

DEPARTMENT OF CHEMISTRY

I - SEMESTER

DSC 21CH101: Fundamentals of Chemistry I

Number of Theory Credits	Number of lecture hours/ semester	Number of practical credits	Number of practical hours / semesters
4	56	2	56
Content of Theory Course 1			

After successful completion of first semester in Chemistry a student should be able to;

CO1: Analyze the analytical methods, Errors and treatment of analytical data and gain knowledge about balance in redox equations, titration curves, theory of redox in metal-ion indicators and applications

CO2: Describe the dual nature of radiation and matter, Quantum mechanics, Orbital shapes, Electronic configurations of the atoms and periodicity.

CO3: Explain bond properties, electron displacement effects, organic reaction mechanism, configurationally and conformational isomers.

CO4: Explain the existence of different states of matter, laws of ideal gases and real gases and understand cooling effect of gas.

Unit – 1 Analytical chemistry

14 hours

Definitions of analysis, determination, measurement, techniques and methods. Classification of analytical techniques. Choice of an analytical method - accuracy, precision, sensitivity, selectivity, method validation. Figures of merit of analytical methods and limit of detection (LOD), Limit of quantification (LOQ)

Errors and treatment of analytical data: Limitations of analytical methods – Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors. Statistical treatment of finite samples -mean, median, range, standard deviation and variance. Numerical problems

Titrimetric analysis: Basic principle of titrimetric analysis. Classification, Preparation and dilution of reagents/solutions. Preparation of ppm level solutions from source materials (salts), conversion factors.

Acid-base titrimetry: Theory, Titration curves for all type of acid- base titrations. Quantitative applications – selecting and standardizing a titrant,

Complexometric titrimetry: Indicators for EDTA titrations - theory of metal ion indicators, titration methods employing EDTA – direct and indirect determinations, Application determination of hardness of water.

Redox titrimetry: Titration curves, Theory of redox indicators, Applications of redox titrations.

Precipitation titrimetry: Titration curves, titrants and standards, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences.

Unit - 2 Atomic structure & Periodicity of elements

14 hours

Atomic Structure: Review of Rutherford's atomic model, Bohr's theory, Hydrogen atomic spectra. Derivation of radius and energy of an electron in hydrogen atom, limitations of Bohr's theory, dual behavior of matter and radiation, de Broglie's equations, Heisenberg Uncertainty principle and their related problems. Quantum numbers and their significance. Orbital shapes of *s, p, d* and *f* atomic orbitals, nodal planes. Rules for filling electrons in various orbitals, Electronic configurations of the atoms (atomic number up to 54). Concept of exchange energy. Anomalous electronic configurations.

9hrs

Periodic properties of elements: Brief account on the following properties of elements with reference to s and p-block and trends in groups and periods. Effective nuclear charge, screening effect, Slater rules, atomic and ionic radii, ionization enthalpy, electron gain enthalpy, and electronegativity, Pauling / Allred-Rochow scales of electronegativity.

5hrs

Unit 3 Bonding in Organic Molecules and Mechanism of Organic reactions

14 hours

Classification and nomenclature of bifunctional organic compounds, Hybridization, Shapes of organic molecules m Influence of hybridization on bond properties.

Nature of bonding in Organic molecules Types of chemical bonding, Formation of Covalent bond, localized and delocalized, conjugation and cross conjugation, concept of resonance, electronic displacements: Inductive effect, Electromeric effect, Resonance and Hyper conjugation with examples. Concept of resonance and aromaticity, Huckel rule, anti-aromaticity explanation with examples.

7hrs

Mechanisms of Organic Reactions-I

Notations used to represent electron movements and directions of reactions- curly arrows, formal charges. Types of bonds breaking- homolytic and heterolytic. Types of reagents- Electrophiles, nucleophiles, nucleophilicity and basicity. Types of organic reactions- substitution, addition, elimination, rearrangement and pericyclic reactions, explanation with examples.

