poisons - universal antidote - treatments for specific poisons – Harmful effects of X-rays, lasers and UV.

References

1. R.Gopalan, P.S.Subramanian and K.Rengarajan: "Elements of Analytical Chemistry", S. Chand & Sons, New Delhi. (1995).
2. Jayashree Ghosh, A textbook of pharmaceutical chemistry, New Delhi: S. Chand & Company, 1999.
3. Applied Chemistry D.M. Yusuff, Nisha Publications

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Long answer questions/Open choice (5 out of 8)	5 X15 =75
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
II	Inorganic, Organic and Physical Chemistry-II		Core II	90	4

Units	Learning Objectives
I	To study the preparation, properties, estimation, structure and uses of hydrogen peroxide, nitrogen compounds and sulfur compounds.
II	To understand the compounds of halogens, interhalogens, zero group elements and reactions in qualitative analysis.
III	To know the details of alkenes, alkynes and types of dienes.
IV	To acquire knowledge about alicyclic compounds, alkyl halides aliphatic nucleophilic substitution.
V	To analyse polar, non-polar molecules and magnetic properties.

UNIT 1: (18 Hrs)	
1.1.	Hydrogen peroxide – Preparation, Properties, estimation, structure and uses.
1.2	Ozone – Preparation, Properties, Estimation, Structure and uses.
1.3.	Compounds of Nitrogen – Chemistry of Hydrazine, hydroxylamine, hydrazoic acid – liquid ammonia as a non-aqueous solvent – Chemistry of HCN and NH_4CNS .
1.4	Compounds of Sulphur–Thionic acids–persulphuric acids–sodium hyposulphite–sodium thiosulphate–alums–properties and uses.
UNIT 2: (18 Hrs)	
2.1.	Compounds of halogens–oxides of fluorine–oxides and oxyacids of halogens–estimation of available chlorine in bleaching powder.
2.2	Interhalogens – preparation, properties and uses – Basic properties of iodine – pseudohalogens.
2.3	Zero group elements–Discovery–Position in the periodic table–occurrence and isolation– oxides and fluorides of xenon- applications of rare gases.
2.4	Types of reactions involved in qualitative analysis – dry reactions – precipitation and complexation reactions – elimination of interfering radicals.
UNIT 3: (18 Hrs)	
3.1.	Electrophilic and free radical addition properties of alkenes – addition reactions with halogen, hydrogen, hydrogen halides, Markovnikov rule – Peroxide effect – Acid - catalyzed addition of water – Hydroboration – Ozonolysis – Hydroxylation with KMnO_4 – Allylic substitution of NBS.
3.2	Acidity of alkynes–preparation of alkynes - addition of H_2O with HgSO_4 catalyst – addition of hydrogen halides and halogens – oxidation – ozonolysis – hydroboration.
3.3	Types of dienes – conjugated – isolated – cumulative dienes – Stability and chemical reactivity of dienes-1,2 and 1,4 - addition - - Diel's - Alder reaction.
UNIT 4: (18 Hrs)	
4.1	Nomenclature of alicyclic compounds – Cycloalkanes – Preparation – Wurtz reaction – Dieckmann's reaction – reduction of aromatic hydrocarbons – substitution and ring opening reaction –Bayer's strain theory and its failure – theory of strainless rings - Equatorial and axial bonds.
4.2	Alkyl halides – preparation: by direct halogenation of alkanes – from alcohols – elimination reaction – Hofmann and Saytzeff elimination – cis-trans elimination – Mechanism of E_1 and E_2 reactions. Preparation and synthetic uses of Grignard reagent.
4.3	Aliphatic nucleophilic substitution– Mechanism of $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reaction – effect of solvents, nucleophiles, leaving group and structure of substrates - elimination versus substitution.
UNIT 5: (18 Hrs)	
5.1	Polar and Non-polar molecules – Polarization of molecules – atomic, induced and orientation polarization – Dipole moment – Determination by Temperature method – application to structural studies – Determination of percentage ionic character.
5.2	Magnetic properties–diamagnetic, paramagnetic, ferromagnetic and antiferromagnetic – magnetic permeability, magnetic susceptibility–its determination using Guoy balance method–its application to structural problems.

References

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. Bahi B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
3. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, 23rd edition, New Delhi, Shoban Lal, Nagin Chand & Co., (1993).
4. Lee J.D., Concise Inorganic Chemistry, UK, Blackwell science (2006).
5. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
6. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).

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1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
I & II	Volumetry Practical		Core – P II	90	4

Learning Objectives
<ul style="list-style-type: none"> ❖ To understand the principle of working of balances. ❖ To become aware of handling of glasswares used in titrimetry. ❖ To know the principles of various types of titrimetric analysis. ❖ To acquire the skills of doing quantitative estimations by titrimetry.

I. ACIDIMETRY AND ALKALIMETRY

1. Estimation of HCl/H₂SO₄
2. Estimation of Na₂CO₃/NaOH

II. PERMANGANOMETRY

1. Estimation of Sodium oxalate
2. Estimation of Ferrous and Ferric ion in a mixture

III. DICHROMETRY

1. Estimation of Ferrous ion using external indicator
2. Estimation of Ferric ion using internal indicator

IV. COMPLEXOMETRIC

1. Estimation of Zinc
2. Estimation of Calcium
3. Estimation of Magnesium

V. IODOMETRY

1. Estimation of Potassium dichromate
2. Estimation of copper

VI. IODIMETRY

Estimation of Arsenious trioxide

VII. ARGENTOMETRY

Estimation of chloride

References

1. Gopalan, R., Subramaniam, P.S. and Rengarajan, K. Elements of Analytical Chemistry, S. Chand and Sons.
2. Mendham, J., Denney, R.C., Barnes, J. D. and Thomas, M. Vogel's Textbook of Quantitative Analysis, 6th Ed., Pearson Education.
3. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & Sons, (1997).

Scheme of Valuation	
Practicals	60 marks
Short procedure	05 marks
Record	10 marks
Total	75 marks

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
III	Inorganic, Organic and Physical Chemistry-III		Core III	60	4

Units	Learning Objectives
I	To understand the principles of volumetric and gravimetric analysis
II	To acquire the knowledge about the aromatic hydrocarbons and electrophilic substitution reactions in aromatic compounds
III	To learn the preparation, properties and characteristics of phenol, dihydric and trihydric phenols.
IV	To study the significance of solid state, X-ray diffraction and also to calculate the total number of atoms in the unit cell.
V	To learn the rate equation, rate constant, order, molecularity and also to derive the rate equations for zero, first, second, third and fractional order of the reactions.

