KARNATAK UNIVERSITY, DHARWAD.

Ref. No. KU/Aca(S&T)/(VVV-03)//Chemistry/UG/2011-12/154 Date: 21-4-2012

NOTIFICATION

Sub: Revision of Syllabus of I and II semester of B.Sc., Chemistry from the academic year 2012-13 and III & IV semesters and also V & VI semesters of revised syllabus from the subsequent years i.e., from 2013-14 and 2014-15.

Ref: 1) BOS Res. No. 04, dt ; 04.11.2011.
2) Science Faculty Res.(with permission of the chair-01), dt; 12.01.2012.
3) Academic Council Res. No.15, dt. 26.03.2012.
4) Vice-Chancellor's Order dated ; 16-4-2012

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Adverting to the above, the Principals of all constituent and affiliated Science degree colleges are hereby informed that the revised syllabus for B.Sc., Chemistry I,II, III, IV, V & VI semesters course will come into force with effect from the academic years as shown below;

1. B.Sc., Chemistry - I & II Semesters - 2012-13
2. B.Sc., Chemistry - III & IV Semesters - 2013-14
3. B.Sc., Chemistry - V & VI Semesters - 2014-15

Hence, the contents of this notification may please be brought to the notice of the teachers, students and all concerned.

The concerned syllabus may be obtained through the Karnatak University, Web Site: www.kud.ac.in.

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REGISTRAR

To,

Principals of all the Constituent and Affiliated Science degree colleges coming under the jurisdiction of Karnatak University, Dharwad.

Copy F.W.cs to;

1. Dean, Faculty of Science & Technology, P.G. Dept of studies in Geology, K.U.Dharwad.
2. The Registrar (Evaluation) K.U. Dharwad.
3. The Chairman, BOS in (UG) Chemistry, PG Dept. of Studies in Chemistry, K.U.Dharwad.
4. Dr. R.M Vatnal, In charge Director, Information Technology, Exam Section, Room No. 104, K.U.Dharwad, with a request to place the said Notification and Syllabi in the University website: www.kud.ac.in

Copy to:

1. P.S. to Vice-Chancellor, K.U. Dharwad.
2. S.A. to Registrar, K.U. Dharwad.
3. O.S. Exam Section (Science Faculty (UG)) K.U.D.
4. O.S. Exam Section (Confidential) K.U.D
5. O.S. Exam Section (QP Branch) K.U.D.
6. O.S. Exam Section (GAD) K.U.D.

Karnatak University, Dharwad

Revised syllabus for Under Graduate Course

In

Chemistry (opt.)

Effective from 2012-13

Karnatak University, Dharwad
Revised syllabus for Under Graduate course in Chemistry (opt.)
Effective from 2012-13

Semester	Subject Code	Practical's	Instruction hour per week	Duration of Examination	Internal Assessment Marks	Semester final Examination Marks	Total
Sem-I	CH: 1.1	Chemistry -I	05 Hrs	03 Hrs	20	80	100
	CH (Pr) 1.2	Chemistry lab Course-I	04 Hrs	04 Hrs	10	40	050
Sem-II	CH: 2.1	Chemistry-II	05 Hrs	03 Hrs	20	80	100
	CH (Pr) 2.2	Chemistry Lab Course-II	04 Hrs	04 Hrs	10	40	050
Sem -III	CH: 3.1	Chemistry-III	05 Hrs	03 Hrs	20	80	100
	CH (Pr) 3.2	Chemistry Lab Course-III	04 Hrs	04 Hrs	10	40	050
Sem-1V	CH: 4.1	Chemistry-IV	05 Hrs	03 Hrs	20	80	100
	CH: 4.2	Chemistry Lab Course-IV	04 Hrs	04 Hrs	10	40	050
Sem -V	CH: 5.1	Chemistry-V	03 Hrs	03 Hrs	20	80	100
	CH: 5.2	Chemistry -VI	03 Hrs	03 Hrs	20	80	100
	CH (Pr): 5.3	Chemistry Lab Course-V	04 Hrs	04 Hrs	10	40	050
	CH (Pr): 5.4	Chemistry Lab Course-VI	04 Hrs	04 Hrs	10	40	050
Sem-VI	CH: 6.1	Chemistry-VII	03 Hrs	03 Hrs	20	80	100
	CH: 6.2	Chemistry-VIII	03 Hrs	03 Hrs	20	80	100
	CH (Pr) 6.3	Chemistry Lab Course-VII	04 Hrs	04 Hrs	10	40	050
	CH (Pr) 6.4	Chemistry Lab Course-VIII	04 Hrs	04 Hrs	10	40	050

CH: 1.1-CHEMISTRY-I (Sem-I)

5 hrs per week, Total 60 hrs, Duration of Exam-3hrs
Marks for theory-80, Marks for IA-20

UNIT-I

1. Atomic Structure:
Bohr's model of hydrogen atom, derivation of Bohr's equation for the energy of an electron in hydrogen atom, Somerfield's extension of Bohr's theory and its short comings, de-Broglie's equation, uncertainty principle, Schrödinger wave equation for hydrogen atom (derivation not expected), eigen values, eigen functions, probability density, significance of Ψ and Ψ^2, shapes of s, p & d orbitals based on radial probability distribution curves, quantum numbers and their significance, rules governing the electronic configuration: Aufbau principle, Hund's rule (n +1) rule, Pauli's exclusion principle, electronic configuration of elements up to atomic number 36. **(07 Hours)**

2. Periodic properties:
Review of modern periodic table, atomic, covalent, van der-Waals and ionic radii and their calculations, periodic trends in atomic radii, ionization energy, electron affinity and electronegativity in predicting and explaining chemical behaviors, general characteristics for s-block (Group 1 & 2) and p-block (Group 16 & 17) elements, unique characteristics of lithium and fluorine. **(04 Hours)**

3. Oxidation number:
Computation of oxidation numbers, balancing of redox reactions, calculations of equivalent masses of oxidizing and reducing agents. **(02 Hours)**

4. Principles of volumetric analysis:
Concentration terms: normality, molarity, molality, mole fraction and percentage, primary standard, acid-base, precipitation, redox, iodimetric, iodometric and complexometric titrations and choice of indicators in these titrations. **(05 Hours)**

5.Acids and Bases:
Lux-Flood and Lewis concepts of acids and bases, hard and soft acids & bases and Pearson's concept of HSAB. **(02Hours)**

UNIT-II

6. **Classification and IUPAC Nomenclature of Organic Compounds**:
Functional group and Classification of organic compounds, IUPAC rules to name mono and bi functional aliphatic and aromatic compounds, bicycles and 3-7 member heterocyclic compounds with one hetero atom and benzo derivatives. **(04 Hours)**

7. Structure and bonding of Organic Compounds:

Hybridization, sigma and pi bonds, comparative bond lengths, bond angles, bond energies and dihedral angles, bond polarity, dipole moment and illustrate with examples of organic compounds, delocalization, electronic displacement and their applications: inductive effect, electrometric effect, resonance effect, hyperconjugation, and steric effect.

