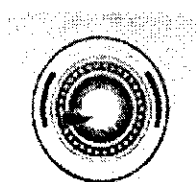


RANCHI WOMEN'S COLLEGE,
RANCHI
(Autonomous College)



Constituent Unit
of
Ranchi University, Ranchi
Undergraduate Syllabus
for
Chemistry Honours & Subsidiary
2013

S. Sivasava
7.10.15

RANCHI WOMEN'S COLLEGE, RANCHI.

A CONSTITUENT AUTONOMOUS COLLEGE OF RANCHI UNIVERSITY

COURSES OF STUDY FOR CHEMISTRY HONOURS

“DEPARTMENT OF CHEMISTRY”

NUMBER OF PAPERS: 20

(14 THEORY PAPERS & 6 PRACTICAL PAPERS)

Full MARKS: 1600

THEORY:1200, PRACTICAL: 400

NUMBER OF SEMESTERS: 6

B.Sc Hons. Part I:400 Marks (Theory:300, Pratical:100)

B.Sc Hons. Part II:400 Marks (Theory:300, Pratical:100)

B.Sc Hons. Part III:800 Marks (Theory:600, Pratical:200)

Department of Chemistry
Meeting of Board of Studies

12.08.2013

A meeting of Board of Studies of chemistry held in the Department of Chemistry, Ranchi Women's College on 12th August at 12.30 p.m. Members present ;

1. Chairperson-- Dr Savita Srivastava, HOD, Dept of Chemistry, RWC, Ranchi *S. Srivastava*
2. University Nominee—Prof Dr Sanjay Mishra PG Dept of Chemistry, RU *Sanjay Mishra*
3. Expert-Prof Dr G.D. Mishra Retd HOD, PG Dept of Chemistry, Ranchi *G.D. Mishra*
4. Expert- Dr Tapan Bhattacharya, Ranchi College *Tapan Bhattacharya*
5. Faculty Members—Dr Sudha Upadhyaya, RWC *Sudha Upadhyaya*
6. Faculty Member---Dr Kiran Mehra, RWC *Kiran Mehra*
7. Faculty Member—Dr Mary Lily Kujur, RWC *Mary Lily Kujur*
8. Faculty Member--- Dr Renuka Thakur, RWC *Renuka Thakur*
9. Faculty Member--- Dr Neeta Sinha, RWC *Neeta Sinha*
10. Faculty Member—Dr Smriti Singh, RWC *Smriti Singh*
11. Faculty Member—Dr Reena Bhadani, RWC *Reena Bhadani*
12. Faculty Member- Dr Neelam, RWC *Neelam*
13. Faculty Member—Dr Shobhna Sharan, RWC *Shobhna Sharan*
14. Faculty Member—Dr Namrata Sinha, RWC *Namrata Sinha*

Agenda of Meeting:

1. To review the syllabus formulated in 2012 and if required to make any changes.

Resolution

It was decided unanimously that the syllabus be retained as formulated, with no changes in PG and UG

DISTRIBUTION OF MARKS IN CHEMISTRY HONS.													
ACADEMIC YEAR	SEMESTER	THEORY PEPER	FULL MARKS				TOTAL	PASS MARKS	DURATION	PRATICAL PAPER	FULL MARKS	PASS MARKS	DURATION
			MSE		ESE								
			FM	PM	FM	PM							
FIRST YEAR	I	1	15	10	60	24	75	34	3 hrs		50	23	4 hrs
		2	15	10	60	24	75	34	3 hrs				
	II	3	15	10	60	24	75	34	3 hrs		50	23	4 hrs
		4	15	10	60	24	75	34	3 hrs				

DISTRIBUTION OF MARKS IN CHEMISTRY HONS.													
ACADEMIC YEAR	SEMESTER	THEORY PEPER	FULL MARKS				TOTAL	PASS MARKS	DURATION	PRATICAL PAPER	FULL MARKS	PASS MARKS	DURATION
			MSE		ESE								
			FM	PM	FM	PM							
SECOND YEAR	III	5	15	10	60	24	75	34	3 hrs		50	23	4 hrs
		6	15	10	60	24	75	34	3 hrs				
	IV	7	15	10	60	24	75	34	3 hrs		50	23	4 hrs
		8	15	10	60	24	75	34	3 hrs				

DISTRIBUTION OF MARKS IN CHEMISTRY HONS.													
ACADEMIC YEAR	SEMESTER	THEORY PEPER	FULL MARKS				TOTAL	PASS MARKS	DURATION	PRATICAL PAPER	FULL MARKS	PASS MARKS	DURATION
			MSE		ESE								
			FM	PM	FM	PM							
THIRD YEAR	V	9	20	13	80	32	100	45	3 hrs	12	100	45	6 hrs
		10	20	13	80	32	100	45	3 hrs				
		11	20	13	80	32	100	45	3 hrs				
	VI	13	20	13	80	32	100	45	3 hrs	16	100	45	6 hrs
		14	20	13	80	32	100	45	3 hrs				
		15	20	13	80	32	100	45	3 hrs				

In every group paper a group for objective questions should be added

B.Sc. PART-I, CHEMISTRY HONS.

W. Khosla
21/8/12

SEMESTER-I

Paper: I, Physical & Inorganic(54 Lectures)

FULL MARKS: 15(MSE)+60(ESE)=75

TIME: 3 HRS.

PASS MARKS:34

Questions will be set in two groups-A & B

Group A: Out of three, any two to be answered, i.e., $2 \times 10 = 20$

Group B: Out of six any four two to be answered, i.e., $4 \times 10 = 40$

GROUP-A (PHYSICAL)

1) GASEOUS STATES [12 hrs.]

Postulates of kinetic theory of gases, deviation from ideal behaviour, van der waals equation of state. Critical phenomena. PV isotherms of real gases, continuity of states, the isotherm of van der waals equation, relationship between critical constant and van der waals constant, the law of corresponding states, reduced equation of states. Molecular velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect).

LIQUID STATE [8 hrs.]

Intermolecular forces, structure of liquids – a qualitative description. Structural differences between solids, liquid crystals: difference between liquid crystal, solid and liquid, Classification, structure of nematic and cholesteric phases, Thermography and Sever segment cell. Swan theory.

Shukla
21/8/12
R. Khosla
21/8/12
R. Khosla
21/8/12
R. Khosla
21/8/12

G. M.
21.8.12

Sharma
21.8.12

Aditya
21.8.12

N. Khosla
21/8/12

S. Phani
21.8.12

GROUP – B (INORGANIC)

1) ATOMIC STRUCTURE [10 hrs.]

Black body radiation, Plank's radiation, Photoelectric effect, Heat capacity of solids, Compton effect, De-broglie hypothesis, Heisenberg's uncertainty principle, Postulates of quantum mechanic, Schrodinger wave equation-time dependent and time independent equations normalization orthogonality. Effective nuclear charge, Significance of 0 and 0^2 , Quantum numbers, Radial and Angular wave functions, probability distribution curves, shapes of s, p, and d, orbital's, Aufbau and Pauli's exclusion principles, Hund's multiplicity rule.

