

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. (SEM –V)

Chemistry - Generic elective subject - DRUGS

70 Marks (External)

30 Marks (Internal)

Total : 45 Hrs

Time : 3 Hrs. (Uni. Exam)

UNIT-I

Topic-1 : Drugs : Classifications-Terminology.

9 Hrs

Definition of the term drug, Drugs obtained from plants, Different class of the drugs.

Explanation of the following terms: Agonist, Antagonist, Receptors, Pharmacophore, Prodrug, Softdrug, CNS depressants, CNS stimulants, Quantitative structural activity relationship (QSAR), Mode of action. Brief accounts of the following agents giving the name and structures of two important drugs in each case (1) Antifungal agents (2) Antiviral agents (3) Anti cancer or Cytotoxic drugs (4) Non Steroidal Anti Inflammatory Drugs (NSAIDS).

UNIT-II

Topic-1 : Micro-organism and Diseases.

9 Hrs

Brief account of microbes: Bacteria, Fungi, Protozoa, Virus.

Classification of the bacteria based on shape and staining and Iehl-Neelson staining.

Names of at least two diseases in case of each of the following types of infection and also the name of microbes responsible for the same: (1) Respiratory tract infections (2) Gastro intestinal tract infections (3) Urinary tract infections (4) Urethritis and sexually transmitted diseases (5) Skin and soft tissue infections (6) Cardio vascular system infections (7) Central nervous system infections.

Name of important drug for each of the following diseases: (1) Typhoid (2) Dysentery (3) Pneumonia (4) Meningitis (5) Gastroenteritis (6) Actinomycosis.

UNIT-III

Topic-1 : Antibiotics.

9 Hrs

Definition, History of discovery of penicillin, Structural variations in penicillin, Broad spectrum antibiotics and their therapeutic uses, sources, structural formula and therapeutic uses of Streptomycin, Tetracycline and Cycloseries, Chloroamphenicol and Some recent antibiotics.

UNIT-IV

Topic-1 : Sulphad rugs.

9 hrs

History of discovery and development of sulphad rug, Structural variations among sulphonamides, mode of action of Sulphonamides, therapeutics uses and antimicrobials activity of sulphonamides.

Synthesis and uses of : Sulphadimidine, Sulphaguanidine, Sulfisoxazole(sulpha furazol), Sulphaacetamide, Succinyl sulphathiazole and Sulphanilamide.

UNIT-V

Topic-1 : Coagulants and Anti coagulants

9 Hrs

Definition, water fall mechanism of blood clotting, Fibrin-Fibrinogen, thrombin prothrombin role of calcium in blood clotting.

Classification and structural variations.

Blood coagulants, Vitamin k group as blood coagulants. Synthesis and uses of Warfarin, Dicoumarol, Bromindione.

Reference Books:

1. May's Chemistry of synthetic Drugs by Dyson.
2. Chemistry of drugs , Ener and Caldwell
3. Synthetic drugs by Tyagi and Yadav.
4. Synthetic Drugs by G. R. Chatwal, Himalaya Publishers.
5. The Organic Chemistry of Drug Synthesis by Daniel Lednicer & L.A.Mitscher
6. Drugs by V.K.Ahluwalia Pub. Ane Books Pvt. Ltd.
7. Medicinal Chemistry by Balkishan Razdan, Pub. CBS Publishers.

8. Pharmaceutical Organic Chemistry by S.K.Dewan, Pub. Narosa
9. Medicinal Chemistry - a Molecular and Biochemical Approach, by Thomas Nogrady & Donald F Weaver
10. Pharmaceutical Organic Chemistry by Shyam Singh Pub. Himalaya Publishers
11. Medicinal Chemistry by G Patrick. Pub. Viva Books.
12. Burger's Medicinal Chemistry & Drug Discovery. Ed. by D.J. Abraham.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. (SEM –V)

Chemistry - Generic elective subject - DYES

70 Marks (External)

30 Marks (Internal)

Total : 45 Hrs

Time : 3 Hrs. (Uni. Exam)

UNIT – I

Topic –1: Dyes intermediates:

6 Hrs

Name and structure of Benzene, naphthalene and anthraquinone intermediates useful in the dyestuff industry, synthesis of 4-amino-2-methoxy toluene, 2,3-diamino anthraquinone, Chromotropic acid, Gama acid, Bromamin acid, p-Cresidine.

