Shri Sangameshwar Education Society's

Sangameshwar College [Autonomous] Solapur

(Affiliated to PunyashlokAhilyadeviHolkarSolapur University,Solapur)

KannadaLinguistic MinorityInstitute

(NAAC Accredited with'A' Grade (III Cycle CGPA3.39)

Academic Council 1(6)
2nd July, 2020

UG Science Programme:B.Sc.-I To be implemented from A.Y. 2020-2021

System: Choice Based Credit System (CBCS) with SGPA and CGPA

B.O.S. in*: **CHEMISTRY**

Structure and Examination for: Discipline Specific Core Courses (DSC-A and DSC-B)

Table-1

Semester	Course		Teaching Scheme/week			
			Course Code	Hours	Lectures	Credits
I	DSC-A	Theory-I: Physical Chemistry	2031102	4	5	4
		Theory-II:Inorganic Chemistry	2031103			
		Practical-I: Chemistry Practical	2031220	3.2	4	2
II	DSC-B	Theory-I: Organic Chemistry	2031202	4	5	4
		Theory-II: Analytical Chemistry	2031203			
		Practical-I: Chemistry Practical	2031220	3.2	4	2

Table-2

Semester	Course		EXAMINATION			Credits
			Marks			
			CA	SEE	Total	
I	DSC-A	Theory-I:Physical Chemistry	15	35	50	4
		Theory-II: Inorganic Chemistry	15	35	50	
II	DSC-B	Theory-I: Organic Chemistry	15	35	50	4
		Theory-II: Analytical Chemistry	15	35	50	
	DSC-A & DSC-B	Practical-I: Chemistry Practical	30	70	100	4

CA: Continuous Assessment SEE: Semester End Examination

Note: -

The above structure (Table-1 and Table-2) is for Sem-I and Sem-II of the undergraduate B.Sc.-I * /B.S.Ecs.-I /B.C.A.-I programmes under science faculty.

* B.Sc.-I Select any four DSC form Chemistry /Physics /Mathematics /Statistics /Electronics /Botany /Zoology /Geography /Psychology.

DSC: Discipline Specific Core Course **AECC:** Ability Enhancement Compulsory Course

Passing in each course is compulsory including Democracy. course.

SGPA/CGPA and Total Marks will be calculated excluding AECC and Democracy. courses.

Compulsory Course:

DEMOCRACY	2000232	DEMOCRACY ELECTIONS AND GOVERNANCE
PHY EDU	2000233	PHYSICAL EDUCATION

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Syllabus for:

DSC-A Theory-I Title: SEMESTER-I PAPER –I

CHEMISTRY-I (2031102)

Title:Physical Chemistry

Hours: 30
Marks:50
Credits: 2

Learning objective:

1. To learn the basic concepts for drawing graphs.
2. To understand the rules of differentiation and integration.
3. To learn the relation between Vander wall's constant and critical constants.
4. To know concentration terms normality & molarity of the solution.
5. To learn the calculation of numerical.

Unit 1: Chemical Mathematics **4**

1.1 Logarithm:- Rules of logarithm, Characteristic and mantissa, Change of sign and base, Problems based on pH and pOH.

1.2 Graphical representation: Graph paper, co-ordinates of a point, equation of straight line and intercept, plotting of graph based on experimental data.

1.3 Derivative: Rules of differentiation (without proof) pertaining to algebraic and exponential functions. Example related to chemistry.

1.4 Integration: Rules of Integration (without proof) pertaining to algebraic and exponential functions. Examples related to chemistry.

Unit 2:Mole Concept and Stoichiometry **6**

2.1 Mole concept

2.2 Mass-Mole conversions: Mole and gram atomic mass, mole and gram molecular mass, mole concept as applied to ionic compounds, mole in terms of volume, numerical based on above topics.

2.3 Concentration of solution andmethods of expressing concentration of solution: ppm and ppb, % w/w, % w/v, % v/v, strength in grams per liter, mass percent, molarity, molality, mole fraction, normality, specific gravity and weight%.

2.4 Preparation of standard solutions of acids and bases Standard solution: Primary standard substances, secondary standard solutions.

2.5 Normality and its relation with molarity in acids and bases.

Unit 3 Chemical Kinetics **7**

3.1 Chemical Kinetics and its scope, Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction: Concentration, pressure, temperature and catalyst.