Aliphatic hydrocarbons: Carbon-Carbon Sigma bonds Alkanes: Formation of alkanes by catalytic hydrogenation of alkenes, alkynes and alkyl halides, Wurtz reaction, Wurtz-Fittig reaction, Free radical substitutions mechanism of Halogenation- relative reactivity with HX. Pyrolysis and isomerisation of higher alkanes.

7hrs

Unit - 4 Gaseous State & Distribution

14hours

Gaseous state: Review of kinetic theory of gases, van der Waals equation of state Boyle temperature. Molecular velocity: Maxwell's Boltzmann distribution law of molecular velocities (most probable, average and root mean square velocities). Relation between RMS, average and most probable velocity and average kinetic energies (derivation not required). Collision frequency, collision diameter, Collision cross-section, collision number and mean free path. Critical phenomena: Andrews isotherms of CO₂, critical constants and their determination Relation between critical constants and van der Waals equation (Derivation), continuity of states, law of corresponding states. Numerical problems are to be solved wherever applicable.

8hrs

Distribution Law: Nernst Distribution Law - Statement and its derivation. Distribution constant, factors affecting distribution constant, validity of Distribution Law, Modification of distribution law when molecules undergo a) Association b) Dissociation. Application of Distribution Law in Solvent extraction. Derivation for simple and multiple extraction. Principles of distribution law in Parkes Process of desilverisation of lead. Numerical Problems.

6hrs

References

1. Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
2. Douglas, B.E., McDaniel, D.H. & Alexander, J. J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
3. Huheey, J. E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Education India, 2006.
4. Shriver, D.F. & Atkins, P.W. *Inorganic Chemistry*, Oxford University Press
5. Heterocyclic Chemistry- R. K. Bansal, 3rd Edition, New- Age International, New Delhi, 2004
6. McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
7. Sykes, P.A *Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
8. Stereochemistry-Conformation and Mechanism-P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
9. Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage Learning India Pvt.Ltd., New Delhi (2009).
10. P.W. Atkins: *Physical Chemistry*.
11. W.J. Moore: *Physical Chemistry*
12. Text Book of Physical Chemistry - P.L. Soni, S. Chand & Co., 1993
13. Willard, H.H., Merritt, L.L., Dean, J. & Settle, F.A. *Instrumental Methods of Analysis*, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
14. Christian, G.D; *Analytical Chemistry*, VI Ed. John Wiley & Sons, New York, 2004.

DEPARTMENT OF CHEMISTRY

I - SEMESTER

DSC 21CH102: Chemistry Practical I

After successful completion of first semester in Chemistry a student should be able to;

CO1: Understand principles of different type's titrations. Titration curves for all types of acids–base titrations.

CO2: Gain knowledge about balance in redox equations, titration curves, theory of redox indicators and applications.

CO3: Gain knowledge about estimation of some organic compounds such as Aniline and Amide

PART-A

1. Determination of sodium carbonate and sodium bicarbonate in a mixture
2. Determination of alkali present in soaps/detergents
3. Determination of oxalic acid using potassium permanganate solution
4. Standardization of EDTA solution and determination of hardness of water
5. Determination of phenol/aniline by bromination method
6. Determination of acetamide/ethylbenzoate by hydrolysis method

PART-B

7. Preparation of acetanilide from aniline using Zn/acetic acid (Green method)
8. Synthesis of p-nitro acetanilide from acetanilide using nitrating mixture
9. Bromination of acetanilide
 - (i) Conventional method and /or
 - (ii) with ceric ammonium nitrate and potassium bromide (Green method).
10. Hydrolysis of methyl m-nitrobenzoate to m-nitrobenzoic acid (Conventional method)

Examination

In the practical examination, a batch of maximum 15 (Fifteen) students may be made. Anyone experiment from Part-A or B can be given by selection done by the students based on lots. **Viva questions must be asked on any of the experiments prescribed in the practical syllabus.**

Part A: Distribution of marks

1. Accuracy: 12 (6+6) Marks
2. Technique and presentation: 03Marks
3. Reactions and Calculations: 05 Marks
4. Viva: 05 Marks

Total 25 marks

Deduction of marks for accuracy: ± 0.4 CC – 6 marks, ± 0.6 CC- 04 marks, ± 0.8 CC- 02 marks, ± 1.0 CC - 01 marks. Above ± 1.0 CC - 00 marks

Part B: Distribution of Marks:

1. Reaction & Mechanism-04 marks,
2. Calculation of theoretical yield – 02 mark,
3. Observed yield -10 marks,
4. M.P- 004 marks,
5. Viva-Voce-5 marks,

Total=25 marks.

