ALAGAPPA UNIVERSITY, KARAIKUDI
NEW SYLLABUS UNDER CBCS PATTERN (w.e.f.2014-15)

B.Sc., CHEMISTRY – PROGRAMME STRUCTURE

Sem	Course			Cr.	Hrs./ Week	Marks		Total
	Part	Subject Code	Name			Int.	Ext.	
I	I	411T	**Tamil/other languages – I**	3	6	25	75	100
	II	412E	**English – I**	3	6	25	75	100
	III	4BCH1C1	**Core – I** – Fundamental Concepts of Chemistry	4	5	25	75	100
		4BCH1C2	**Core – II –**Inorganic Chemistry - I	4	4	25	75	100
		----	**Core – III** – Inorganic Volumetric Analysis Practical – I	-	3**	-	-	-
			Allied – I (Theory only) **(or)** **Allied – I** (Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I (For subjects other than Mathematics)	-	2**	--	--	---
	IV	4NME1A / 4NME1B / 4NME1C	**Non-Major Elective – I** – (a)தமிழ்மொழியின் அடிப்படைகள் / (b) இக்கால இலக்கியம / (c) Communicative English	2	1	25	75	100
			Total(Allied-Theory only)	**21**	**30**	**-**	**-**	**600**
			Total(Allied-Theory cum Practical)	**20**				**575**
II	I	421T	**Tamil/other languages – II**	3	6	25	75	100
	II	422E	**English – II**	3	6	25	75	100
	III	4BCH2P1	**Core – III** – Inorganic Volumetric Analysis Practical – I	4	3	40	60	100
		4BCH2C1	**Core-IV –** Organic Chemistry - I	4	4	25	75	100
		4BCH2C2	**Core – V** – Physical Chemistry –I	4	4	25	75	100
			Allied – II (Theory only) (or) **Allied– II(Theory cum Practical)**	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I (For subjects other than Mathematics)	2	2	20	30	50
	IV	4BES2	**(3) Environmental Studies**	2	2	25	75	100
			Total(Allied-Theory only)	**25**	**30**	**-**	**-**	**700**
			Total(Allied-Theory cum Practical)	**26**				**725**
III	I	431T	**Tamil /other languages – III**	3	6	25	75	100
	II	432E	**English – III**	3	6	25	75	100
		4BCH3C1	**Core –VI** –Inorganic Chemistry-II	4	5	25	75	100
	III	-----	**Core – VII** – Inorganic Qualitative Analysis - Practical – II	-	4	--	--	---
			Allied –III (Theory) (or) **Allied–III**(Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I (For subjects other than Mathematics)	--	2**	--	--	---

	IV	4NME3A/ 4NME3B/ 4NME3C	**(1) Non-major Elective – II** – (a) இலக்கியமும் மொழிப் பயன்பாடும் /(b) பழந்தமிழ் இலக்கியங்களும் இலக்கிய வரலாறும் / (c) Effective Employability Skills	2	2	25	75	100
		4SBS3A1/ 4SBS3A2	**(2) Skill Based Subjects – I**	2	2	25	75	100
	V	4BEA3	**Extension activities**	1	--	100	--	100
			Total(Allied-Theory only)	**19**	**30**	-	-	**675**
			Total(Allied-Theory cum Practical)	**20**				**700**
IV	I	441T	**Tamil /other languages – IV**	3	6	25	75	100
	II	442E	**English – IV**	3	6	25	75	100
	III	4BCH4P1	**Core – VII** – Inorganic Qualitative Analysis Practical – II	4	4	40	60	100
		4BCH4C1	**Core –VIII**–Organic Chemistry–II	4	5	25	75	100
			Allied – IV (Theory only) (or) **Allied–IV(Theory cum Practical)**	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I - (For subjects other than Mathematics **)**	2	2	20	30	50
	IV	4SBS4B1/ 4SBS4B2	**(2) Skill Based Subjects – II**	2	2	25	75	100
	IV	4BVE4/ 4BMY4/ 4BWS4	**(4) Value Education / Manavalakalai Yoga / Women's Studies**	2	2	25	75	100
			Total(Allied-Theory only)	**23**	**30**	-	-	**700**
			Total(Allied-Theory cum Practical)	**24**				**725**
V	III	4BCH5C1	**Core – IX**–Physical chemistry – II	4	5	25	75	100
		4BCH5C2	**Core–X**–Inorganic Chemistry-III	4	5	25	75	100
		4BCH5P1	**Core–XI**–Gravimetric estimations, Colorimetric estimations and Organic Preparation Practical– III	4	3	40	60	100
		-----	**Core – XII**– Physical Chemistry – Practical – IV	--	3	--	--	---
		4BCHE1A / 4BCHE1B	**Elective–I**– Analytical Chemistry **(or)** Agricultural Chemistry	5	5	25	75	100
		4BCHE2A / 4BCHE2B	**Elective – II**–Industrial Chemistry **(or)** Medicinal Chemistry	5	5	25	75	100
	IV	4SBS5A3/ 4SBS5A4/ 4SBS5A5	**(2) Skill Based Subjects – III**	2	2	25	75	100
			(2) Skill Based Subjects – IV	2	2	25	75	100
			Total	**26**	**30**	-	-	**700**
VI		4BCH6P1	**Core–XII**–Physical Chemistry–Practical – IV	4	4	40	60	100
		4BCH6C1	**Core–XIII–**Organic chemistry-III	4	6	25	75	100
		4BCH6C2	**Core–XIV–**Physical Chemistry-III	4	6	25	75	100
		4BCH6P2	**Core – XV** – Organic estimation and Organic Analysis Practical – V	4	5	40	60	100

	III	4BCHE3A / 4BCHE3B 4BCHEPR	**Elective – III** –Polymer Chemistry **(or)** Material Chemistry & Nano-Science **(or)** Project	5	5	25	75	100
	IV	4SBS6B3/ 4SBS6B4/ 4SBS6B5	**(2) Skill Based Subjects – V**	2	2	25	75	100
			(2) Skill Based Subjects – VI	2	2	25	75	100
Total				**25**	**30**	**-**	**-**	**700**
Grand Total				**140**	**180**	**-**	**-**	**4100**

**** University Examinations will be held in the Even semesters.**

I YEAR – I SEMESTER
COURSE CODE: 4BCH1C1

CORE COURSE I –FUNDAMENTAL CONCEPTS OF CHEMISTRY

Unit I: Atomic Structure.

1.1. Atom, constituents of an atom – Bohr's postulates – Bohr's atom model – limitations of the Bohr's atom model - Sommerfeld atom model.

1.2. Particle and wave character of electron – de-Broglie's equation and its derivation – The Davisson and Germer experiment – Heisenberg's uncertainity principle. Photoelectric effect - Einstein photoelectric equation – Compton effect.

1.3. Quantum theory – postulates of quantum mechanics - The Schrodinger wave equation, particle in a box, degeneracy - Zeeman effect - Physical significance of Ψ and Ψ^2 – Quantum numbers.

1.4. Aufbau principle – Hund's rule of maximum spin multiplicity – Pauli's exclusion principle – n + l rule – electronic configurations of elements.

Unit II: Periodic Table

2.1 Modern periodic law – modern periodic table – classification of elements based on electronic configuration.

2.2 Fundamental properties like atomic size, valency, ionization energy, ionic radius, electron affinity, electronegativity, metallic and nonmetallic character - variation of the above fundamental properties – explanation for the periodic variation of the fundamental properties – diagonal relationship.

Unit III

3.1. **IUPAC** Nomenclature of organic compounds

3.2. Molecular weight determination of organic acids and bases – Silver salt and platinicchloride methods. Problems arriving empirical and molecular formula using percentage composition of elements and molecular weight.

3.3. **Fundamental concepts**: Homolytic fission and Heterolytic fission of carbon-carbon bonds.

3.4. **Reaction intermediates**: Formation and stability of Free radicals, carbonium ions and carbanions – nucleophilic and electrophilic reagents.

3.5. **Types of reactions**: Substitution, addition, elimination, rearrangement and polymerization with suitable examples.

3.6. Inductive effect and electromeric effect: Explanation with suitable examples.

Unit IV: Physical Properties and Chemical constitutions.

4.1. **Dipole moment:** Definition – Experimental determination – Calculation of percentage of ionic character of HF and HCl – Dipole moment and molecular structure: CO_2,H_2 O,NH_3 and CH_4.

4.2 **Polarizability:** Definition – polarization of a molecule – molar polarization – Clausius-Mosotti equation.

4.3. **Magnetic properties:** Paramagnetic, diamagnetic and ferro magnetic substances and their characteristics – magnetic permeability – magnetic susceptibility – specific and molar magnetic susceptibilities – determination of magnetic susceptibility by Gouy's method

4.4. **Applications of magnetic susceptibilities:** number of unpaired electrons in a molecule – structure of co-ordination compounds – formation of free radicals.

Unit V

5.1. **Introduction to computers and their applications in Chemistry**
Introduction to computers: Definition – classification of computers – components of computer – input unit, CPU and output unit

5.2. **High level languages** – importance – BASIC – structure – constants and variables – control statements – application of BASIC in the computation of some simple programmes for half-life period, normality and molarity of a solution and root mean square velocity.