UNIT 1 (12 Hrs)	
1.1	Ionic bond – formation and factors favouring its formation – characteristics of ionic compounds-covalent bond – formation of simple and multiple bonds -valence bond theory – molecular orbital diagram for H ₂ , O ₂ , N ₂ , CO, NO, He ₂ - shapes of molecules – Hybridization and V.S.E.P.R. theory-transition from ionic to covalent bond-Fajans’ rule. Electronegativity-polarity of bonds.
1.2	Hydrogen bond-Nature-Types and effects on properties – Vander Waals’ forces - types and origin.
UNIT 2 (12 Hrs)	
2.1	Aromatic hydrocarbons – Resonance in benzene – Delocalized pi cloud in benzene. Aromaticity – Huckel’s rule and its application to monocyclic benzenoid and non-benzenoid aromatic systems. Polynuclear hydrocarbons – Naphthalene – Anthracene – isolation, synthesis, properties, structure and uses.
2.2.	Electrophilic substitution reactions in aromatic compounds-Nitration, Sulphonation, Halogenation, Friedel – Crafts Alkylation and Acylation reactions - effect of activating and deactivating groups – orientation.
UNIT 3 (12 Hrs)	
3.1	Phenols – preparation – effect of hydrogen bonding on solubility, melting point and boiling point of phenols and substituted phenols – Acid character of phenols as compared to alcohols – Effect of substituents on acid character of phenols – Replacement of OH group by halogen, hydrogen and NH ₂ group – Aromatic substitution reactions of phenols halogenations, nitration ,sulphonation, Reimer – Tiemann, Kolbe and Gatterman reactions – Fries rearrangement - oxidation and reduction of phenol.
3.2	Dihydric and Trihydric phenols (Nomenclature only). Preparation, properties and uses of Anisole, Benzyl alcohol and β - phenyl ethyl alcohol.
UNIT 4 (12 Hrs)	
4.1	Solid State: Nature of solids – isotropic and anisotropic solids – crystal lattice – unit cell – Bravais lattice – calculation of the total number of atoms in an unit cell and coordination number for simple cubic, face centred cubic and body centred cubic systems – Law of rationality of indices- Various symmetry elements in the simple cubic system- Liquid crystals and their uses.
4.2	X-ray diffraction – Bragg’s equation – Derivation – Laue’s powder method – crystal structure of NaCl, KCl and CsCl – Determination of Avogadro number.
UNIT 5 (12 Hrs)	
5.1	Rate equation – Rate constant – Order and molecularity – factors influencing the rate of a reaction – Differential and integral forms of rate equations for zero, first, second and third order reactions. Reactions of fractional order (derivation not required) and higher order with their rate equations – examples.
5.2	Determination of order of a reaction – Half-life period, Differential method, Graphical method, Ostwald dilution method.

References

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. Bahi B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
3. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, 23rd edition, New Delhi, Shoban Lal, Nagin Chand & Co., (1993).
4. Lee J.D., Concise Inorganic Chemistry, UK, Blackwell science (2006).
5. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
6. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).

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1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
III	Health Chemistry		Major Elective – I	60	4

Units	Learning Objectives
I	To study the classification of drugs
II	To gain ideas about common diseases
III	To acquire the knowledge of diabetes and cancer
IV	To study the importance of inorganic compounds
V	To acquire knowledge about blood.

UNIT 1 (12 Hrs)	
1.1.	Nature and sources of drugs -classification of drugs-Biological, Chemical and Commercial and by lay public.
1.2	Indian herbal medicines -
UNIT 2 (12 Hrs)	
2.1	Common diseases, their symptoms, treatment and prevention – Malaria, Filariasis, Plague, Tuberculosis, Influenza, Measles, Cholera, Typhoid, Dysentery, Jaundice, Asthma and epilepsy, diarrhoea, dengue, chickungunya.
UNIT 3 (12 Hrs)	
3.1	Diabetes and hypoglycemic drugs: Blood sugar level-Diabetes-types, causes, symptoms and control-Preliminary ideas about the structure and sources of insulin- oral hypoglycemic drugs-sulphonyl ureas and biguanides (synthesis not expected).
3.2	Antineoplastic drugs - Causes of cancer – treatment methods-alkylating or cytotoxic agents-antimetabolite drugs.
UNIT 4 (12 Hrs)	
4.1	Biological role of some inorganic compounds – role of sodium, potassium, calcium, iodine, copper, zinc and their compounds.
4.2	Medicinally important inorganic compounds: Aluminium hydroxide, Aluminium acetate, Ferrous sulphate, Ferrous gluconate, Magnesium sulphate, Magnesium hydroxide, Hypophosphorous acid and Plaster of Paris.
UNIT 5 (12 Hrs)	
5.1	Blood: Composition of blood-Coagulation of blood-anti-coagulant drugs, Haematological agents- anaemia: causes and control-antianaemic drugs-role of blood as oxygen carrier
5.2	Hypertension -types-causes-prevention and treatment-Anti-hypertensive drugs.

References

1. S.Lakshmi, Pharmaceutical Chemistry, S.Chand & Co., 2nd Edition (1998).
2. Ashutosh Kar, Medicinal Chemistry, 4th Edition, New Age International Publishers (2007).
3. Jayashree Ghosh, A textbook of pharmaceutical chemistry, New Delhi: S. Chand & Company, 1999.

Question pattern for Semester Examinations

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1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
III	Chemistry of Water	UCH3SBE2	Sill Based Elective - II	30	4

Units	Learning Objectives
I	To acquire the knowledge of water resources and the composition of different types of water.
II	To learn the water quality parameters and standards.
III	To learn the types of water and hardness and their removal.
IV	To learn the definition, significance and methods for the determination DO, BOD & COD
V	To understand the treatment processes of water.

UNIT 1 (6 hrs)	
1.1	Water resources: The hydrologic cycle - Chemistry of sea water-composition-pH of seawater and cause of deviation from neutral value-chemical composition of river (lake) water & ground water.
UNIT 2 (6 hrs)	
2.1	Domestic water quality parameters-USPH, International standards for drinking water (WHO) and ISI standards-pH, specific conductance, ammonia, Total hardness, chlorine, sulphate, fluoride, nitrate, calcium, magnesium, arsenic, pesticides, bacteria-surface waters-contaminants.
UNIT 3 (6 hrs)	
3.1	Hard and Soft water-temporary and permanent hardness-causes-method of estimation-EDTA method-Removal of hardness-Boiling, by adding washing soda, caustic soda - Clark's method- Calgon and Zeolite processes-Ion-exchange process.
UNIT 4 (6 hrs)	
4.1	D.O, BOD and COD-Definitions-significance and methods of determination-Eutrophication - Heavy metal contamination – mercury, lead, cadmium and chromium – sources and effects.
UNIT 5 (6 hrs)	
5.1	Potable water-water treatment processes in drinking water supplies-(metro/municipal water)-R.O. Process-Domestic waste water treatment & Industrial effluent treatment methods-Primary, secondary and tertiary treatments.

References

1. A.K.De, Environmental Chemistry", 3rd Edition, Wiley Eastern, New Delhi (1994).
2. B. K. Sharma and H, Kaur. 1985 .Environmental Chemistry, 3rd Edition (1985).
3. P.S.Sindhu, Environmental Chemistry, New Age International Pvt Ltd Publishers (2009).
4. S.S. Dara, A text Book of Environmental Chemistry & Pollution Control,S. Chand & Co. (1997).

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Long answer questions/Open choice (5 out of 8)	5 X15 =75
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
IV	Inorganic, Organic and Physical Chemistry-IV		Core IV	90	4

Units	Learning Objectives
I	To learn the general properties of d-block elements.
II	To know the details of separation of lanthanides and actinides by ion-exchange and solvent extraction method.
III	To acquire the knowledge of aryl halides preparation by direct halogenation and Sand Meyer's method, benzyne mechanism, intermediate complex formation mechanism.
IV	To understand the methods of studying reaction kinetics and also to describe the effect of temperature on reaction rate of Arrhenius equation, collision theory, activated complex theory, Lindemann's hypothesis.
V	To gain ideas about the catalysis, positive, negative and auto catalyst and also to describe the enzyme catalysis.

UNIT 1 (18 Hrs)	
1.1.	General properties of d-block elements – Comparative study with respect to physical and chemical properties – Oxides, halides, acids and salts of the following groups of elements: Titanium, Zirconium and Hafnium; Chromium, Molybdenum and Tungsten; Iron, Cobalt and Nickel.
1.2	Metallurgy of the following elements –vanadium, molybdenum, tungsten.
UNIT 2 (18 Hrs)	
2.1	Separation of lanthanides by ion-exchange and solvent extraction methods – general study of lanthanides including electronic configuration, oxidation states, lanthanide contraction (cause and consequences), colour, magnetic properties, complex formation – extraction of uranium and thorium.
2.2.	Separation of actinides by ion-exchange and solvent extraction methods- general properties of actinides and their comparison with lanthanides-elements with atomic numbers 104 and 105 – preparation and their position in the periodic table.
UNIT 3 (18 Hrs)	
3.1	Aryl halides – preparation by direct halogenation and Sandmeyer's method–comparison of its properties with alkyl halides.
3.2	Aromatic nucleophilic substitution – benzyne mechanism – intermediate complex formation mechanism and evidences-Chichibabin reaction.
UNIT 4 (18 Hrs)	
4.1	Methods of studying reaction kinetics – polarimetry – spectrophotometry – volumetry – conductometry.
4.2	Effect of temperature on reaction rate – Arrhenius Equation – Collision Theory – activated complex theory–Lindemann's hypothesis–chain reaction (H ₂ and Cl ₂ reaction)–explosion limit–primary kinetic salt effect–Bronsted – Bjerrum equation.
UNIT 5 (18 Hrs)	
5.1	Catalysis – definition – positive catalysts, negative catalysts, auto catalysts, inhibitors, promoters – industrial applications – theory of homogeneous and heterogeneous catalysis (Intermediate and adsorption theories).
5.2	Acid – Base catalysis – enzyme catalysis – Michaelis–Menten equation – mechanism – factors affecting enzyme catalysis (Effect of pH and temperature).