2) PERIODIC PROPERTIES [6 hrs.]

Atomic and ionic radii, ionization energy, electron affinity and electro negativity definition, methods of determination or evolution, trends in periodic table and applications in predicting and explaining the chemical behavior.

3) CHEMICAL BONDING [10 hrs.]

Covalent bond valence bond theory and its limitation directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions, Valence shell electron pair repulsion (VSEPR) theory with reference to XeF_2 , XeF_4 , XeOF_4 , PO_4^{3-} , ClO_4^- , etc. NH_3 , H_3O^+ , SF_4 , ClF_3 and H_2O molecules Molecular Orbital (MO) theory homonuclear and heteronuclear, (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electro negative difference.

4) STRUCTURAL ASPECTS OF SOLIDS [8 hrs.]

Types of solids, properties of Ionic solids, Ionic Solids-Ionic structure, Radius ratio effect and Coordination number, limitation of radius ratio rule, Lattice defects (stoichiometric and non stoichiometric). Semiconductors, Lattice Energy and Born Haber cycle, Solvation energy and solubility of ionic solids Polarizing power and Polarizability of ions, Fajan's energy and solubility of ionic solids Polarizing power and Polarizability of ions, Fajan's rule Metallic bond free electron, valence bond and band theories. Weak interactions Hydrogen, Van-der Waal's forces.

Handwritten signatures and dates at the bottom of the page:

- Shubh 21/8/12
- R. D. Mahur 21/8/12
- R. Shadani 21/8/12
- G. M. 21/8/12
- Shubh 21/8/12
- Neelam 21/8/12
- Shubh 21/8/12
- S. Shadani 21/8/12

Books Recommended:

1. Physical Chemistry by E. Glass-Stone.
2. Physical Chemistry by P.C. Rokshit.
3. Physical Chemistry by Sharma, Puri and Pathania
4. Advanced Physical Chemistry by D.N. Bajpai
5. Advanced Inorganic Chemistry by Cotton & Will Kingson
6. Concepts in Inorganic Chemistry by Madan, Malik & Tuli
7. Inorganic Chemistry by Sharma, Puri, Kalia
8. Inorganic Chemistry Vol. I, II & III by Ravi Prasad & Sons

SEMESTER-I**Paper: 2, Physical & Organic (54 Lectures)**

Question will be set in two groups-A & B.

Group A: Out of three, any two to be answered.

2*10=20

Group B: Out of six, any four two to be answered.

4*10=40

Full Marks: 15(MSE)+60(ESE)=75

Time: 3 Hrs.

PASS Marks:34

GROUP-A (PHYSICAL)**1. SOLID STATE [8 hrs.]**

Definition of space lattice, unit cell.

Laws of crystallography- (1) Law of constancy of interfacial angles.

(2) Law of rationality of indices.

(3) Law of symmetry.

Symmetry element in crystals. X-Ray diffraction by crystals. Derivation of Bragg's equation, determination of crystal structure of NaCl, KCl and CsCl (Laue's method and Powder method).

Sharma
21/8/12
R. Shukla
21/8/12

P. Bhadani
21/8/12

G. Sharma
21/8/12

G. Sharma
21/8/12
Sharma
21.8.12
S. Sharma
21.8.12

Sharma
21/8/12

4

GROUP-B (ORGANIC)

Hybridisation, bond lengths and bond angles, bond energy, localized and delocalized chemical bonds. Van der Waal's interactions, inclusion compounds, elatherates. Charge transfer complexes, resonance, hyper conjugation, aromaticity, hydrogen bodings.

Curved arrow notation drawing electron movements with arrows, half headed and double headed arrows, homolytic and heterolytic bond breaking, types of reagents, electrophiles, types of organic reactions, energy considerations, reactive intermediates, carbocations, carbanions, free radicals, carbenes, arynes and other ionic species. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereo chemical studies).

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reaction of alkyl halides. SN1 and SN2 reaction with energy profile diagrams. Poly halogen compounds, chloroform,

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R. B. Shedd. 21.8.12

21/12/12

G. Mosh
21/8/12
Nishi
21.8.12

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21.8.20

5

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes, isomerism in alkanes sources, methods of formation of alkanes (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes orientation reactivity and selectivity, cycloalkanes-nomenclature methods of formation chemical reactions, Bayer's strain theory and its limitations, Ring strain in small rings(cyclopropane and cyclobutane), theory of strainless strings. The case of cyclopropane ring banana bonds.

1. Physical Chemistry by E. Glass-Stone.
2. Physical Chemistry by P.C. Rokshit.
3. Physical Chemistry by Sharma, Puri and Pathania.
4. Advanced Physical Chemistry by D.N. Bajpai.
5. Advanced organic Chemistry by S. Chand & Co.
6. Organic Chemistry Vol-I by I.L. Finar, ELBS.
7. Organic Chemistry Vol-II by I.L. Finar, ELBS.
8. Advanced Concepts in Organic Chemistry by Morrison and Boyd, TMH.
9. Organic Reaction Mechanism by Peter Syes.
10. Organic reaction by O.P. Agrawal & Reagents.

7

SEMESTER-I

Paper – Practical

Full Marks :50

Time : 4 Hrs.

Pass Marks : 23

(INORGANIC)

(1) Semi micro qualitative inorganic Analysis of Salt Mixtures containing THREE Basic Radicals and THREE Acid Radicals, including Interfering Radicals.

BASIC RADICALS

Ag^+ , Pb^{2+} , Cu^{2+} , Sb^{2+} , Fe^{2+} , Fe^{3+} , Cr^{3+} , Co^{3+} , Ni^{2+} , Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+} , Na^+ , K^+ , Mg^{2+} , NH_4^+

ACID RADICALS:

CO_3^{2-} , SO_3^{2-} , SO_4^{2-} , S^{2-} , NO_2^- , NO_3^- , Cr , Br , I

INTERFERING RADICALS : Phosphate, Borate

(PHYSICAL)

(2) Kinetics:

- (a) To determine the specific reaction rate of the hydrolysis of ethyl acetate catalyzed by H^+ ion at room temp.
- (b) Kinetics of Saponification of ester- Titrimetry.

SEMESTER-II

Paper: 3 Physical & Inorganic (54 Lectures)

Full Marks: 15(MSE)+60(ESE)=75

Time: 3 Hrs.

PASS Marks:34

Question will be set in two groups-A & B.

Group A: Out of three, any two to be answered.

2*10=20

Group B: Out of six, any four to be answered.

4*10=40

Shirky
21/8/12
R. N. M. Khan
21/8/12

R. Bhadani
21/8/12
21.8.12

21/8/12

21/8
G. M.
21/8/12

21/8/12

Aditya
21.8.12
S. Sharma
21.8.12

GROUP-A (PHYSICAL)

1. THERMODYNAMICS-I [14 hrs.]

Definition of thermodynamics terms- system, surroundings etc, types of systems, intensive & extensive properties. States And path functions and their differentials, thermodynamic processes, constant of heat and work. First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacities at constant volume and pressure and their relationship. Joule's law, Joule-Thomson coefficient and inversion temperature. Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversal process.