Topic –2: Diazotisation and coupling:(AZO dyes)

9 Hrs

Definition and mechanism of diazotization, common method of diazotization, common and special coupling components, laws of coupling reaction with phenols and amines of benzene and naphthalene series, monoazo dyes, synthesis of Direct black EW, Eriochrome Black - T, Orange - II, Fast sulfone Black - F, Orange – IV, Orange – III, Eriochrome Black – A.

UNIT – II

Topic –1: Disperse Dyes:

5 Hrs

Definition, classification of disperse dyes with examples, application of disperse dyes, synthesis of Cellitone Scarlet B, Dispersol Blue, Golden yellow VIII.

Topic –2: Dyes and pigments:

10 Hrs

Relation between colour and chemical constitution with reference to Witt's theory, definition of dyes & pigments, difference between dyes & pigments.

classification of dyes based on,

(a) Chemical constitution with illustrative example .

(b) Methods of application to fibres, synthesis of Pigment yellow G, Pigment yellow 10 G, Benzidine orange, Pigments Orange VI, Pigments Red – II.

UNIT – III

Topic –1: Vat dyes:

15 Hrs

(a) Definition and general account of vat dyes, Indigo obtained from natural source, Synthesis of Indigo by Heumann process and Sand Meyer process. Halogen derivatives of Indigo (Brilliant Indigo – 4B, Brilliant indigo -4G, 5;5- dibromoindigo vat blue -35) Synthesis of thioindigo by anthranilic acid, halogen derivatives of Thioindigo, Indanthrene Red Violet RRN, Indanthrene Scarlet –B.

(b) Anthraquinone vat dyes : Bohn's discovery of Anthraquinone Vat dyes, classification with reference to anthraquinone derivatives synthesis of Caledon Jade-green, Indanthrene Khaki GG, Indanthrene yellow 5 GK, Indanthrene Brilliant Scarlet –RK, Indanthrene Red –FFB.

Reference books:

(1) Synthetic organic chemistry by O.P. Agrawal

(2) The chemistry of synthetic dyes and pigments by H. A. Lubes

(3) chemistry of synthetic dyes VOL I to VII by K. Venkatraman

(4) An introduction to synthetic dyes by D. W. Ranghekar & P. P. Singh

(5) A had book of synthetic dyes and their application by C. T. Bhastana, V. H. Raichura & others

(6) chemistry of dyes & Principles of dyeing Vol II by V. A. Shehai

(7) chemistry of synthetic dyes by I. G. Vashi

(8) Chemistry of dyes and pigments by K. M. Shah

(9) Synthetic dyes by G. R. Chatwal

(10) Synthetic dyes and pigments by E. N. Abrahart.

(11) High tech Dyes by Smith.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. (SEM –V)
Chemistry - Generic elective subject - PETROCHEMICALS

70 Marks (External)
30 Marks (Internal)

Total : 45 Hrs
Time : 3 Hrs. (Uni. Exam)

UNIT – I

Topic-1:Source of petrochemicals: **8 Hrs**

- (a) Natural gas: Composition, Natural gas as Petrochemical feed stock.
(a) Crude oil: Composition, Distillation and Refining, Utilization of various fractions (oil product)

Topic-2:Classification of petrochemicals: **7 Hrs**

First, Second and Third generation petrochemicals .
Conversion process: Cracking reforming, Isomerisation, Hydrogenation, Alkylation and Hydrodealkylation, Dehydrocyclisation of petroleum products, Polymerization of gaseous hydrocarbons.

UNIT – II

Topic-1: **8 Hrs**

Petrochemicals obtained from **C1** cut of petroleum manufacture and application of Methanol, Synthesis gas , Ammonia, HCN, Formaldehyde, Hexamethylene tetramine, Chlorinated methanes, Per chloro ethelene & CS₂.

Topic-2: **7 Hrs**

A) Industrial Fuels:
Natural fuels, Synthetic fuels, Hydrogen- Fuel of tomorrow, Fuel for rocket (Hydrazine)
B) Intermediates of Pharmaceuticals and Dyes: Quinoline, Sulphanilamide,H-acid, J-acid, Neville Vinther's acid, DASDA

UNIT – III

Topic-1: **10 Hrs**

Petrochemicals obtained from **C2** cut of petroleum [Ethylene and Acetylene]
Manufacture and industrial applications of chemicals obtained from Ethylene: Ethanol, Acetaldehyde (Wacker-Chemie process), Ethylene Oxide, Ethylene Glycol, Ethanolamines, Acrylonitrile, Styrene, Vinyl acetate. Manufacture and industrial applications of chemicals obtained from Acetylene, Acrylic acid, Acrylonitrile , Vinylchloride , Vinylacetate, Acetaldehyde, Chloroprene, Trichloethylene, Methyl vinyl ether.

