

Hemchandracharya North Gujarat University. Patan.

F.Y.B.Sc.

Chemistry.(CC CH 101)

Semester: I

Unit : 1 (A) CHEMICAL BONDING

- Valence bond theory & its application
- Directional characteristics of covalent bond
- Various types of hybridization and shape of simple inorganic molecules
- V.S.E.P.R. theory for NH_3 , H_2O
- M.O. Theory-Energy level diagram for homo nucleus diatomic molecules (N_2 and O_2) and hetero diatomic molecule (CO and NO)

(B) F-BLOCK ELEMENTS

- Lanthanide electronic configuration, Oxidation state
- Lanthanide contraction, Effect of lanthanide contraction
- Separation method
 - (1) Solvent extraction methods
 - (2) Ion Exchange Method

Unit : 2(A) STRUCTURE AND PROPERTIES

Factors affecting to the properties of organic molecule

- Intramolecular forces (dipol-dipol interaction, vander waals forces)
- Electromeric effect
- Inductive effect
- Resonance effect(draw resonating structures of Nitro benzene, Chlorobenzen, Phenoxide ion, Anillinium ion, Acetate ion)
- Hyper conjugation (o,p-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals)

(B) REACTION MECHANISM

- Fission of Co-Valent bond (With atleast one example of each intermediates)
- Types of reagents.
- Types of organic reaction with mechanism.
- Substitution reactions (Nucleophilic & Electrophilic)
- Addition reactions (Nucleophilic & Electrophilic)
- Elimination reactions (E_1 & E_2)

UNIT : 3 THERMODYNAMICS

- Thermodynamics (only introduction)
- System and surrounding- work & heat, state function, thermodynamic process, internal energy, enthalpy, free energy, maximum work function.
- First law of thermodynamics
- Heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship
- Work done in adiabatic and isothermal reversible expansion of an ideal gas.
- Second law of thermodynamics
- Carnot cycle and its efficiency
- Concept of entropy ; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases
- Gibbs-Helmholtz equation
- Want-hoff isotherm and isochors
- Numerical

Unit : 4 ANALYTICAL CHEMISTRY

- Introduction to Analytical Chemistry
- Classification of Classical and Electroanalytical Techniques.
- Literature of Analytical Chemistry (Names of Author and Publishers for Any Ten Books, Journals and Reviews)
- Criterion for Selection of analytical Techniques.
- Analytical Data Treatment
 - Error, Types of errors, Accuracy and Precision.
 - Statistical Terms :
Mode, Average, Median, Deviation,
Average Deviation, Relative Average Deviation,
Standard Deviation & Coefficient of variance.
 - Q-Test for the rejection of result and related numericals.

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Chemistry. (SE CH 101)

Semester : I

SUBJECT ELECTIVE PAPER

(Agricultural Chemistry)

Unit : 1 FERTILIZERS

- Plant Nutrients, Major Nutrients, Minor Nutrients, Trace Nutrients
- Definition of Fertilizer
- Classification of Fertilizer
- Synthesis of N Containing Fertilizer i.e. $(\text{NH}_4)_2\text{SO}_4$, $\text{Ca}(\text{CN})_2$, and Urea
- Synthesis of P Containing Fertilizer i.e. Super Phosphate, Tripal Super Phosphate
- Mix Fertilizer

Unit : 2 INSECTICIDE

- Introduction
- Inorganic Insecticide
- Organic Insecticide
- Natural or Plant Insecticide
- Synthesis of DDT, BHC, Malathion.

Reference : Industrial Chemistry by B.K.Sharma.

: REFERENCE BOOKS :

Inorganic Chemistry

1. 'Source Book on Atomic Energy' by glastone, 1969.
2. 'Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn, colling Educational, 1983.
3. 'Inorganic Chemistry' D.F.Shriver, P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999.
4. 'Nuclear and Redio Chemistry' by G fried lander, J.W.Kennedy, E.S.macias and J.M.Miller, 3rd edn, John wiley, 1981.
5. Essentials of Nuclear Chemistry' H.J.Arnical, 4th edn, New Age International, 1995.
6. 'Concise Inorganic Chemistry' J.D.Lee, 5th edn.
7. 'Inorganic Chemistry', D.F.Shriver, P.W.Atkinss, 3rd edn, Oxferd, 1999.
8. 'Concise Inorganic Chemistry' J.D.Lee, 4th edn, Champman and Hall ELBS, 1991.
9. 'Inorganic Chemistry' by A.G.Sharp, 3rd edn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age international Publishers.
2. Text book of organic Chemistry, P.S.Kalsi, New Age international Publishers.
3. Organic Chemistry Vol. I & II, S.M.Mukherji, S.P.Singh, R.P.Kapoor.
4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi, S.P.Singh. 3rd edn, Macmillan.
5. Reaction Mechanism and Reagents in Organic Chemistry, Gurdeep R. Chatwal 4th edn, Himalaya Publication House.
6. Text book of Organic Chemistry, Arun Bahal, S.Chand.
7. Organic Chemistry, R.Morrison and R.Boyd, 6th edn, Pearson Education 2003.
8. Organic Chemistry, T.W.Graham Solomons, 4th edn, John Wilay, 1998.