2. THERMOCHEMISTRY [10 hrs.]

Standard state, standard enthalpy of formation-Hess's law of heat summation and its application. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo chemical data, temperature dependence of enthalpy. Kirchhoff's equation.

GROUP-B (INORGANIC)

1. ACIDS AND BASES [6 hrs.]

Arrhenius theory, Bronsted-Lowry theory, Lux flood and solvent system concept, relative strength of acids and bases.

2.S-BLOCK ELEMENTS [6 hrs.]

Comparative study, diagonal relationships, salient features of hydrides, salivation and complexation tendencies including their function in biosystems and alkals and aryls

3.P-BLOCK ELEMENTS [12 hrs.]

Hard & Soft Acid Base pair theory, Insert pair effect Compounds like hydrides, Oxides, Oxyacids and halides of groups 13-16. Hydrides of boron diborane and higher

Adil
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R. J. Khatiw
21/8/12

R. B. Shadai
21/8/12

Adil
21/8/12

G. M. M.
21/8/12

Adil
21.8.12

S. Shama
21.8.2012

Adil
21/8/12

boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, Silicates (Structural principle), Tetrasulphur, tetra nitride, basic properties of halogens, interhalogens, and polyhalides.

4. CHEMISTRY OF NOBLE GASES [6 hrs.]

Compounds of noble gases, Chemistry of xenon, structure and bonding in xenon compounds.

Books Recommended:

1. Physical Chemistry by E. Glass-Stone.
2. Physical Chemistry by P.C. Rokshit.
3. Physical Chemistry by Sharma, Puri and Pathania.
4. Advanced Physical Chemistry by D.N. Bajpai.
5. Advanced Inorganic Chemistry by Cotton & Will Kingdon.
6. Concepts in Inorganic Chemistry by Madan, Malik & Tuli.
7. Inorganic Chemistry by Sharma, Puri, Kalia.
8. Inorganic Chemistry Vol. I, II & III by Ravi Prasad & Sons.

SEMESTER-II

Paper: 4 Physical & Organic (54 Lectures)

Full Marks: 15(MSE)+60(ESE)=75

Time: 3 Hrs.

PASS Marks:34

Instructions to Paper-setter & Examinee

Question will be set in two groups-A & B.

Group A: Out of three, any two to be answered.

2*10=20

Group B: Out of six, any four to be answered.

4*10=40

Handwritten signatures and dates:
R. J. Kulkarni 21/8/12
R. B. Shinde 21/8/12
G. M. 21/8/12
S. P. 21/8/12
N. S. 21/8/12
V. S. 21/8/12
S. P. 21/8/12
N. S. 21/8/12
V. S. 21/8/12
S. P. 21/8/12
N. S. 21/8/12
V. S. 21/8/12

GROUP-A (PHYSICAL)

1. COLLOIDAL STATE [8 hrs.]

Definition of colloids, classification of colloids, solids in liquids(sols.): properties-kinetics, optical and electrical, stability of colloids, protective action, Hardy-Schulze law, gold number. Liquids in liquids(emulsions): types of emulsions, preparation, emulsifier. Liquids in solids(gels): classification, preparation and properties, inhibition, general application of colloids.

2. THERMODYNAMICS-II [12 hrs.]

Second law of thermodynamics, need for the law, different statement of the law. Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature, concept of entropy, entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, clausius inequality, entropy as a criteria of spontaneity and equilibrium, entropy change in ideal gases and mixing of gases.

Third law of thermodynamics, Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy, from heat capacity data, Gibbs and Helmholtz function. Gibbs function(G) and Helmholtz(A) as thermodynamic quantities. A&G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change, variation of G and A with P, V and T.

GROUP-B (ORGANIC)

1. ALKENES, CYCLOALKENES, DIENES AND ALKYNES [12 hrs.]

Nomenclature of alkenes, method of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule, Hoffmann elimination, physical properties and relative stabilities of alkenes, chemical reaction of alkenes- mechanism involved in hydrogenation. Electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 , polymerization of alkenes, substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene. Methods of formation, conformation and chemical reactions of

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R. B. Shinde
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R. J. Naker
21/8/12

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Adisha
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21/8/12
S. Shinde
21.8.2012

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N. C. Chaudhary
21/8/12

cycloalkanes, nomenclature and classification of dienes: isolated conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization, chemical reactions 1:2 and 1:4 additions. Diels-Alder reaction. Nomenclature, structure and bonding in alkynes, methods of formation, chemical reactions of alkynes, acidity of alkynes, mechanism of electrophilic addition reaction, hydrocarboxylation, metal-ammonia reduction, oxidation and polymerization reactions.

2. ARENES AND AROMATICITY [10 hrs.]

Nomenclature of Benzene derivatives, aryl group, aromatic nucleus and side chain, structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure and molecular picture. Aromaticity: the Huckel rule, aromatic ions, mechanisms of nitration, halogenations, sulphonation, mercuration and Fridel-Craft reaction, energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reaction of benzene derivatives. Birch reaction. Method of formation and chemical reaction of alkyl benzenes.

3. STEREO CHEMISTRY OF ORGANIC COMPOUNDS [8 hrs.]

Concept of isomerism, type of isomerism, optical isomerism, elements of symmetry, molecular chirality, enantiomers, meso compounds, resolution of enantiomer, inversion, retention and racemisation. Relative and absolute configuration, sequences rule D & L and R & S System of nomenclature, geometric isomerism in oximes and alicyclic compounds conformation isomerism, conformation analysis of ethane and n-butane, conformation of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives, Newman projection and Sawhorse formula, Fischer and flying wedge formula, difference between configuration and conformation.

Books Recommended:

1. Physical chemistry by E. Gass - Stome.
2. Physical chemistry by p. c. Rokshit.
3. Physical chemistry by Sharma, Puri, and Pathania.
4. Advanced Physical chemistry by D. N. Bajpai.

Sharma
21/8/12
R. Bhadani
21/8/12

R. Bhadani
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21/8/12

G. Puri
21/8/12
Sharma
21/8/12
N. Saha
21/8/12
S. Sharma
21/8/12

5. Advanced Physical chemistry by S. Chand and Co.
6. Organic chemistry vol-I by L. L. Finer, ELBS.
7. Organic chemistry vol-II by L. L. Finer, ELBS.
8. Advanced concept in organic chemistry by Morrison and Boyd, TMH.
9. Organic reaction mechanism by Peter Sykes.
10. Organic reaction by O. P. Agrawal & Reagents.

SEMESTER II

Paper Practical

FULL MARKS : 50	TIME : 4HRS	PASS MARKS : 23
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(ORGANIC)

1. Determination of melting point of organic compounds.
2. Determination of boiling point of organic compounds.
3. Crystallization of organic compounds using boiling water, ethanol as solvents.
4. Detection of elements N, S & halogens.
5. Detection of functional groups, phenol(OH), carboxylic(-COOH), Keto(>C=O). Immiscible liquids. Steam distillation, (NH₂), Amide(-CONH₂), nitro(-NO₂) groups and carbohydrates.