(05 Hours)

8. Basics of Organic reaction Mechanism:

Meaning of the term reaction mechanism, classification of organic reactions: substitution, addition, elimination, rearrangement, oxidation and reduction reactions with suitable examples, Curly arrow rules, types of bond fission, electrophiles and nucleophiles: nucleophilicity and basisity, reactive intermediates: structure, formation and stability of carbocation, carbanion, free radicals, and carbenes. **(07 Hours**)

9. Stereoisomerism -I:

Meaning of stereoisomerism, conformational isomers and configurational isomers (distinction between conformation and configuration), geometrical isomerism: definition, reason for geometrical isomerism, E and Z notation -CIP rules and examples, determination of configuration of geometric isomers by dipole moment method and anhydride formation method, syn and anti isomers in compounds containing C=N.

(04 Hours)

UNIT-III

10. Gaseous State:

Distribution of molecular speed: Maxwell's Boltzmann law of distribution of molecular velocities, calculation of molecular velocities of gaseous molecules, average, most probable and RMS velocities, collision diameter, mean free path, collision number, critical phenomenon: critical constants, Andrew's isotherms, van der Waal's equation and critical constants, measurement of critical constants (Tc, Pc and Vc), law of corresponding state and reduced equation of states. **(08 Hours)**

11. Liquid State:

Intermolecular forces, structure of liquids (quantitative description), structural differences between solids, liquids and gases, physical properties of liquids:

a) vapour pressure and enthalpy of vaporization and numerical problems.

b) surface tension, surface energy, effect of temperature on surface tension, shapes of liquid drops and soap bubbles, capillary action, determination of surface tension of liquids by drop number method, parachor and its applications and numerical problems.

c) viscosity, effect of temperature on viscosity, determination of viscosity of liquids by using Ostwald's viscometer and numerical problems.

d) refractive index, specific and molar refractions and their applications, determination of refractive index of liquid using Abbe's refractometer and numerical problems.

(08 Hours)

12. Nernst distribution law:

Distribution law: thermodynamic derivation of distribution law, calculation of partition coefficient, deviation from distribution law due to molecular complexity (association and dissociation), applications of distribution law- extraction of substance from solution with derivation and numerical problems. **(04 Hours)**

CH (Pr): 1.2-Lab. Course in Chemistry –I (Sem I)

4 hrs per week, Total 54 hrs, Duration of Exam-4hrs
Marks for Pract-40, Marks for IA-10

1) Calibration of glass wares (burette, pipette, volumetric flask) and weights (both grams and milligrams).Use of analytical balance.

2) Preparation of standard oxalic acid solution, standardization of NaOH solution and determination of HCl in the given solution.

3) Preparation of standard sodium carbonate solution, standardization of HCl solution and determination of sodium hydroxide in the given solution.

4) Preparation of standard sodium carbonate solution, standardization of HCl solution and determination of sodium carbonate and sodium hydroxide in the given solution.

5) Preparation of standard oxalic acid solution, standardization of NaOH and $KMnO_4$ solution and determination of mixture of oxalic acid and sulphuric acid in the given solution

6) Preparation of standard sodium carbonate solution, standardization of HCl solution and determination of sodium carbonate and sodium bicarbonate in the given solution.

7) Preparation of standard oxalic acid solution, standardization of $KMnO_4$ solution and determination of Mohr's salt in the given solution.

8) Preparation of standard Mohr's salt solution, standardization of $K_2Cr_2O_7$ solution and determination of Fe^{2+} ions in the given solution.

9) Preparation of standard $K_2Cr_2O_7$ solution, standardization of $Na_2S_2O_3$ solution and determination of iodine in the given solution.

10) Determination of ferrous and ferric ions in a given mixture using standard potassium dichromate solution.

11) Preparation of standard $ZnSO_4$ solution, standardization of EDTA solution and determination of Zn^{2+} in the given solution.

12) Determination of temporary, permanent and total hardness of water using standard EDTA solution.

NOTE: In a batch of ten students, at least three different determinations may be given in the practical examination. Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. During practical examination chart is not allowed, wherever necessary simple procedure may be given.

Distribution of Marks:
Accuracy- Standardization titration 10 + main titration 16 marks, Technique and Presentation-4 marks, Journal-5 marks, Viva-Voce-5 marks, Total=40 marks.

Deduction of Marks for accuracy:
Standardization titration: ±0.2 CC -10 marks, ± 0.4 CC- 08 marks, ±0.6 CC- 06marks, ±0.8 CC- 04 marks, above ±0.8 CC- zero marks.
Main titration:±0.2 CC -16 marks, ± 0.4 CC- 14 marks, ±0.6 CC- 12 marks, ±0.7 CC- 10 marks, ±0.8 CC- 08 marks, ±0.9 CC- 06 marks, above ±1.0 – zero marks.

CH: 2.1-CHEMISTRY-II (Sem-II)

5 hrs per week, Total 60 hrs, Duration of Exam-3hrs
Marks for theory-80, Marks for IA-20

UNIT-I

1. Chemical bonding –I:
Ionic bond : factors favouring the formation of ionic bond, lattice energy and solvation energy, Born-Haber cycle for the formation of NaCl and problems on calculation of lattice energy, Born- Lande equation (derivation not required).Covalent Bond : factors favoring the formation of covalent bond, valence bond theory with respect to F_2, O_2 and N_2 molecules, concept of resonance in CO_3^{2-} and NO_3^- ions. Hybridisation: hybridistion in $BeCl_2$, BCl_3, $SiCl_4$,PCl_5 and SF_6 molecules, VSEPR theory to explain the structures of NH_3, H_2O and Cl_2O molecules. **(08 Hours)**

2. Chemical bonding –II:
Molecular Orbital Theory: bonding and antibonding molecular orbitals, linear combination of atomic orbitals, conditions for the combinations and bond order. Electronic configuration, energy level diagram and predicting the magnetic property for H_2 , He_2, N_2, O_2, O_2^+ and O_2^- molecules, comparison of valence bond and molecular orbital theory. Metallic bond: band theory, electrical properties of metals, non metals, semiconductors and superconductors. Hydrogen bonding in HF, H_2O and nitrophenols. van der Waals forces in noble gases. **(08 Hours)**

3. Chemistry of d & f- block elements:

General characteristics of d-block elements (*viz*. oxidation states, metallic, colour, magnetic, catalytic & complex forming properties), general characteristics of lanthanides & consequences of lanthanide contraction, comparison of d and f-block elements, general features of actinides, transuranic elements. **(04 Hours)**

UNIT-II

4. **Chemistry of Aliphatic Hydrocarbons:**

Hydrocarbons as source of energy, relationship between dihedral angle and conformation, conformation analysis of ethane and butane.

Alkenes: mechanism of addition of hydrogen halides and bromine, Markovnikoff's Rule, peroxide effect, acid catalyzed hydration of alkenes (mechanism), oxymercuration-oxidation (Markovnikoff Addition), hydroboration and oxidation (anti-Morkovnikoff's addition), oxidative cleavage of alkenes with $KMnO_4$ and ozone (ozonolysis), polymerization.

Alkadienes: classification, mechanism of addition of halogen and hydrogen halides in 1,3-diene, polymerization and Diels-Alder reaction.