Text Books:

Inorganic chemistry

1. "Advanced Inorganic Chemistry", R.D.Madan
2. "Inorganic Chemistry", Puri and Sharma
3. "Engineering Chemistry", B.C.Jain and Monica Jain

Organic chemistry

1. "Advanced Organic Chemistry", B.S.Bahl and Arun Bahl
2. "Organic Chemistry", R.T.Morrison and R.W.Boyd

Physical chemistry

1. "Principles of Physical Chemistry", B.R.Puri, L.R.Sharma and M.S.Pathania
2. "Physical Chemistry", N.Kundu and SN.Jain

Reference Books:

1.Inorganic Chemistry – Shriver & Atkins
2.Inorganic Chemistry – Jame E.Huheey
3.Organic Chemistry – J.Clayden
4.Physical Chemistry – Walker J Moore
5.Physical Chemistry – S.Glasstone

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I YEAR – I SEMESTER
COURSE CODE: 4BCH1C2

CORE COURSE II – INORGANIC CHEMISTRY - I

Unit I: Chemical bonding:

1.1. Valence Bond Theory(VBT)
1.2. **Overlapping of atomic orbitals** : s–s, s–p and p–p overlapping– sigma- and pi- bonds
1.3. **Hybridization** – sp, sp^2, sp^3, sp^3d and sp^3d^2 with suitable examples – VSEPR theory – Application of VSEPR theory to explain the shapes of molecules like CH_4, NH_3 and H_2O.
1.4. **Molecular orbital theory (MOT)**: Bonding and Antibonding molecular orbitals – Bond Order
1.5. **MO diagrams**: Homonuclear diatomic molecules (N_2, O_2 and F_2) and Heteronuclear diatomic molecules (HF, CO and NO)
1.6. Differences between VBT and MOT.

Unit II

2.1 **Hydrogen:** ortho and para hydrogen – Position of Hydrogen in the Periodic Table.
2.2 **Hydrides** – Types of Hydrides with suitable examples – preparation, properties and uses of $LiAlH_4$ and $NaBH_4$.
2.3 **Oxygen:** Oxides and their classification - simple explanation with examples.
2.4 **Ozone:** manufacture, oxidizing and reducing properties and uses.
2.5 **Hydrogen peroxide**: preparation, oxidizing and reducing properties and uses

Unit III

3.1. **Basic principles of Metallurgy**
Ores and minerals – concentrating the ore by gravity separation, froth flotation and magnetic separation – Roasting– Calcination – Smelting – Flux – Purification by electrolytic refining, zone refining and Van-Arkel vapour phase refining with suitable examples– Alumino thermit process.

3.2. **Group – IA**
Extraction of lithium and its uses - Diagonal relationship of Lithium with Magnesium

3.3. **Group – II A**
Extraction of Beryllium and its uses – Diagonal relationship of Beryllium with Aluminium

3.4. **Group – I B**
Extraction of copper and its uses – Extraction of silver and its uses

Unit IV: Group – VA

4.1. **Nitrogen:** Ammonia – manufacture, properties, uses and structure.
4.2. **Hydrazine:** preparation, properties and uses
4.3. **Nitric Acid**: Manufacture of Nitric acid – Action of nitric acid on metals
4.4. **Arsenic:** Extraction and uses– Distinction between arsenites and arsenates
4.5. **Antimony:** Extraction and uses of Antimony – preparation and uses of tartar emetic
4.6. **Bismuth**: Extraction of Bismuth and its uses – preparation and the use of Sodium bismuthate.

Unit V

5.1. **Nuclear chemistry:** Constitution of nuclei – leptons and hadrons - stability of nuclei and (n-p) ratio – magic number– mass defect and binding energy – mass – energy relationship.
5.2. **Radioactivity:** Natural radioactivity — Soddy's group displacement law – Radioactivity equilibrium – Rate of radioactive disintegration – half life period and average life period– radio active disintegration series.
5.3. **Nuclear fission**: Theory – applications – principle of atom bomb.
5.4. **Nuclear fusion**: Theory – Solar and Stellar energy – principle of hydrogen bomb
5.5. **Applications of radioactivity**: medicine – agriculture – industry – structural elucidations– carbon dating.
5.6. **Particle accelerators**: linear accelerator – cyclotron.

Text Books:

1. "Inorganic Chemistry", R.D.Madhan
2. "Inorganic Chemistry", P.L.Soni
3. "Principles of Physical Chemistry", B.R.Puri, L.R.Sharma and M.S.Pathania

Reference Books:

1. Inorganic Chemistry – J.D.Lee
2.Advanced Inorganic Chemistry – F.A.Cotton & Wilkinson
3.Inorganic Chemistry – Shriver & Atkins
4.Inorganic Chemistry – Jame E.Huheey

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I YEAR – I / II SEMESTER
COURSE CODE: 4BCH2P1

CORE COURSE III – INORGANIC VOLUMETRIC ANALYSIS PRACTICAL – I

(University Examination will be held in the Second Semester only)

Max. Marks: 60 **Duration: 3 Hrs.**

A double titration involving the making up the solution to be Estimated and the preparation of a primary standard solution.

I. ACIDIMETRY AND ALKALIMETRY

1. Estimation of NaOH/KOH (Std. Na_2CO_3)
2. Estimation of Na_2CO_3(Std. Na_2CO_3)
3. Estimation of HCl/H_2SO_4 (Std. Oxalic acid)
4. Estimation of Oxalic acid (Std. Oxalic acid)

II. REDOX TITRATIONS

a) PERMANGANOMETRY

1. Estimation of Ferrous Ion
2. Estimation of ferric ion by reduction with stannous chloride
3. Estimation of calcium (direct method)
4. Estimation of hydrogen peroxide

b) DICHROMETRY

1. Estimation of Ferrous Ion
2. Estimation of ferric ion using external indicator

III. IODO AND IODIMETRY

1. Estimation of Potassium dichromate
2. Estimation of Potassium Permanganate
3. Estimation of Copper
4. Estimation of arsenious oxide
5. Estimation of Iodine

IV. ARGENTIMETRY

1. Estimation of potassium chloride

Distribution of External marks:

Record: 10 marks
Procedure: 10 marks → 60 marks
Experiment: 40 marks

Experiment: Less than 1% error.....40 marks
1 – 2 % error…...30 marks
2 – 3 % error…...20 marks
3 – 4 % error…...15 marks
>4 % error…...10 marks

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I YEAR – II SEMESTER
COURSE CODE: 4BCH2C1

CORE COURSE IV – ORGANIC CHEMISTRY – I

Unit I

1.1. Aliphatic hydrocarbons:

1.1.1. **Alkenes:** Ozonolysis, Hydroboration and polymerization with suitable examples.

1.1.2**. Dienes**: Classification – preparation, properties and uses of Butadiene.

1.1.3. **Alkynes:** Acidity of alkynes

1.2. **Alkyl halides**: S_N1 and S_N2 Mechanism – E_1 and E_2 Mechanism – Hofmann and Saytzeff's rule.

1.3. **Poly halogen derivatives**: Preparation and applications of Westron and Freon.

1.4. **Halogen derivatives of unsaturated hydrocarbons**: Preparation and uses of vinyl chloride, allyl chloride and allyl iodide.

1.5. **Organo metallic compounds**: Synthetic applications of Grignard reagents.

Unit II

2.1 **Aliphatic alcohols:**

2.1.1 **Definition**: Rectified spirit – Absolute alcohol – Methylated spirit – Power alcohol

2.1.2 Preparation, properties and uses of allyl alcohol.

2.1.3**. Polyhydric alcohol**: Estimation of number of hydroxyl groups in a polyhydric alcohol.

2.1.4 **Ethers**: Estimation of alkoxy groups – Zeisel's method – preparation of chlorex and vinyl ether.

2.1.5 **Thioalcohols and thioethers**: Preparation and uses of ethyl mercaptan, diethyl ether, sulphonal and mustard gas.

2.2. **Phosphorous ylides** – preparation and properties –Wittig reaction.

Unit III

3.1 **Aldehydes and Ketones**: Preparation of aldehydes and ketones from fatty acids – Rosenmund reduction – Stephen's method – Mechanism of nucleophilic addition to Carbonyl compounds – Hemiacetal and Acetal formations – Cyanohydrin formation – Meerwein-Pondorf-Varley reduction – Oppaenaur oxidation – preparation of Acrolein, Crotonaldehyde, Chloral , Hydroxy acetone and Acetylacetone

3.2 **Carboxylic acids and their derivatives**: Structure of carboxylic acids – acidity of carboxylic acids – effect of subsituents on acidity – preparation of acrylic acid and crotonic acid.

3.3**. Halogen substituted acids:** Preparation and properties of mono, di and tri chloro carboxylic acids – Relative strengths of mono, di and tri chloro acetic acids.

3.4. **Hydroxy acids:** Preparation of lactic acid and tartaric acid – conversion of lactic acid into pyruvic acid – action of heat on hydroxy acids.

3.5. Preparation of citric acid.

3.6. Preparation of maleic acid and fumaric acid – conversion of maleic acid into fumaric acid and vice versa process.

3.7. **Dicarboxylic acids:** Preparation of Malonic acid and Malonic ester – Synthetic applications of diethyl malonate – Action of heat on dicarboxylic acids

Unit IV

4.1. **Alicyclic compounds** – general methods of preparation of cycloalkanes – Baeyer's strain theory and its modifications.

4.2. **Conformational analysis**: differences between configuration and conformation Fischer and Sawhorse and Newman projection formulae – conformational analysis of ethane, n-butane and 1,2-dichloro ethane .

4.3. **Geometrical isomerism** – maleic acid and fumaric acid – aldoximes and ketoximes– E-Z notations.

4.4. **Optical isomerism**: definition: optical activity and optical isomerism – optical isomerism of compounds containing asymmetric carbon atom – tartaric acid – enantiomers and diastereoisomers – racemic and meso forms – racemisation – resolution of racemic mixture – Walden inversion – asymmetric synthesis – chirality – specifications of absolute configurations by R and S notations.