(PHYSICAL)

1. To determine the heat capacity of calorimeter.
2. To determine the enthalpy of neutralization of weak acid/weak base versus strong base/strong acid.
3. Determine the enthalpy of ionization of the weak acid weak base.
4. To determine the integral enthalpy of solution ammonium chloride.
5. Kinetics of reaction between sodium tetrathionate and hydrochloric acid by initial rate method.
 - a. The order of reaction in S₂O₃²⁻ ion.
 - b. The order of reaction in H⁺ ions at low concentration range.

Sharma
21/5/12
A. Bhandari
21/8/12

R. Mahan
21/8/12

Sharma
21.8.12

Sharma
21/8/12

Adika
21.8.12
S. Phane
21.8.12

Sharma
21/8/12

Sharma
21/8/12
13

B.Sc. PART-II, CHEMISTRY HONS.

SEMESTER-III

Paper: 5 Physical & Inorganic (54 lectures)

Question will be set in two groups- A & B

Group A: Out of three, any two will be answered.

Group B: Out of six any four will be answered.

FULL MARKS: 15(MES)+60(ESE)=75

TIME: 3HRS

PASS MARKS: 34

GROUP- A (PHYSICAL)

1. CHEMICAL EQUILIBRIUM [8 hrs.]

Equilibrium constant and free energy.

Thermodynamic derivation of law of mass action.

Le-chatelier's principle. Reaction isotherm and reaction isochore.

Clapeyron equation and Clausius-Clapeyron equation, application.

2. PHASE EQUILIBRIUM-I [12 hrs.]

Statement and meaning of the term-phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component-water, CO₂ and S System.

Phase equilibria of two component system, solid-liquid equilibria.

Simple eutectic-Bi-Cd, Pb-Ag system. Desilverisation of lead.

Solid solution. Component formation with congruent melting point (Mg-Zn) and incongruent melting point (NaCl-H₂O), (FeCl₃-H₂O) and CuSO₄-H₂O system.

Freezing mixtures. Acetone- dry ice.

Shah
21/8/12

R. Bhandari
21/8/12

P. K. Jha
21/8/12

Var
21.8.12

G. M.
21/8/12

Chandra
21/8/12

Aditya
21.8.12

S. Phani
21.8.2012

Sharma
21.8.12

Neelam
21/8/12

GROUP – B (INORGANIC)

1. CHEMISTRY OF ELEMENTS OF FIRST TRANSITION SERIES. [12 hrs.]

Characteristics of properties of d- block elements. Physical chemical properties atomic/ ionic radii metallic character, atomic volume, mp, bp, ionization energy, Reduction potential oxidation states, color, magnetic properties, interstitial compounds, alloy formation, catalytic activity.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

2. CHEMISTRY OF ELEMENTS OF SECOND AND THIRD TRANSITION SERIES. [10 hrs.]

General characteristics, comparative treatment with their analogues in respects of their ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.

3. COORDINATION COMPOUND [12 hrs.]

Nomenclature of coordination compounds. Including polynuclear complexes.

THEORIES OF BONDING IN COMPLEXES

- Werner's theory and its experimental verification
- Effective atomic number concept (Sidgwick's theory) – predication of unpaired electrons.
- Valence bond theory of transition metal complexes inner and outer orbital octahedral complexes and square planar complexes.

ISOMERISM IN COMPLEXES.

Valence bond theory of transition metal complexes.

- Structural Isomerism including Ionization, ~~Legand~~ Hydrate, Coordination position, Polymerization & Valence Isomerism.
- Stereo Isomerism : Geometrical isomerism of four and six coordinate complexes. Optical isomerism in complexes having co-ordination no. four & six.

R. B. Shadon
21/8/12

R. J. Lakshmi
21/8/12

Aditya
21/8/12

Aditya
21.8.12

P. Sharan
21.8.12

Aditya
21.8.12

Aditya
21/8/12

Aditya
21/8/12

Books Recommended:

1. Physical Chemistry by E. Glass-Stone.
2. Physical Chemistry by P.C. Rokshit.
3. Physical Chemistry by Sharma, Puri and Pathania.
4. Advanced Physical Chemistry by D.N. Bajpai.
5. Advanced Inorganic Chemistry by Cotton & Will Kingson.
6. Concepts in Inorganic Chemistry by Madan, Malik & Tuli.
7. Inorganic Chemistry by Sharma, Puri, Kalia.
8. Inorganic Chemistry - Vol. I, II & III by Ravi Prasad & Sons.

SEMESTER-III

Paper: 6, Physical & Organic (54 Lectures)

Question will be set in two groups-A & B.

Group A: Out of three, any two to be answered.

$$2 * 10 = 20$$

Group B: Out of six, any four two to be answered.

$$4 * 10 = 40$$

Full Marks: 15(MSE)+60(ESE)=75

Time: 3 Hrs.

PASS Marks:34

GROUP-A (PHYSICAL)

1. ELECTROCHEMISTRY-I

Electrical transport-conduction in Metals and in electrolyte solutions, specific conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions and Kohlrousch law. Arrhenius theory of electrolyte dissociation and its limitations.

Weak and strong electrolytes. Ostwald's dilution law, its use and limitations. Debye-Huckel Onsager's equation for strong electrolytes (elementary treatment only).

Transport number-definition and determination by Hittorf's method and moving boundary method.

Application of conductivity measurement: determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt. Conductometric titrations.

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2. SURFACE CHEMISTRY [5 hrs.]

Adsorption, difference between adsorption and absorption, free energy, isotherms-Freundlich and Langmuir adsorption isotherms. Quantitative treatment of B.E.T isotherms and its applications to surface area measurement.

GROUP-B (ORGANIC)

1. ALDEHYDES AND KETONES [12 hrs.]

Nomenclature of aldehydes and ketones, structure of carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of the aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and carboxylic acids. Physical properties of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular emphasis to Benzoin, Aldol, Perkin and Knoevenagel condensations, condensation with ammonia and its derivatives, Wittig reaction, Mannich reaction.

Use of acetyl as protecting group. Oxidation of aldehydes, Baeyer-Vigillier oxidation of ketones, Cannizzaro reaction, Meerwein Ponderf Valerey, Clemmensen, Wolf-Kishner reduction, reductions with LiAlH_4 and NaBH_4 halogenation of enolizable ketones.

An introduction to unsaturated aldehydes and ketones.

2. ALCOHOLS [10 hrs.]

Classification of nomenclature, Monohydric alcohols-methods of formation by reduction of Aldehydes, Ketones, carboxylic acids and esters. Hydrogen bonding in alcohols, acidic nature. Reaction of alcohols.

Dihydric alcohols-nomenclature, methods of formation chemical reactions of vicinal glycols, oxidative cleavage [with $\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol pinacolone rearrangement. Trihydric alcohols-methods of formation, chemical reactions of glycerol.

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3. PHENOLS [10 hrs.]