References

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co.,(1993).
2. Lee J.D., Concise Inorganic Chemistry, UK, Blackwell science (2006).
3. Bahi B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
4. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).
5. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, 23rd edition, New Delhi, S.Chand &Co., 1993.
6. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
7. R. Goplan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry,S.Chand & Sons, New Delhi(1995)

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1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
III & IV	Semimicro Qualitative Analysis	UCH4CP2	Core – P V	90	4

Learning Objectives
<ul style="list-style-type: none"> ❖ To acquire skills of using various glass wares and apparatus used in qualitative analysis. ❖ To know the principles applied in the qualitative analysis. ❖ To analyse a mixture containing two cations and two anions, of which one will be interfering ion, by adopting Semimicro method.

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

CATIONS TO BE STUDIED:

Lead, Copper, Bismuth, Cadmium, Antimony, Iron, Aluminum, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

ANIONS TO BE STUDIED:

Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate, Arsenite, Arsenate, Phosphate and Chromate.

References

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, 2nd edition, Sultan Chand & Sons, New Delhi, 1997.
2. Ramanujam, V.V., Inorganic Semimicro Qualitative Analysis, 3rd edition, The National Publishing Company, Chennai, 1974.
3. Vogel's Text Book of Inorganic Qualitative Analysis, 4th edition, ELBS, London, 1974.

Scheme of Valuation	
Practicals	60 marks
Record	10 marks
Short Procedure	05 marks
Total	75 marks

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
IV	APPLIED CHEMISTRY		Non-Major Elective – I (NME – I)	30	2

Units	Learning Objectives
I	To understand the role of Vitamins and Indian medicinal plants.
II	To acquire the knowledge about Common diseases.
III	To acquire the knowledge about agricultural chemistry
IV	To know the details about Preparation of domestically useful chemical products.
V	To know the details about Pyrotechnics.

UNIT I Medicinal Chemistry (6 Hrs)	
1.1.	Vitamins - Definition-Classification - water soluble and fat soluble - (A, B complex, C, D, E, P and K) - Sources, deficiency diseases, symptoms – therapeutic uses.(structural aspects not included)
1.2.	Indian medicinal plants and trees- uses of Thulasi, Neem, Adathoda, Tuduvalai, Keezhanelli and Mango.
UNIT II Common diseases (6 hrs)	
2.1.	Common diseases – their causes, symptoms, treatment and prevention - Malaria, Filariasis, Tuberculosis, Typhoid, Dysentery, Jaundice, Asthma.
UNIT III Agricultural chemistry (6 hrs)	
3.1.	Fertilizers – Definition, Role of nitrogen, phosphorus and potassium on plant growth
3.2.	Micro nutrients – Mn, B, Cu, Mo and Zn – effects on plant growth.
3.3	Manures – compost, organic manures, oil cakes, Bone meal.
UNIT IV Articles in day today life (6 hrs)	
4.1.	Preparation of domestically useful chemical products - Washing powder, Cleaning powder, Soap oil, Shampoo, face powder, Phenoles, Liquid blue..
4.2.	Paints and Varnishes – Definition –Types - Requirements for good paint.
UNIT V Pyrotechny (6 hrs)	
5.1.	Match Industry – Raw materials for match industry – Manufacturing processes
5.2.	Fireworks – composition of fireworks – colours in fireworks.

References

- Jayashree Ghosh, A textbook of Pharmaceutical Chemistry, New Delhi: S.Chand & Company, 1999.
- Industrial Chemistry – B.K.Sharma – Goel Publishing House, Meerut

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S.No.	Section	Marks
1.	Long answer questions/Open choice (5 out of 8)	5X15 =75
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Hrs	Credits
V	Inorganic Chemistry-I		Core VII	90	5

Units	Learning Objectives
I	To know the stability of complexes.
II	To know the details of theories of coordination compounds.
III	To learn the applications of coordination compounds.
IV	To acquire the knowledge of biomolecules, carbonyls, and nitrosyl compounds.
V	To study about binary metallic compounds and chromatography.

UNIT 1 (18hrs) COORDINATION CHEMISTRY-1 - Isomerism and Stability	
1.1.	Double salts – alums – preparation, properties and uses.
1.2	Coordination compounds – types of ligands, nomenclature, types of isomerism
1.3	Stability of complexes - factors affecting the stability of complexes.
UNIT 2 (18 hrs) COORDINATION CHEMISTRY-II	
2.1	Theories of coordination compounds- Werner, Sidgwick, Valence bond theory.
2.2	Crystal field and molecular orbital theories.
2.3	Colour and Magnetic properties of complexes.
UNIT 3 (18 hrs) COORDINATION CHEMISTRY-III (Kinetics and Applications)	
3.1	Unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square planar complexes – Trans effect – its applications.
3.2	Applications of coordination compounds- Detection of potassium ion, separation of copper and cadmium ions, estimation of nickel using DMG, estimation of aluminium using oxine.
3.3	Chelation – structure of EDTA and its uses – Determination of Hardness of water.
UNIT 4 (18 hrs) BIOMOLECULES, SIGMA and Pi COMPLEXES	
4.1	Structure and applications of chlorophyll, haemoglobin and Vitamin B ₁₂ .
4.2	Mono and bimolecular carbonyls of Ni, Fe, Cr, Co and Mn - their synthesis, reactions, uses and structure.
4.3	Nitrosyl compounds - classification, preparation, properties and structure of nitrosyl chloride and sodium nitroprusside. Organometallic compounds with alkenes, alkynes and cyclopentadiene.
UNIT 5 (18 hrs) BINARY METALLIC COMPOUNDS and CHROMATOGRAPHY	
5.1	Binary metallic compounds- Hydrides, Carbides, nitrides and borides - Classification, preparation, properties and uses.
5.2	Adsorption chromatography, Partition chromatography – principle.
5.3	Paper and Thin layer chromatography and Ion- exchange - Technique and its applications.

References

1. Soni P.L., Text Book of Inorganic Chemistry, S.Chand & Co, New Delhi (2006).
2. Satyaprakash, Tuli, G.D., Basu, S.K. and Madan, R.D., Advanced Inorganic Chemistry (Vol. I & II), S. Chand, New Delhi (2006).
3. Madan R.D., Tuli G.D. and Malik S.M., Selected Topics in Inorganic Chemistry, S.Chand & Co, New Delhi (2006).
4. Puri, B.R., Sharma L.R. and Kalia, Principles of Inorganic Chemistry, New Delhi (2002).