Unit V

5.1. Optical activity of compounds without asymmetric carbon atoms – allenes and spiranes.

5.2. Optical activity of elements other than carbon atoms – quarternary ammonium compounds – tertiary amine oxides.

5.3. **Carbohydrates:**

5.3.1. **Monosaccharides**: Configuration of glucose and fructose – mutarotation – epimerization – interconversion of glucose and fructose – estimation of glucose.

5.3.2. **Disaccharides:** structure and properties of sucrose.

5.3.3. **Polysaccharides**: Structure of starch and cellulose – cellulose derivatives and their uses.

Text Books:

1. "Organic Chemistry", P.L.Soni
2. "Advanced Organic Chemistry", B.S.Bahl and Arun Bahl
3. "Organic Chemistry", R.T.Morrison and R.W.Boyd

Reference Books:

1. "Organic Chemistry – Volume I", I.L.Finar
2. "Organic Chemistry – Volume II", I.L.Finar
3. Organic Chemistry – J.Clayden
4. Organic Chemistry – Jerry March
5. Organic Chemistry – Mc muray

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I YEAR – II SEMESTER
COURSE CODE: 4BCH2C2

CORE COURSE V – PHYSICAL CHEMISTRY – I

Unit I : Gaseous state:

1.1. Kinetic theory of gases – equation of kinetic theory of gases – derivation of gas laws from the equation of kinetic theory of gases.

1.2. Ideal gases and real gases – deviations of real gases from ideal behaviour – Van der waal's equation (Derivation) – Significances of van der Waal's constants – other equations of state like Clausius, Berthelot and Dieterici (no derivation).

1.3. Law of corresponding states - Reduced equation of state – Boyle and Inversion temperatures of gases (no derivation) and related problems.

Unit II

2.1. **Critical phenomenon of gases**
P-V isotherms – Andrew'sexperiment–critical states of gases – Definition and determination of the critical constants – relation between van der Waal's constants and critical constants – problems related to the calculation of Van der waal's constants and critical constants.

2.2**. Kinetic theory of gases:** Mean free path – collision frequency – Definition and problems involving RMS velocity, Most probable velocity and Average velocity – Boltzman distribution of molecular velocities (No derivation) – viscosity of gases – Loschmidt number – Principle of equipartition of energy.

Unit III

3.1. **Liquid State:**

3.1.1. Theory of liquids – free volume of liquids – Vapour pressure – Surface tension, effect of temperature on surface tension, parachor – Viscosity,effect of temperature on viscosity – hole theory – Reynolds number – structure of liquids.

3.1.2. Trouton's rule and its significance

3.1.3. **Liquid crystals** – Classification – Transformation into the mesomorphic states – Theory of liquid crystals – structural features of mesomorphic substances – Applications of liquid crystals

3.2. **Adsorption:** Definitions – Adsorbate, adsorbent and interface – Distinction between physisorption and chemisorption – Surfactants.

3.2.1 Adsorption of gases on solids – Freundlich, Langmuir and BET adsorption isotherms

3.2.2. Applications of adsorptions.

Unit IV

4.1. **Chemical Equilibrium**: Reversible and irreversible reactions – statement of law of mass action – Derivation of law of mass action from kinetic theory – Relationship between Kp and Kc (derivation).

4.2. Applications of Law of mass action to the equilibria involving the formation of NH_3,dissociation of $CaCO_3$ and the dehydration of $CuSO_4.5H_2O$. Lechatelier's principle: statement – application to the formation of NH_3.

4.3**. Catalysis:** Homogeneous and heterogeneous catalysis – promoters and catalytic poisons – auto catalysis – Acid-base catalysis – Enzyme catalysis –Kinetics of enzymed catalysed reaction.

Unit V

5.1. **Colloidal state**: types of colloids – sols – Lyophilic sols and lyophobic sols – properties of colloids – optical property (Tyndall effect) – kinetic property (Brownian movement) – Electrical properties like electrical double layer, zeta potential, electrophoresis and electro-osmosis – stability of colloids – Coagulation – protective colloids – Gold number – flocculation values – Hofmeister series.
5.2. **Gels**: Elastic and non-elastic gels – imbibition – syneresis – thixotropy
5.3. **Emulsions**: Definition – types of emulsions – emulsifiers – Bancroft's rule – HLB number.
5.4. **Applications of colloids**: Cottrel precipitator – Sewage disposals – detergent action of soaps – artificial rain – formation of delta – smoke screens.

Text Books

1. "Principles of Physical Chemistry", B.R.Puri and L.R.Sharma
2. "Principles of Physical Chemistry", B.R.Puri, L.R.Sharma and M.S.Pathania
3. "Physical Chemistry", N.Kundu and SN.Jain

Reference Books

1. Physical Chemistry – P.W. Atkins
2. "Textbook of Physical Chemistry", S.Glasstone
3. "Physical Chemistry", G.M.Barrow
4. "Introduction to Electrochemistry", S.Glasstone

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II YEAR – III SEMESTER
COURSE CODE: 4BCH3C1

CORE COURSE VI – INORGANIC CHEMISTRY – II

Unit I: 1.1 Halogens

1.1.1 General trends in the properties of halogens – deviation of fluorine from other elements of the group.

1.1.2 Preparation of fluorine – properties of fluorine – hydrogen fluoride – oxides of halogens – preparation properties and uses of hydrogen halides, oxy acids of halogens – freons.

1.1.3 Interhalogen Compounds**:** XY, XY_3, XY_5 and XY_7 types and their structure.

1.1.4 Pseudohalogens and pseudohalides definition with exmples.

1.2 **Inorganic Carbon Compunds:**
Types of **c**arbides - Covalent, ionic and interstitial carbides with suitable examples – oxides of carbon – oxy acids of carbon – carbonates – fullerenes.

1.3 **Noble gas compounds**: preparation and properties of xenon fluorides and oxyfluoride and kryptonfluoride.

Unit II:

2.1 **Peracids and persalts:** preparation, properties and structure of permonosulphuric acid, perdisulphuric acid and potassium perdisulphate.

2.1.1 Preparation and properties of permonocarbonic acid, perdicarbonic acid and perdicarbonates.

2.2. Solubility of ionic compounds: Lattice energy – Born-Lande equation (no derivation) – Born Haber cycle – Fajan's rule

2.3. Van der Waal's forces: dipole-dipole, ion-dipole and dipole-induced dipole interactions.

2.4. Hydrogen bonding: Intra and intermolecular hydrogen bonding with suitable examples – applications of hydrogen bonding.

Unit III: Transition Elements - Group Study

3.1 Transition elements-position in the periodic table – general characteristics of d-block elements.

3.2 Occurrence, extraction, properties and uses of titanium, vanadium, molybdenum and tungsten.

3.3 Chemistry of titanium dioxide, titanium tetrachloride, vanadium penta oxide-ammonium vanadate, ammonium molybdate, molybdenum blue, tungsten oxide, tungsten bronze, zirconium halide.

Unit IV: Lanthanides and Actinides

4.1 Position of lanthanides actinides in the periodic table – general characteristics of lanthanides and actinides – lanthanide contraction – actinide contraction.

4.1.1 Occurrence and general methods of extraction of lanthanides by reducing the trihalides, ion exchange and valence exchange methods. Isolation of thorium from monazite – Preparation properties and uses of oxides, oxy acids, hydrides and halides of cerium and lanthanum.

4.2 Organometallic compounds of lanthanoides – optical properties – magnetic properties of lanthanides

4.3 Applications of lanthanides and actinides.

Unit V : Solid State

5.1. **Crystallography —** Definition: unit cell, crystal lattice and interfacial angle

5.2. **Laws of crystallography**:
(i) Law of constancy of interfacial angle.
(ii) Law of Rationality of indices
(iii) Laws of symmetry

5.3. **Crystallographic systems**: Bravis lattices – simple, cubic, face-centered cubic and body-centered cubic systems.

5.4. **Application of X-rays –** to study the structure of crystals – Bragg's equation (derivation) – powdered crystal method.

5.5. **Types of crystals**: Ionic crystal – Structure of NaCl – Molecular crystals: Structure of H_2O – Covalent crystals: structure of diamond and graphite – metallic crystals.

5.6. Bonding in crystals – electrical properties - Condutors, semiconductors and insulators – super conductors – simple explanation with examples – Defects in crystals.

Text Books

1. "Inorganic Chemistry", P.L.Soni
2. "Inorganic Chemistry", Puri and Sharma
3. "Advanced Inorganic Chemistry", R.D.Madan

Reference Books

1. "Basic Inorganic Chemistry", F.A. Cotton and Wilkinosn
2. "In-organic Chemistry", Shriver and Atkins
3. "Inorganic Chemistry", James E.Huheey
4. "Concise Inorganic Chemistry", J.D.Lee
5. "Fundamentals of Inorganic Chemistry", Gilreath
6. "Engineering Chemistry", B.C.Jain and Monica Jain

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II YEAR – III / IV SEMESTER
COURSE CODE: 4BCH4P1

CORE COURSE VII – INORGANIC QUALITATIVE ANALYSIS PRACTICAL – II
(University Examination will be held in the fourth semester only)

Max. Marks: 60 **Duration: 3 Hrs.**

Analysis of a mixture containing two cations and two anions of which one anion will be an interfering ion. Semimicro methods are to be used.

Anions to be studied: Carbonate, Sulphide, Bromide, Sulphate, Nitrate, chloride, Fluoride, Oxalate, Phosphate, Borate, Arsenate and chromate.

Cations to be studied: Lead, Bismuth, Cadmium, Copper, Aluminium, Iron (only ferrous), Cobalt, Manganese, Nickel, Zinc, Barium, Calcium, Strontium, Magnesium and Ammonium ion.