Nomenclature structure and bonding Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of peroxide ion. Reactions of phenols-electrophilic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement Gatterman synthesis, Hauben-Hoesch reaction, Leaderer-manasse reaction and Reimer-Tiemann reaction.

4. ETHERS AND EPOXIDES [10 hrs.]

Nomenclature of ethers and methods of their formation. Physical properties. Chemical reactions-cleavage and out oxidation. Diesels' method. Synthesis of epoxies. Acid and base catalyzed reactions ring opening reactions of epoxides, orientation of epoxidizing opening, reaction with Grignard reagents and organolithium compounds. Reactions with epoxies.

Books Recommended:

1. Physical Chemistry by E. Glass-Stone.
2. Physical Chemistry by P.C. Rokshit.
3. Physical Chemistry by Sharma, Puri and Pathania.
4. Advanced Physical Chemistry by D.N. Bajpai.
5. Advanced organic Chemistry by S. Chand & Co.
6. Organic Chemistry Vol-I by I.L. Finar, ELBS.
7. Organic Chemistry Vol-II by I.L. Finar, ELBS.
8. Advanced Concepts in Organic Chemistry by Morrison and Boyd, TMH.
9. Organic Reaction Mechanism by Peter Sykes.

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SEMESTER-III**Paper Practical
(PHYSICAL)****Full Marks :50****Time : 4 Hrs.****Pass Marks : 23****VISCOSITY & SURFACE TENSION**

1. To determine the coefficient of viscosity of a given liquid or (non interacting system) liquid solution.
2. To determine the surface tension of a given liquid or liquid solution.

(INORGANIC)

- a. Determination of acetic acid in commercial vinegar using NaOH.
- b. Determination of alkali content-antacid tablet using HCl.
- c. Estimation of hardness of water by EDTA.
- d. Estimation of calcium content in chalk as calcium oxalate by permanganometry.

B.Sc. PART-II, CHEMISTRY HONS.

SEMESTER-IV

Paper: 7, Physical & Inorganic(54 Lectures)

Full Marks: 15(MSE)+60(ESE)=75

Time: 3 Hrs.

PASS Marks:34

Questions will be set in two groups-A & B

Group A: Out of three, any two to be answered, i.e. ,

2*10=20

Group B: Out of six any four two to be answeres, i.e. ,

4*10=40

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GROUP-A (PHYSICAL)

1. PHASE EQUILIBRIUM-II [8 hrs.]

Liquid-liquid mixture, ideal liquid mixture, Raoult's law and Henry's law. Non-ideal system. Azeotropes. $\text{HCl-H}_2\text{O}$ and ~~ethanol~~ water systems. Partially miscible liquids, phenol water, trimethylamine-water, nicotine water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature. Immiscible liquids, steam distillation, Nernst distribution law-thermodynamic derivation application.

2. PHYSICAL PROPERTIES AND MOLECULAR STRUCTURE [6 hrs.]

~~Parachore~~, refractive index and molecular refractivity, dipole moment, magnetic properties and magnetic susceptibility. Additive & consecutive properties and their uses in elucidation of molecular structure

GROUP-B (INORGANIC)

1. ANALYTICAL CHEMISTRY [7 hrs.]

Principle involved in the separation of cations. Application of and solubility product. Common ion effect. Detection and removal of interfering radicals, principles involved in the redox titration. Uses of KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$ iodometry and iodimetry.

2. CHEMISTRY OF LANTHANIDE ELEMENTS [6 hrs.]

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. Magnetic properties and colour.

3. CHEMISTRY OF ACTINIDES [6 hrs.]

General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U similarities between the latter actinides and the latter lanthanides.

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4. NUCLEAR CHEMISTRY & ISOTOPES [6 hrs.]

Nuclear stability, mass defect, packing fraction, nuclear binding energy, nuclear shell model. Half life, radio active series and radio active equilibrium. Detection, separation and applications of isotopes.

5. NON-AQUEOUS SOLVENTS [6 hrs.]

Physical properties of a solvent, types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid ammonia and liquid sulphur.

Books Recommended:

1. Physical Chemistry by E. Glass-Stone.
2. Physical Chemistry by P.C. Rokshit.
3. Physical Chemistry by Sharma, Puri and Pathania.
4. Advanced Physical Chemistry by D.N. Bajpai.
5. Advanced Inorganic Chemistry by Cotton & Will Kingson.
6. Concepts in Inorganic Chemistry by Madan, Malik & Tuli.
7. Inorganic Chemistry by Sharma, Puri, Kalia.
8. Inorganic Chemistry Vol. I, II & III by Ravi Prasad & Sons.

SEMESTER-IV

Paper: 8, Physical & Organic (54 Lectures)

Question will be set in two groups-A & B.

Group A: Out of three, any two to be answered.

2*10=20

Group B: Out of six, any four two to be answered.

4*10=40

R. Bhardwaj
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S. Sharma
21.8.2012

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Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acid derivatives by nucleophilic acyl substitution.

ides. Relative stability of acid derivatives by nucleophilic acyl substitution.

Preparation of carboxylic acid derivatives, chemical reaction, Mechanisms of esterification of hydrolysis (acidic and basic)

3. ORGANIC COMPOUNDS OF NITROGEN [8 hrs.]

Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic neutral and alkaline media. Picric acid. Halonitroarenes: reactivity structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrides), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts, azo coupling.

4. GENERAL INTRODUCTION TO SPECTROSCOPY [10 hrs.]

Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

Ultraviolet (UV) absorption spectroscopy-absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transition, effect of conjugation concept of chromophores and auxochrome, Bathochromic, hypsochromic, hyperchromic shifts; UV spectra of conjugated dienes and enones. Infrared (IR) absorption spectroscopy-molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

Books Recommended:

1. Physical Chemistry by E. Glass-Stone.
2. Physical Chemistry by P.C. Rokshit.
3. Physical Chemistry by Sharma, Puri and Pathania.
4. Advanced Physical Chemistry by D.N. Bajpai.
5. Advanced organic Chemistry by S. Chand & Co.
6. Organic Chemistry Vol-I by I.L. Finar, ELBS.

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7. Organic Chemistry Vol-II by I.L. Finar, ELBS.
8. Advanced Concepts in Organic Chemistry by Morrison and Boyd, TMH.
9. Organic Reaction Mechanism by Peter Sykes.

SEMESTER IV
Paper Practical

FULL MARKS : 50

TIME : 4HRS

PASS MARKS : 23

ORGANIC

1) A. TLC

- (a) Separation of Green leaf pigments (spinach leaves)
- (b) Preparation and separation of 2, 4-dinitrophenyl hydrosome of acetone, 2-butanone using toluence & liquid petroleum (40:60)

B. PAPER CHROMATOGRAPHY

- (a) Separation of mixture of phnylalanine & glycine. Alanine & aspartic acid. Spray reagent – ninhydrin.
- (b) Separation of monosaccharide's-a mixture of D-galactose & D-fructose using n-butanol acetone water (4:5:1). Spray reagent quiline hydrogen phthalate.