Alkynes: mechanism of addition of halogen and halogen halides, hydration of alkynes, oxidative cleavage of alkynes with $KMnO_4$ and ozone (ozonalysis), polymerization.

(07 Hours)

5. Cycloalkanes:

Relative stability and conformational analysis of cyclopropane, cyclobutane, cyclopentane and cyclohexane, axial and equatorial bonds, conformation of monosubstituted cyclohexane. **(03 Hours)**

6. Basic Concept in aromaticity :

Criteria for aromaticity: heat of hydrogenation (eg. benzene), resonance and resonance energy(eg. benzene). Huckel's rule-explanation using examples of benzene, furan, thiphene, pyridine, naphthalene and anthracene.. Ions: cyclopropene cation, cyclopentadiene anion, and cycloheptatriene cation. Molecular orbital theory using examples of benzene, pyrrole and pyridine. **(04 Hours)**

7. Aromatic Hydrocarbon:

A general mechanism for electophillic aromatic substitution: Arenium ion path way. examples of halogenation, nitration, sulphonation and Friedel -Crafts's reaction. Orientation and reactivity in monosubstituted benzene. Theory of orientation: explanation on the basis of stability of sigma complex using example of one electron withdrawing group and one electron donating group. Polynuclear hydrocarbons: Classification and constitution of naphthalene and its synthesis by Howarth's method. **(06 Hours)**

UNIT-III

8. Chemical Kinetics I:

Rate of reaction, second order reaction: derivation of second order velocity constants, when a = b and a ≠ b, relation between half life period and order of reaction, determination of order of reaction by differential equation method and half life period method, numerical problems. Complex reactions: derivations of rate constant for first order parallel, reversible and consecutive reactions. **(06 Hours)**

9. Solutions:

Raoult's law: relation between mole fractions and vapour pressure of the components in the liquid and vapour phases, non-ideal solutions, activity coefficients, thermodynamics of ideal solution, Gibb's Duhem – Margules equation and its applications, theory of fractional distillation: fractional azeotropic distillations, the nature of azeotropic mixtures, partially miscible liquids, critical solution temperature (CST), completely immiscible liquids, solutions of solid in liquids, solid solutions (qualitative treatment). **(10 Hours)**

10. Physical properties and Chemical constitutions:

Polarisation- orientation of dipoles in an electric field, Clausious – Mossatti equation, dipole moment and its measurement by temperature variation and refractivity method, induced dipole moment, dipole moment and structure of molecules, magnetic properties: para, dia and ferromagnetism, optical activity: optical activity and chemical constitutions.

(04 Hours)

CH (Pr): 2.2-Lab. Course in Chemistry –II (Sem II)

4 hrs per week, Total 54 hrs, Duration of Exam-4hrs
Marks for Pract-40, Marks for IA-10

1. Explanation regarding crystallisation, fractional crystallisation, sublimation, reflux, distillation, fractional distillation, distillation under reduced pressure and steam distillation. (Students should write in the journal regarding the above).
2. Recrystallization and determination of melting point of the crystallized solid. (Mixed melting point determination and its importance may be mentioned).
3. Preparation of acetanilide from aniline.
4. Preparation of phthalimide from phthalic anhydride.
5. Preparation of p-nitroacetanilide from acetanilide.
6. Preparation of aspirin from salicylic acid.
7. Preparation of 1, 1-bis-2-naphthol from 2-naphthol.
8. Determination of phenol.
9. Determination of aniline.
10. Determination of acetamide.
11. Determination of carboxylic acids.
12. Determination of aspirin.

NOTE: In a batch of ten students, for six students preparation experiments and for four students determination experiments may be given in the practical examination. Two different preparation experiments and two different determination experiments may be distributed to the students. Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. During practical examination chart is not allowed, wherever necessary simple procedure may be given.

Distribution of Marks:

1. For Preparation Experiments:
yield-16 marks, nature of crystals -4marks, technique and presentation-4 marks, purity and M.P- 06 marks (4+2), journal-5 marks, viva-voce-5 marks, Total=40 marks.
Deduction of Marks:
Error yield- less than 10%- 16 marks, 11-15% 14 marks, 16-20% 12 marks, 21-25% 10 marks, 26-30% 8 marks, more than 30% Zero marks

2. For Determination Experiments:
Blank titration- 08 marks, Main titration-12 marks, technique and presentation-05 marks, calculation-05 marks,journal-5 marks, Viva-Voce-5 marks, Total=40 marks.

Deduction of Marks:
For Blank Titration:
± 0.2 CC – 08 marks, ±0.4 CC- 06 marks, 0.6 CC- 04 marks, ±0.8 CC- 02 marks, above ± 0.8 CC- zero marks.

For Main Titration:
± 0.2 CC – 12 marks, ±0.4 CC- 10 marks, 0.6 CC- 08 marks, ±0.7 CC- 06 ±0.8 CC- 04 ±0.9 CC- 02 marks, above ± 0.9 CC- zero marks.

CH: 3.1-CHEMISTRY-III (Sem-III)

5 hrs per week, Total 60 hrs, Duration of Exam-3hrs
Marks for theory-80, Marks for IA-20

UNIT-I

1. Chemistry of non-metals:
Preparation, structures and properties of diborane and borazole, classification of silicates, preparation and structures of NF_3, N_2F_2, $SOCl_2$ and S_4N_4, preparation, structures, and properties of inter halogen compounds ClF_3, BrF_5 and IF_7, structure and bonding in xenon compounds XeF_2, XeF_4 and XeO_3. **(06 Hours)**

2. Metallurgy:
Review of the steps involved in metallurgical process, thermodynamic concepts of selection of reducing agent using Ellingham's diagrams, extraction of nickel by Mond's

process, lead by carbon reduction process, uranium from pitchblende & plutonium from spent nuclear fuel, advantages & applications of powder metallurgy, techniques in the production of metal powders and production of tungsten powder from wolframite.

(08Hours)

3. Solids:

Space lattice, unit cell, calculation of particles per unit cell, laws of crystallography, symmetry elements in crystals, derivation of Bragg's equation, determination of the structure of NaCl by rotating crystal method, defects in stoichiometric crystals (Schottky & Frenkel defects) and non-stoichiometric crystals (metal excess & metal deficiency defects). **(06 Hours)**

UNIT-II

4. **Stereoisomerism –II** :

Molecular representation: Fischer's projection formulae, Newman's formulae, Saw horse formulae. Optical Isomerism: optical activity, specific rotation and optical purity, chirality/asymmetric centers, enantiomers. R and S notations(one asymmetric center): CIP rules with examples, molecules with two or more asymmetric centers, diastereomers, meso compounds, R and S notations (two asymmetric center), D and L configuration and threo and erythro nomenclature, recemic mixture and recemisation, resolution of recemic mixture through mechanical separation, formation of diastereomers, and biochemical methods, biological significance of chirality. **(06 Hours)**

5. **Halogen Compounds**:

Reactivity of halogen in alkyl halides, vinyl/allyl halides, aryl halides, aryl-alkyl halides, nucleophilic aliphatic substitution: mechanism, stereochemistry and comparison between SN1 and SN2 reactions, elimination reactions: mechanism, stereochemistry and comparison between E1 and E2 reactions, Saytzeff's rule, Hoffman's rule, aromatic nucleophilic substitution and elimination-addition mechanism (benzyne intermediate).