Distribution of External marks

Record	:	10 marks
Two anions with correct procedure	: 13 + 13	26 marks
Group Separation	:	8 marks
Two cations with correct procedure	: 8 + 8	16 marks
		60 marks

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II YEAR – IV SEMESTER
COURSE CODE: 4BCH4C1

CORE COURSE VIII – ORGANIC CHEMISTRY – II

Unit I

1.1. **Aromatic compounds**: Aromatic hydrocarbons – aromaticity and Huckel's rule – Simple applications
1.2. **Aromatic substitution**: Electrophilic substitution with suitable examples – Mechanism of Halogenation, Nitration, Sulphonation and Friedel-Craft's reactions – nucleophilic and free radical substitution with suitable examples.
1.3. **Directive influence of substituents**: Orientation – Effect of substituents – activating and deactivating groups – Rules of disubstitution and trisubstitution in benzene – steric hindrance
1.4. **Aromatic halogen compounds:** preparation of nuclear and side chain halogen compounds – Distinction between them – preparation and uses of benzylidene chloride, benzylidyne chloride and DDT.

Unit II

2.1. **Phenol:** Mechanism of kolbe's reaction and Reimer-Tieman reaction – Test for phenol – estimation of phenol
2.2. **Nitro Phenols**: Preparation of o-, p- and m- nitro phenols – preparation and uses of picric acid
2.3. **Dihydric phenols**: preparation and uses of catechol, resorcinol and quinol
2.4. **Trihydric phenols**: preparation and uses of pyrogallol, phloroglucinol and hydroxyl quinol
2.5. **Aromatic ethers**: preparation of anisole, phenetole and diphenyl ether

Unit III

3.1. **Aromatic aldehydes**: Mechanism of the following reactions; Perkin reaction – Claisen reaction – Knoevenagal reaction – Benzoin condensation – Cannizzaro's reaction.
3.2. **Aromatic ketones**: Preparation of acetophenone and benzophenone by Friedel – Craft's reaction – halogenation of acetophenone – Distinction between acetophenone and benzophenone
3.3. **Aromatic acids:** Effect of substituents on the acidic character of benzoic acid – substituted benzoic acids – preparation and uses of salicylic acid and anthranilic acid.
3.4. **Derivatives of phthalic acid**: preparation and properties of phthalic anhydride and phthalimide
3.5. **Preparation of the following compounds and their uses** – phenylacetic acid, mandelic acid, cinnamic acid, aspirin and methyl salicylate.

Unit IV

4.1. **Aromatic sulphonic acids**: preparation, properties and uses of benzene sulphonic acid – preparation and uses of saccharin, chloramine-T and dichloramine-T

4.2. **Aromatic nitro compounds**: conversion of nitrobenzene into o-,p- and m-dinitro benzenes – reduction of nitrobenzene in neutral,acidic and basic media – preparation and uses of TNT and amatol.

4.3. **Relative basic character of aromatic amines** – derivatives of aniline – preparation and uses of acetanilide, sulphanilic acid and sulphanilamide.

4.4. **Benzene diazonium chloride:** synthetic applications of benzene diazonium chloride.

Unit V

5.1. **Polynuclear hydrocarbons**: preparation, properties and uses of naphthalene, anthracene and phenanthrene – structure of naphthalene.

5.2. **Preparation and uses** of naphthylamine, naphthols, naphthaquinone and anthraquinone – preparation of biphenyl, benzidine and stilbene.

5.3. **Oils and fats**: definition – determination and application – saponification value – iodine value – Reichert-Meissel value – acid value.

Text Books

1. "Organic Chemistry", P.L.Soni
2. "Advanced Organic Chemistry", B.S.Bahl and Arun Bahl
3. "Organic Chemistry", R.T.Morrison and R.W.Boyd

Reference Books

1. "Organic Chemistry – Volume I", I.L.Finar
2. "Organic Chemistry – Volume II", I.L.Finar
3. "Reaction Mechanism of Organic Compounds" – Jerry March
4. "Organic Chemistry" – J. Clayden

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III YEAR – V SEMESTER
COURSE CODE: 4BCH5C1

CORE COURSE IX – PHYSICAL CHEMISTRY – II

Unit I

Thermodynamics – Part – I

1.1. Definition of thermodynamic terms: System and surroundings – isolated system, open system and closed system – homogeneous system and heterogeneous system – state of the system – intensive and extensive variables – state and path functions – Thermodynamic processes: reversible and irreversible – isothermal and adiabatic – exact and inexact differentials

1.2. **Laws of thermodynamics:**

1.2.1. Zeroth law of thermodynamics and its significance.

1.2.2. **First law of thermodynamics**: Statement – mathematical derivation.

1.2.3. **Definitions:** Internal energy (U), enthalpy (H), molar heat capacity at constant volume (C_v) and molar heat capacity at constant pressure (Cp) – Relationship between C_v and Cp – work done in an isothermal reversible expansion of an ideal gas – adiabatic reversible expansion, compression of an ideal gas – reversible adiabatic expansion – derivation of the relationship between P,V and T ($PV^{\square\square}$ = a constant, $T_1/T_2 = (V_2/V_1)^{\gamma-1}$ and $(T_1/T_2)^{\gamma} = (P_2/P_1)^{1-\gamma}$ – derivation of work done.

1.2.4. **Joule-Thomson effect** – derivation of Joule-Thomson co-efficient in ideal and real gases – Joule-Thomson coefficient and inversion temperature – calculation of Joule – Thomson's coefficient and inversion temperature.

1.2.5. Calculation of q, w, ΔU and ΔH for the reversible isothermal expansion of an ideal gas.

1.3. **Thermochemistry:**

1.3.1. Hess's law of constant heat summation and its applications – Bond energy and its applications.

1.3.2. Variation of enthalpy of change of reaction with temperature – Krichoff's equation.

Unit II

Thermodynamics – Part – II

2. **Second law of thermodynamics**:

2.1. Different statements of second law of thermodynamics – cyclic process – Carnot cycle and efficiency of a heat engine (derivation) – Carnot's theorem.

2.2. **Concept of entropy**: Entropy as a state function – calculation of entropy changes in terms of P, V and T – entropy changes in reversible and irreversible processes – entropy of mixing of gases – entropy of change of phases – physical significance of entropy.

2.3. **Free energy functions**: Helmholtz free energy (A) –Gibbs free energy (G) – variation of Gibbs free energy with temperature and pressure. Maxwell's relationships – Thermodynamic equation of state – Criteria for reversible and irreversible processes. Gibbs- Helmholtz equation and its applications.

2.4. **Partial molar quantities**: Definition – chemical potential – Gibbs-Duhem equation – variation of chemical potential with temperature and pressure – Classius-Clapeyron equation – derivation and applications – concept of fugacity and activity and their significances.

2.5. **Third law of thermodynamics**: Nernst heat theorem – third law – determination of absolute entropy.

Unit III: Chemical kinetics

3.1. Rate of reactions – rate constant – order and molecularity of reactions – first order and pseudo unimolecular reactions (definition and examples) – derivation of rate constant for the inversion of cane sugar.

3.2. **Second order reactions** – definition – examples – derivation of rate constant (same concentration and different concentration) and half life period – application to saponification of ester.

3.3. **Third order reactions**: definition and examples – application to the reaction between $FeCl_3$ and $SnCl_2$.

3.4. Methods of determination of order of reactions.

3.5. **Zero order reactions** – definition and examples – derivation of rate constant.

3.6. **Theory of reaction rates** – collision theory of bimolecular reactions – unimolecular reactions – Lindemann's hypothesis – theory of absolute reaction rates

Unit IV: Group theory

4.1. Molecular symmetry elements and symmetry operations – products of symmetry operations – properties of a group – classes and sub groups – group multiplication table (C_2V table only).

4.2. **Point groups** – classification of molecules into point groups.

4.3. Vector and matrix algebra – symmetry operations and transformation matrices – inverse matrices.

Unit V: Fundamental Concepts of Spectroscopy

Spectroscopy – electromagnetic spectrum – Born-Oppenheimer approximation – energy of a molecule – energy of a photon – resonance – absorption and emission of electromagnetic radiation – absorption and emission spectra – allowed and forbidden transitions – selection rule.

Rotational spectroscopy of diatomic molecules – rigid rotator – rotational constant – calculation of bond length – dipole moment and percentage of ionic character.

Vibrational spectroscopy: harmonic oscillator – Hooke's equation – anharmonicity – potential energy surface of harmonic and anharmonic oscillator – zero-point energy – types of vibrations –vibrational frequencies of functional groups – fundamental vibration – overtones – combination bands.

Raman spectroscopy: stokes and anti-stokes – theory of Raman spectroscopy. Rotaion-vibration Raman spectrum – Q-, R- and P- branches – comparison of Raman and IR-spectroscopy.

Magnetic resonance spectroscopy: nuclear magnetic moment – Larmor precession – Larmor frequency – resonance – Bohr frequency condition – shielding and deshielding –chemical shift – factors affecting chemical shift – spin-spin coupling – coupling constants

Text Books

1. "Principles of Physical Chemistry", B.R.Puri and L.R.Sharma
2. "Principles of Physical Chemistry", B.R.Puri, L.R.Sharma and M.S.Pathania
3. "Physical Chemistry", N.Kundu and SN.Jain

Reference Books

1. "Textbook of Physical Chemistry", S.Glasstone
2. "Physical Chemistry", G.M.Barrow
3. "Advanced Physical Chemistry", P.W. Atkins
4. "Chemical Kinetics ", K.J.Laidler
5. "Group theory in Chemistry", V.Ramakrishnan and M.S.Gopinathan
6. "Introductory Group theory for Chemist", George Davidson
7. "Modern spectroscopy", Banwell
8. "Modern spectroscopy", J. Micheal Hollas

III YEAR –V SEMESTER
COURSE CODE: 4BCH5C2

CORE COURSE X – INORGANIC CHEMISTRY – III

Unit I

CO-ORDINATION CHEMISTRY

Ligands, classification of ligands,IUPAC nomenclature of coordination compounds, Co-ordination number, Sidgwick's electronic interpretation of coordination compounds and the concept of effective atomic number (EAN).