3.2 Order and Molecularity of reaction.

3.3First order reaction: Derivation of rate constant. Characteristics of first order reaction. Examples: Decomposition of N_2O_5, Hydrogenation of ethane.

3.4 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction. Examples: i) Reaction between $K_2S_2O_8$ and KI.

3.5 Pseudo-unimolecular reactions such as Hydrolysis of methyl acetate in presence of Acid.

3.6 Temperature dependence of the rate of a reaction

3.7 Methods to determine the order ofreaction:

a) Integration method, b) Graphical method c) Half change method, d) Ostwald's isolation (Numerical Problems Expected)

3.8 Zero Order Reactions: Expression for rate constant, Variation in the concentration vs time plot for a zero order reaction. Examples: The decomposition of gaseous ammonia on a hot platinum surface, the thermal decomposition of HI on gold surface.

Unit 4:Thermodynamics **6**

4.1 Spontaneous and non-spontaneous processes, Second law of thermodynamics and its different statements.

4.2 Carnot's Theorem (Heat engine), Carnot cycle and its efficiency.

4.3 Entropy changes for system and surroundings for reversible and irreversible processes, Entropy changes for an ideal gas in isothermal, isobaric and isochoric changes, Entropy Changes in chemical reactions. Entropy changes accompanying fusion. (Numerical Problems Expected).

Unit 5: Gaseous State **7**

5.1 a) Ideal and Non ideal gases, b) Deviation from ideal behaviour, c) Causes of deviation compressibility factor (Z), van der Waal's equation of state and its application to explain deviation of gases, explanation of real gas behaviour by van der Waal's equation.

5.2 Critical Phenomena: PV-Isotherms of real gases (Andrew's isotherms), continuity of

state, Relationship between critical constants and van der Waal's constants. Critical constant of gas in terms of van der Waal's constant, (Numerical Problems expected).

Course outcome:

After successful completion of this course students will be able to:-

1. Draw graphs by using variables.
2. Apply rules of differentiation and integration to various Chemical equations.
3. Prepare standard solutions of different concentrations.
4. Define and differentiate between order and molecularity of the reaction.
5. Derive an equation for rate constant of first and second order reaction.
6. Define the fundamental concepts of thermodynamics.
7. Calculate the efficiency of heat engine from given data.
8. Distinguish between ideal and non-ideal gases.
9. Formulate the relation between Vander wall's constant and critical constants.
10. Differentiate between concentration terms normality & molarity of the solution.
11. Solve numerical problems related to theory.

Reference Books:

Physical Chemistry

1) Mathematical preparation of Physical Chemistry: F. Daniel Mc-Graw Hill Book Com.

2) Elements of Physical Chemistry: S. Glasstone and D. Lewis (D. Van Nostrand Co. Inc)

3) Physical Chemistry: W. J. Moore (Orient Longman)

4) Principles of Physical Chemistry: MaronPrutton

5) University Chemistry: B. H. Mahan (Addision - Weseley Publ. Co.)

6) Chemistry Principle & Applications: P.W. Atkins, M. J. Clugsto, M.J. Fiazer, R. A. Y. Jone (Longman)

7) Physical Chemistry: G. M. Barrow (Tata Mc-Graw Hill)

8) Essentials of Physical Chemistry: B. S. Bahl& G.D. Tuli (S. Chand)

9) Physical Chemistry: A. J. Mee.

10) Physical Chemistry: Daniels - Alberty.

11) Principles of Physical Chemistry: Puri - Sharma (S. Nagin)

12) Text Book of Physical Chemistry: SoniDharmarha

13) University General Chemistry: CNR. Rao (McMillan)

14) Chemistry: Sienko - Plane (RecentEdn,.)

15) Physical Chemistry Through problems: Dogra and Dogra (Wiley Eastern Ltd.,)

16) Physical Chemistry: S. Glasstone.

17) Basic Chemical Thermodynamics: V. V. Rao.

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DSC-A Theory-II Title: SEMESTER-I PAPER –II

CHEMISTRY-II(2031103)

Title:Inorganic Chemistry

Hours: 30
Marks:50
Credits: 2

Learning objective:

1. To know the various types of chemical bonds.
2. To understand valence shell electron pair repulsion theory.
3. To learn for drawing molecular orbitals based on MOT.
4. To know the geometry of molecule from hybridization
5. To understandHund's rule of maximum multiplicity.