(06Hours)

6. **Polyhydric alcohol and ethers**:

Preparation of glycol from ethene and glycerol from propene, preparation and use of nitroglycerine, ethers: mechanism of Williamson's ether synthesis, mechanism of synthesis of ether by intermolecular dehydration of alcohols, reaction of ethers-mechanism of ether cleavage by strong acids, epoxides: synthesis from alkenes using peroxides, acid and base catalyzed ring opening of epoxides with mechanism and polyether formation.

(04 Hours)

7. **Phenols**:

Acidic character, comparative acid strengths of alcohols and phenols, mechanism of Kolbe's reaction, Claisen rearrangement, Fries rearrengements, Gattermann synthesis, Ledrer-Mannase reaction, Reimer-tiemann reaction. **(04 Hours)**

UNIT-III

8. **Thermodynamics:**

First law of thermodynamics, heat contents (qv and qp), work done in reversible and irreversible isothermal expansion of ideal gas, work done on the system in reversible adiabatic of ideal gas (T–V and P-V relations), Joule – Thomson effect, inversion temperature, Joule – Thomson experiment, derivation for Joule -Thomson coefficient, Kirchoff's equation (problem) second law of thermodynamics: cyclic process, Carnot's cycle, heat engine and its efficiency, Carnot's theorem, entropy and its significance, entropy changes in reversible and irreversible processes for ideal gases, free energy; dependence of free energy on pressure and temperature, free energy change and spontaneity of reaction, Gibbs – Helmoltz equation, Clausius – Clapeyron integrated equation and applications, partial molal quantities – chemical potential of an ideal gas.

(10 Hours)

9. Ionic equilibria:

Types of salts and hydrolysis of all four types, degree of hydrolysis and expression for hydrolysis constant, derivation of relation between Ka/ Kb, Kh, Kw and pH in case of salts of all three types of hydrolysable salts and problems. **(04 Hours)**

10. Photochemistry:

Laws of photochemistry, Grotthus-Draper law, Stark – Einstein's law, difference between photophysical and photochemical process with examples, comparison of photochemical and thermal reactions, quantum yield of photochemical combination of a. H_2 and Cl_2 , b. H_2 and Br_2, c. Dissociation of HI, d. Dimerisation of anthracene. Determination of quantum yield by thermo-couple method and chemical actinometer, photosensitization, photostationary equilibrium single and triplet states, fluorescence, phosphorescence, chemiluminescence, bioluminescence, chemical sensors, Beer Lambart's law, applications and problems on absorption and molar extinction coefficient. **(06 Hours)**

CH (Pr): 3.2-Lab. Course in Chemistry –III (Sem III)

4 hrs per week, Total 54 hrs, Duration of Exam-4hrs
Marks for Pract-40, Marks for IA-10

1. Explanation regarding errors, types of errors, accuracy, precision, significant figures and standard deviation (students should write in the journal regarding the above).
2. To study the effect of acid strength on hydrolysis of methyl acetate using HCl and H_2SO_4.
3. Determination of the velocity constant and effect of concentration on velocity constant of second order reaction KI + $K_2S_2O_8$ (a = b).
4. Study of the adsorption of acetic acid on animal charcoal.
5. Determination of surface tension and parachor of benzene series or alcohol series.

6. Determination of surface tension and parachor of toluene, xylene and n-hexane and calculate the atomic parachor of Carbon and Hydrogen
7. Determination of viscosity of toluene and carbon tetrachloride by Ostwald's Viscometer method.
8. Determination of viscosity of binary liquid mixtures of Toluene & carbon tetrachloride and to calculate the percentage composition of the unknown mixture.
9. Study of the distribution of acetic acid/ benzoic acid between water and toluene.
10. Determination of enthalpy of ionization of acetic acid by calorimetric method.
11. Determination of degree of dissociation of KCl by Landsberger's method.
12. Determination of heat of solution of KNO_3 by solubility method.

NOTE: In a batch of ten students, not more than two students should get the same experiment in the practical examination. Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. During practical examination chart is not allowed, wherever necessary simple procedure may be given.

Distribution of Marks:

Accuracy-18 marks, Technique and Presentation-3 Calculation and graph- (5+4) 9 marks, Journal-5 marks, Viva-Voce-5 marks, Total=40 marks.

Deduction of Marks for accuracy:

Error up to 5% - 18 marks, 6 - 10% 15 marks, 11-15% 12 marks, 16-20% 6 marks, above 20% zero (0) marks

CH: 4.1-CHEMISTRY-IV (Sem-IV)

5 hrs per week, Total 60 hrs, Duration of Exam-3hrs
Marks for theory-80, Marks for IA-20

UNIT-I

1. Nuclear Chemistry:

Nuclear particles (positron, neutrino, mesons,pions and quarks), nuclear instability, problems on: mass defect, binding energy, decay constant and half life period. Nuclear reactions [(α, n), (α, p), (p, α), (p, n), (n, α) & (n, p)], liquid drop model of nuclear fission, nuclear reactor and types of nuclear reactors in India, nuclear fusion, uses of radioisotopes in tracer technique, agriculture, medicine, food preservation and carbon dating, problems on carbon dating. **(08 Hours)**

2. Inorganic Polymers :

General properties and types of inorganic polymers, comparison with organic polymers, classification, preparation, structures, properties and applications of silicones. Preparation, structures, properties and applications of phosphazines. (**04 Hours)**

3. Environmental Chemistry:

Air pollutants: sources & control measures of CO_x, SO_x, NO_x, H_2S, hydrocarbons, CFC's & particulates.Water pollutants: sources & adverse effects of sewage, infectious agents,

organic chemicals , inorganic minerals, sediments, oil & detergents. Definition and determinations of D.O., B.O.D & C.O.D . Preliminary, primary and secondary treatment of sewage or industrial effluents.Pesticides and their adverse effects **(07 Hours)**

UNIT-II

4. Carbonyl Compounds-I :

Structure of carbonyl compound, synthesis of aldehydes and ketones by oxidation of alcohol, aldehydes by reduction of acyl chloride, esters, nitriles and ketones from Gillmann's reagent, general mechanism of nucleophilic addition to the carbonyl compounds, mechanism of addition of hydrogen cynide and hydroxyl amine, addition of alcohol, amines and phosphorus ylids (No mechanism required) (**04 Hours)**

5.Carbonyl Compounds –II:

Acidity of α-hydrogens, mechanism of aldol condensation, Perkin's condensation, Claisen's condensation, Dieckman condensation and Darzen's condensation, reactions of compounds with no α-hydrogens -mechanism of benzoin condensation and Cannizaro's reaction, crossed Aldol, Claisen's condensation, crossed Cannizaro's reaction. (**04 Hours)**