2) QUALITATIVE ANALYSIS

Identification of organic compounds.

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B.Sc. PART-III, CHEMISTRY HONS.

SEMESTER-V

Paper: 9, Inorganic(48 Lectures)

Full Marks: 20(MSE)+80(ESE)=100

Time: 3 Hrs.

PASS Marks:45

Instruction to paper setter & Examinee

Altogether eight questions will be set. Out of eight, any five to be answered, i.e.,
5*16=80

GROUP-A (INORGANIC)

1. HARD AND SOFT ACID AND BASES (HSAB) [10 hrs.]

Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electro negativity and hardness and softness.

2. METAL LIGAND BONDING IN TRANSITION METAL COMPLEXES. [10 hrs.]

Limitations of valence bond theory, and elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factor affecting the crystal field parameters.

3. MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES [10 hrs.]

Type of magnetic behavior: Para magnetism, diamagnetism, ferromagnetism, and ferromagnetism method of determining magnetic, susceptibility ~~low~~ & Faraday's method, Curie & Weiss's law spin-only formula: L-S coupling, correlation of μ_{obs} and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3D-metal complexes.

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4. SILICONES AND PHOSPHAZENES [8 hrs.]

Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

5. ANALYTICAL CHEMISTRY [10 hrs.]

Organic reagents used in Inorganic analysis : DMG, Oxine, cupferron, aluminum, a-nitro so a-nuptial o-phenanthroline, EDTA, Theories of Indicators: precipitation, Redox and Absorption indicators.

Books Recommended:

1. Advanced Inorganic Chemistry by Cotton & Will Kingdon.
2. Concepts in Inorganic Chemistry by Madan, Malik & Tuli.
3. Physical Chemistry by Sharma, Puri and Kalia.
4. Inorganic Chemistry Vol. I, II & III by Ravi Prasad & Sons

SEMESTER-V

Paper: ~~10~~, Organic(54 Lectures)

Full Marks: 20(MSE)+80(ESE)=100

Time: 3 Hrs.

PASS Marks:45

Instruction to paper setter & Examinee

Altogether eight questions will be set. Out of eight, any five to be answered, i.e. ,

5*16=80

GROUP-A (ORGANIC)

1. ORGANIC SYNTHESIS VIA ENOLATES. [10 hrs.]

Acidity of α hydrogen's, alklation of diethyl malonate and ethyl acetate. Synthesis of ethyl acetoacetate: the Claisen condensation Keto-enol tautomerism of ethyl acetoacetate, Alkylation of 1, 3-dithianes, alkylation and acylation of enamines.

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2. CARBOHYDRATES [10 hrs.]

Classification and nomenclature, Monosaccharide's, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of al.oses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+) – glucose Mechanism of mutarotation. Structures of ribose and deoxyribose. An introduction to disachharides (maltose, sucrose and lactose) and polysachharides (starch and cellulose) without involving structure determination.

3. ORGANO METALLIC COMPOUNDS [8 hrs.]

Organomagnesium compounds : the Grignard reagents-formation, structure and chemical reactions.

4. ORGANO SULPHUR COMPOUNDS [8 hrs.]

Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine.

5. FATS, OILS AND DETRGENTS. [8 hrs.]

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates.

6. SPECTROSCOPY

Nuclear magnetic resonance (NMR) spectroscopy. Proton Magnetic resonance (H-NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure spin splitting and coupling constants, areas of signals. Interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 1-2 tribromoethane.

Ethyl acetate, Toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR. Spectroscopic techniques. [10 hrs.]

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Books Recommended:

1. Advanced organic Chemistry by S. Chand & Co.
2. Organic Chemistry Vol-I by I.L. Finar, ELBS.
3. Organic Chemistry Vol-II by I.L. Finar, ELBS.
4. Organic Reaction Mechanism by Peter Sykes.
5. Organic Reaction by O.P. Agrawal and Reagents.

SEMESTER-V**Paper:11 Physical(42 Lectures)**

Altogether eight questions will be set. Out of eight, any five to be answered, i.e. ,
 $5 \times 16 = 80$

Full Marks: 20(MSE)+80(ESE)=100	Time: 3 Hrs.	PASS Marks:45
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GROUP-A (PHYSICAL)**1. ELEMENTARY QUANTUM MECHANICS [15 hrs.]**

Black-body radiation, Plank's radiation law, photoelectric effect. Heat capacity of solids. Bohr's model of hydrogen atom (no., derivation and its defect), Compton effect. De-Broglie hypothesis, the Heisenberg's uncertainty principle, sinusoidal wave equation, Hamiltonian operator. Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum for H-atom, separation into three equations(without derivation). Quantum numbers & their importance, hydrogen like wave functions, radial wave functions, angular wave functions. Molecular orbital theory, basic ideas criteria for forming MO from AO. Construction of M.O's by LCAO H^+ ion.

Calculation of energy levels from wave functions. Physical picture of bonding and antibonding wave function. Concepts- sp , sp^2 , sp^3 , calculation of coefficients of A.O's used in these hybrid orbitals. Introduction of valence bond model of H_2 , comparison of M.O and V.B models.

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2. PHYSICAL PROPERTIES AND MOLECULAR STRUCTURE [15 hrs.]

Optical activity, polarization-(Clausius-Mossotti equation), orientation of dipoles in an electric fields, dipole moment induced, measurement of dipole moment and structure of method and refractivity method, dipole moment and structure of molecules. Magnetic properties-paramagnetism, diamagnetism and ferromagnetism.

3. SOLUTIONS, DILUTE SOLUTIONS AND COLLIGATIVE PROPERTIES [15 hrs.]

Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and coefficient, dilute solutions, colligative properties. Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling and depression of freezing point.

~~Thermodynamic~~ derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

Books Recommended:

1. Physical Chemistry by E. Glass-Stone.
2. Physical Chemistry by P.C. Rokshit.
3. Physical Chemistry by Sharma, Puri and Pathania.
4. Physical Chemistry-Vol. III by Pradeep Publication.
5. Advanced Physical Chemistry by D.N. Bajpai.

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SEMESTER V

Paper: ~~12~~ Practical

(INORGANIC)

FULL MARKS : 100

TIME : 6HRS

PASS MARKS : 23

1. SYNTHETIC ANALYSIS

- Pren. of Nickel-DMG complex.
- Pren. of $\{ \text{Cu}(\text{NH}_3)_4 \} \text{SO}_4$.
- Pren. of $\text{Na}_3\{\text{Fe}(\text{C}_2\text{O}_4)_3\}$ & determination of its composition by permagnometry.

2. COLUMN CHROMATOGRAPHY

Seperation of leaf pigments from spinach leaves.

3. QUALITATIVE ANALYSIS

Analysis of an organic mixture containing two or three solid components using water, organic solvents, NaHCO_3 & NaOH for separation & their identification.

- CST of Phenol water system.
 - Effect of impurity of CST of Phenol water system.

PROJECT + SEMINAR

Every student should either complete one project approved by any teacher of the department or should deliver at least one seminar on any suitable topic approved by the department.