Unit 1: Atomic Structure and periodic properties **7**

1.1 Atomic Structure a) Proton- its discovery and properties, Neutron- its discovery and properties, Ritz – combination principle, Bohr's model of hydrogen atom, postulates, derivation for its radius and energy. Application of Bohr's theory, Limitations of Bohr's theory. b) Shapes of s, p, d orbitals. c) Aufbau and Pauli's exclusion principle, Hund's rule of maximum multiplicity, Quantum numbers d) Electronic configuration of sp and d (At no. 21 to 30) block elements.

1.2 General Characteristics of s and p block elements w.r.t. Atomic and Ionic radii, Ionization energy, Electron affinity, Electronegativity, Reactivity, Melting and Boiling point.

Unit 2: Chemical bonding and Ionic Solids **7**

2.1 Types of chemical bonding i) Attainment of stable configuration. ii) types of bonds a) ionic, b) covalent c) Coordinate d) metallic

2.2 Ionic Bonding a) Formation of ionic bond, Energetics of ionic bonding :Ionisation potential, Electron affinity and Lattice energy. b) Characteristics of ionic compounds. c) Born-Haber Cycle for Alkali metal halide (NaCl) d) Fajan's rules.

2.3 Radius ratio and crystal structure. a) Definition: Radius ratio (r+ / r-), Coordination number, Stoichiometry and unit cell. b) Concept and calculation of radius ratio (r+ / r-) for ionic solid with octahedral geometry. c) Radius ratio effect on geometry. d) Crystal structure of NaCl and CsCl

w.r.t. unit cell, radius ratio, coordination number and stoichiometry.

Unit 3:Covalent bonding **10**

Valence Bond Theory (VBT)

3.1 Valence Bond Theory: Heitler–London Theory and Pauling-Slater Theory

3.2 Limitations of VBT

3.3 Need of Hybridization, Applications of hybridization concept, geometries of molecules like BeF_2 CH_4, BF_3,$SiCl_4$,PCl_5,IF_7,SF_6,$[Ni(CN)_4]^{2-}$

3.4 ValenceShellElectron Pair Repulsion (VSEPR) theory w.r.t. H_2O, NH_3, $TiCl_4$, ClF_3, ICl_2, BrF_3, BrF_5, OF_2.

Molecular Orbital Theory (MOT)

3.5 Atomic and Molecular orbitals.

3.6 L.C.A.O. Principle. Bonding, Antibonding and Nonbonding Molecular orbitals.

3.7 Conditions for successful overlap, Different types of overlap (s-s, s-px, px - px and py- py or pz- pz)

3.8 Energy level sequence of molecular orbitals for n = 1 and n = 2.

3.9 M. O. Diagrams w.r.t. bond order, stability and magnetic properties for: a) Homonuclear diatomic molecule. H_2,Li_2, Be_2, C_2, N_2 and O_2 b) Heteronuclear diatomic molecules CO and NO.

Unit 4:Chemistry of Hydrogen and Noble Gases. **6**

Hydrogen:

4.1 Position of hydrogen in periodic table, isotopes of Hydrogen, properties of Isotopes, heavy water, its preparation and application

4.2 Hydrogen bonding Types of hydrogen bonding, effect of hydrogen boding on physical properties of substances like a) Physical State b) MP & BP c) Solubility d) Viscosity

Noble Gases

4.3 Position of these elements in periodic table, Electronic configuration.

4.4 Chemical Properties of Noble Gases.

4.5 Chemistry of xenon structure and bonding in xenon compounds. XeF_2, XeF_4, XeF_6 XeO_2, XeO_4, $[XeO_6]^{-4}$, $XeOF_4$, XeO_2F_2.

Course outcome:

After successful completion of this course students will be able to:-

1. Define and identify various types of chemical bonds.
2. Predict shapes of molecules based on number of electron pairs with respect to VSEPRT.
3. Draw the various molecular orbitals based on MOT
4. Identify and draw the geometry of molecule from hybridization
5. Calculate the bond order and stability of simple molecules like O_2, N_2, CO & NO.
6. Apply the Hund's rule of maximum multiplicity.

Reference Books:
Inorganic Chemistry

1) Advanced Inorganic Chemistry - Cotton and Wilkinson.

2) Inorganic Chemistry - J. E. Huheey.

3) Concepts and models of Inorganic Chemistry - Douglas &Mc-Daniel.