Isomerism – geometric isomerism in coordination number 4 and 6 compounds, optical isomerism and conditions for optical isomerism, optical isomerism in coordination number 4 and 6 compounds.

Stability of complexes – definition of labile and inert complexes – factors affecting stability of complexes.

Unit –II

Theories of metal – ligand bonding in complexes:

Werner's coordination theory, limitations of Werner's theory.

Valence bond theory (VBT) – formation of inner and outer orbital complexes – application of VBT to octahedral complexes, square planar and tetrahedral complexes, limitations of VBT.

crystal field theory (CFT) – crystal field splitting in tetrahedral, square planar and octahedral complexes, strong and weak ligands, spectrochemical series – high – spin and low – spin complexes, magnetic properties of octahedral and tetrahedral complexes, crystal field stabilization energy (CFSE) and its uses, limitations of CFT - comparison of VBT and CFT.

Ligand field theory – application of LFT to octahedral and tetrahedral complexes – metal ligand π – bonding.

Unit –III

3.1 Magnetic properties of transition metal complexes (spin only moment)

3.2 Metal carbonyls – classification with suitable examples – metal carbonyls and EAN rule – stability of metal carbonyls – applications.

3.3 Chelates – application of chelates.

3.4 Applications of co- ordination compounds in qualitative and quantitative analysis:

3.4.1 Separation of silver and mercury ions, copper and cadmium ions, identification of aluminium, chromium, nickel, zinc, manganese and potassium,

3.4.2 Complexometric titrations – principle and applications – quantitative estimation of nickel using DMG, aluminium using oxine – structure of EDTA complexes.

3.5 Cluster compounds: Boranes – carbaboranes – carbonyl clusters.

Unit IV

Bio – inorganic chemistry

4.1. Essentiality (significance) of metal and metal ions in biological systems.

4.2 Role of alkaline and alkaline earth metal ions in biological systems.

4.3 Role of iron in biological systems – structure of haemoglobin (structural elucidation not required) – oxygen transportation by haemoglobin (elementary study)

4.4. Structure of chlorophyll – photosynthesis.

4.5. Role of zinc in biological systems.

4.6. Metal poisoning – cadmium and mercury poisoning.

Unit V

Silicones (polysiloxanes) and Silicates

Types of silicones – structure of silicones – versatile properties of silicones. Preparation and properties of dimethyl, methylphenyl and diphenyl siliconesanes.

Applications of silicones – desired properties – sealants and adhesives – rubber – paints and coatings – health care – Automotive – aerospace – household – defoaming drycleaning electronics lubricants personalcare – construction.

Zeolites – types of zeolites - uses like ion- exchangers water softeners, molecular sieves dehydrating agents, adsorbents and catalysts**,**

Text Books

1. "Inorganic Chemistry", P.L.Soni
2. "Advanced Inorganic Chemistry", R.D.Madan
3. "Inorganic Chemistry", Puri and Sharma

Reference Books

1. "Basic Inorganic Chemistry", F.A. Cotton and Wilkinosn
2. "A Textbook of quantitative Inorganic Analysis", Arthur.I.Vogel
3. "Inorganic Chemistry", James E.Huheey
4. "Concise Inorganic Chemistry", J.D.Lee
5. "Fundamentals of Inorganic Chemistry", Gilreath
6. "Engineering Chemistry", B.C.Jain and Monica Jain
7. "In-organic Chemistry", Shriver and Atkins

III YEAR – V SEMESTER
COURSE CODE: 4BCH5P1

CORE COURSE XI – GRAVIMETRIC ESTIMATIONS, COLORIMETRIC ESTIMATIONS AND ORGANIC PREPARATION PRACTICAL – III

Max. Marks: 60 **Duration: 6 Hrs.**

I. Gravimetric Estimation

1. Estimation of barium as barium chromate / sulphate
2. Estimation of lead as lead chromate / sulphate
3. Estimation of calcium as calcium oxalate
4. Estimation of nickel as nickel dimethyl glyoxime complex

Colorimetric Estimation

1. Estimation of iron
2. Estimation of copper
3. Estimation of nickel
4. Estimation of cobalt

II. Preparation of organic compounds

Preparations involving the following methods

a. Oxidation
b. Reduction
c. Hydrolysis
d. Nitration
e. Ozasone formation
f. Bromination
g. Diazotisation
h. Benzoylation

Distribution of External marks:

1. Record		10 marks
2. Gravimetric / colorimetric estimations		25 marks
a. Procedure	5 marks	
b. Experiment	20 marks	
3. Organic preparation		25 marks
a. Procedure	5 marks	
b. Crude sample	15 marks	
c. Recrystallized sample	5 marks	
		60 marks

Gravimetric / Colorimetric estimations:

Less than 1% error.....20 marks
1 – 2 % error…...15 marks
2 – 3 % error…...10 marks
3 – 4 % error…... 8 marks
>4 % error…... 6 marks

III YEAR – V / VI SEMESTER
COURSE CODE: 4BCH6P1

CORE COURSE XII – PHYSICAL CHEMISTRY PRACTICAL – IV
(University Examination will be held in the sixth semester only)

Max. Marks: 60 **Duration: 6 Hrs.**

1. Phase diagram:
a. Simple eutectic
b. Compound formation

2. Determination of molecular weight:
a. Rast-macro method (using naphthalene as solvent)
b. Transition temperature (using sodium thio sulphate penta hydrate as salt hydrate)

3. Critical solution temperature
a. CST of phenol – water system
b. Estimation of sodium chloride by studying the CST of phenol-water system

4. Kinetics
Determination of relative strength of acids by acid catalysed hydrolysis of ester

5. Partition co-efficient
a. Study of equilibrium $KI + I_2 \rightleftharpoons KI_3$ by studying the partition co-efficient of iodine between water and carbon tetra chloride.
b. Determination of association factor of benzoic acid in benzene

6. Electrochemistry
a. **Conductometric titration** between an acid and a base (HCl Vs NaOH)
b. Potentiometric method – Potentiometric titration between 1. an acid and a base (HCl Vs NaOH) and 2. $KMnO_4$ Vs FAS

7. **Thermochemistry**
a. Determination of heat of solution – ammonium oxalate

Distribution of External marks:

Record	10 marks
Experiment	50* marks
	60 marks

*Marks are suitably allotted for formula with expansion, tabular column with correct units, calculation, graphs and final results.

III YEAR – V SEMESTER
COURSE CODE: 4BCHE1A

ELECTIVE COURSE I (A) – ANALYTICAL CHEMISTRY

Unit I

Laboratory Hygiene and Safety

Storage and handling of chemicals – carcinogenic, corrosive, explosive, toxic and poisonous chemicals – general precautions for avoiding accidents – first aid techniques for acid in eye, alkali in eye, acid burns, alkali burns, bromine burns, poisoning, inhalation of gases, cut by glasses and heat burns – methods to avoid poisoning – treatment for specific poisons.

Unit II

2. Separation and Purification Techniques

2.1. Solvent extraction – Soxhelt extraction – Principles and applications of distillation, fractional distillation, steam distillation – crystallization and sublimation.

2.2. Desiccants – classification – choice of desiccant – vaccum drying – drying of solid and liquid.

Unit III

Error Analysis

Definition and classification of errors – methods of minimizing errors – Accuracy – Methods of expressing accuracy, Precision – methods of expressing precision – Students t-test and F-test – confidence limit – rejection of experimental data – significant figures – curve fitting – method of least squares – problems involving straight line graphs.

Unit IV

4.1 **Instrumental Method of Analysis**

Colorimetric Analysis – Principle – Beer-Lambert's Law – standard series method (Nessler's method) – balancing method – Photoelectric colorimetric method – estimation of iron, copper and nickel

4.2 **Thermoanalytical methods**

Thermogravimetric analysis – Principle – instrumentation – characteristics of thermogravimetric curve – Applications of TGA for calcium oxalate monohydrate

Differential Thermal Analysis – Principle – instrumentation – characteristics of differential thermal curve – Applications of DTA for calcium oxalate monohydrate.

Unit V

5.1. Chromatography

Definition – Principles involved in chromatograpic technique – Working and applications of following chromatographic techniques – Paper chromatography – column chromatography – GLC – TLC – Superiority of TLC over other techniques.

5.2. Gravimetric analysis

Characteristics of precipitating agents – choice of precipitant – specific and selective precipitant – conditions of precipitation – factors affecting precipitation – co-precipitation advantages and disadvantages of co-precipitation - post-precipitation – precipitation from homogeneous solution – digestion and washing of precipitates – ignition of the precipitate – use of sequestering agents.

Recommended Books

1) R.Gopalan, P.S.Subramanian and K.Rengarajan, Elements of Analytical Chemistry, Sultan Chand & Sons, New Delhi, 1995.
2) Douglas A.Skoog and D.M.West, Principles of Instrumental Analysis, W.B.Saunders, New York, 1982.
3) Gurdeep Chatwal, Sham Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, Mumbai, 1998.

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III YEAR – V SEMESTER
COURSE CODE: 4BCHE1B

ELECTIVE COURSE I (B) – AGRICULTURAL CHEMISTRY

Unit I

1.1. Origin of earth – Geological formations of India – Soil forming rocks and minerals – Classification – weathering of rocks and minerals – processes of weathering and factors affecting them. Soil formation – Factors of soil formation – soil forming processes – profile development – definition of soil – soil composition.