6. Carboxylic acids and their derivatives:

Acidity of carboxylic acid, effect of substituents on acidity of aliphatic and aromatic acids, preparation of carboxylic acid from nitriles and Grignard's, synthesis of acylchlorides from PCl_5, amides from acylchlorides, esterification and hydrolysis of esters, $A_{AC}2$, $B_{AC}2$ reaction mechanism, definition and examples keto-enol tautomerism using example of ethyl acetoacetate(EAA), use of EAA in preparation of alkyl acetic acid, dicarboxylic acid and alkyl ketones, Knoevenagel's Reaction and Michel addition (mechanism not required) (**06 Hours)**

7.Amines:

Structure of amines, basicity of aliphatic amines, aryl amines and heterocyclic amines, effect of substituent's on basicity of aliphatic and aromatic amine, basicity of amines versus amides, preparation of amines by Gabriel's phthalimide synthesis, through reduction of nitro compound by Halfmann and Curtius reaction (mechanism required), reactions of aliphatic and aromatic amines with nitrous acid, replacement reaction of arenediazonium salt (replacement by –Cl/-Br, -CN, -I, -F, -OH, -H), coupling reaction of arenediazonium salt. (**04 Hours)**

8. Organo metallic compounds:

Defination and examples of organometallic compounds, synthesis and application of Grignards reagent in preparation of alkanes, alcohols, aldehydes and ketones, esters, ethers and thiols. (**02 Hours)**

UNIT-III

9. Adsorption and Catalysis:

Adsorption: adsorption isotherms (all five types) Freundlich's and Langmuir's adsorption isotherms (derivation) and their limitations, Multilayer theory: BET adsorption isotherm (equation only), measurement of surface area of adsorbent, Gibb's adsorption equation and its applications. Theories of catalysis: intermediate compound and adsorption theory. Kinetics of acid–base catalysis: general and specific. Enzyme catalysis: Michael's-Menton equation, bio-enzymes and industrial applications. **(08 Hours)**

10. Phase rule:

Statement and explanation of the terms with examples: phase, component, degree of freedom, Gibb's phase rule. Applications of phase equilibria for one component systems (water and sulphur), reduced phase rule, two component systems: (Zn - Cd, KI - H_2O and Ag - Pb), Pattinson's process of desilverization, eutectic and freezing mixtures and their applications. **(08 Hours)**

11. Micelles:

Emulsions, micro emulsions or micellar emulsions, electro kinetic effects, colloidal electrolytes or association colloids, surface active agents or surfactants, solubilization of surfactant solutions. **(04 Hours)**

CH (Pr): 4.2-Lab. Course in Chemistry –IV (Sem IV)

4 hrs per week, Total 54 hrs, Duration of Exam-4hrs
Marks for Pract-40, Marks for IA-10

1. Explanation regarding solubility, solubility product, common ion effect and applications of these in physico-chemical principles of separation of cations into groups in qulitative analysis of in-organic salts (students should write in the journal regarding the above).

2 to 10: Semi-micro qualitative analysis of mixtures of two simple inorganic salts containing two anions and two cations.

ANIONS: CO_3^{2-}, S^{2-}, Cl^-, Br^-, I^-, NO_3^-, SO_4^{2-}, $C_2O_4^{2-}$ and PO_4^{3-}

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

Phosphate separation technique is to be demonstrated but not to be given at the time of examination.

11. Determination of dissolved oxygen present in water by Winkler's method.

12. Determination of C.O.D in polluted water.

NOTE: In a batch of ten students, not more than two students should get the same mixture in the practical examination. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. During practical examination chart may be referred whenever necessary.

Distribution of Marks:

Preliminary tests and presentation (6+2) - 8 marks , Negative radicals (group test + C.T) (2+3)×2=10 marks, positive radicals (group test + C.T) (2+4)×2=12 marks, Journal-5 marks, Viva-Voce-5 marks, Total=40 marks.

CH: 5.1-CHEMISTRY-V (Sem-V, Paper-I)

3 hrs per week, Total 40 hrs, Duration of Exam-3hrs
Marks for theory-80, Marks for IA-20

UNIT-I

1. Coordination Chemistry –I:

Review of terms: double salts, complex compounds, central metal ion, ligand, coordination number and complex ion, classification of ligands, Werner's theory of coordination compounds with reference to cobalt ammine complexes, IUPAC nomenclature of coordination compounds, calculation of effective atomic number (EAN) in different complexes, stereochemistry and examples of coordination compounds with coordination numbers 2,3,4,5 and 6. Ionization, hydrate, linkage, geometrical and optical isomerism in coordination compounds with respect to co-ordination numbers 4 & 6. **(07 Hours)**

2.Organometallic chemistry:

Classification of organo-transition metal complexes, metal carbonyls, bonding in metal carbonyls, 18- electron and 16-electron rules with reference to metal carbonyls. Synthesis, structure, bonding and reactions of metal alkyl complexes. **(04 Hours)**

3.Metal Clusters:

Carbonyl clusters and halide type clusters, examples and structures of low and high nuclearity carbonyl clusters, examples and structures of halide type clusters**.** **(03 Hours)**

UNIT-II

4.Heterocyclic Compounds:

Classification, aromaticity of 5-membered and six member rings containing one hetero atom, synthesis of pyrrole, furan (Paal-Knor synthesis), pyridine (Hantzsch synthesis), indole(Fischer's synthesis), quinoline (Skrap's synthesis) and isoquinoline (Bischler-Napierabki synthesis), reactions of furan, pyrrole and pyridine, mechanism of elecrophilic substitution reaction in pyrrole and pyridine. **(05 Hours)**

5. Alkaloids:

Classification, extraction, general properties, Hofman's exastive methylation, constitution of hygrine, coniine and nicotine. (Synthesis expected) **(03 Hours)**

6. Pericyclic reaction:

Types of pericyclic reaction, molecular orbital theory(MOT), symmetry properties of reactant and product orbitals, cyclo addition reaction-[2+2] and [4+2] cycloaddition reactions. Electro cyclic reaction: cyclisation of 4n and [4n+2]π systems, sigmatropic rearrangements. **(05 Hours)**

UNIT-III

7. Electrochemistry:

Theory of strong electrolytes: Debye – Huckel theory of strong electrolytes, Debye – Huckel Onsagar equation (no derivation), relaxation effect, electrophoretic effect, viscous effect, interionic attraction theory, activity coefficients of electrolytes, mean ionic activity coefficients of electrolyte, ionic strength of electrolyte solution. Theory of electrolyte dissociation: Arrhenius theory of ionization and its limitations. Migration of ions: transport number, Hittorf's method and Moving boundary method with problems, conductometric titrations. **(08 Hours)**

8. Chemical kinetics –II:

Theories of reaction rates: collision theory, Lindemann's theory of unimolecular reactions. Theory of absolute reaction rates: thermodynamic treatment to activated complex, comparison between collision theory and theory of absolute reaction rates, RRKM theory (qualitative), chemical kinetics in solutions, influence of ionic strength on reaction rates, salt effects (primary and secondary). **(05 Hours)**

CH: 5.2-CHEMISTRY-VI (Sem V Paper-II)

3 hrs per week, Total 40 hrs, Duration of Exam-3hrs
Marks for theory-80, Marks for IA-20