4) Principles of Inorganic Chemistry - Puri, Sharma.

5) New Concise Inorganic Chemistry - (ELBS) - J. D. Lee.

6) Text book of Inorganic Chemistry - P. L. Soni.

7) Advanced Inorganic Chemistry - Satyaprakash, Tuli, Basu.

8) Theoretical Principles of Inorganic Chemistry - G. S. Manku.

9) Principles of Inorganic Chemistry - Puri, Sharma &Kalia.

10) Inorganic chemistry: Principles of structure and reactivity – J. E. Huheey.

11) Advanced Inorganic Chemistry, Vol. I – Gurudeep Raj.

12) A New Guide to Modern Valency Theory- G. J. Brown.

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DSC-B Theory-I Title: SEMESTER-II PAPER III:

CHEMISTRY-III (2031202)

Title:Organic Chemistry

Hours: 30 Marks:50

Credits: 2

Learning objective:

1. To learn the structure of reaction intermediates and their role in reaction mechanism.
2. To understand aromaticity and Huckel's rule.
3. To learn the electrophilic substitution reactions. .
4. To understand the methods of synthesis of alkanes, alkenes and alkynes.

Unit 1: Fundamentals of organic reaction mechanism **5**

1.1 Meaning of reaction mechanism, curved arrow notation, Half headed and double headed arrows.

1.2 Types of bond breaking: Homolytic and Heterolytic.

1.3 Types of reagents: Electrophilic and Nucleophilic.

1.4 Types and sub-types of following organic reactions with definition and at least one example of each. a) Substitution b) Addition c) Elimination d) Rearrangement.

1.5 Reactive Intermediates with examples carbocations, carbanions (formation, structure, stability and reactions are expected). Carbon free radicals, carbenes, arenes, nitrenes (Definition with example only)

Unit 2: Structure and Bonding **5**

2.1 Hybridization: sp3, sp2 and spw.r.t. methane, ethylene and acetylene respectively.

2.2 Bond length, Bond angle and Bond energy with factors affecting these properties w.r.t. : sp3, sp2 and sphybridization

2.3 Resonance effect with respect to phenol, aniline, chlorobenzene and nitrobenzene.

2.4 Hyperconjugation: stability, order Example: w.r.t. toluene.

2.5 Inductive effect, + I and - I . 2.6 Steric effect w.r.t. mesitoic acid.

Unit 3: Chemistry of Saturated and Unsaturated Hydrocarbons **8**

3.1 Alkanes: Physical properties, Methods of formation with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acid. Industrial methods of preparations, Reactions of alkanes, Combustion, pyrolysis, cracking, controlled oxidation, Reaction with steam, Isomerisation, Aromatisation. Analysis of alkanes.

3.2 Chlorination of Methane, Ethane, Selectivity of chlorination in n-propane. Mechanism of free radical halogenation of alkanes.

3.3 Cycloalkanes -Reactivity, Stresses of Small Rings, Nomenclature, methods of formation (a) Internal Wurtz reaction (b) Distillation of calcium or barium salt of dicarboxylic acid.

3.4 Chemical properties of cyclopropane (i) Free radical substitution of chlorine in presence of light. (ii) Action of HBr and conc. H_2SO_4 iii) Catalytic reduction by H_2/Ni

3.5 Nomenclature, Methods of formation of alkenes with mechanism i) By dehydration of lower alcohols. ii) By dehydrohalogenation of lower alkyl halides.

3.6 Chemical reactions of alkenes - Hydrogenation, Electrophilic and free radical additions, Hydroboration, Oxidation, Epoxidation, Ozonolysis, Hydration, Hydroxylation, Oxidation with $KMnO_4$, Polymerisationof alkenes - ethylene and propylene

3.7 Nomenclature and classification of dienes, Isolated, Conjugated and cumulated dienes.

3.8 Butadiene-Methods of formation,polymerisation,1:2 and 1:4additions and Diels-Alder reaction.

3.9 Alkynes- Nomenclature, Methods of preparation, Acidity of alkynes, Reactions of Ethyne: Electrophilic and Nucleophilic addition reactions, Hydroboration, oxidation.