Topic-2: **5 Hrs**

General account of petrochemicals used as monomers in the manufacture of Nylon - 6, Nylon - 6-6, Nylon - 6-10, Nylon –12 and Nylon –8-6 fibers, Industrial production of Caprolactum, HMDA, Adipic acid, Sabecic acid, Lauryl lactum.

Reference Books: (New edition)

- (1) Introduction to petrochemicals by Sukumar Maiti oxford and IBH pubs co. New Delhi.
- (2) A text on petrochemicals by Dr. B. K. Bhaskar Rao, Khanna pubs. New Delhi.
- (3) Chemicals from petroleum by A. L. Wadams (ELBS and John Murray London)
- (4) Petrochemicals by S. L. Venkatewarn (Colour pubs. Pvt. Ltd. Bombay)
- (5) Petrochemicals digest by MGK Manon (Asia Publishing house Bombay)
- (6) Hand book of industrial chemicals Vol-I by K. M. Shah (Multi tech publishing co. 15 yogesh, hingwala lane, ghatkoper (E) Bombay-400077)
- (7) Industrial chemistry including chemical engineering by B. K. Sharma, Goel pubs house, Meerut.
- (8) Hand Book of Synthetic Dyes and Pigments (Vol. II) By K. M. Shah, Multi-tech Publishing Co.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. (SEM –V)
Chemistry - Generic elective subject – POLYMER CHEMISTRY

70 Marks (External)

30 Marks (Internal)

Total : 45 Hrs

Time : 3 Hrs. (Uni. Exam)

UNIT – I

General Introduction

15 Hrs

Introduction, Classification of Polymers, Nomenclature of Polymers
Isomerism in Polymer Chains, History of Polymers
Industrial Scenario, Intermolecular Forces in Polymers
Conformations in Polymer Chains
Polymer Waste Disposal and Remedies

UNIT – II

Synthesis of Polymers

15 Hrs

Chain Growth Polymerisation (Addition Polymerisation)

Introduction

Mechanism of Polymerisation (Free Radical, Cationic and Anionic)

Coordination Polymerisation, Ring Opening Polymerisation

Kinetics of Free Radical Addition (Chain) Polymerisation

Kinetics of Cationic Polymerisation, Kinetics of Anionic Polymerisation

Phase Systems in Polymerisation (Techniques of Polymerisation)

Industrial Polymerisation, Thermodynamic Aspects of Polymerisation

Copolymerisation

Step-growth Polymerisation (Polycondensation)

Mechanism of Polycondensation

Phase Techniques in Polycondensation

Kinetics of Polycondensation

Synthesis and Application of Some Common Industrial Polymers

UNIT – III

Polymers Analysis and Characterisation

15 Hrs

Identification

Physical Testing, Spectral Methods, Chromatographic Methods

Identification of Typical Plastic Materials

Testing Methods: Thermal methods, Electrical methods, Chemical methods

Characterisation:

Molecular Weight Distribution, Fractionation

Determination of Molecular Weight of Polymers

Molecular Weight Distribution (MWD) Curves

Behaviour of Polymers

Crystalline behaviour, Thermal behaviour, Dilute Solution behaviour,

Rheological behaviour, Chemical behavior.

Reference Books

1. Billmeyer, F.W., Jr., Text Book of Polymer Science, 3 ed New York: Wiley 1984.
2. Elias, Hans-Georg, An Introduction to Polymer Science, Weinheim: VCH, 1997
3. Hiemenz, P.C. Polymer Chemistry, New York: Dekker, 1984
4. Seymour, R.B., and C.E. Carraher., Jr., Polymer Chemistry- An