1.2. Soil Physical properties – soil separates and particle size distribution – soil texture and structure – Bulk density, particle density, pore space, soil air, soil temperature, soil water, soil consistence and significance of physical properties to plant growth.

1.3. Soil chemical properties – soil colloids – Inorganic colloids – clay minerals – amorphous – exchange reactions – organic colloids – soil organic matter – decomposition – Humus formation – significance of soil fertility, soil reaction – Biological properties of soil – nutrient availability.

Unit II

2.1. Fertilizer – definition – fertilizer selection based on soil testing – fertility index – Nitrogenous fertilizers – effect of nitrogen on plant growth and development. Phosphate fertilizers – Effect of phosphorus on plant growth and development – super phosphate and Bone meals. Potassium fertilizers – function of potassium on plant growth.

2.2. Secondary and micronutrient fertilizers – complex and mixed fertilizers – sources, manufacture, properties and reactions in soils.

2.3. Biofertilizers – nitrogen fixing biofertilizer – rhizobium, azospirillum – phosphate mobilizing biofertilizer – bacteria – bacillus, pseudomonas, fungi – aspergillus, pencillium

Unit III

3.1. Nutrient potential of different organic manures – Agricultural, industrial and urban waste preparation of enriched farm yard manures – Zinc enriched organics.

3.2. Green manures – green leaf manure – bulky organic and concentrated organic manures – compost – enriched farmyard manures, composting of coir pith; sugarcane trash, leaf litters and farm wastes – oil cakes, bone meal, fish meal, guano poultry manures – integrated nutrient management.

3.3. Preparation of different fertilizer mixtures.

Unit IV

4.1. Pest management and control

Pesticides – formulations – emulsifiable concentrate, water miscible liquids, wettable powder dusts, granules, classification of pesticides – mode of action – characteristics – uses – fate of pesticides in soil and plants – impact of pesticides on environment – safety measures in analysis and handling of pesticides.

4.2. Insecticides – plant products – Nicotine, pyrethrum, rotenone, petroleum oils.

Inorganic pesticides – Arsenical fluorides, borates. Organic pesticides – organo chlorine compounds D.D.T, B.H.C, methoxychlor, chloredane, endosulfon. Organophosphorus compounds – Dischlorevas, methyl Carbamic acid derivatives – carbaryl – structure and mode of action.

Unit V

5.1. Fungicides – Inorganic – Sulphur compounds – Copper compounds – Mercuric compounds Organic – dithiocarbamates – Dithane M and Boredeaux mixture.

5.2. Herbicides: Inorganic herbicides – Arsenical compounds Boron compounds – cyanamide – Cyanides and thiocyanates, chlorates and sulphamates. Organic herbicides & Nitro-compounds – chlorinated compounds – 2-4D-Phridine compounds – Triazine compounds – Propionic acid derivatives – Urea herbicides, Alachlor.

References

1) N.C.Brady, The Nature of properties of soils Eurasia publishing house, (P) Ltd., 9th Ed. 1984.
2) Biswas, T.D. and Mukherjee S.K. 1987 Text book of soil science.
3) A.J.Daji (1970) A Text book of soil science – Asia publishing house, Madras
4) Donahue. R.L. Miller.R.W. and Shickluna, J.C. 1987. soils – An introduction to soils and plant Growth – Prentice Hall of India (P) Ltd., New Delhi.
5) Colling, G.H. 1955, Commercial Fertilizers – McGraw Hill Publishing Co., New York.
6) Tisdale.S.L. Nelson.W.L. and Beaton.J.D. 1990, Soil fertility and fertilizers. Macmillan Publishing company, New York
7) Hesse, P.R. 1971. A text book of soil chemical analysis John Murray, New York.
8) Jackon, M.L. 1958, Soil Chemical Analysis, Prentice Hall of India, New Delhi.
9) Buchel, K.H. 1983, Chemistry of pesticides – John wiley & sons, Newyork.
10) Melnikov, N.N.1971. Chemistry of pesticides Vol.36 of Residue Review – springer verlac, New York.
11) Sree Ramula, U.S.1979, Chemistry of Insecticides and Fungicides – Oxford and IBH publishing Co., New Delhi.

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III YEAR – V SEMESTER
COURSE CODE: 4BCHE2A

ELECTIVE COURSE II (A) – INDUSTRIAL CHEMISTRY

Unit I

1.1. **Paints**: Paint – definition – classification of paints based on their applications – constituents – Requisites of a good paint

1.2. **Pigments:** Definition – composition, characteristics and uses of white lead, Zinc oxide Lithopone and TiO_2 – Blue pigments – Ultra marine blue – characteristics – uses. Red pigments – red lead –characteristics and uses. Green pigments – chrome green, Guigwet's green and chromium oxide – characteristics and their uses.

1.3. **Varnishes:** Definition – constituents of varnish – characteristics of a good varnish – uses – Japans varnish. Enamel – definition – Types – Ingredients and uses.

Unit II

2.1. **Ceramics:** Definition, classification of ceramics, general properties of ceramics – permeable (porous) and impermeable (non porous wares) – Basic raw material – Manufacture – applications of colour to pottery.

2.2. **Glass:** Definition – physical and chemical properties of glass – raw materials – Manufacture – types of glasses.

2.3 **Cement:** Raw materials – Portland cement – composition – types of Portland cement – Manufacture – Uses of Cement – chemistry of setting of cement mortar - Cement Raw Materials in India – Growth of Cement Industry in India.

Unit III

3.1 **Soap:** Definition – General consideration in soap making – manufacture of soap – toilet and transparent soaps.

3.2 **Detergents:** Definition – classification of face active agents – anionic detergents – cationic detergents – shampoo – raw materials

3.3 **Refractories**:- Introduction, Classification – Properties – Manufacture – Fire clay bricks – manufacture – Uses

Unit IV

4.1. **Fertilizers:** Definition – manufacture of Ammonium sulphate, CAN, urea, calcium super phosphate and mixed fertilizers (NPK) – Fertilizer industries in India.

4.2. **Sugar Industry:** Manufacture of sugar from molasses and beetroot – sugar industries in India. Fermentation: Manufacture of spirits and wines. Distillation: Manufacture of vinegar and ethyl alcohol.

4.3. **Match industries:** Manufacture – chemistry of lighting and pyrotechny

Unit – V

5.1 **Adhesives:** definition – classification of adhesives – animal glue – preparation – uses– protein adhesives – starch adhesives – preparation – uses.

5.2 **Enamels**: Introduction – Raw Materials – Manufacture and Applications

5.3 **Explosives:** Definition – Classification – Characteristics of explosives – Nitro cellulose, T.N.T. Picric acid, Gun Powder, Cordite and Dynamite.

References

1) B.K. Sharma – "Industrial Chemistry", 1st Ed., (1983), Goel Publication, Meerut.
2) B.N. Charabarthy – "Industrial Chemistry", 1st Ed., Oxford and IBh Publishing. New Delhi.
3) P.L. Soni – "Text Book of Organic Chemistry", 26th Ed., (1994), S. Chand & Co, New Delhi.
4) Arun Bahl and B.S. Bahl – "Text Book of Organic Chemistry", 11th and 18th Ed., (2006), S.Chand, New Delhi.
5) Krishnamoorthy, P. Vallinayagan & K. Jaya Subramanian – "Applied Chemistry", 2nd Ed., (1999, 2001), Tata MaGraw-Hill Publishing Co. Ltd., New Delhi

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III YEAR – V SEMESTER
COURSE CODE: 4BCHE2B

ELECTIVE COURSE II (B) – MEDICINAL CHEMISTRY

Unit I

Basic concepts

1.1 Concepts – Definition: drug – classification of drugs: biological and chemical – Nomenclature of drugs.

1.2 Mechanism of drugs – factors affecting metabolic activity – chemical pathway of drug metabolism – bio transformation – oxidative, reductive and hydrolytic biotransformations – conjugate reactions – gluco uranides, amino acids, ethereal sulphate, methylated, acetylated and glucothione conjugations.

1.3 Absorption of drugs – routes of administration – factors affecting absorption – digestion of proteins – gastric, intestinal and exopeptidaces – absorption of proteins – digestion and absorption of fats.

1.4 Assay of drugs – chemical, biological and immunological assay.

1.5 Theories of drug action – occupancy theory and induced fit theory.

Unit II

Diagnostic Medical Instruments

2.1 Design of medical instruments – general components – transducers – types – biopotential recorders – Electrocardiograph (ECG) – principles, block diagram, measurement and analysis of the ECG.

2.2 Electroencephalography (EEG) – principles, block diagram, measurement and analysis of the EEG.

2.3 X-ray – principles, block diagram, measurement and analysis of x-ray.

2.4 Ultrasonic Scanning – principles block diagram, measurement and analysis of the scans.

2.5 C.T.Scan – principles, block diagram, measurement and analysis of the scan.

2.6 MRI Scan – principles, block diagram, measurement and analysis of the scan.

Unit III

Clinical Chemistry

3.1 Clinical chemistry – Composition of blood – blood grouping – determination of blood groups and matching – blood pressure – hypertension – determination.

3.2.1 Determination of glucose in serum – Folin method, Wu's method, Nelson method, somogyi method and O-toluidine method – determination of serum cholesterol – Sackett's method – tests for cholesterol.