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SEMESTER-VI

Paper:13. Inorganic(48 Lectures)

Full Marks: 20(MSE)+80(ESE)=100

Time: 3 Hrs.

PASS Marks:45

Instruction to paper setter & Examinee

Altogether eight questions will be set. Out of eight, any five to be answered, i.e. ,

5*16=80

1. ELECTRONIC SPECTRA OF TRANSITION METAL COMPLEXES. [12 hrs.]

Types of electronic transition, selection rules for d-d transition, spectroscopic ground state, Spectrochemical series. Orgel energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $\{Ti(H_2O)_6\}^{3+}$ Complexion.

2. THERMODYNAMIC AND KINETIC ASPECTS OF METAL COMPLEXES [12 hrs.]

Stability of complexes : Thermodynamic & kinetic stability. Factors affecting stability. Methods of determination of stability. Labile & Inert complexes. Ligand substitution reactions in octahedral complexes & square planar complexes.

3. ORGANOMETALLIC CHEMISTRY. [12 hrs.]

Definition, nomenclature and classification of organ metallic, Compounds. Preparation, properties, bonding and applications of alkyls of Li, Al, Hg, Sn and Ti, a brief account of metal ethylene complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

4. BIOINORGANIC CHEMISTRY [12 hrs.]

Essential and trace elements in biological processes, metalloporphyrins with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+} , Nitrogen fixation.

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Book Recommended:

1. Advanced Inorganic chemistry by cotton & Will Kingson.
2. Concepts in Inorganic Chemistry by Madan, Malik and Tuli.
3. Inorganic Chemistry by Sharma, Puri, Kalia.
4. Inorganic Chemistry Vol. I, II & III by Ravi Prasad & Sons.
5. Molecular Spectroscopy by G.N. Banwell, TMH.
6. Concept of organic Chemistry by Willian Kemp.
7. Organic Spectroscopy by Silverstein.

SEMESTER-VI

Paper: 14, Organic(48 Lectures)

Full Marks: 20(MSE)+80(ESE)=100

Time: 3 Hrs.

PASS Marks:45

Instruction to paper setter & Examinee

Altogether eight questions will be set. Out of eight, any five to be answered.

5*16=80

(BIO-ORGANIC CHEMISTRY)

1. AMINO ACIDS, PEPTIDES, PROTEINS AND NUCLEIC ACIDS. [12 hrs.]

Classification, structure and stereochemistry of amino acids. Acid-base behavior & isoelectric point and electrophoresis. Preparation and reaction of amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structure of peptides and proteins. denaturation/ renaturation. Nucleic acid: introduction Constituents of nucleic acids. Ribonucleosides and Ribonucleotides. The double helical structure of DNA.

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2. SYNTHETIC POLYMERS [12 hrs.]

Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization, Polyesters, Polyamide, Phenol formaldehydes resins, urea formaldehyde resins, epoxy resins and polyurethanes.

Natural and synthetic rubbers.

3. HETEROCYCLIC COMPOUNDS [12 hrs.]

Introduction: molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution.

Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher Indole, quinoline synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reaction of Indole and isoquinoline.

4. SYNTHETIC DYES [12 hrs.]

Colour and constitution (electronic concept). Classification of dyes, Chemistry and synthesis of methyl orange, Congo red, malachite green, crystal violet, phenolphthalein, fluorescein, alizarin and indigo.

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2. PHOTOCHEMISTRY [22 hrs.]

Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry. Grothus- Drapper law, Stark-Einstein law, Jablonski diagram depicting various process occurring in the excited state, qualitative description of flurescence, phosphorescence, non-radiative processes, internal conversion, inter system crossing, quantum yield, photosensitized reactions-energy transfer processes(simple examples.)

BOOKS RECOMMENDED:

1. Physical Chemistry by E. Glass-Stone.
2. Physical Chemistry by P.C. Rokshit.
3. Physical Chemistry by Sharma, Puri and Pathania.
4. Advanced Physical Chemistry by D.N. Bajpai

SEMESTER-VI

Paper 16, Pratical

(ORGANIC)

Full Marks: 20(MSE)+80(ESE)=100

Time: 6 Hrs.

PASS Marks:45

1. SYNTHESIS OF ORGANIC COMPOUNDS

- a. Acetylation of salicylic acid and anilines.
- b. Benzoylation of aniline & phenol.
- c. Prepn. of p-nitroacetanilide.
- d. Prepn. of 2,4,6-tribromophenol
- e. Pren. of methylorange.
- f. Pren.of aniline from nitrobenzene.

N. Chandra 21/8/12
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S. Sharma 21.8.12
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2. ORGANIC ESTIMATION

- Determination of $-NH_2$ group by bromination method.
- Estimation of phenol by bromination method.
- Estimation of glucose by Benedict's/ Fehling solution.

(PHYSICAL)

3. ELECTROCHEMISTRY

- To determine the strength of the given acids conductometrically using standard alkali solutions.
- To determine the ionization constant of acids conductometrically.

4. PHASE EQUILIBRIUM

- Distribution coefficient of iodine in carbon tetrachloride-water system.
- Distribution coefficient of Benzoic acid in Toulene-water system.

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 S. Bhadani
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INSTRUCTION FOR CHEMISTRY SUBSIDIARY

There will be TWO semesters in 1st year and TWO semesters in 2nd year.

There will be ONE theory paper of 75 marks and ONE practical paper of 25 marks in Ist semester as well as in IInd semester of Ist year.

Similarly there will be ONE theory paper of 75 marks and ONE practical paper of 25 marks in IIIrd semester as well as in IVth semester of 2nd year.

QUESTION SETTING:

There will be THREE groups in theory paper of I, II, III, IVth semesters. There will be THREE questions from each group and candidates are required to answer six questions selecting at least TWO questions from each group.

MARKS DISTRIBUTION:

● The details of marks distribution in different theory papers in I, II, III and IVth semesters will be as follows.

GROUPS	FULL MARKS	PASS MARKS
Group A (INORGANIC)	25	
Group B (ORGANIC)	25	23
Group C (PHYSICAL)	25	

B.Sc - I

(75 Marks)

1. ATOMIC STRUCTURE:

Bohr's atomic model, instruction to spectral lines, hydrogen atom, quantum numbers, Aufbau Principle, Pauli's Exclusion principle, Hund's rule.

2. PERIODICITY:

Electronic lay out of the periodic table, periodicity of properties eg. Ionic, covalent, and Vander waal's radius, Ionisation Potential, Electron affinity and Electro negativity.

GROUP-B (ORGANIC)

1. (a) Shape and structure of organic compounds. Tetravalency of carbon. Hybridisation (sp^3 , sp^2 , and sp). Explain with suitable examples of Organic compounds.
- (b) Classification and nomenclature of organic compounds. Detection and Estimation of elements. Determination of molecular weight of acids and Bases.
- (c) Elementary idea of electron displacement effects: Inductive effect, Electromeric effect, Resonance, Mesomeric effect and Hyper Conjugation.