- Introduction, 3rd ed. New York, Dekker, 1992
5. Stevens, M.P., Polymer Chemistry, 2nd ed. New York: Oxford Univ. Press, 1990.
 6. Odian, G., Principles of Polymerization, 3d ed., New York: Wiley 1992
 7. Braun, D., Simple Methods for Identification of Plastics, 2d ed., Cincinnati, Ohio: Hanser-Gardner, 1986
 8. Woodward, A.E., Understanding Polymer Morphology, Munich: Hanser, 1995
 9. Tanford, C., Physical Chemistry of Macromolecules, New York: Wiley-Interscience, 1961
 10. Agassant, J.F., P. Avenas, J. Sergent, and P.J. Carreall, Polymer Processing, Principles and Moulding, Cincinnati, Ohio: Hanser-Gardner, 1990.
 11. Barry, A.J., and Beck, H.N., in F.G.A. Stone and W.A.G. Graham (eds.), Inorganic Polymers, New York: Academic Press, 1962
 12. Dyson, R.W. (ed.), Specialty Polymers, New York: Chapman and Hall, 1987
 13. Collyer, A.A., (ed.), Liquid Crystal Polymers; From Structure to Applications, New York: Chapman and Hall 1992
 14. Principles of Polymer Science, P. Bahadur and N. V. Sastry

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. (SEM –V)

Chemistry Paper – IX (Industrial Chemistry)

Proposed syllabus from July 2013

50 Marks (External)

20 Marks (Internal)

Total : 30 Hrs

Time : 2 Hrs. (Uni. Exam)

UNIT-I

- (A) Manufacture with flowsheet & uses of** **5 Hrs**
Acrylonitrile (Sohio Process), Bisphenol-A, Styrene, Chloroprene, 2,4-TDI, DMT.
- (B) Fluorocarbons** **5 Hrs**
Nomenclature of chloro fluoro derivatives of Methane & Ethane, Uses of Fluoro carbons, Manufacture of Freon-12 from fluorspar, Manufacture of Freon-12 from Vinylidene fluoride, pollution hazards of Fluoro carbons.

UNIT-II

Unit Processes in Organic Chemistry **10 Hrs**

- (A) Nitration**
Definition, Nitrating agent, Reaction mechanism of Nitration. Nitration of acetylene, Nitration of Benzene, Nitration of Naphthalene
Artificial perfumes: Musk xylene, Musk ketone, Musk ambrette.
Explosives: Trinitrophenol, Trinitrotoluene, Trinitro glycerine, Emitol.
- (B) Amination**
Definition, Amination by reduction: Metal - Acid reduction, Metal - Alkali reduction, Catalytic reduction, Sulphide reduction.
Amination by ammonolysis : Amination of chlorobenzene, Phenol & Sulphonic acid.
Importance of amination in industry in the manufacture of m-Phenylene diammine, HMDA, Anthranilic acid, Hexamethylene tetramine.
- (C) Sulphonation** - Definition, Methods of sulphonation, sulphonating agents, mechanism of sulphonation.
Sulphonation of Benzene, Toluene, Naphthalene

UNIT-III

Metallurgy of different metals (occurrence, extraction ,properties and uses) **10 Hrs**

- (A) (1) Tungsten (2) Molybdenum (3) Titanium (4) Chromium (5) Aluminium**
- (B) Some small scale preparation of**
- (1) Safety matches
 - (2) Naphthalene balls
 - (3) Wax candles
 - (4) Shoe polish
 - (5) Writing/ fountain pen ink
 - (6) Chalk crayons
 - (7) Plaster of paris.

Reference books:

1. Shreve Chemical Process Industries 5 ed. George. T. Austin . Mag. Hill. Book Agency
2. Reigel's Industrial Chemistry Ed. By James A. Kent.
3. Unit Process in Organic Synthesis by D. H. Groggins.
- 4, An Introduction to Industrial Chemistry by Peter Wiseman , Applied Science Pub. Ltd. London.
5. Industrial Chemistry by B. K. Sharma Goel Pub.
6. Quantitative Analysis by R.A.Day & A L Underwood, 6th ed. Pub.Prentice Hall of India ltd.
7. Vogel's Text Book Inorganic Quantitative Analysis, 6 th ed.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. Semester -V

Chemistry Paper – VI (Inorganic Chemistry)

Proposed syllabus from July 2013

50 Marks (External)

20 Marks (Internal)

Total : 30 Hrs

Time : 2 Hrs. (Uni. Exam)

UNIT – I

Topic –1: Quantum Mechanics:

5 Hrs

Postulates of Quantum mechanics, particles in three dimensional box, Schrodinger's wave equation in polar coordinates, its separation in to R , θ and Φ .