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Hrs	Credits
V	Organic Chemistry-I		Core VIII	90	5

Units	Learning Objectives
I	To acquire the knowledge about the physical and chemical properties of aliphatic and aromatic amines. To understand the synthetic applications of benzene diazonium salt and to know the properties and uses of phenylenediamines.
II	To study about the important derivatives of aromatic sulphonic acids. To learn the concept of acid strength and to compare the acid strength of substituted aromatic carboxylic acids and to learn the applications of compounds with reactive methylene group.
III	To enrich the knowledge of students in the chemical reactions of aromatic and aliphatic aldehydes and ketones.
IV	To understand the concept of chirality and optical activity of organic molecules. To study about the optical isomerism exhibited by the compounds with chiral carbon and without chiral carbon atoms and to arrive at the R/S & D/L configurations in organic molecules.
V	To understand the concept of geometrical isomerisms in compounds with C=C bond. To understand nomenclature of cis/trans, E/Z & syn/anti isomers and to study the methods of determining configurations of geometrical isomers. To understand the concept of conformational isomers in ethane, butane and cyclohexane.

UNIT 1: (18 hrs)	
1.1.	Aliphatic and aromatic amines – Comparison of Primary secondary and tertiary amines – Effect of substituents on the ring and on Nitrogen – The basic strength of aliphatic and aromatic amines – Salt formation.
1.2	The effect of Hydrogen bonding on the solubility and the boiling point of aliphatic and aromatic amines – Conversion to amides – Ring substitution in aromatic amine.
1.3	Reactions of Nitrous acid with primary, secondary and tertiary amines – Diazotisation and synthetic applications of diazonium salts – phenylenediamines – preparation and uses.
UNIT 2: (18 hrs)	
2.1	Acidity constant in carboxylic acids – Factors affecting the acid strength of aliphatic and aromatic carboxylic acids –Acid strength of substituted benzoic acids.
2.2	Aromatic sulphonic acids – Sulphanilic acid – Sulphanilamide, saccharin and chloramine – T – structure, preparation and uses.
2.3	Characteristics of reactive methylene group – Synthetic uses of malonic and acetoacetic ester – Keto- enol tautomerism in acetoacetic ester.
UNIT 3: (18 hrs)	
3.1	Reactions of aldehydes and ketones (aliphatic and aromatic) – Oxidation – Reduction – Electrophilic substitution reactions, Nucleophilic addition reactions.
3.2	Reaction and mechanisms of Aldol, Perkin, Knoevenagel reaction, benzoin condensation, Wittig, Tieschanko, Reformatsky – Claisen and Cannizaro reaction – Halogenation of ketones.
3.3	Photochemistry of carbonyl compounds – Norrish type-I and Norrish type-II reactions.
UNIT 4: (18 hrs)	
4.1	Stereo isomerism – optical isomerism – conditions of optical activity – asymmetric centers – causes of optical activity – symmetry elements – optical activity of lactic and tartaric acid - Fischer, Newmann and Sawhorse projection of simple molecules (interconversion not needed).
4.2	Relative configuration (D&L) – absolute configuration (R&S) – Cahn – Ingold rules.
4.3	Optical isomerism in compounds containing no chiral C-atom-biphenyls, allenes and spiranes.
UNIT 5: (18 hrs)	
5.1	Geometrical isomerism – cis-trans, syn-anti, E&Z notations – Geometrical isomerism in maleic and fumaric acid.
5.2	Methods of determining the configuration of geometrical isomers.
5.3	Conformation – conformational analysis and energy diagram of ethane, n – butane and cyclohexane

References

1. Bahl B.S, Arun Bahl, Advanced Organic Chemistry, 12th edition, S. Chand and Co., , New Delhi (1997).
2. Morrison R.T, Boyd R.N., Organic Chemistry, 6th edition, Allyn & Bacon Ltd., New York (2006).
3. Finar I. L, Organic Chemistry, Vol. 1&2, 6th edition, Addison Wesley Longman Ltd., England (1996).
4. Pine S. H, Organic Chemistry, 4th edition, McGraw- Hill International Book Company, New Delhi (1986).

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
V	Physical Chemistry-I		Core IX	90	4

Units	Learning Objectives
I	To learn the various thermodynamic terms and the concepts of First law and Second law of thermodynamics.
II	To understand the concept of entropy and third law of thermodynamics.
III	To derive the Gibbs – Helmholtz equation, Clapeyron equation and Clausius – Clapeyron equation and to know its applications.
IV	To know the thermodynamics of phase changes.
V	To know the thermodynamics of the solutions.

UNIT 1: (18 hrs)	
1.1	Definition of Thermodynamic terms-Isolated, closed, and open systems-Intensive and extensive variables- Thermodynamic processes-Cyclic, reversible, irreversible, isothermal and adiabatic processes-State and path functions-concept of heat and work.
1.2	First law of Thermodynamics- Statement-definition of internal energy (E) and enthalpy (H) – E and H as thermodynamic quantities-Temperature dependence of ΔH – Kirchoff's equation-Relation between C_p and C_v - Calculation of w , q , dE and dH for the expansion of ideal and real gases for reversible isothermal and adiabatic processes- Zeroth law of thermodynamics.
1.3	Second law of Thermodynamics- Need for the law-Different statements of the law-Heat engine – Carnot cycle and its efficiency – Carnot theorem – Thermodynamic scale of temperature.
UNIT 2: (18 hrs)	
2.1	Concept of entropy – Entropy as a state function – Entropy changes in ideal gases – Entropy as a function of V and T – Entropy as a function of P and T – Entropy changes during physical transformations – Entropy of a mixture of ideal gases – physical significance of entropy – Clausius inequality – Entropy as a criteria for spontaneous and equilibrium processes in isolated systems.
2.2	Third law of thermodynamics-Nernst heat theorem – Third law of thermodynamics – its statement - Evaluation of absolute entropies from heat capacity data.
2.3	Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities- dA and dG as criteria for thermodynamic equilibrium and spontaneity- their advantage over entropy change -Variation of G and A with P , V and T . Maxwell's relations-Thermodynamic equations of state- Partial molar quantities - chemical potential of a component in an ideal mixture – Gibbs-Duhem equation-Variation of chemical potential with T and P
UNIT 3: (18 hrs)	
3.1	Gibbs – Helmholtz equation and its applications - Clapeyron equation and Clausius-Clapeyron equation – applications.
3.2	Definition of ideal and non-ideal solutions-concentration units – molality, molarity, formality, mole fraction- Activity and activity coefficients.
3.3	Determination of molecular weights-relative lowering of vapour pressure-Raoult's law-law of osmosis- osmotic pressure and its measurement-elevation of boiling point and depression in freezing point- thermodynamic derivations-determination by experimental methods- Relation between colligative properties and molecular mass- Abnormal molar mass.
UNIT 4: (18 hrs)	
4.1	Meaning of the terms phase, component and degrees of freedom-Derivation of Gibbs phase rule – Phase equilibria of one component systems.
4.2	Phase equilibria of two components systems, solid – liquid equilibria – simple eutectic -Pb-Ag systems – desilverisation of lead. Solid solutions, compound formation with congruent melting points (Mg-Zn) and incongruent melting points (Na-K)-(NaCl-water) and (FeCl ₃ – water) systems – Freezing mixtures-Efflorescence and deliquescence.
UNIT 5: (18 hrs)	
5.1	Ideal liquid pairs mixture (Benzene – Toluene) – Raoult's law and Henry's law – Duhem-Margules equation – Its application to fractional distillation of binary miscible liquids. Non-ideal systems – Azeotropes (HCl – Water and Ethanol – Water systems).
5.2	Partially miscible liquids – Lower and Upper CST's - Phenol - water, triethylamine – water and nicotine – water systems – Effect of impurities on CST.
5.3	Immiscible liquids – steam distillation – Nernst distribution law – derivation and applications.

References

1. B.R.Puri and L.R.Sharma, Principles of Physical Chemistry, Shoban Lal, Nagin Chand & Co., 33rd Edition (1992).
2. S.H.Maroon and J.B.Lando, Fundamentals of Physical Chemistry, Macmillan Limited, New York (1996).
3. S.K.Dogra and S.Dogra, Physical Chemistry through problems, New Age International, 4th edition (1996).
4. K. L. Kapoor, A Text Book of Physical chemistry, Vol. 2 & 3, Macmillan India Ltd. (1994).
5. Atkins P.W., Physical Chemistry, (5th edition) Oxford University Press.(1994).
6. Puri B.R., Sharma L.R., Pathania M.S., Principles Of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal, Nagin Chand & Co., (1993).