Unit 4: Stereochemistry of organic compounds **6**

4.1 Types of stereo-isomerism - Optical isomerism, Geometrical isomerism and Conformational isomerism. 4.2 Chiral center [Explanation with lactic acid]

4.3 Elements of symmetry

4.4 Optical isomerism in lactic acid, tartaric acid and 2,3 - dihydroxybutanoic acid

4.5 Enantiomers and diastereoisomers.

4.6 Racemic modification.

4.7 Geometrical isomerism-cause ofgeometrical isomerism.

4.8 Geometrical isomerism w.r.t. C = C, Geometrical isomerism in maleic acid and fumaric acid.

Unit 5: Aromaticity and Benzene **6**

5.1 Meaning of the terms - Aromatic, non-aromatic, antiaromatic and psuedoaromatic compounds.

5.2 Structure of benzene (Kekule's structure, Resonance structures, Molecular orbital picture, Representation of benzene ring.

5.3 Modern theory of aromaticity. Fundamental Concepts - delocalisation of electrons, coplanarityandHuckel's (4n+ 2) π rule. Applications of Huckel's rule to napthalene, pyrrole and pyridine.

5.4 Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration, sulphonation, halogenation and Friedel - Craft's reaction- alkylation and acylation.

5.5 Structure of benzene diazonium chloride–preparation, Formation of benzene, Sandmeyer'sreaction.

Course outcome:

After successful completion of this course students will be able to:-

1. Explain the structure of reaction intermediates and their role in reaction mechanism.
2. Differentiate between optical, geometrical and conformational isomers.
3. Draw the real 3D structure of molecules
4. Define aromaticity and apply the Huckel's rule to explain aromaticity.
5. Comment on Aromatic/Nonaromatic character of compounds.
6. Able to predict of sy the mechanism of aromatic electrophilic substitution reactions.
7. Describe the methods of synthesis of alkanes, alkenes & alkynes and their chemical properties.

Reference books:

Organic Chemistry

1) Organic Chemistry: Hendrickson, Cram, Hammond.
2) Organic Chemistry: Morrison and Boyd
3) Organic Chemistry: Volume I and II I.L. Finar
4) Organic Chemistry: Pine
5) Advanced Organic Chemistry: SachinkumarGhosh
6) Advanced Organic Chemistry: B.S. Bahl and ArunBahl
7) A Guide book to Mechanism in organic Chemistry: Peter Sykes
8) Stereochemistry of Organic Chemistry: Kalsi,
9) Stereochemistry of Carbon Compounds: Eliel
10) Text book of Organic Chemistry: P. L. Sony
11) Practical Organic Chemistry: By A. I. Vogel
12) Advanced Organic Chemistry - Reactions, Mechanism and Structure: Jerry March
13) Organic Chemistry: M.R. Jain
14) Organic Chemistry: J. M. Shaigel

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DSC-B Theory-II Title: SEMESTER-II PAPER IV:

CHEMISTRY-IV (2031203)

Title:Analytical Chemistry

Hours: 30
Marks:50

Credits: 2

Learning objective:

1. To learn qualitative and quantitative analysis of organic compounds.
2. To understand the physical properties of liquids.
3. To know types of catalysis and mechanism.
4. To aware factors affecting water and air pollution.

Unit1:Physical properties of liquids **6**

1.1 Introduction, additive and constitutive properties

1.2 Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer

1.3 Surface tension:- Determination of surface tension by Drop –Weight method

1.4 Parachor:-Macleod equation and its modification by Sugden, applications of parachor in the determination of molecular structures as benzene and NO_2 group

1.5 Dipole moment, electrical polarization of molecules

1.6 Use of dipole moment in the study of molecular structure

Unit 2: Catalysis **3**

2.1. Introduction

2.2 Classification of catalytic reaction- Homogenous and Heterogeneous

2.3 Types of Catalysis

2.4 Characteristics of catalytic reactions

2.5 Mechanism of catalysis i. Intermediate compound formation ii. Adsorption

2.6 Industrial applications of catalysts.

Unit 3: Environmental Chemistry **6**

3.1 Introduction: Meaning of terms: Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and BiologicalOxygen Demand (BOD)

3.2 Types of Pollution (Only Introduction): Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and nuclear pollution.

3.3 Air Pollution: Classification of Air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards. Cause and Effects of depletion of the Ozone layer

Water pollution:

3.4 Introduction: Resources of water, Types of water Pollutants, water Pollution and its sources (Brief Account)

3.5 Treatment of water: A) Potable Water: Parameters of potability of water Step I: Removal of suspended matter : a) Prolonged storage b) Screening c) Sedimentation d) Coagulation e) Filtration Step II: Removal of germs and bacteria- Physical and Chemical method. Physical Methods: a) Boiling b) Exposure to UV or Sunlight c) Distillation. Chemical Method: a) Chlorination b) Fluorination c) Ozonisation d) Aeration e) Use of $KMnO_4$ B) Industrial Water: Mention names of the methods only, Ion exchange method in detail. C) Municipal Sewage: Meaning of Sewage; mention the names of methods; activated sludge process in detail.