Deduction of marks for observed yield: Less than 10% - 10 marks, 11-15% - 8 marks, 16-20% - 6 marks, 21-25 % - 4 marks & above 25% - zero mark.

References

1. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, Pearson Education Pvt. Ltd.(2007).
2. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th edition, Saunders College Publishing, New York (2005).
3. Analytical Chemistry, G.D. Christian, 6th edition, Wiley-India (2007).
4. Practical Volumetric Analysis, Peter A C McPherson, Royal Society of Chemistry, Cambridge, UK (2015).
5. Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India), Pvt. Ltd. (Pearson Education)
6. Finar, I. L. *Organic Chemistry (Volume I)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education)
7. McMurry, J. E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013
8. Organic Reaction mechanism by V. K. Ahluwalia and K. Parashar (Narosa Publishers).
9. Organic Chemistry by S. M. Mukherji, S. P. Singh and R. K. Kapoor. (Narosa Publishers)
10. A Guide book to mechanism in Organic Chemistry by Peter Sykes. Pearson.

DEPARTMENT OF CHEMISTRY

I - SEMESTER

OEC- 21CH111: CHEMISTRY IN DAILY LIFE

Courses	Credits	No. of Classes/ Week	Total No. of Lectures/ Hours	Duration of Exam in hrs	Internal Assessment Marks	Semester End Exam Marks	Total Marks
Theory	03	03	42	2	40	60	100
Content of Theory Course 1							42 Hrs

COURSE OUTCOMES: OEC-1 Chemistry

On completion of the course students will be able to:

CO1: Understand the chemical constituents in various day today materials using by a common man.

CO2: Understand the chemical constituents in fertilizers, insecticides and pesticides, chemical explosives etc.

CO3: Understand the chemical constituents in polymers, surface coatings etc.

Unit – 1

Dairy Products: Composition of milk and milk products. Analysis of fat content, minerals in milk and butter. Estimation of added water in milk. Beverages: Analysis of caffeine in coffee and tea, detection of chicory in coffee, chloral hydrate in toddy, determination of methyl alcohol in alcoholic beverages.

Food additives, adulterants, and contaminants- Food preservatives like benzoates, propionates, sorbates, disulphites. Artificial sweeteners: Aspartame, saccharin, dulcin, sucralose, and sodium cyclamate. Flavors: Vanillin, alkyl esters (fruit flavors), and monosodium glutamate.

Artificial food colorants: Coal tar dyes and non-permitted colors and metallic salts. Analysis of pesticide residues in food. **14 hours**

Unit – 2

Vitamins: Classification and Nomenclature. Sources, deficiency diseases, and structures of Vitamin A1, Vitamin B1, Vitamin C, Vitamin D, Vitamin E & Vitamin K1.

Oils and fats: Composition of edible oils, detection of purity, rancidity of fats and oil. Tests for adulterants like argemone oil and mineral oils. Halphen test.

Soaps & Detergents: Definition, classification, manufacturing of soaps and detergents, composition and uses **14 hours**

Unit – 3

Chemical Energy Sources: Introduction, Classification, definitions of CV, LCV and HCV. Determination of calorific value of solid/liquid fuel using bomb calorimeter, numerical problems. Synthesis of synthetic petrol (Bergius Process).

Batteries and Fuel cell: Definition and classification of batteries (primary & secondary batteries) characteristics of batteries. Basic concepts, Advantages and limitation of fuel cells. Basics of solar energy, photovoltaic cells, working of PV Cells.