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
V	Organic and Gravimetry Practical		Core - P X	60	4

Learning Objectives

- ❖ To know the method of determining the melting point or boiling point of organic compounds.
- ❖ To know the methods of analyzing the organic compounds qualitatively.
- ❖ To know the basic principles of organic qualitative analysis.
- ❖ To learn the skills of handling of organic chemicals.
- ❖ To know methods of preparing some organic compounds by converting the functionalities.
- ❖ To know the basic principles of gravimetric analysis.
- ❖ To learn the skills of precipitation, filtration and weighing.
- ❖ To know the chemistry principles involved in estimations of various inorganic salts.
- ❖ To learn the skills of doing different gravimetric estimations.

ORGANIC CHEMISTRY EXPERIMENTS

- Preparation involving Oxidation, Reduction, Hydrolysis, Nitration, Sulphonation, Halogenation and Diazotization.
- Characterization of organic compounds by their functional groups and confirmation by preparation of derivatives.
- Determination of melting and boiling points of simple organic compounds.

GRAVIMETRIC ANALYSIS

- Estimation of calcium as calcium oxalate.
- Estimation of barium as barium sulphate.
- Estimation of barium as barium chromate.
- Estimation of lead as lead sulphate.
- Estimation of lead as lead chromate.
- Estimation of nickel as nickel dimethylglyoxime complex.
- Estimation of magnesium as oxinate.

References

- N.S. Gnanapragasam and G. Ramamurthy, Organic chemistry – Lab manual, S. Viswanathan Co. Pvt. Ltd., 1998.
- J.N. Gurtu and R. Kapoor, Advanced Experimental Chemistry (Organic), S. Chand and Co., 1987.
- Vogel's Textbook of Practical organic chemistry, 401 edition, ELBS/Longman, England, 1984.

Scheme of Valuation	
Practicals	60 marks
Record	10 marks
Short Procedure	05 marks
Total	75 marks

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
V	Industrial Chemistry		Major Elective-II (ME II)	75	5

Units	Learning Objectives
I	To understand the general and basic scientific concepts required for industrial technology.
II	To apply the concepts in solving industrial problems
III	To gain knowledge in the new developments in engineering and technology.
IV	To familiarize with concepts, theories, processes and applications for industry
V	To study about the electrochemical processes involved in industries.

UNIT I (15 hrs)	
1.1	Ceramics -Important clays and feldspar- glazing and vitrification.
1.2	Glass -Types-Composition-manufacture of Optical glass, coloured glasses, lead glass and neutron absorbing glass.
1.3	Fertilizers -Fertilizer industries in India-manufacture of ammonia, ammonium salts, urea, superphosphate, triple superphosphate and nitrate salts.
UNIT II (15 hrs)	
2.1	Paints & Varnishes -Primary constituents of paints, Dispersion medium (solvent), binder, Pigments, oil based paints, latex paints baked on paints (alkyl resins)-formulation of paints and varnishes-requirements of a good paint.
2.2	Cleansing Agents: Preparation of toilet and washing soaps, synthetic detergents – alkyl and aryl sulphonates-fatty alcohol sulphates -ethanolamines –non-ionic detergents – Builders - additives – corrosion inhibitors.
Unit III (15 hrs)	
3.1	Chemical Explosives - Origin of explosive- preparation and chemistry of lead azide, nitroglycerine, nitrocellulose, TNT, Dynamite, cordite, picric acid, gunpowder- introduction to rocket propellants.
3.2	Leather Industry – curing , preservation and tanning of hides and skins- process of dehairing and dyeing-treatment of tannery effluents.
Unit IV (15 hrs)	
4.1	Fuels: Liquid fuels – Petroleum – Origin – refining – Cracking – reforming – flash point - fire point – knocking-octane number – LPG – synthetic petrol.
4.2	Fuel Gases: Large scale production, Composition and uses of coal gas, water gas, producer gas and oil gas.
Unit V (15 hrs)	
5.1	Electrochemical Industries - Production of materials like chlorine, caustic soda, sodium chlorate, perchlorates, potassium permanganate, hydrogen peroxide and hydroxylamine-Electrolytic refining of aluminium-Electrosynthesis of aniline, p-aminophenol- Electro-Oxidation and electroreduction processes with examples-Batteries – primary and secondary cells- solar cells- fuel cells.

References

1. B.K Sharma., Industrial chemistry, Goel publishing House, 2003, Meerut.
2. P.P.Singh, T.M.Joseph, R.G.Dhavale, College Industrial Chemistry, Himalaya Publishing House, Bombay, 4th Ed., 1983.
3. B.N. Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing Co, New Delhi, 1981.

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
V	Chemistry in Everyday life		Non-Major Elective-II (NME II)	30	2

Units	Learning Objectives
I	To understand the Diagnostics of sugar and cholesterol, Detection of poison.
II	To learn about the Importance of first aid.
III	To know the details about the Medicinal chemistry.
IV	To understand the chemistry of food adulteration and adulterants
V	To know the details about Preparation of domestically useful chemical products.

UNIT I: CLINICAL CHEMISTRY (6 hrs)	
1.1	Diagnostics test and estimations of sugar and cholesterol in serum.
1.2	Detection of poison - Antidotes for common poisons (Acid, alkali, morphine, mercury, salicylates, carbon monoxide and cyanide - Treatment for specific poisons (Acetone, strong acids and bases, salts of copper, mercury, arsenic, antimony, lead, cyanide and phenol.
UNIT II: FIRST AID FOR ACCIDENTS (6 hrs)	
2.1	Important rules of first aid – First aid for Burns, Cuts, abrasion, Bleeding, Fractures, fainting, poisonous bites - First aid box – Uses of Plaster of Paris.
UNIT III: MEDICINAL CHEMISTRY (6 hrs)	
3.1	Analgesics – Definition - classification - Narcotic analgesics – Morphine and Pethidine (Medicinal uses and adverse effects only (structure not needed)
3.2	Antipyretic analgesics – mechanism of action-Salicylic acid derivatives , p-aminophenol derivatives (Medicinal uses and structure only).
UNIT IV: FOOD ADULTERATION (6 hrs)	
4.1	Adulterants and contaminants in food – Definition of Adulterated food – common adulterants of milk and milk products, vegetables, fats and oil - contamination of food with toxic chemicals.
UNIT V: ARTICLES IN DAY TODAY LIFE (6 hrs)	
5.1	Preparation of chalk crayons, writing ink, incense sticks , Naphthalene balls, wax candle, face powder, Tooth powder, Tooth paste, Gum paste, Shoe polish.
5.2	Methods of removing stains – Paan, tobacco, Iron rust, grease, tea and coffee stain.

References

- Jayashree Ghosh, Fundamental concepts of Applied chemistry, S. Chand & Co. Publishers.
- Swaminathan M., Food Science and Experimental foods, Ganesh and Company.
- Industrial Chemistry – B.K.Sharma – Goel Publishing House, 2003, Meerut..

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Long answer questions/Open choice (5 out of 8)	5X15 =75
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
VI	Inorganic Chemistry-II		Core XI	90	5

Units	Learning Objectives
I	To acquire knowledge about nucleus.
II	To study the nuclear reactions.
III	To know the details of metallic state.
IV	To acquire the knowledge of silicates.
V	To study about acid - base theories and solvents.