Topic –2: Boron Hydride:

5 Hrs

Boron hydride and its classification, Wade's Rule

Bonding in tetra Borane (10), penta borane (9) and dodeca borane (12) anion.

UNIT – II

Topic –1: Thermodynamic and Kinetic Aspects of metal complexes:

5 Hrs

A brief out line of thermodynamic stability of metal complexes and factors affecting a stability of metal complexes. Lability and inertness, Factors affecting lability of metal complexes. Trans effect, Theories of Trans effect (i) Electrostatic Polarization Theory (ii) - Bond Theory.

Topic –2: Bonding in Transition Metal Complexes:

5 Hrs

Jahn Teller Theorem, Distortation in octahedral complexes. Ligand Field Theory. Molecular energy level diagram and magnetic properties for $[\text{CoF}_6]^{3-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{FeF}_6]^{3-}$, $[\text{Fe}(\text{CN})_6]^{3-}$

UNIT – III

Topic –1: Metal Carbonyls:

5 Hrs

Definition, classification, nature of bonding in metal carbonyls, structure and IR spectra in $\text{Ni}(\text{CO})_4$; $\text{Fe}(\text{CO})_5$, $\text{Fe}_2(\text{CO})_9$, $\text{Mn}_2(\text{CO})_{10}$.

Topic –2: Corrosion and its Protection:

5 Hrs

Definition and importance of corrosion, Types of corrosion : uniform, pitting, intercrystalline and stress cracking corrosion, electro-chemical theory of corrosion. Protection methods: Coating, Inhibitors (Organic, Inorganic, anodic, cathodic), anodic and cathodic protection.

Reference Books:

- (1) Introduction to quantum chemistry, by A. K. Chandra, Tata Mc.Graw Hill, Delhi.
- (2) Quantum mechanics in chemistry by M. H. Hanna
- (3) Theoretical Inorganic chemistry by Day & Selbin, Affiliated East West Publ. Pvt. Ltd.
- (4) Advanced Inorganic Chemistry by Cotton and Wilkinson, John Wiley.
- (5) Uni. Chemistry by B. H. Mohan
- (6) Structural Inorganic chemistry by A. F. Wells.
- (7) Chemical Bonding - an introduction By Rawal, Patel & Patel.
- (8) Environmental Chemistry by Amritha anand and Sugumar.
- (9) Basic Inorganic Chemistry by Cotton and Wilkinson
- (10) A Text book of Inorganic Chemistry by P.L.Soni

- (11) Introduction to Inorganic Chemistry by Durrant and Durrant
- (12) Modern Co-ordination Chemistry by R. Lewis and R.G. Wilkinson.
- (13) Inorganic Chemistry- Principles of structure and reactivity by J.E. Huheey and E.A. Keiter.
- (14) Application of Group Theory to Chemistry by P.K.Bhattacharya., Himalaya Publishing House, Mumbai.
- (15) Quantum Rasayan, University Granth Nirman Board (Gujarat).
- (16) Environmental Chemistry by A.K. De.
- (17) The corrosion and oxidation of metals by Evans U.R. (1961), Arnold, London.
- (18) Corrosion, Causes and Prevention, Speller. F.,Mc Graw Hill,New york.
- (19) Dhatvik Ksharan, Part-I & II by M.N. Desai, Uni. Granth Nirman Board (Gujarat).
- (20) Corrosion and Corrosion Control, Uhlig H., Wiley.
- (21) Corrosion Engineering by Fontana M.G. and Green N.D., Mc Graw Hill.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. (SEM –V)

Chemistry Paper – VII (Organic Chemistry)

Proposed syllabus from July 2013

50 Marks (External)

20 Marks (Internal)

Total : 30 Hrs

Time : 2 Hrs. (Uni. Exam)

UNIT – I

(A) Reaction Mechanism:

6 Hrs

(a) Different types of mechanism for Esterification and Hydrolysis:



(b) Mechanism of formation and hydrolysis of amides.

(c) Pyrolytic elimination : Cope and Chugaev reaction

(B) Vitamins and Hormons:

4 Hrs

Structural determinations of Pyridoxine and Thyroxine and their synthesis, General introduction, structural determination of Riboflavin (Lactoflavin) & its Synthesis.

UNIT – II

(A) Alkaloids:

5 Hrs

The occurrence, Classification, General methods to determine their structure, Analytical and Synthetic evidence to prove the structure of Nicotine and Papavarine.