UNIT-I

1. Theory of Gravimetric Analysis :

Gravimetric analysis: principles, super saturation, von Weirman equation, conditions of precipitation, co-precipitation and post precipitation, separation of precipitate from mother liquor, washing, properties of washing liquid, drying , ignition of precipitate and weighing form. **(04 Hours)**

2. Industrial Chemistry:

Alloys: Significance, types of alloys (ferrous and non-ferrous alloys), preparation (fusion and electro-deposition) and their applications. **(03 Hours)**
Glass: raw materials, manufacture, types, composition and uses. **(02 Hours)**
Cement: raw materials, manufacture and mechanism of setting. **(03 Hours)**
Nanomaterials: introduction, preparation, charactors & applications (sensors) **(02 Hours)**

UNIT-II

3. Ultraviolet Spectroscopy:

Types of electronic transitions, λ_{max}, chromophores and auxochromes, bathochromic and hypsochromic shifts, intensity of absorption, Woodward rules for calculating λ_{max} of α,β-unsaturated aldehydes, ketones, carboxylic acids, esters. Conjugated dienes: alicyclic, homoannular and heteroannular, cis-trans isomerism, applications of UV spectroscopy.

(05 Hours)

4. Infrared Spectroscopy:

Introduction to infrared spectroscopy, intensity of absorption band, position of absorption bands, C-H absorption bands, >C=0 absorption bands, O-H absorption bands, N-H absorption bands (for every functional group reason for variation in band values must be explained), effect of hydrogen bonding. **(04 Hours)**

5. Dyes:

Colour and constitution, classification, mordant and wet dyes, synthesis and applications of congo red, malachite green, phenolphthalein and alizarin, dyes used in food and their safety concern, organic pigments with examples. **(04 Hours)**

UNIT-III

6. Molecular spectroscopy:

Interaction of electromagnetic radiation with matter, electromagnetic spectrum.

(a). Rotational spectroscopy:

Rotation of molecules, diatomic: rigid rotator, selection rule : derivation for expression of energy and bond length (HCl), polyatomic molecules: linear, symmetric top, asymmetric top molecules(qualitative approach). (**3 Hours)**

(b). Vibrational spectroscopy:

Vibrating diatomic molecules - energy of diatomic molecules, force constant,vibrational spectra: harmonically vibrating diatomic molecules (HCl) and anhormonic case, Morse potentials function and dissociation energy(problem),vibration and rotational spectra of diatomic molecules (only CO), group frequencies (-NH, -OH, $-NH_2$, >CO, >CHO, >COOH, >C=N, S-H), Raman spectra: vibration and rotational Raman spectra (complementary of Raman and IR). (**7 Hours)**

(c). Electronic spectroscopy:

Diatomic molecules: Born- Oppenheimer approximation, vibrational course structure of electronic transition and intensity, Franck – Condon principle, pre-dissociation, application of UV- Visible spectra in organic molecules. (**3 Hours)**

CH (Pr): 5.3-Lab. Course in Chemistry –V (Sem V Paper-I)

4 hrs per week, Total 54 hrs, Duration of Exam-4hrs
Marks for Pract-40, Marks for IA-10

Qualitative analysis of solid – solid organic mixtures

Identification of nature and separation of mixture (in semi micro scale). Characterization of any one separated compound through Preliminary tests, Element test, Physical constant, Functional Group test and preparation of suitable derivative and its physical constant.

Acids: Salicylic, Cinnamic, Phthalic and Anthranilic acid.
Phenol: α –naphthol, β–naphthol,.
Base: p-toluidine, m-nitroaniline and p-nitroaniline.
Neutral: Naphthalene, Acetanilide, Diphenyl, Benzamide, Benzophenone and m-dinitrobenzene.

NOTE: In a batch of ten students, not more than two students should get the same mixture in the practical examination. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. During practical examination chart may be referred whenever necessary.

Distribution of marks:

Nature and Separation: (2+3) 5marks, Preliminary test: 2marks, Element test: 4marks, Physical Constant: 3marks, Functional Group test: 4marks, Identification and Structure: 3marks, Preparation of derivative: 3marks, Physical constant of derivative: 3martks, Systematic Presentation: 3marks. Journal: 5marks, Viva-voce: 5marks.

CH (Pr): 5.4-Lab. Course in Chemistry –VI (Sem V, Paper-II)

4 hrs per week, Total 54 hrs, Duration of Exam-4hrs
Marks for Pract-40, Marks for IA-10

1. Determination of the concentration of HCl by conductometric titrations using the standard NaOH.
2. Determination of the concentration of CH_3COOH by conductometric titrations using the standard NaOH.
3. Determination of equivalent conductance of strong electrolyte (NaCl) and equvivalent conductance at infinite dilution (λ_∞).
4. Determination of concentration of strong acid by potentiometric titration against standard solution of 0.1 N NaOH.
5. Preparation of standard acidic buffer solutions using 0.1M acetic acid & 0.1M sodium acetate using Henderson-Hasselbatch and determination of mole ratio of buffer solutions of unknown pH
6. Determination of second order rate constant for the hydrolysis of ethyl acetate by NaOH conductometrically.
7. Verification of Beer- Lambert's law by colorimetric method and calculation of molar

extinction coefficient of Cu^{2+}.

8. Determination of dissociation constant of acetic acid conductometrically.
9. Determination of Ka of a weak acid potentiometrically.
10. Determination of pH of the following biological fluids (i) milk (ii) orange juice iii) Lime water iv) citrus acid solution and v) $NaHCO_3$.
11. Verification of Beer- Lambert's law by colorimetric method and determination of unknown concentration of ferric (Fe^{3+}) ions.
12. Determination of critical solution temperature of two partially miscible liquids (water and phenol).

NOTE: In a batch of ten students, not more than two students should get the same experiment in the practical examination. Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. During practical examination chart is not allowed, wherever necessary simple procedure may be given.

Distribution of Marks:

Accuracy-18 marks, Technique and Presentation-3 Calculation and graph- (5+4) 9 marks, Journal-5 marks, Viva-Voce-5 marks, Total=40 marks.

Deduction of Marks for accuracy:

Error up to 5% - 18 marks, 6 - 10% 15 marks, 11-15% 12 marks, 16-20% 6 marks, above 20% zero (0) marks

CH: 6.1-CHEMISTRY-VII (Sem-VI, Paper-I)

3 hrs per week, Total 40 hrs, Duration of Exam-3hrs
Marks for theory-80, Marks for IA-20

UNIT-I

1. Coordination Chemistry-II:

Valence bond Theory of coordination compounds with reference to $[Fe(CN)_6]^{4-}$, $[Fe(CN)_6]^{3-}$, $[FeF_6]^{3-}$, $[Zn(NH_3)_4]^{2+}$, $[NiCl_4]^{2-}$, $[Ni(CN)_4]^{2-}$, $[Ni(H_2O)_6]^{2+}$ and its limitations, crystal field theory with reference to octahedral, tetrahedral and square planar complexes, calculation of crystal field stabilization energy, explanation of color and magnetic properties of metal complexes, determination of magnetic susceptibility by Guoy method, stability constant, stepwise and overall formation constants, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelates: definition, characteristics, factors influencing the stability of metal chelates and importance of chelates. **(08 Hours)**