UNIT 1: NUCLEAR CHEMISTRY (18hrs)	
1.1.	Introduction – Composition of nucleus–Nuclear forces, stability, binding energy, n/p ratio, mass defect, packing fraction, magic numbers–liquid drop model.
1.2	Isotopes – detection and separation.
1.3	Isotopic constitution of elements and whole number rule-deviation atomic weights from whole numbers- Isobars and Isotopes.
UNIT 2: RADIOACTIVITY AND NUCLEAR TRANSFORMATIONS (18 hrs)	
2.1	Radioactivity-Discovery-detection and measurement (Wilson’s cloud chamber)–radioactivity emanations.
2.2	Disintegration theory – modes of decay – group displacement law – rate of disintegration – half-life period and average life – radioactive disintegration series.
2.3	Nuclear transformations–use of different projectiles–artificial transmutation of elements–nuclear reactions–nuclear fission–nuclear reactor–nuclear fusion–applications of radioisotopes–carbon dating.
UNIT 3: METALLIC STATE (18 hrs)	
3.1	Packing of atoms in metals (bcc, fcc, hcp) – radius ratio – metallic bond – electron gas – Pauling and band theories.
3.2	Structure of alloys – substitutional and interstitial solid solutions – Hume Rothery ratio.
3.3	Crystal defects – Stoichiometric and non stoichiometric defects, Semiconductor – Intrinsic and extrinsic, n-type and p-type (composition, structure and uses in electronic industry)
UNIT 4: SOME SPECIAL CLASSES OF COMPOUNDS (18 hrs)	
4.1	Clathrates – Inorganic polymers – phosphonitrilic compounds.
4.2	Silicones – coordination polymers – silicates – classification with examples.
4.3	Composition – properties and uses of beryl, talc, asbestos, mica, zeolites and ultramarines.
UNIT 5: ACID – BASE CONCEPTS AND SOLVENTS (18 hrs)	
5.1	Acid-Base concepts – Arrhenius, Bronsted-Lowry, Lewis, Lux-Flood and Usonovich theories. Solvents – classification – properties of ionizing solvents – solvation – solvolysis – levelling and differentiating solvents.

References

- Soni P.L., Text Book of Inorganic Chemistry, S.Chand & Co, New Delhi (2006).
- Puri B.R. and Sharma L.R., Principles of Inorganic Chemistry, Soban Lal Nagin Chand & Co.
- Satyaprakash, Tuli, G.D., Basu, S.K. and Madan, R.D. Advanced Inorganic Chemistry (Vol I & II), S.Chand, New Delhi (2006).
- Lee J.D., Concise Inorganic Chemistry ELBS Edition.

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
VI	Organic Chemistry-II		Core XII	90	4

Units	Learning Objectives
I	To know the chemical aspects of amino acids and proteins.
II	To understand the organic chemical reactions involving structural changes.
III	To understand the chemistry of carbohydrates.
IV	To know chemistry of some alkaloid and terpenoid compounds and their structural characteristics.
V	To know the chemistry of dyes and heterocyclic and their preparation, properties and uses.

UNIT 1: AMINO ACIDS AND PROTEINS (18 hrs)	
1.1	Essential amino acids and non essential amino acids – preparation of α amino acids – properties – reactions – Estimations of free NH_2 group and COOH group. Peptide-dipeptide- preparation – Protein classification – Primary, Secondary and Tertiary structure. Analytical tests for proteins, Protein denaturation – Nucleoproteins – Nucleic acids – DNA, RNA – Elementary treatment only.
UNIT 2: MOLECULAR REARRANGEMENTS (18 hrs)	
2.1	Mechanism – evidences – applications of Pinacol– Pinacolone, Baeyer – Vileger, Hofmann, Schmidt, Curtius, Fries, Claisen – para-Claisen , Cope and Oxy cope, Benzidine and Beckmann rearrangements.
UNIT 3: CARBOHYDRATES (18 hrs)	
3.1	Modified definition of carbohydrates – Classification of Carbohydrates – D & L form. Number of optical isomers – epimers – epimerization –Structural elucidation of glucose and fructose –.open chain and cyclic structures Disaccharides – Structural elucidation of Sucrose - Structure and reactions of Lactose. Poly saccharides – Starch – amylose – amylopectin – reactions (Structural elucidation not necessary) cellulose derivatives – cellulose nitrate and cellulose acetate.
UNIT 4: Terpenoids and Alkaloids (18 hrs)	
4.1	Terpenoids – definition – isoprene rule – classification and isolation of terpenoids –structural elucidation of geraniol and nerol – Menthol and α - terpineol.
4.2	Alkaloids – definition – classification – extraction – Hoffman exhaustive methylation - structural elucidation of conine, piperine and nicotine.
UNIT 5: Dyes and Heterocyclics (18 hrs)	
5.1	Dyes -theory of colour and constitution-classification-Preparation and uses of methyl orange, Bismarck brown, malachite green, rosaniline, phenolphthalein, fluorescein, alizarin and indigo.
5.2	Heterocyclic compounds – Preparation, properties and uses of furan, pyrrole, thiophene, pyridine, quinoline, isoquinoline and indole- comparison of aromatic and basic character of these compounds.

References

1. Finar I. L, Organic Chemistry, Vol 1&2, (6th edition) England, Addison Wesley Longman Ltd.(1996).
2. Morrison R.T, Boyd R.N., Organic Chemistry, (6th edition) New York, Allyn &Bacon Ltd., (2006).
3. Bahl B.S, Arun Bahl, Advanced Organic Chemistry, (12th edition) New Delhi, Sultan Chand and Co., (1997).
4. Pine S. H, Organic Chemistry, (4th edition) New Delhi, McGraw- Hill International Book Company. (1986).
5. Reactions and Reagents – Agarwal.
6. Chemistry of Natural products Vol. 1 & Vol.2 – Chatwal.
7. Chemistry of Natural products Vol. 1 & Vol.2 - O.P. Agarwal.
8. Reaction Mechanisms in organic chemistry. Singh and Mukerjee
9. A textbook of organic chemistry – P.L.Soni.

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
Total Marks		75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
VI	Physical Chemistry-II		Core XIII	75	4

Units	Learning Objectives
I	To acquire the knowledge of electrodes, electrode reaction and electrode potentials.
II	To derive the thermodynamic quantities and EMF measurements.
III	To study the significance of electromagnetic radiation with molecules.
IV	To know the details of electronic spectroscopy.
V	To learn the concepts of orbitals and quantum numbers.

UNIT 1: (15 hrs)

1.1	Elementary treatment of Debye- Huckel- Onsager equation for strong electrolytes-The conductance at high fields and high frequencies-Transport number-Hittorf rule-Determination by Hittorf method and moving boundary method.
1.2	Electrolytic and Galvanic cells. Reversible and irreversible cells.
1.3	Types of reversible electrodes – Gas, metal / metal ion, metal – insoluble salt / anion and redox electrodes – Electrode reactions. Conventional representation of electrochemical cells. Measurement of single electrode potentials and electromotive force of a cell. Standard electrode potentials – sign conventions – electrochemical series and its significance. Derivation of Nernst equation for cell EMF and single electrode potentials – calculation of cell EMF from single electrode potentials.

UNIT 2: (15 hrs)

2.1	Calculation of Thermodynamic quantities of cell reactions - ΔG , ΔH , ΔS and K. Concentration cells – with and without transference - Liquid junction potential – salt bridge and its uses.
2.2	Applications of EMF measurements – valency of ions, solubility product and activity coefficient-Potentiometric titrations-Determination of pH using quinhydrone, hydrogen and glass electrodes-Determination of pK_a of acids by Potentiometric methods.
2.3	Polarization-Over potential and hydrogen over voltage-corrosion types-Theories of corrosion and methods of controlling it.

UNIT 3: (15 hrs)

3.1	Electromagnetic radiations – interaction of electromagnetic radiations with molecules and quantization of different forms of energies (translational, rotational, vibrational and electronic) in molecules. Microwave spectroscopy – Theory of microwave spectroscopy - Effect of isotopic substitution – calculation of individual bond lengths in polyatomic molecules.
3.2	Infra red spectroscopy – theory of IR spectra – types of vibrations – stretching and bending vibrations – calculation of force constant – factors influencing vibrational frequencies-applications of IR spectra.
3.3	Raman spectroscopy – Rayleigh and Raman scattering – stokes and anti stokes lines – Difference between Raman and IR spectroscopy – mutual exclusion principle – Applications.