3.2.2 Estimation of glucose in urine – Benedict's test – tests for salt in serum – test for chlorides in serum – tests for salt in urine – tests for cholesterol in urine – Detection of diabetes and anemia

3.3 Estimation of hemoglobin (Hb concentration) – estimation of red blood cells (count).

3.4 Analysis of blood – determination of blood urea – urease method.

3.5 Estimation of bile pigment in serum – estimation of total protein in serum – estimation of total proteins and albumin based on Biuret and BCG methods.

3.6 Determination of Hallucinogens and poisons – antidotes – common poisons and their antidotes

3.7 First aid for accidents – important rules – first aids for cuts, bruisers, bleeding, fractures, burns, fainting and poisonous bites – composition of first aid box.

Unit IV

Diseases and treatment I

4.1.1 Common diseases – Causes and treatment of some common diseases – insect borne diseases – malaria and filariasis

4.1.2 Air borne diseases – diphtheria, woophing cough, influenza, cold, fever and tuberculosis

4.1.3 Water borne – cholera, typhoid and dysentery

4.1.4 Digestive disorders – Jaundice – respiratory disorder – asthma – nervous disorder – epilepsy – other diseases – piles and leprosy.

4.2 Important Indian medicinal plants and their uses.

4.3 Structure, functions, dosage, uses and effects of the following drugs.

4.3.1 Cardiovascular drugs – antiarrythmic drugs – quinidine.

4.3.2 Anti hypertensive drugs – clondine and reserpine

4.3.3 Anti anginal drugs – glyceryl trinitrate and isosorbide dinitrate.

4.3.4 Sulpha drugs – sulphanilide and sulpha diazine.

4.5 Health care medicines – vitamins – structure, functions and deficiency disease of vitamins A, D, K, B_1, B_2, B_6, B_{12} and C.

Unit V

Diseases and treatment II

5.1.1 Cancer – causes, spread and treatment – structure, dosage and effects of chlorambusil, methotreate, plant products and hormones.

5.1.2 Diabetes – control – structure, dosage and uses of barbiturates, hydantoin and succinimides.

5.2 Structure, uses and effects of the following drugs: Analgesics – narcotic analgesics – action, uses and structural activity of morphine. Non-narcotic analgesics – aspirin and paracetamol.

5.3 Anesthetic – general anesthetic – uses and disadvantages of vinyl ether and halothane. Intravenous anesthetics – thiopental sodium – local anesthetics – cocaine and chincocaine

5.4 Anti psychotic drugs – piperazine and benzamides – anti-anxiety drugs – benzodiazepine

5.5 Psychotogenic drugs – marijuana

5.6 Anti depressant drugs – barbiturates – mechanism of action and uses.

5.7 Antibiotics – classification – structure, properties, uses and assay of chloramphenicol, penicillin, streptomycin, erythromycin and tetracycline.

Books Recommended for Reference

1) Practical Biochemistry – David Plummer – 2005, Tata McGraw-Hills Publishing Company.
2) Text Book of Pharmaceutical Chemistry – Jeyashree Gosh – 2003, S.Chand and company, New Delhi
3) Medicinal Chemistry – G.R.Chatwal, 2002, Himalaya Publishing House, New Delhi.
4) Drugs – G.L.D. Krupadanam, D.V.Prasad, K.V.Rao, K.L.N. Reddy and C.Sudhakar
5) HANDBOOK OF BIOMEDICAL INSTRUMENTATION 2ED – R.S.Khandpur, Tata McGraw – Hill Publishing Company, New Delhi.
6) BIOMEDICAL INSTRUMENTATION AND MEASUREMENTS – Leslie Cromewell, F.J.Weilbell, E.A.Pfeiffer, Prentice Hall of India, New Delhi.
7) Principles of Medical Electronics and Biomedical Instrumentation – C.Raja Rao and S.K.Guha, 2005, Orient Longmann

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III YEAR – VI SEMESTER
COURSE CODE: 4BCH6C1

CORE COURSE XIII – ORGANIC CHEMISTRY – III

Unit I

1. **Organic Spectroscopy**

1.1. **Applications of spectroscopy to organic molecules:** Theory and applications of spectroscopic methods – electromagnetic spectrum – UV spectrum – identification of conjucation – calculation of absorption maxima.

1.2. **IR spectra** – functional group detection – finger print region – study of intermolecular and intramolecular hydrogen bondings.

1.3. **NMR spectrum** – TMS – choice of TMS as a better solvent – equivalent and non-equivalent protons – number of signals – chemical shift – peak area and proton counting – splitting of signals – spin-spin coupling – detailed study of NMR spectrum of ethyl alcohol.

1.4. Identification of simple organic compounds by using UV-Visible, IR and NMR spectral datas.

Unit II

2.1 **Tautomerism:** definition – prototropy and anionotropy

2.2 **Detailed study of the following types of tautomerism**

2.2.1. Keto-enol tautomerism

2.2.2. Nitro – aci-nitro tautomerism

2.2.3. Lactam-lactim tautomerism

2.3. **Free radicals:**

2.3.1. Free radicals: definition – preparation and reactions of short-lived and long-lived free radicals – stability of free radicals – factors influencing the stability – role of free radicals in chain reactions.

2.3.2. **Organic photochemistry** – photochemical reactions of olefins, cis-trans isomerisation and dimerisation.

2.4. **Molecular rearrangements**: Detailed study of the following rearrangements: Pinacol-pinacolone, Hofmann, curtius, Benzil-benzilic acid, Claisen, Beckman, Fries and Benzidine rearrangements.

Unit III

3.1. **Heterocyclic compounds containing one heteroatom**: preparation, properties and resonance structures of furan, thiophene. Preparation and resonance structures of pyrrole, pyridine, quinoline and isoquinoline.

3.2. **Heterocyclic compounds containing two heteroatoms**: Preparation and properties of oxazole and pyrazole. Preparation of thiozole and imidazole.

3.3. **Natural products:** definition – occurrence – extraction of alkaloids from plants – classification of alkaloids – General properties – structural elucidation and synthesis of the following alkaloids: Coniine and Piperine.

3.4. **Terpenes:** definition – isoprene rule – isolation – classification – General properties – structural elucidation and synthesis of citral and geraniol.

Unit IV

4.1. **Green Chemistry**

Green Chemistry – Overview, Set of Principles of Green Chemistry, Green synthetic methods, Catalytic methods, Organic synthesis in aqueous media, Ionic liquid, Supercritical fluids and microwave, Solvent free organic reactions, solid phase organicsynthesis.

4.2 **Dyes:** definition – Otto-Witt theory of colour and constitution – bathochromic shift and hypsochromic shift – classification of dyes with examples according to structure and applications. Preparation and uses of following dyes: Methyl orange, malachite green, phenolphthalein, indigo and alizarin

Unit V

5.1. **Chemothrapy** and applications of a few drugs (elementary study)

5.1.1. **Sulpha drugs** – sulphadiazine, prontosil – prontosil-S

5.1.2. **Antimalarials** – quinine, plasmaquine and chloroquine.

5.1.3. **Arsenical drugs** – salvarsan-606 and neo-salvarsan

5.1.4. **Antibiotics**: definition – importance of antibiotics – structure and uses of penicillin, tetracycline (auromycin and terramycin), streptomycin and chloromycetin (structural elucidation not required).

5.2. **Harmones:** definition – classification – origin, structures and functions of testosterone, progesterone, and thyroxine.

5.3 **Vitamins:** Definition – classification of vitamins based on solubility – effect of deficiency of different vitamins – source, structure and uses of vitamin-C.

Text Books

1. "Organic Chemistry", P.L.Soni
2. "Advanced Organic Chemistry", B.S.Bahl and Arun Bahl
3. "Organic Chemistry", R.T.Morrison and R.W.Boyd

Reference Books

1. "Organic Chemistry – Volume I", I.L.Finar
2. "Organic Chemistry – Volume II", I.L.Finar
3. "Reaction Mechanism of Organic Compounds" – Jerry March
4. "Electro organic spectroscopy" – Y. R. Sharma
5. Organic Chemistry – J.Clayden

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III YEAR – VI SEMESTER
COURSE CODE: 4BCH6C2

CORE COURSE XIV – PHYSICAL CHEMISTRY – III

Unit I

1. **Photo chemistry**

1.1. **Definition of photochemical reactions** – comparative study of photochemical and thermal reactions – laws of photochemistry – Grotthus-Draper's law, Lambert-Beer's law and Stark-Einstein's law – quantum yield – definition – examples – Actinometry.

1.2. Consequence of light absorption by atoms and molecules – Jablonsky diagram – fluorescence, phosphorescence, photosensitization, chemiluminescence and Bioluminescence.

1.3. **Kinetic study of photo chemical reactions:** Gaseous reactions: formation of HCl – formation of HBr.

Unit II

2.1. **Metallic and electrolytic conductors -** specific, equivalent and molar conductance – measurement of conductance – variation of conductance with dilution for strong and weak electrolytes (qualitative explanation) – Transport number and its determination by Hittorffs and moving boundary method – ionic mobility and its determination – Kohlrausch's law and its applications.

2.2. **Applications of conductivity measurements:** degree of hydrolysis, solubility product and conductometric titrations.

2.3. **Common ion effect:** Definition – Application of solubility product in qualitative analysis.

2.4. **Definition** – pH and pKa – buffer solutions – theory of buffer action – derivation of Henderson equation – applications of buffer solutions.

Unit III

3. **Electrode potentials and electrochemical cells:**

3.1. **Electrolytic and galvanic cells** – reversible and irreversible cells – conditions for reversible cell.

3.2. **Types of electrodes**: metal-metal ion, metal-insoluble salt, redox, glass electrodes, hydrogen and calomel electrodes.