2.Bioinorganic Chemistry :

Essential and trace elements in biological processes, role of Na, K, Ca, Mg, Fe and Zn in biological systems, toxic effects of Hg,Cd, Pb and As, role of haemoglobin, myoglobin and chlorophyll in biological systems. **(03 Hours)**

3. Non-aqueous solvents:

Solvent properties and typical reactions studied in liquid ammonia and liquid sulphurdioxide. **(03 Hours)**

UNIT-II

4. Carbohydrates:

Definition, classification, osazone formation, epimers and epimerisation, inter conversion of fructose and glucose, Kiliani synthesis and Ruff degradation, ring structure of D-glucose, mutarotation, and determination of ring size of D-glucose by Haworth -Hirst method, perspective formula of D-glucose. Disaccharides: structure of sucrose and lactose (mention hydrolysis product, glycoside linkage and reducing properties). Polysaccharides: partial structure of starch and cellulose. **(05 Hours)**

5. Amino acids and proteins:

Classification of amino acids, stereochemistry of amino acids, Zwitter ion and explanation to isoelectric point, synthesis of amino acids from Gabriel phthalimide synthesis, Strecker's synthesis, ninhydrin reaction. Peptides: defination and Bergman's synthesis of simple dipeptide. Protiens: biological importance, primary, secondary structure of proteins (α-helical, β-sheet) **(04 Hours)**

6.Vitamins and Hormones:

Classification and biological significance, source and structure of Vitamin A, B1(thiamine), B2(riboflavin), B6(pyridoxine), a-tocopherol, K1 (phylloquinone),C (abscorbic acid). Van Drop's synthesis of Vitamin A,synthesis of Vitamin C from D-glucose. Hormones: definition, classification with examples, functions and deficiency diseases of hormones, synthesis of aderanaline and thyroxine. **(04 Hours)**

UNIT-III

7. Electro Motive Force(EMF)

Reversible and irreversible cells, EMF of a chemical cell and its measurement by potentiometer, standard cell (Western standard cell), types of electrodes, reference electrode; calomel electrode, sign conventions, Nernst equation, electrochemical series and its applications, determination of pH of solution by hydrogen electrode, quinhydrone and glass electrode methods, concentration cell with and without transference, liquid junction potential, salt bridge and its applications. Application of concentration cells, determination of solubility, potentiometric titrations: acid–base, calculation of Ka and redox titration, determination of redox potential and numerical problems. **(09 Hours)**

8. Battery technology:

Primary and secondary cells, lead storage battery and its applications, Ni-Cd cells, Lithium battery, fuel cells and their applications. Corrosion: types and factors influencing corrosion, theory of corrosion and methods of prevention. **(04 Hours)**

CH: 6.2-CHEMISTRY-VIII (Sem-VI, Paper-II)

3 hrs per week, Total 40 hrs, Duration of Exam-3hrs
Marks for theory-80, Marks for IA-20

UNIT-I

1.Analytical Chemistry:

Chromatography: defination and classification, column chromatography: principle and application, paper chromatography: principle, types , applications and sgnificance of R_f value, ion-exchange chromatography: types of ion exchange resins, basic requirments of useful resin, principle, applications, separation of lanthanides and determination of chlorides, high performance liquid chromatography: principle, instrumentation and applications, gas chromatography: advantages, principle, instrumentation and applications. **(08 Hours)**

Flame Photometry: principle, instrumentation, applications and determination of Na & K. **(02 Hours)**

Atomic adsorption spectroscopy: principle, instrumentation, advantages over flame emission spectroscopy and applications. **(02 Hours)**

Thermogravimetry: principle and applications of TG & DTA. **(02 Hours)**

UNIT-II

2. Nuclear Magnetic resonance(NMR):

Basic principles of PMR, nuclear shielding and deshielding, chemical shift and molecular structure, structure, spin-spin splitting and coupling constant, areas of signals. Interpretation of PMR structure of simple organic molecules such as ethylbromide, ethanol, acetaldehyde, ethyl acetate, toluene, acetophenone and acetanilide. **(04 Hours)**

3. Drugs:

Definition and classification, requirement of an ideal drug, synthesis and therapeutic use of a) Analgesic and antipyretic: ibuprofen and diclofenac sodium, b) Antibacterial: sulphadiazine and sulphathiazole, c) Antimalarial: chloroquine, d) Antibiotic : chlorramphenicol, e) Tranquilizers: mysoline and pentothal sodium, f) Local anesthetics: novacaine, g) Antihistamines : chlorpheniramine maleate. **(06 Hours)**

4. Terpenes:

Classification, isoprene rule, special isoprene rule constitution and synthesis of citral and α-terpinol. **(03 Hours)**

UNIT-III

5. Macromolecules:

Types of polymers: natural and synthetic, types of poly-reactions: chain reaction, polyethylene, polystyrene, PVC and polymethylmethacrylate, mechanism of addition, polymerization reaction and condensation reaction (Nylon 66), molecular weight of polymers: number average and weight average molecular mass, determination of molecular mass of macromolecules by osmotic pressure method and by viscosity method.

(05 Hours)

6. Quantum chemistry:

Black body radiation, Plank's theory, Einstein's theory, photoelectric effect, Compton effect, Bohr's theory of hydrogen atom (interpretation of spectrum, no derivation for energy), Sommerfield theory, wave particle duality, de-Broglie's hypothesis (derivation), Heisenberg's uncertainty principle (derivation & problems), wave nature of electron, derivation of Schrödinger's wave equation, wave function and its interpretation, Eigen function and Eigen values, normalization and orthogonality. **(08 Hours)**

CH (Pr): 6.3-Lab. Course in Chemistry –VII (Sem VI, Paper-I)

4 hrs per week, Total 54 hrs, Duration of Exam-4hrs
Marks for Pract-40, Marks for IA-10

Gravimetric Analysis

1. Determination of barium as $BaSO_4$.
2. Determination of Al as Al_2O_3.
3. Determination of iron as Fe_2O_3.
4. Determination of lead as $PbSO_4$.

Volumetric Analysis

5. Extraction of Iron(III) from haematite ore or solid Fe_2O_3 and determination of percentage of iron in the solution using standard $K_2Cr_2O_7$ solution (internal indicator method).
6. Extraction of Cu and Zn from brass and determination of percentage of copper in the solution using standard $Na_2S_2O_3$ solution.
7. Extraction of calcium from limestone and determination of percentage of calcium in the solution by oxalate method.

Complex Preparation

8. Preparation of bis dimethyldioximato nickel(II).
9. Preparation of trans-potassium diaqua di oxalato chromate (III).
10. Preparation of tris(thiourea) copper (I) sulphate monohydrate.
11. Preparation of sodium tris oxalate ferrate(III).
12. Separation of Mg (II) and Fe (II) by ion exchange method.

Industrial study tour report or Project work report is compulsory. The report carries 10 marks and it should be submitted in paper-I practicals.