2. ALDEHYDES AND KETONES:

General methods of preparation and properties(Electronic nature of carbonyl group), difference between aldehydes and ketones.

GROUP- C (PHYSICAL)

1. THERMOCHEMISTRY:

Hess's law, Kirchhoff's law, Bond energy and their calculation.

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~~S. Ghuman~~
21/8/12
21/8/12

2. THERMODYNAMICS:

System and surroundings, types of systems, heat, work and internal energy, first law of thermodynamics, enthalpy, heat capacities, relation between C_p and C_v , calculation of W, Q, E and H in isothermal and adiabatic expansion of ideal gas.

3. GASEOUS STATES:

Kinetic theory of gases- Postulates, Kinetic gas equation, deduction of gas laws from kinetic gas equation, R.M.S velocity, Average velocity and kinetic energy of gas molecules, deviation from ideal gas behaviour, Vander Waal's equation of state.

B.Sc-I CHEMISTRY SUBSIDIARY/GENERAL

SEMESTER-I (LABORATORY COURSES)

VOLUMETRIC ANALYSIS (25 Marks)

A. ACIDIMETRY AND ALKALIMETRY

1. Estimation of Sodium Carbonate and Sodium Hydroxide in a mixture.

B. REDOX TITRATION:

2. Estimation of Iron in Mohr's salt using $KMnO_4$.
3. Estimation of Iron in Mohr's salt using $K_2Cr_2O_7$.

C. IODOMETRY:

4. Estimation of Copper in a solution of Cupric Salt.

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SEMESTER-II

(LABORATORY COURSES)

Qualitative inorganic analysis of mixture containing four radicals:

Basic radicals:

Pb^{2+} , Cu^{2+} , Cd^{2+} , Fe^{2+} , Fe^{3+} , Al^{3+} , Cr^{3+} , Ni^{2+} , Co^{2+} , Zn^{2+} , Mn^{2+} , Ca^{2+} ,
 Ba^{2+} , Mg^{2+} , Na^{+} , K^{+} , NH_4^{+} .

Acid radicals:

CO_3^{2-} , SO_4^{2-} , NO_2^{-} , NO_3^{-} , Halides.

B.Sc-II
CHEMISTRY SUBSIDIARY

SEMESTER-III

(75 Marks)

GROUP-A

(INORGANIC)

(8+12 Hrs)

1. IONIC BOND:

Lattice energy, Born- Haber cycle, factors favouring ionic bond formation, variable, valency, properties of ionic compounds.

2. COVALENT BOND:

Formation of sigma(σ) and pi bonds(π), hybridisation and directional bonding, valence bond theory, structure and shapes of BF_3 , PCl_5 , SF_6 , SiCl_4 , H_2O , NH_3 and CH_4 . Properties of covalent compounds.

GROUP-B

(ORGANIC)

(6+6+6 Hrs)

1. CARBOHYDRATES:

Classification, nomenclature, structure of glucose and fructose and their inter conversions, configuration and preliminary treatment of ring structure.

2. ISOMERISM:

Conformational and stereoisomerism. Resolution of racemic mixtures, elements of symmetry.

3. HYDROXY ACIDS:

Lactic acid, tartaric acid and citric acid- their isolation, synthesis, properties and constitution. Isomerism of lactic acid and tartaric acid.

GROUP-C

(PHYSICAL)

(8+6+8 Hrs)

18/9

1. THERMODYNAMICS:

Second law of thermodynamics. Conversion of heat into work. Carnot theorem and Carnot cycle. Entropy, entropy change in reversible and irreversible processes. Entropy of expansion of ideal gases. Entropy of mixing of gases.

2. CHEMICAL KINETICS:

Rate of reaction. Order and molecularity of a reaction. First and second order reactions.

3. COLLOIDAL CHEMISTRY:

Classification, preparation, purification and properties of colloidal solutions. Peptization of colloids. Protection of colloids. Origin of charge on colloids. Electrophoresis. Coagulation. Dialysis. Brownian movement. Gold number.

B.Sc-II

CHEMISTRY SUBSIDIARY/GENERAL

SEMESTER-III (LABORATORY COURSES) (25 Marks)

I. PREPARATION OF FOLLOWING COMPOUNDS:

- Acetanilide from aniline
- Benzanilide from aniline
- m-dinitrobenzene from nitrobenzene
- Benzoic acid from ethyl benzoate

Shriya
21/8/12

G. M.
21/8/12

W. M.
21/8/12

Shakun
21/8/12

Aditi
21/8/12

Ami
21/8/12

R. Bhadani
21/8/12

Neha
21/8/12

Harsh
21/8/12

S. Sharma
21/8/12

B.Sc-II
CHEMISTRY SUBSIDIARY

SEMESTER-IV

(75 Marks)

GROUP-A

(INORGANIC)

(12+12 Hrs)

1. GENERAL DISCUSSION OF GROUP IIIA AND IVA ELEMENTS. PREPARATION, PROPERTIES AND USES OF THE FOLLOWING:

Hydrazine, hydrazoic acid. Hydroxyl amine. Oxy acids of phosphorus.
Potassium permanganate and potassium dichromate.

2. METALS:

Occurrence, metallurgy, properties and uses of Cr, Mn, Co and Ni and their compounds.

GROUP-B

(ORGANIC)

(14+10 Hrs)

1. AROMATIC COMPOUNDS:

Benzene and its mono substituted derivatives: Toluene, nitrobenzene, aniline, benzene diazonium chloride, phenol, benzaldehyde, benzenesulphonic acid, benzoic acid(preparation, properties and uses). Elementary idea of electrophilic substitution in benzene ring.

2. IMPORTANT REACTIONS:

Perkin reaction, Friedel Craft's reaction, Cannizaro's reaction, Kolbe's reaction, Sand Meyer's reaction, Reformatsky reaction, Reimer-Tiemann's reaction and Claisen condensation.

GROUP-C

(PHYSICAL)

(4+6+14 lrs)

1. KINETICS:

1) Determination of order of reactions. Effect of temperature on reaction rates.
Activation energy.

Determination of order of reactions. Effect of temperature on reaction rates.
Activation energy.

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2. CATALYSIS:

Characteristics of catalysts. Types of catalysts. Enzyme catalysts. Theory of catalysis Auto catalysts.

3. ELECTROCHEMISTRY:

Equivalent and molecular conductivities. Effect of dilution on different types of conductivities. Experimental determination of conductivities. Conductivity cell and cell constant. Ionic mobility. Kohlrausch's law.

B.Sc-II CHEMISTRY SUBSIDIARY/GENERAL

SEMESTER-IV

(LABORATORY COURSES)

(25 Marks)

1. Detection of nitrogen, sulphur and halogen in organic compounds containing one functional group including monosaccharide. (-COOH phenolic-OH, aldehyde, ketone, nitro, amino and amides)

R. Shaker
21/8/12

Shubha
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Adisha
21.8.12

R. Bhaden
21/8/12

Neehar
21/8/12

S. Shaver
21.8.2012

Prishu
21/8/12

Gu
21/8/12

Shruti
21.8.