3.3. **Single electrode potentials** – oxidation and reduction potentials – Definition and calculation

3.4. **Chemical or Voltaic cell**: definition – cell reaction – representation of electrodes and cell – e.m.f of cells – experimental determinations of e.m.f of cells – calculation of ΔG, ΔS, ΔH and K from e.m.f data – derivation of Nernst equation for calculation of e.m.f. – liquid junction potential – salt bridge.

3.5. **Concentration cells**: definition – types of concentration cells – calculation of e.m.f – concentration cell with transference and without transference.

Unit IV

4.1. **Commercial cells**: Standard cells: Weston cadmium cell – Distinction between primary and secondary cells – lead storage battery – fuel cells: hydrogen and oxygen fuel cells.

4.2. **Applications of e.m.f measurements**: determination of valency of ion – determination of transport number – determination of pH using hydrogrn electrode and glass electrode – determination of solubility of sparingly soluble salt – Potentiometric titrations: acid-base, redox and precipitation titrations.

4.3. **Electrolysis and polarization**: over voltage – decomposition potential – hydrogen over voltage – electrolytic separation of metals – corrosion and passivity.

4.4. Polarography – Concentration polarization – limiting current density and diffusion current (definitions) – dropping mercury electrode

Unit V

5. **Phase rule:**

5.1 **Definition** – phase, number of components and number of degrees of freedom – Gibbs phase rule (derivation)

5.2 **One component system**: water system and carbon dioxide system

5.3 **Two component system**: reduced phase rule – simple eutectic systems – Pb-Ag system and KI-H_2O system

5.4 **Systems involving compound formation: C**ongruent and incongruent melting points– Zn-Mg system, $FeCl_3$-H_2O system and Dehydration of $CuSO_4.5H_2O$

5.5 **Distribution law:** Statement – Conditions for the validity of distribution law – thermodynamic derivation – applications of the distribution law.

Text Books

1. "Principles of Physical Chemistry", B.R.Puri and L.R.Sharma
2. "Principles of Physical Chemistry", B.R.Puri, L.R.Sharma and M.S.Pathania
3. "Physical Chemistry", N.Kundu and SN.Jain

Reference Books

1. "Textbook of Physical Chemistry", S.Glasstone
2. "Physical Chemistry", G.M.Barrow
3. "Introduction to Electrochemistry", S.Glasstone
4. "Fundamentals of Photochemistry", K.K.Rohatgi – Mukherjee
5. Physical Chemistry – P.W.Atkins

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III YEAR – VI SEMESTER
COURSE CODE: 4BCH6P2

CORE COURSE XV – ORGANIC ESTIMATION AND ORGANIC ANALYSIS PRACTICAL – V

Max. Marks: 60 **Duration: 6 Hrs.**

I. Organic Estimation

1. Estimation of phenol
2. Estimation of aniline
3. Estimation of glucose

II. Organic Analysis

Substances to be analysed:

1. Aromatic acid (mono carboxylic acid)
2. Aromatic ester (mono functional group)
3. Aromatic aldehyde
4. Aromatic ketone
5. Phenol
6. Carbohydrate (Glucose only)
7. Aliphatic amide (urea)
8. Aromatic amide
9. Aromatic amine (Aniline)
10. Aromatic nitro compound

Distribution of External marks

1. Record		10 marks
2. Organic estimation		25 marks
a. Procedure	5 marks	
b. Experiment	20 marks	
3. Organic analysis		25 marks
		60 marks

Organic Estimation

Less than 2% error	–	20 marks
2 – 3 % error	–	15marks
3 – 4 % error	–	10 marks
>4 % error	–	8 marks

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III YEAR – VI SEMESTER
COURSE CODE: 4BCHE3A

ELECTIVE COURSE III (A) – POLYMER CHEMISTRY

Unit I

1.1 Introduction: Monomer – Polymer – Functionality of monomers and its significance – Natural and Synthetic polymers – classification of polymers – tactic, isotactic and atactic polymers – addition and condensation polymers.

1.2 General methods of preparation of polymers – stepwise polymerization – chain growth polymerization and polymerization through ring opening – Polymerisation techniques: Bulk, solution, suspension and emulsion polymerization – degree of polymerization.

1.3 Mechanism: Free-radical, cationic and anionic polymerization reactions

Unit II

2.1 Polymer structure: Linear, branched and cross-linked polymers with suitable examples – comparison of their properties.

2.2 Properties of polymers: The glassy state and the glass transition temperature – thermal analysis of polymers – polymer degradation: Thermal, mechanical, unsaturated oxidative and hydrolytic degradation.

2.3 Molecular weight of polymers: Number average molecular weight and weight average molecular weight.

Unit III

3.1 Copolymerisation: Definitions : homo polymer and copolymer – Block and Graft copolymers

3.2 Kinetics of polymerization: Free-radical polymerization – cationic polymerization. Degree of polymerisaton – Inhibition.

3.3 Synthesis of reactants and intermediates: Adipic acid, sebacic acid, hexamethylene diamine, caprolactum, vinyl acetate, acrylonitrile and methyl methacrylate.

Unit IV

4.1 Polyolefins: Preparation and uses of polyethylene, PTFE, PVC, PVA, polypropylene and polystyrene.

4.2 Rubber: Natural and synthetic rubbers – isoprene rule – preparation and uses of Butyl, Buna, Buna-S, Buna-N, Neoprene, Thiocol, Polyurethane and Silicone rubbers – Compounding of rubber – reclaim rubber, spongy rubber and foam rubber.

Unit V

5.1 Plastics and Resins: Definition: Thermoplastics and thermosetting plastics – constituents of plastics – fillers, dye pigments, plasticizers, lubricants and stabilisers.

5.2.1 Important thermoplastic resins: cellulose derivatives – cellulose acetate and cellulose nitrate.

5.2.2 Important thermosetting resins: phenolic resins, amine resins, epoxy resins and silicone resins.

5.3 Textile Fibres: Definition: Fibres: fibre polyamides: preparation and uses of Nylon 6 and Nylon 66 – polyesters: preparation and uses of terylene and Viscose rayon.

5.4 Biodegradable polymers – advantages of biodegradable polymers – polyglycolic acid, polylactic acid and polybutyrate.

References

1) V.R.Gowarikar, N.V.Viswanathan, Polymerscience, Wiley Eastern Limited, New Delhi 1986.
2) F.W.Billmeyer, A Text book of Polymer Chemistry, John wiley & sons, Singapore, 1994.
3) R.B.Seymour, Introduction to Polymer Chemistry, Mc Graw Hill, New York, 1971.
4) A.Ravve, Organic chemistry of macromolecules, Marcel Dekker, New York 1967.

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III YEAR – VI SEMESTER
COURSE CODE: 4BCHE3B

ELECTIVE COURSE III (B) – MATERIAL CHEMISTRY & NANO SCIENCE

Unit I

Ionic Conductivity and Solid Electrolytes

Types of ionic crystals – alkali halides – silver chloride – alkali earth fluorides – simple stoichiometric oxides.

Types of Ionic conductors – halide ion conductors – oxide ion conductors – solid electrolytes and its applications.

Electrochemical cell: Principle, batteries sensors and fuel cells. Crystal defects in solids: Line and plane defects – point defects – Schottky and Frenkel defects – electronic properties and band theory: metals, semiconductors. Inorganic solids, colour, magnetic properties, optical properties, luminescence and lasers.

Unit II

Alloys and its Importance

Definition: Alloys – purpose of making alloys – composition and uses of alloys of iron, copper, aluminium, lead, nickel and titanium.

Ferrous alloys: Fe-C phase transformation in ferrous alloys – carbon and ferrous alloys – Properties and uses of various types of carbon steels – stainless steel.

Non-ferrous alloys: Properties and applications.

Unit III

Glass, Ceramics and Composites

Glassy state, glass formers and glass modifiers and their applications.

Ceramic structure – mechanical properties – clay products – refractories – characterisation – properties and applications.

Microscopic composites, dispersion – strengthened and particle reinforced, fibre reinforced composites, macroscopic composites. Nano-crystalline phase: Preparation, properties and applications.

Unit IV

Synthetic Organic Metals

Conducting organics, organic super conductors, magnetism in organic materials. Electrically conducting organic solids – organic metals – Preparation and applications of conjugated polymers: Doped polyacetylene, polyparaphenylene, polyaniline and polypyrrole.

Blends and composites of polymer materials – Organic charge-transfer complexes and new superconductors: Fullerenes – doped fullerenes as superconductors – Nanocarbon and its applications

Unit V

Nanomaterials – Synthesis and Characterisation

Preparative method for nanoparticles: Sol-gel thermolysis, combustion method, solvothermal method and microemulsion method

Thinfilm deposition techniques: Physical methods – vaccum evaporation, sputtering, Pulse laser deposition, chemical methods, CVD, chemical solution deposition, electrochemical deposition, spray pyrolysis deposition.

Materials characterization Techniques: Physical characterization techniques: XRD, XPS, Laser Raman spectroscopy. Microscopic techniques: SEM, AFM and TEM.

References

1) Solid state chemistry and its application; Anthony.R. West, John Wiley & Sons (1989)
2) Materials Science; R.S.Khurmi and R.S.Sedha, S.Chand & Company Ltd (2000)
3) Materials Science and Engineering, V.Raghavan, Prentice – Hall of India Pvt. Ltd., (2001)
4) K.I.Chopra and I.Kaur, Thin film Devices and Their Applications, Plenum Press, New York, 1983.
5) J.P.Sibilia, A Guide to Materials Characterisation, VCH Publishers Inc., New York 1998.

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III YEAR – VI SEMESTER
COURSE CODE: 4BCHEPR

ELELCTIVE COURSE III (C) – PROJECT

Dissertation report presentation	–	80 marks
Viva-Voce	–	20 marks

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