The following projects may be considered

Soil analysis, water analysis, sewage water treatment and management, ion exchange methods, chromatography, preparation and assay of organic compound of pharmaceutical importance , effect of pesticides and insecticides, milk analysis, chemical processes in; textile industries / fertilizer industries/ dairy industries / chemical industries / ceramic industries / sugar industries/ oil industries / solvent extraction / liquor industries, alternate sources of generating electric power / engine fuel (apart from these, any other projects of student interest may also be considered)**.**

NOTE: In a batch of ten students in the practical examination, five students may be given volumetric determination and preparation of complexes and the other five students may be given gravimetric determination. Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. During practical examination chart is not allowed, wherever necessary simple procedure may be given.

Distribution of Marks:

Gravimetric Determination:

Accuracy-16 marks, Technique and calculation - 04marks, Journal-5 marks, Viva-Voce-5 marks, Industrial tour report or Project work report -10 marks. Total - 40 marks.

Deduction of Marks for accuracy:

±6mg -16 marks, ± 8mg-14 marks, ±10 mg -12 marks, ±12mg-10 marks, ±14mg-08 marks, ±16mg-06 marks, above ±16 mg -zero marks.

Volumetric Determination and Preparation of Complex

Accuracy-(For two titre values 2×5)10 marks, Yield of the complex- 06marks, Technique and Presentation - 2marks, calculation -2marks, Journal-5 marks, Viva-Voce-5 marks, Industrial tour report or Project work report -10 marks. Total 40 marks.

Deduction of Marks for accuracy:

Determination ±0.2 CC -10 marks, ± 0.4 CC- 08marks, ±0.6 CC- 06 marks, ±0.8 CC- 04 marks, above ±0.9 - zero marks.

Preparation Error yield- Less than 10%- 06 marks, 11-15% -05 marks, 16-20% -04 marks, 21-25% -03 marks, 26-30% -02 marks, more than 30% -zero marks

CH (Pr): 6.4-Lab.Course in Chemistry –VIII(Sem VI, Paper-II)

4 hrs per week, Total 54 hrs, Duration of Exam-4hrs
Marks for Pract-40, Marks for IA-10

1-6 :Separation of organic liquid binary mixture by distillation.

Characterization of any one separated compound through preliminary tests, element test, physical constant, functional group test and preparation of suitable derivative and its physical constant.

Low Boiling: ethyl acetate, acetone, toluene, chlorobenzene.

High Boiling: phenol, aniline, nitrobenzene, benzaldehyde, acetophenone, bromobenzene.

Physical Experiments

7. Determination of the concentrations of given acids in a mixture (HCl + CH_3COOH) conductometrically using the standard NaOH.

8. Determination of solubility of sparingly soluble salt ($BaSO_4$/$PbSO_4$) conductometrically.

9. Determination of redox potentials of Fe^{3+}/Fe^{2+} using of $FeSO_4.7H_2O$ solution (0.1N) by potentiometric titration against the standard solution of $K_2Cr_2O_7$ (0.1N)

10. Determination of the solubility and solubility product of sparingly soluble salts (AgCl) potentiometrically.

11. To determine the percentage composition of unknown mixture of A and B liquids using Abbe's refractometer (formula and graphical method).

12.Determination pKa of acetic acid by potentiometrically.

NOTE: In a batch of ten students in the practical examination, five students may be given experiment number 1-6 (binary mixture) and remaining five students may be given experiment number 7-12 (physical experiments). Selection of experiments may be done by the students based on the picking up of chits. In a batch of five students in the practical examination(1-6), not more than two students should get the same mixture. In a batch of five students in the practical examination(7-12), not more than two students should get the same experiment. Viva questions may be asked on any of the experiments prescribed in the practical syllabus. During practical examination of expt. 1-6 chart may be referred whenever necessary. During practical examination of expt. 7-12 chart is not allowed, wherever necessary simple procedure may be given.

Distribution of marks: experiment (1-6)

Separation: 3marks, Preliminary test: 2marks, Nature: 2marks, Element test: 4marks, Physical Constant: 3marks, Functional Group test: 4marks, Identification and Structure: 3marks, Preparation of derivative: 3marks, Physical constant of derivative: 3martks, Systematic Presentation: 3marks. Journal: 5marks, Viva-voce: 5marks.

Distribution of Marks: experiment(7-12)

Accuracy-18 marks, Technique and Presentation-3 Calculation and graph- (5+4) 9 marks, Journal-5 marks, Viva-Voce-5 marks, Total=40 marks.

Deduction of Marks for accuracy:

Error up to 5% - 18 marks, 6 - 10% 15 marks, 11-15% 12 marks, 16-20% 6 marks, above 20% zero (0) marks

Pattern of theory question paper for all the semester

1. Question number 1-12 carries 2marks-answer any 10 questions-marks:20
2. Question number 13-21 carries 5marks-answer any 6 questions- marks:30
3. Question number 22-24 carries 10marks from unit I,II & III choice for every question -marks:30

Total: 80 marks

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5. Environment al Chemistry-A.K.De,Wiley Eastern Ltd., 1999
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8. Principles of Inorganic chemistry-B.R.Puri and L.R.Sharma, Jauher, S.P. – S.N. Chand & Co. 1988
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2. Advanced Organic Chemistry- C.S.Bahi and A. Bahi, S Chand & Co., 1995
3. Organic Chemistry - R. T. Morrison and R.N. Boyd, Prentice Hall, 1991

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9. A Guide Book to Mechanism in Organic Chemistry - P. Sykes, Orient Longman, 1390

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1. Physical Chemistry(7th Edition) - P.W. Atkins and Julio de Paula, Oxford Univ. Press, 2002
2. The Elements of Physical Chemistry(3rd edition) - Peter Atkins, Oxford Univ. Press, 2000
3. Physical Chemistry – A molecular Approach - Donald A, Macquarie and John D Simon, Viva Low-Priced Student Edition, 2001
4. Introduction to Physical Chemistry (3rd edition), Mark Ladd, Cambridge Low – priced edition, 1999
5. Text Book of physical chemistry - S. Glasstone, Mackmillan India Ltd., 1982
6. Principles of Physical Chemistry - B. R. Puri, L.R. Sharma and M.S.Patania, S.L.N. Chand & Co. 1987
7. Text Book of Physical Chemistry - P.L. Soni, S. Chand & Co.,1993
8. Physical Chemistry - Alberty R. A. and Silbey, R.J.John Wiley and sons, 1992
9. Physical Chemistry - G.M.Barrow, Mc Graw Hill, 1986
10.Physical Chemistry(3rd Edition) - Gilbert W. Castilian, Narosa Publishing House, 1985
11.Text Book of Polymer Sciece - Bilmeyer, Jr. F.W. John Wiley & Sons, 1984
12.Basic Physical chemistry - Walter J. Moore, Prentice Hall, 1972

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1. Vogel's Textbook of Qualitative Chemical Analysis - J Bassett, R. C. Denney, G.H.Jeffery and J.Mendham, ELBS (1986)
2. Inorganic Semimiero Qualitative Analysis- V.V. Ramanujam, The National Pub. Co., (1974)
3. Practical Inorganic Chemistry - G. Marr and B.W. Rackett, Von Nostrand Reinhold, (1972)
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9. An introduction to Practical Biochemistry - David Plummer, McGraw-Hill Publishing Co., (1992).
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