UNIT 4: (15 hrs)

4.1	UV-visible spectroscopy-theory of electronic spectroscopy-types of electronic transitions-Frank-Condon principle- Predissociation - Applications.
4.2	N.M.R. spectroscopy – Principle of N.M.R. - shielding and deshielding – chemical shift – number of signals – spin – spin coupling, coupling constant (J) – splitting of signals, N.M.R. spectrum of simple organic molecules (CH_3CH_2OH , C_6H_5OH , and $C_6H_5CH_3$) – Applications in structural elucidations.
4.3	E.S.R. spectroscopy – theory of ESR spectra – hyperfine splitting – ESR spectra of simple radicals.

UNIT 5: (15 hrs)

5.1	Quantum chemistry – Bohr's model – Atomic spectrum of hydrogen atom and hydrogen like ion - Sommerfeld model of atom - Heisenberg's uncertainty principle - de Broglie equation – Schrodinger's wave equation (statement only) significance of ψ and ψ^2 – concept of orbitals and shapes of orbitals-Quantum numbers.
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References	
1.	Puri B.R., Sharma L.R., Pathania M.S., Principles Of Physical Chemistry, (23rd edition), New Delhi, S.Chand&Co., (1993).
2.	Glasstone S. and Lewis D., Elements of Physical Chemistry, Macmillan.
3.	Khetarpal S.C. Pradeeps, Physical Chemistry, Volume I & II, Pradeep Publications Jalandhur, (2004).
4.	Jain D.V.S. and Jainhar S.P., Physical chemistry, Principles and problems, Tata Mc Graw Hill, New Delhi, (1988).
5.	Elementary Organic Spectroscopy by Y.R.Sharma, S.Chand Publications, New Delhi
6.	C. N. Banwell and E.M.McCash, Fundamentals of Molecular Spectroscopy, 4th ed., McGraw-Hill, 1994.
7.	P.L.Soni & O.P. Dharmaha : Text Book of Physical Chemistry Sultan Chand & Sons, New Delhi.

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
VI	Physical Chemistry Practical		Core – P XIV	75	4

Learning Objectives

- ❖ To know the basic principles of various physical chemistry experiments.
- ❖ To learn the skills of drawing graph, handling of some precision instruments.
- ❖ To learn to do some experiments using various cycles.

1. DISTRIBUTION LAW:

Partition coefficient of iodine between carbon tetrachloride and water.

2. KINETICS:

Acid-catalyzed hydrolysis of an ester (Methyl acetate or Ethyl acetate)

3. RAST MICRO METHOD

4. SIMPLE EUTECTIC

5. HETEROGENEOUS EQUILIBRIUM:

- a) Critical Solution Temperature of phenol-water system.
- b) Effect of impurity on C.S.T. (2% NaCl or 2% Succinic acid solutions).
- c) **Determination of transition temperature:** Sodium acetate, Sodium thiosulphate, $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$ & $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$.

6. ELECTROCHEMISTRY:

a. Conductometry:

- a) Cell constant
- b) Equivalent conductivity
- c) Conductometric titration

b. Potentiometry:

Redox titration: FAS Vs KmnO_4 , FAS Vs $\text{K}_2\text{Cr}_2\text{O}_7$

References

- D. P. Shoemaker, C. W. Garland & J. W. Nibler. *Experiments in Physical Chemistry* (5thedn.), McGraw Hill (1989).
- V. D. Athawala & P. Mathur. *Experimental Physical Chemistry*, New Age International Publishers (2001).
- Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons, (1997).
- Findlay A., Practical Physical Chemistry, 7th edition, London, Longman (1959).
- Ahluwalia, V. K., Dingra, S. and Gulati, A. College Practical Chemistry, Orient Longman Pvt. Ltd., Hyderabad, (2005).

Scheme of Valuation	
Practicals	60 marks
Short Procedure	05 marks
Record	10 marks
Total	75 marks

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
VI	Pharmaceutical Chemistry		Major Elective-III (ME III)	75	4

Units	Learning Objectives
I	To understand basic definitions, technical terms in pharmaceutical chemistry and methods of analysis followed in clinical laboratories.
II	To study in detail about antibiotic drugs and appreciate their uses.
III	To review the knowledge of vitamins, their sources, uses and syntheses. To study in detail about diagnostic agents and appreciate their applications.
IV	To learn elaborately about analgesics, antipyretics and anti-inflammatory drugs.
V	To distinguish between antiseptics and disinfectants with examples and uses. To study different types of anaesthetics and their applications.

UNIT 1 (15 hrs)	
1.1.	Drugs – routes of administration – Local enemata – oral or enteral types – parenteral types – advantages and disadvantages of parenteral type – LD ₅₀ , Pharmacophore, antimetabolites, additive effect, Synergism, antagonism – metabolism of drugs – mechanism of action – general assay.
1.2	Clinical Chemistry: Diagnostic tests for sugar, salt (including lithium) and Cholesterol in serum and urine – Detection of hallucinogens – detection of anaemia and diabetes.
UNIT 2 (15 hrs)	
2.1	Synthesis, assay, uses and structure – activity relationship (SAR) of chlorampenicol and penicillin - sulphonamides – mechanism of action of sulpha drugs – characterization – SAR – assay of sulpha drugs – Preparation and uses of sulphadiazine, sulphapyridine, sulphathiazole, sulphafurazole – prontosil.
UNIT 3 (15 hrs)	
3.1	Vitamins – classification – fat and water soluble vitamins – role of vitamins – deficiency diseases of vitamin A, B ₁ , B ₂ , B ₆ , C, D, E and K – synthesis, estimation and uses of vitamin A, B ₁ , B ₂ and C.
3.2	Organic diagnostic agents: X-ray contrast media-sodium diatrizoate, Iodipamide, Iophenylate, diodone – Drugs used to test organ functions-Dyes-phenolsulphonaphthalein, Evans blue, indigo carmine, methylene blue, histamine, pentagestrin, xylose, sodium benzoate.
UNIT 4 (15 hrs)	
4.1	Analgesics – Definition – classification – Narcotic type – morphine and its derivatives with reference to SAR – Totally synthetic analgesics: pethidines and methadones – preparation, assay and uses.
4.2	Antipyretic analgesics – salicylic acid derivatives – aminophenol derivatives – mechanism of action.
4.3	Anti-inflammatory analgesics-Indolyl derivatives-indomethacin, Ibuprofen.
UNIT 5 (15 hrs)	
5.1	Antiseptics and disinfectants – definition and distinction – standardization – Uses of Phenol, dyes, chloramines, formaldehyde and cationic surface active agents
5.2.	Anaesthetics: General and local anaesthetics-Inhalation anaesthetics-Diethyl ether, divinyl ether, chloroform, halothane; Gaseous – cyclopropane , Nitrous oxide-Intravenous anaesthetics: Thiopentane sodium, Methohexitone, Propanidid-Local anaesthetics: cocaine, benzocaine, procaine, amthocaine, tignocaine, cinchocaine.

References

- Lakshmi S., Pharmaceutical chemistry, S. Chand & Sons, 1995, New Delhi.
- Ashutosh Kar, Medicinal chemistry, Wiley Eastern Ltd., 1993, New Delhi.
- Jayashree Ghosh, Pharmaceutical chemistry, S.Chand and Company Ltd., 2006, New Delhi.

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
VI	Food and Nutrition		Skill Based Elective-III (SBE III)	30	4

Units	Learning Objectives
I	To learn the nutritive value of foods.
II	To acquire the knowledge about food preservation.
III	To be aware of the nutrition required for children, adolescents and pregnant & lactating women.
IV	To learn to treat certain diseases by the required diet.
V	To find adulterants in food and to study their effects.