Polymers: Basic concept of polymers, classification of polymers. Glass transition Temperature: parameters influencing on T_g value (crystallinity, molecular weight and effect of side group). Synthesis, properties and applications of some important commercial polymers (Teflon, PMMA and polyurethanes). **14 hours**

References Text Books

1. B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)
2. Medicinal Chemistry- Ashtoush Kar.
3. Analysis of Foods – H.E. Cox: 13.
4. Chemical Analysis of Foods – H.E. Cox and Pearson.
5. Foods: Facts and Principles. N. Shakuntala Many and S. Swamy, 4th ed. New Age International (1998)
6. Physical Chemistry – P I Atkins and J. de Paula – 7th ed. 2002, Oxford University Press.

DEPARTMENT OF CHEMISTRY

II - SEMESTER

DSC- 20CH201: FUNDAMENTALS OF CHEMISTRY II

Number of Theory Credits	Number of lecture hrs/ semester	Number of practical Credits	Number of practical hrs/ sem
4	56	2	56
Content of Theory Course 2			56 Hrs

On completion of the course students will be able to:

CO1: Understand the chemical constituents in various day to day materials using by a common man.

CO2: Understand the chemical Composition and analysis of milk and milk products, beverages, food preservatives and analysis of pesticides residue in food.

CO3: Understand the chemical constituents in chemical fuels and polymers.

Unit – 1 Chemical bonding, molecular structure

14hours

Ionic Bonding: General characteristics of ionic compounds. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Born-Landé equation and calculation of lattice energy. Born-Haber cycle and its applications.

Polarizing power and polarizability: Fajan's rules, ionic character in covalent compounds and percentage of ionic character.

Covalent bonding: General characteristics of covalent compounds. VB approach, shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures of NO_3^- , CO_3^{2-} and SO_4^{2-} .

Molecular Orbital Theory: LCAO method, bonding and antibonding MOs and their characteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules: H_2 , O_2 , N_2 and ions of 1st and 2nd periods: He_2^+ , O_2^+ and heteronuclear diatomic molecules such as CO , NO and NO^+ . Comparison of VB and MO approaches. Numerical problems are to be solved wherever applicable.

Unit - 2 Acidic Strengths of Organic compounds and Stereochemistry **14 hours**

Strengths of Organic acid and bases: Comparative study with emphasis on factors effecting pKa values. Relative strength of aliphatic and aromatic carboxylic acids-Acetic acid and chloroacetic acid, acetic acid and propionic acid, acetic acid and Benzoic acid. Steric effect- Relative stability of trans and cis-2-butene.

Concept of Conformational analysis with reference to Ethane & n-Butane with staggered & eclipsed conformations & energy profile diagrams. **4hrs**

Stereoisomersim: Definition of stereoisomerism, conformational isomers and configurational isomers (distinction between conformation and configuration). Newman, Sawhorse and Fischer projection formulae and their interconversions.

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.

Optical isomerism: Chirality/asymmetry, enantiomerism, diastereomerism and meso Compounds. R and S notations (compounds with two asymmetric centers), D and L configurations and *threo* and *erythro* nomenclature, racemic mixture and racemization, Resolution: Definition, Resolution of racemic mixture by: i) Mechanical separation ii) Formation of diastereomers iii) Biochemical methods. Biological significance of chirality. **10hrs**

Unit - 3 Solids & Liquid crystals **14 hours**

Liquid Crystals: Explanation, classification with examples- Smectic, nematic, cholesteric, disc shaped and polymeric. Structures of nematic and cholesteric phases-molecular arrangements in nematic and cholesteric liquid crystals. Applications of liquid crystals in LCDs and thermal sensing. **6hrs**

Solids: Types of solids. Unit cell and space lattice, anisotropy of crystals, size and shape of crystals, Laws of Crystallography: Law of constancy of interfacial angles, Law of rational indices, Law of symmetry, Symmetry elements, X-Ray diffraction by crystals: Bragg's law and derivation of Bragg's equation, Structure of NaCl, KCl and CsCl, Defects in crystals, glasses and liquid crystals. Numerical problems. **8hrs**

Unit - 4 Chemical Kinetics I, Liquid state & Gravimetric Analysis **14hours**

Chemical Kinetics I: Review of reaction rates, order and molecularity. Factors affecting rates of reaction: concentration pressure, temperature, catalyst, etc. Examples for different orders of reactions. Derivation of integrated rate equations for zero and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction (numerical problems). Methods for determination of order of a reaction by half-life period and differential equation method. **3hrs**

Liquid state: Molecular forces and general properties of liquids.