Unit 4: Qualitative and Quantitative elemental analysis 6

4.1 Qualitative analysis of Carbon, Hydrogen, Nitrogen &Sulphur

4.2 Quantitative analysis of - i) Carbon and hydrogen by Combustion method ii) Nitrogen by Kjeldahl's method iii) Halogen and Sulphur by Carius method.

4.3 Determination of molecular weight of an acid by titration method.

4.4 Empirical formula and molecular formula determination. (Numerical Problems Expected)

Unit 5: Oxidation and Reduction 5

5.1 Introduction and essential terms,Valency and oxidation number

5.2 Rules to find out oxidation number

5.3 Balancing of redox reactions: Ion exchange method, oxidation number method

5.4 Equivalent weight: Equivalent weight of oxidant and reductant

5.5 Preparation of normal solutions of oxidant and reductant .

5.6 Oxidizing and Reducing Agents

Unit 6: Petroleum and petrochemicals 4

6.1 Constituents and refining of petroleum, cracking, knocking, octane, hydro-forming

6.2 Synthesis and Industrial applications of following petrochemicals: a) Ethylene oxide b) Adipicacid c) Styrene d) 2-Phenyl ethanol e) Paracetamol

Course outcomee:

After successful completion of this course students will be able to:-

1. Explain and define the physical properties of liquids such as surface tension, viscosity and dipole moment.
2. Explain principle, reactions, procedure and calculations needed for qualitative and quantitative analysis of organic compounds.

3. Identify the oxidation-reduction reactions and also able to balance reactions.
4. Describe the types of catalysis and mechanism
5. Describe the factors affecting water and air pollution and health hazardous.
6. Discuss the applications of petrochemical compounds.

Reference Books
Analytical chemistry

1) Chemistry - Central Science, Brown, Lemay, Bursten8th Edition.
2) Principles of Physical Chemistry - S.H.Maron / C.F.Prutton
3) Elements of Physical Chemistry - P.Atkins / J.Paula
4) Essentials of Physical Chemistry - A.Bahl / B.Bahl / G.Tuli
5) Textbook of Physical Chemistry - S.Glasstone
6) Principles of Physical Chemistry - B.Puri / L.Sharma / M.Pathania
7)Textbook of Physical Chemistry - P.Soni /O.Dharmarha
8) Environmental Chemistry - A.K. De
9) Environmental pollution analysis - S.M. Khopkar
10) Organic Chemistry: Hendrickson, Cram, Hammond.
11) Organic Chemistry: Morrison and Boyd
12) Organic Chemistry: Volume I and II I.L. Finar
13) Organic Chemistry: Pine
14) Advanced Organic Chemistry: SachinkumarGhosh
15) Advanced Organic Chemistry: B.S. Bahl and ArunBahl
16) Practical Organic Chemistry: By A. I. Vogel
17) Industrial Chemistry: Rogers
18) Industrial Chemistry: R.K.Das
19)Industrial Chemistry: B. K. Sharma

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Chemistry Practical Course

DSC-A & DSC-B

CHEMISTRY PRACTICAL-I(2031220)

Total Credits: 4 **Hours:**
Marks: 100

N.B. i) Use of Digital balance is allowed. ii) Use S.I. Units Wherever Necessary.

Learning objective:

1. To understand basic concept of physical, organic and Inorganic chemistry.

2. To impart practical skills and learn basics behind experiments.

3. To prepare background for advanced practical in chemistry.

4. To learn various techniques of chemistry practical.

A) Physical Chemistry

1. Determination of viscosity of given liquids A and B. (Density data of liquids, viscosity of water to be given.) [Any two liquids from, Acetone, CCl_4, Ethyl alcohol, Ethylene glycol and n- propyl alcohol]

2. Determination of equivalent weight of Mg by Eudiometer.

3. Study of specific reaction rate of hydrolysis of methyl acetate in presence of HCl.

4. Study of specific reaction rate of hydrolysis of methyl acetate in presence of H_2SO_4

5. Study of reaction between $K_2S_2O_8$ and KI (Equal Concentrations)

6.Determination of heat of ionization of weak acid.