Physical Chemistry

1. Advance Physical Chemistry by Gurdeepraj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli, S.Chand.
3. Principal of Physical Chemistry by Puri, Sharma, Pathania.
4. Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher, New Delhi.
6. Essentials of physical Chemistry by B.S.Bahal, Arun Bahal, G.D.Tuli.
7. Physical Chemistry by P.W.Atkins, 5th edn, Oxferd 1994 7th edn-2002.
8. Physical Chemistry by R.A.Albert and R.J.Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow, 5th edn, Mac Graw Hill, 1988, 6th edn, 1996.
10. Physical Chemistry by W.J.Moore, 4th edn, Orient Longmans 1969.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos & West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry & Hergins.
5. Qualitative Analysis by A.I.Vogel, 5th edn.

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Chemistry Practical

Laboratory Course (LC CH 101)

Semester : I

This syllabus is to be completed by assigning two laboratory sessions per week, each of two hours. Total laboratory work is 60 hrs/semester (4 hrs/week) or 15 weeks.

The number of students in the laboratory batch should not exceed fifteen (15). The medium of instruction should be English in laboratory course.

1. Inorganic Chemistry

Semi micro Analysis:-

- Cation analysis; separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B.
- Anion analysis like
 Cl^- , Br^- , I^- , NO_3^- , NO_2^- , SO_4^{2-} , SO_3^{2-} , S^{2-} , CrO_4^{2-} , CO_3^{2-} , PO_4^{3-}
(Water Soluble and insoluble).
- Candidate should perform the analysis of at least 10 compounds.

2. Standardization

- 1) Preparation of standard solution of succinic acid and standardization of NaOH/KOH solution.
- 2) Preparation of standard solution of $\text{Na}_2\text{S}_2\text{O}_3$ and standardization of I_2 solution.
- 3) Preparation of standard solution of EDTA and estimation of $\text{Ca}^{+2}/\text{Mg}^{+2}$ in $\text{CaCl}_2/\text{MgCl}_2$ solution.
- 4) Preparation of standard solution of Oxalic acid and standardization of KMnO_4 solution.
- 5) Preparation of standard solution of $\text{K}_2\text{Cr}_2\text{O}_7$ and standardization of FeSO_4 solution.

3. Demonstrations

- Preparation of standard stock solution by w/v method and their different dilutions.
- Preparation of standard stock solution of HCl by v/v method and their different dilutions.

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F.Y.B.Sc.

Chemistry. (CC CH 201)

Semester: II

Unit : 1 (A) COORDINATION COMPOUNDS

- Definition
- Nomenclature of Complex.
- Werner's theory and its experimental verification.
- Concept of Effective Atomic Numbers (E.A.N.) for Coordination Compounds.
- Limitations of Valence bond theory of transition metal Complexes.
- An Elementary idea of (C.F.T.) Crystal field splitting of d-orbital in O_h and T_d .
- Factors affecting to the crystal field splitting.
- Application of common complexes & chelates.

(B) ACTINIDE.

- Electronic Configuration.
- Oxidation state.
- Synthesis of ${}_{94}^{239}\text{Pu}$, ${}_{94}^{241}\text{Pu}$.

Unit : 2 STEREO CHEMISTRY OF ORGANIC COMPOUNDS

Introduction of Stereo Isomers;

- Optical isomerism :

General, Discussion of elements of symmetry, Molecular chirality, Enantiomers, Optical activity, Properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, Diastereomers, Threo and Erythro diastereomers, Meso compounds.

- Geometrical isomerism:

Definition and general discussion of geometric isomers, General methods of structure determination (physical methods), E-Z nomenclature (Simple illustration should be given).