Surface tension: surface tension, surface energy, effect of temperature on surface tension, shapes of liquid drops and soap bubbles, capillary action, determination of surface tension by capillary rise method, drop weight and drop number methods using stalagmometer. Effect of temperature on surface tension. Parachor, Additive and constitutive properties: atomic and structural parachor. Elucidation of structure of benzene and benzoquinone. .

Viscosity: Definition, viscosity coefficient, fluidity, molecular viscosity, relative viscosity and absolute viscosity, determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature, size, weight, shape of molecules and intermolecular forces.

Refractive index: Definition, Specific and molar refraction. Determination of refractive index using Abbe's refractometer. Additive and constitutive properties: Numerical problems are to be solved wherever applicable. **7hrs**

Gravimetric Analysis: Stages in gravimetric analysis, requisites of precipitation, factors influencing precipitation, co-precipitation and post-precipitation. Structure, specificity, conditions and applications of organic reagents such as salicylaldehyde, oxine, dimethylglyoxime, cupron in inorganic analysis. **4hrs**

Reference Books

I Inorganic Chemistry

1. Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J. J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
4. Huheey, J. E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Education India, 2006.
5. Shriver, D.F. & Atkins, P.W. *Inorganic Chemistry*, Oxford University Press.
6. Wulfsberg, G. *Inorganic Chemistry*, Viva Books Pvt. Ltd.
7. Rodgers, G.E. *Inorganic & Solid State Chemistry*, Cengage Learning India Ltd., 2008.
8. Mark Weller and Fraser Armstrong, 5th Edition, Oxford University Press (2011-2012) Adam, D.M. *Inorganic Solids: An introduction to concepts in solid-state structural chemistry*. John Wiley & Sons, 1974.
9. G.L. Miessler & Donald A. Tarr: *Inorganic Chemistry*, Pearson Publication.
10. Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
11. Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).

Organic Chemistry

1. Organic Chemistry-P. Y. Bruice, 7th Edition, Pearson Education Pvt. Ltd., New Delhi (2013).
2. Heterocyclic Chemistry- R. K. Bansal, 3rd Edition, New- Age International, New Delhi, 2004
3. McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition,

2013.

4. Sykes, P.A *Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi(1988).
5. Stereochemistry-Conformation and Mechanism-P. S. Kalsi, Wiley-Eastern Ltd, New Delhi.
6. Morrison, R.T.&Boyd,R.N.*OrganicChemistry*,Pearson,2010.
7. Bahl,A.&Bahl,B.S.*AdvancedOrganicChemistry*,S.Chand,2010.
8. Graham Solomons, T.W., Fryhle, C.B. &Snyder, S.A. *Organic Chemistry*, John Wiley & Sons(2014).
9. Organic Chemistry Volume-I, II- I. L. Finar, 6th Edition, ELBS London (2004).
10. Organic Chemistry-F.A. Carey, 4th Edition, McGraw Hill (2000).
11. Modern Organic Chemistry - R.O.C. Norman and D.J. Waddington, ELBS, 1983
12. Understanding Organic reaction mechanisms - A. Jacobs, Cambridge Univ. Press, 1998
13. Organic Chemistry - L.Ferguson, Von Nostrand, 1985
14. Organic Chemistry - M. K. Jain, Nagin & Co., 1987
15. Organic Chemistry- Mehta and Mehta.