B) Inorganic Chemistry

1) Inorganic Quantitative Analysis: Volumetric Analysis

7. To prepare a standard solution of Oxalic acid and determine the strength of Sodium hydroxide solution in terms of normality and Kg/dm^3

8. To prepare a standard solution of Oxalic acid and determine the strength of Potassium permanganate solution in terms of normality and Kg/dm^3

9. To prepare standard solution of Potassium dichromate and determine strength of Ferrous Ammonium Sulphate solution in terms of normality and Kg/dm^3 (Use internal indicator).

2) Qualitative Analysis:

10. 1) Spot Tests: Detection of following cations using spot tests : Cu^{2+}, Co^{2+}, Ni^{2+}, Fe^{3+}, Zn^{2+}, Mg^{2+}, Al^{3+}, Pb^{2+}

11.2) Chromatography: Separation and identification of cations by Paper Chromatographic technique from the following mixtures : a) Ni^{2+} + Cu^{2+} b) Ni^{2+} +Co^{2+} c) Cu^{2+} + Co^{2+}

C) Organic Chemistry

1) Estimations: (any two)

12. i) Estimation of aniline, ii) Estimation of acetamide and iii) Estimation of Aspirin

2) Organic Qualitative Analysis.

13.Identification of at least five organic compounds with reactions including one from acids, one from phenols, one from bases and two from neutrals from the list of the compounds given below) i) Acids : Oxalic acid, Benzoic acid and Cinnamic acid ii) Phenols : β - Naphthol, Resorcinol. iii) Bases : Aniline, p - Toluidine. iv) Neutrals: Acetone, Ethyl acetate, Glucose, Chloroform, Chlorobenzene, m-dinitrobenzene, Thiourea.

Note: A systematic study of an organic compound involves the following operations which should be taught in details with reactions in the detection of elements and functional group. 1) Preliminary tests and physical examination. 2) Determination of physical constant. 3)Detection of Elements. 4) Determination of functional group. 5) A search into the literature. 6) Special Test. 7) Summary. 8) Result.

3) Organic Preparation: (Any one)

14. i) Preparation of benzoic acid from benzamide. ii) Preparation of dibenzal acetone from benzaldehyde and acetone. (Wt. of crude product is expected. M.P. of the recrystallized product is not expected).

Course outcome:

After successful completion of this course students will be able to:-

- Physical chemistry:

1. Determine the viscosity of different liquids.
2. Hands on use of eudiometer to determine equivalent weight of metal.
3. Application of reaction rates to study hydrolysis of methyl acetate.
4. Examine the study of second order reaction.
5. Establish the heat of ionization of weak acid.

- Inorganic chemistry:

1. Develop the skill for the preparation of standard solution of any concentration.
2. Apply the various synthetic skills to prepare inorganic complexes
3. Identify the presence of cations in a solution by using spot chemical tests.
4. Develop hands on expertise for the paper chromatographic techniques.

- Organic chemistry:

1. Estimate quantitatively the amount of given drug samples.
2. Identify the given organic compounds qualitatively by applying various simple laboratory tests.
3. Prepare benzoic acid from benzamide.
4. Determine the melting and boiling point of given organic compound.

Reference Books: Practical Course:

Physical Chemistry

1) Practical book of Physical Chemistry: Nadkarni, Kothari &Lawande.

2) Experimental Physical Chemistry: A. Findlay.

3) Systematic Experimental Physical Chemistry: S.W. Rajbhoj, Chondhekar (Anjali Pub.)

4) Experiments in Physical Chemistry: R.C.Das and B. Behra. (Tata Mc. Graw Hill)

5) Advanced Practical Physical Chemistry: J. B. Yadav (Goel Publishing House)

6) Practical Physical Chemistry: B. D. Khosala(R. Chand & Sons.)

7) Experiments in Chemistry: D. V. Jagirdar

Inorganic Chemistry

1) Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)
2) Vogel's Text Book of Qualitative Chemical Analysis (Longman ELBS Edition)
3) Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar.

Organic Chemistry

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