Unit I (6 hrs)	
1.1	Nutritional classification of foods-nutrients and type of nutrients-proteins, carbohydrates, fats, minerals and vitamins-their importance-balanced diet (definition only)
1.2	Nutritive value of foods-cereals, wheat, rice, vegetables, fruits, milk, egg, meat and fish.
Unit II (6 hrs)	
2.1	Requirement of water, mineral and trace elements for human.
2.2	Food preservation-definition, principle and importance-food spoilage-causes of food spoilage-fermentation, rancidity and putrefication – food poisoning.
Unit III (6 hrs)	
3.1	Nutrition for children and adolescents.
3.2	Nutrition during pregnancy and lactation.
Unit IV (6 hrs)	
4.1	Diets during diseases-peptic ulcer, dysentery, constipation, blood pressure and diabetes.
4.2	Obesity and under nutrition-causes, complications and treatment.
Unit V (6 hrs)	
5.1	Food adulteration-definition, common adulterants in food and their ill effects.
5.2	Food laws and standards-Bureau of Indian Standards, AGMARK-Consumer protection Act.

References

1. M. Swaminathan, Handbook of Food & Nutrition, 5th edition, Bangalore printing (2005).
2. B. Srilakshmi, Food Science, 3rd edition, New Age International (P) Ltd., New Delhi (2005).
3. B. Srilakshmi, Nutrition Science, 1st Edition, New Age International (P) Ltd., New Delhi.
4. Corinne H. Robinson, Fundamentals of Normal Nutrition, Macmillan Publishing Co., Inc. New York.
5. M. Swaminathan, Food Science and Experimental Foods, Ganesh and Company, Chennai.

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Long answer questions/Open choice (5 out of 8)	5X15 =75
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
III	Allied Chemistry-I		Allied IV	60	3

Units	Learning Objectives
I	To study about various chemical bonds.
II	To learn about basic concepts of in organic chemistry
III	To know about synthetic dyes, chemical explosives and sulphur drugs.
IV	To study about the photochemistry and concept of pH & pOH
V	To know about corrosion and catalysis.

UNIT 1: (12 hrs)	
1.1	Causes of chemical combination – Ionic bond – Lattice energy – Born – Haber cycle.
1.2	Covalent bond – Molecular orbital theory – Bonding, non-bonding and antibonding orbitals – Molecular orbitals-MO configuration of H ₂ , N ₂ , O ₂ , F ₂ – Bond order – Diamagnetism and paramagnetism.
1.3	Coordinate bond – Hydrogen bond – Metallic bond – Band theory of metals – semiconductors.
UNIT 2: (12 hrs)	
2.1	Basic concepts in organic chemistry – types of organic reactions – addition, elimination, substitution, condensation and polymerization reactions (Mechanism not required). Types of reagents – electrophilic – nucleophilic and free radicals.
2.2	Polar effects–Inductive-resonance-hyper conjugation and steric effects–effects in properties of compounds.
2.3	Isomerism – Geometrical and optical isomerisms – Tautomerism.
UNIT 3: (12 hrs)	
3.1	Synthetic dyes–Azo dyes –Methyl orange, Congo red, bismarck brown and vat dyes–indigo – Preparation and uses – Synthetic polymers – polythene, Nylon, epoxy resins – Preparation and uses.
3.2	Chemical explosives – leadazide, nitroglycerine, nitrocellulose, TNT- Introduction to rocket propellants – preparation and uses.
3.3	Sulphur drugs – Sulphapyridine and sulphathiazole preparation, structure and uses.
UNIT 4: (12 hrs)	
4.1	Laws of photochemistry – Beer – Lambert’s, Stark – Einstein, Grothuss – Drapers’ laws – photosensitization–chemiluminescence – bioluminescence – fluorescence – phosphorescence–industrial applications of photochemistry
4.2	Concept of pH and pOH – importance of pH–determination of pH by colorimetric method–Buffer solution – importance of buffers.
UNIT 5: (12 hrs)	
5.1	Corrosion – Theory and Prevention.
5.2	Catalysis – Types – positive, negative, auto and enzyme catalysis – industrial applications of catalysis.

References

- Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co.,(1993).
- Bahi B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
- Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, 23rd edition, New Delhi, Shoban Lal, Nagin Chand & Co., (1993).

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
IV	Allied Chemistry-II		Allied VI	60	3

Units	Learning Objectives
I	To understand the theories related to coordinate bonding and biological role of Haemoglobin and chlorophyll.
II	To study about the nuclear chemistry.
III	To learn the concepts of various techniques of chromatography.
IV	To study about the chemistry of carbohydrates.
V	To understand the solid state chemistry.

UNIT 1 (12 hrs)	
1.1	Nomenclature of mononuclear complexes–Werner, Sidgwick, Pauling theories–chelation and its industrial importance with particulars reference of EDTA-Biological role of Haemoglobin and Chlorophyll (elementary idea only).
UNIT 2 (12 hrs)	
2.1	Composition of nucleus–nuclear radius–nuclear charge–nuclear forces–nuclear structure– liquid drop model–shell model–meson theory–binding energy, packing fraction–mass defect–stability of the nucleus - Isotopes, Isobars, Isotones and nuclear isomers.
UNIT 3 (12 hrs)	
3.1	Chromatography–column, paper, TLC and ion-exchange-techniques and its applications–Electro dialysis–reverse osmosis–softening of water.
UNIT 4 (12 hrs)	
4.1	Carbohydrates- Classification–reactions of glucose and fructose–open and ring structure of glucose–conversion of glucose into fructose–vice versa–structure of maltose and sucrose-poly saccharides-Cellulose-reactions-Cellulose nitrate-Cellulose acetate.
UNIT 5 (12 hrs)	
5.1	Elements of symmetry–unit cell–types of crystal lattices–simple cubic, fcc, bcc lattices–Derivation of Bragg equation–structure of NaCl – Dipole moment–definition and its application to structural studies of simple molecule.

References

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co.,(1993).
2. Bahi B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
3. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, 23rd edition, New Delhi, Shoban Lal, Nagin Chand & Co., (1993).

Question pattern for Semester Examinations

S.No.	Section	Marks
1.	Section A (10 Questions): Short Answer Questions	10 X 2 =20
2.	Section B (5 Questions): Built-in-Choice (Either /Or)	5 X 5 =25
3.	Section C (3 Questions): Long answer questions/ Open choice (3 out of 5)	3 X10 =30
	Total Marks	75

Semester	Subject Title	Subject Code	Category	Total hrs	Credits
III & IV	Allied Chemistry Practical		Allied –P V	30	3

Learning Objectives

- ❖ To become aware of handling of glasswares used in titrimetry.
- ❖ To know the principles various types of titrimetric analysis.
- ❖ To acquire the skills of doing quantitative estimations by titrimetry.
- ❖ To know the methods of analyzing the organic compounds qualitatively.

I. VOLUMETRIC ANALYSIS

1. **Acidimetry and alkalimetry**
 - a) Strong acid versus strong base
 - b) Weak acid versus strong base
2. **Permanganometry**
 - a) Estimation of ferrous sulphate using KMnO_4
 - b) Estimation of oxalic acid using KMnO_4
3. **Iodometry**
 - a) Estimation of copper.
 - b) Estimation of dichromate.

II. ORGANIC ANALYSIS

A study of reactions of the following organic compounds

1. Carbohydrate (Glucose)
2. Ketone (Acetophenone)
3. Acid (Benzoic acid)
4. Amine (Aniline)
5. Diamide (Urea)

The students may be trained to perform the specific reactions like test for aliphatic or aromatic nature, saturated or unsaturated compounds and functional group of the compound and record their observations. (tests for Nitrogen, Sulphur and halogens NOT INCLUDED)

References

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons, (1997).
2. Vogel's Textbook of Practical Organic Chemistry, 7th edition, London, ELBS – Longman, (1984).

Scheme of Valuation	
Practicals	60 marks
Short Procedure	05 marks
Record	10 marks
Total	75 marks