Physical Chemistry

1. Barrow, G.M. *Physical Chemistry* Tata Mc Graw-Hill(2007).
2. Castellan, G.W. *Physical Chemistry* 4th Ed.Narosa(2004).
3. Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage Learning India Pvt.Ltd.,New Delhi(2009).
4. P.W. Atkins: PhysicalChemistry.
5. W.J. Moore: PhysicalChemistry
6. Text Book of Physical Chemistry - P.L. Soni, S. Chand & Co.,1993
7. Text Book of physical chemistry - S. Glasstone, Mackmillan India Ltd., 1982
8. Principles of Physical Chemistry - B. R. Puri, L.R. Sharma and M.S.Patania, S.L.N. Chand & Co. 1987
9. Physical Chemistry - Alberty R. A. and Silbey, R.J.John Wiley and sons, 1992
10. Physical Chemistry - G.M.Barrow, McGraw Hill, 1986
11. Physical Chemistry(3rd Edition) - Gilbert W. Castilian, Narosa Publishing House,1985
12. Chemical Kinetics by K. J. Laidler, Tata McGraw Hill Publishing Co., New Delhi.
13. Kinetics and Reaction Mechanisms by Frost and Pearson, Wiley, New York.

Analytical Chemistry

1. Jeffery, G.H., Bassett, J., Mendham, J. & Denney, R.C. *Vogel's Textbook of Quantitative Chemical Analysis*, JohnWiley&Sons,1989.
2. Willard, H.H., Merritt, L.L., Dean, J. & Settle, F.A. *Instrumental Methods of Analysis*,7thEd. Wadsworth Publishing Company Ltd.,Belmont, California, USA, 1988.
3. Christian, G.D; *Analytical Chemistry*, VI Ed. John Wiley & Sons, NewYork, 2004.
4. Harris, D.C. *Exploring Chemical Analysis*, Ed.New York, W.H. Freeman,2001.
5. Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.

DEPARTMENT OF CHEMISTRY

II - SEMESTER

DSC- 20CH202: CHEMISTRY PRACTICAL II

After successful completion of course, the student should be able to;

CO1: Understand the different type's titrimetric experiments

CO2: Gain the knowledge about determination of Ba^{2+} and Cu^{2+} by gravimetric methods.

CO2: Gain the knowledge about determination of Density, Viscosity and Surface tension.

PART-A Inorganic Chemistry

A. 1. TITRIMETRY

1. Determination of carbonate and hydroxide present in a mixture.
2. Standardization of potassium permanganate solution and determination of nitrite in a water sample
3. Determination of chlorine in bleaching powder using iodometric method.

A. 2. GRAVIMETRY

1. Determination of Ba^{2+} as $BaSO_4$
2. Determination of Cu^{2+} as $CuSCN$

PART-B Physical Chemistry

1. Determination of density using specific gravity bottle and viscosity of liquids using Ostwald's viscometer (Ethyl acetate, Toluene, Chloroform, Chlorobenzene or any other non-hazardous liquids).
 2. Study of the variation of viscosity of sucrose solution with the concentration of a solute.
 3. Determination of the density using specific gravity bottle and surface tension of liquids using Stalagmometer (Ethyl acetate, Toluene, Chlorobenzene, any other non-hazardous liquids).
 4. Study of variation of surface tension of detergent solution with concentration.
 5. Determination of specific and molar refraction by Abbes Refractometer. (Ethyl acetate, Methyl acetate, Ethylene Chloride).
 6. Determination of the composition of liquid mixture by refractometry. (Toluene & Alcohol, Water & Sucrose).
- ** Standard solution is to be prepared by students for both in regular and in practical examination.

Examination

In the practical examination, a batch of maximum 15 (Fifteen) students may be made. Anyone experiment from Part-A or B can be given by selection done by the students based on lots.

Viva questions must be asked on any of the experiments prescribed in the practical syllabus.

Part A1: Distribution of marks

1. Accuracy: 12 (6+6) Marks

2. Technique and presentation: 03Marks
3. Reactions and Calculations: 05 Marks
4. Viva: 05 Marks

Total 25 marks

Deduction of marks for accuracy: ± 0.4 CC – 6 marks, ± 0.6 CC- 04 marks, ± 0.8 CC- 02 marks, ± 1.0 CC - 01 marks. Above ± 1.0 CC - 00 marks