- Conformational isomerism:

Definition, Conformational analysis of ethane, n-butane with rotational and torsional diagram, Conformation of cyclo hexane, Axial and equatorial bonds, Newmann projection, Saw horse formula, Fisher & flying wedge formula, Difference between conformation and configuration.

Unit : 3 (A) CHEMICAL KINETICS.

- Introduction of following terms.
- Rate of reaction, Order of reaction, Molecularity.
- Rate equation for second order reaction. ($a=b$) & ($a \neq b$).
- Characteristics of second order reaction.
- Rate equation for third order reaction.
- Characteristics of third order reaction.
- Numerical.

(B) NUCLEAR CHEMISTRY.

- Concept of Nuclear particle.
- Definition of Isotopes, Isotones, Isobars, Isomers.
- Packing fraction.
- Nuclear binding energy.
- Nuclear coulomb barrier.
- Rate of radio active disintegration, half life period, Average life period.
- Rutherford & Soddy's law (Group transfer law)
- Numerical.

Unit : 4 INTRODUCTION TO VOLUMETRIC ANALYSIS

Principle, Mechanism and Applications of,

- Acid-Base Titrations (Only strong acid Vs strong Base).
- Redox Titrations (Only Fe(II) vs KMnO_4)
- Complexometric Titrations (Only $\text{Ca}^{+2}/\text{Mg}^{+2}$ vs EDTA)
- Precipitation Titrations (Only Cl^- vs AgNO_3).
- Related Numericals.

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Chemistry. (SE CH 201)

Semester : II

SUBJECT ELECTIVE PAPER

(Medicinal Chemistry)

Unit : 1 INTRODUCTION

- Introduction of drugs.
- History of medicinal chemistry.
- Classification of drugs.
- General importance of drugs.
- Drug Design.

Unit : 2 ANTI-MALARIAL DRUGS

- Introduction and History.
- Life cycle of Plasmodium.
- Natural anti-malarial drugs :
Role of activity side in quinine structure
- Classification of anti-malarial drugs.
- Synthesis of Quinoline derivatives :
8-Amino quinoline derivatives.
(Plasmoquine & Pamaquine).

- Reference :
1. Sanshleshit Auoshadho nu Rasayan by Dr. Anamik Shah.
 2. Sanshleshit Auoshadho nu Rasayan by Dr. J.P.Trivedi & Dr.K.A.Thakar.
 3. Chemistry of Synthetic Drugs by Dyson & May.

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F.Y.B.Sc. Semester : II

Chemistry Practical (Laboratory Course) CH LC-201

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The number of students in the laboratory batch should not exceed fifteen (15). The medium of instruction should be English in laboratory course.

1. Organic Chemistry

- 1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point, Preparation of suitable derivative.
- 2) Candidate should perform the analysis of at least 10 compounds.

List of compounds

▪ Acids:

Benzoic acid, Cinnamic acid, Phthalic acid, Oxalic acid, Succinic acid.

▪ Phenols:

α -Naphthol, β -Naphthol.

▪ Bases:

p-Toluidine, Diphenylamine, Aniline, Methyl aniline.

▪ Neutrals:

Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene, Acetone, Benzaldehyde, Methyl acetate, Ethyl acetate, Ethanol, 1-Propanol, Glycerol, Chloroform, Carbon tetrachloride, Chlorobenzene, Nitrobenzene.

2. Volumetric Titrations

- 1) To determine the strength of NaOH and Na₂CO₃ present in the solution mixture of NaOH & Na₂CO₃ and to find out their percentage composition.
- 2) To determine the strength of NaHCO₃ and Na₂CO₃ present in the solution mixture of NaHCO₃ & Na₂CO₃ and to find out their percentage composition.
- 3) To determine the Normality, gram/liter and molarities of H₂C₂O₄, 2H₂O and H₂SO₄ present in the solution mixture of H₂C₂O₄, 2H₂O & H₂SO₄ by using X N NaOH and Y N KMnO₄ solutions.
- 4) To determine the Normality, gram/liter and molarity of H₂C₂O₄, 2H₂O and K₂C₂O₄ present in the solution mixture of H₂C₂O₄, 2H₂O & K₂C₂O₄ by using X N NaOH and Y N KMnO₄ solutions.
- 5) To determine the amount of Ca⁺² and Mg⁺² ion by EDTA solution from the mixture solution of CaCl₂ and MgCl₂.

3. Demonstrations

- Melting point and Boiling point of an organic compound.
- Calibration of burette and Pipette.