Part A2: Distribution of marks

1. Accuracy: 12 Marks
2. Technique and presentation: 03Marks
3. Reactions and Calculations: 05 Marks
4. Viva: 05 Marks

Total 25 marks

Deduction of marks for accuracy : ± 6 mg – 12 marks, ± 7 mg- 10 marks, ± 8 mg - 08 marks, ± 10 mg - 06 marks. Above 10mg - 00 marks

Part B: Distribution of marks

1. Accuracy: 12 Marks
2. Technique and presentation: 03marks
3. Graphs and Calculations: 05 Marks
4. Viva: 05 Marks

Total 25 marks

Deduction of marks for accuracy: Error up to 5% - 12 marks, 6 - 10% 09 marks, 11- 15% 6 marks, 16 % or above 3 marks.

DEPARTMENT OF CHEMISTRY
II - SEMESTER
OEC-21CH 222: MOLECULES OF LIFE

Course	Credits	No. of Classes/ Week	Total No. of Lecture Hours	Duration of Exam in hrs	Internal Assessment Marks	Semester End Exam Marks	Total Marks
Theory	03	03	42	3	40	60	100

After studying this course, the student would be able to

CO1: Acquire knowledge about different types of sugars and their chemical structures and identify different types of amino acids and determine the structure of peptides.

CO2: Explain the actions of enzymes in our body and interpret enzyme inhibition, Predict action of drugs. Depict the biological importance of oils and fats.

CO3: Understand the importance of lipids in the metabolism Differentiate RNA and DNA and their replication. Explain production of energy in our body.

UNIT I: Carbohydrates

Sugars, non-sugars, reducing and non-reducing sugars. Occurrence and general properties of glucose and fructose. Open chain and Haworth ring structures of glucose and fructose. Epimers, mutarotation and anomers.

Disaccharides: Occurrence of disaccharides (Sucrose, Maltose and Lactose). Glycosidic linkage in disaccharides. Ring structures of sucrose, maltose and lactose.

Polysaccharides: Starch – monomer units, glycosidic linkage, components-difference in their structure (explanation only) and solubility in water. Cellulose and glycogen– monosaccharide, glycosidic linkage, structure (explanation only). Biological importance of carbohydrates. **8hrs**

Amino Acids, Peptides and Proteins

α - amino acids, general formula, zwitter ion form of α - amino acid, general formula. Isoelectric point and its importance. Classification of amino acids as essential and non-essential-examples. Configuration of optically active α -amino acids (found in proteins). Peptide bond. Proteins: classification based on molecular shape–fibrous and globular, examples. Structure of protein – qualitative idea about primary, secondary, tertiary, and quaternary structures (diagrams not required). Denaturation of protein. **8hrs**

UNIT II: Enzymes and correlation with drug action

Mechanism of enzyme action, factors affecting enzyme action, Co-enzymes and cofactors and their role in biological reactions, Specificity of enzyme action (including stereo specificity),

Enzyme inhibitors and their importance, phenomenon of inhibition (Competitive and Non-competitive inhibition including allosteric inhibition). **7hrs**

Drug action- Receptor theory. Structure–activity relationships of drug molecules, binding role of –OH group, –NH₂ group, double bond and aromatic ring. **4hrs**

Oils and fats

Biological Importance of oils and fats. Fatty acids (saturated, unsaturated fatty acids, formation of triglycerides and general formula of triglycerides. Chemical nature of oils and fats-saponification, acid hydrolysis, rancidity and its prevention methods, refining of oils, hydrogenation of oils, drying of oils. Iodine value.

Introduction to lipids, classification. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol). **6hrs**

UNIT III

Nucleic Acids

Components of nucleic acids: Adenine, guanine, thymine and cytosine (Structure only), other components of nucleic acids, Nucleosides and nucleotides (nomenclature), Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA (types of RNA), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation. **6hrs**

Vitamins and Hormones

Classification and biological significance, source and structure of Vitamin A, B1 (thiamine), B2 (riboflavin), B6 (pyridoxine), α -tocopherol, K1 (phyloquinone), C (ascorbic acid). Deficiency diseases of vitamins,

Hormones: definition, classification with examples, functions and deficiency diseases of hormones. **5hrs**

Reference Books:

1. Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
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