(B) Carbohydrates:

5 Hrs

Introduction to disaccharide and polysaccharide. Structure determination of Maltose, Lactose and Starch.

UNIT – III

(A) Synthetic Drugs:

5 Hrs

Their classification, based on pharmacological action, synthesis and uses of Amylnitrate, Nalidixic acid, Ibruprofen, Pyrimethamine, Diazepam, Lidocaine, Chlorpropamide, Dapsone, Isoniazide, 5-Floro Uracil.

(B) Polypeptides:

5Hr

Definition, Synthesis of peptide by Merry Field Method, End group analysis, N-terminal determination, Sanger's method, Edman method, C-terminal determination by generation of amino alcohol and using digestive enzymes. End group analysis, selective hydrolysis of peptides classical levels of protein structure, Protein denaturation / renaturation.

Reference Books:

- (1) Mechanism and Structure in organic chemistry-Goulde. S.
- (2) Reaction mechanism in organic chemistry by Mukhargy & Singh
- (3) Principles of reaction mechanism in organic chemistry by Dharmaraha & Chawla
- (4) Organic reaction mechanism by Bansal Tata Mac. Hill
- (5) Organic Chemistry (Vol I & II) 6 th Edn, I. L. Finar.
- (6) Organic Chemistry by Hendrickson, Cram & Hammond
- (7) Organic Chemistry by Brown R. F.
- (8) Organic Chemistry by Solomon W. Graham
- (9) Principles of Organic Synthesis- R. O. C. Norman

- (10) Basic Principles of Organic chemistry, by R. Y. Caserio, W. A. Benjamin
- (11) May's Chemistry of synthetic Drugs by Dyson.
- (12) Chemistry of drugs, Ener and Caldwell
- (13) Synthetic drugs by Tyagi and Yadav.
- (14) Chemistry of synthetic Dyes Vol. I & II by Venkatraman
- (15) Synthetic Organic Chemistry by O. P. Agarwal
- (16) Synthetic Dyes by Chatwal & Anand
- (17) Chemistry of synthetic Dyes by I. G. Vashi
- (18) Organic Chemistry by Morrison and Boyd.
- (19) Chemistry of organic Natural Product Vol. I & II by O. P. Agarwal.
- (20) Chemistry of synthetic drugs by Trivedi
- (21) Green Chemistry, Environmentally Verigin Reactions by V. K. Ahuwalia published by Ane books India.
- (22) Principles of Medicinal Chemistry Vol. I & II by S. S. Kadam, K. R. Mahadik, K. G. Bothara (Nirali Prakashan)
- (23) Medicinal Chemsitry By Asuthosh kar 4/e
- (24) Organic reactions & their mechanism by P. S. Kalsi, New age international publishers.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. (SEM –V)

Chemistry Paper – VIII (Physical Chemistry)

Proposed syllabus from July 2013

50 Marks (External)

20 Marks (Internal)

Total : 30 Hrs

Time : 2 Hrs. (Uni. Exam)

UNIT - I

A - OPEN SYSTEM THERMODYNAMICS

5 Hrs

Partial molal free energy, (chemical potential), Derivation of Gibb's Duhem Equation, chemical potential in case of a system of ideal gases. Concept of fugacity, Fugacity function, Fugacity at low pressures, Physical significance of fugacity, Graphical method for determination of fugacity, Lewis fugacity rule. Activity and activity coefficient (Only concept). Standard state, Standard state of Solid, Liquid and Gas, **Numerical problems.**

B - THE THIRD LAW OF THERMODYNAMICS

5 Hrs

The Nernst Heat Theorem (NHT), limitations of NHT, Statement of The third law of Thermodynamics, Consequence of third law of thermodynamics, Determination of absolute entropy of gases and liquids and solid, Applications of third law of thermodynamics, Concept of residual entropy, Exceptions to the third law of thermodynamics, **Numerical problems.**

UNIT-II

A - BASICS OF ELECTRODICS

4 Hrs

Concept of Oxidation and Reduction, Electrochemical series (Reduction series), definition of electrode, half cell and cell, single electrode potential, sign of electrode potential, standard electrode potential (oxidation and reduction potential), Electrochemical process, Galvanic cell with example of Daniel cell, EMF of a cell and its measurements, Standard Weston cell, Different types of reversible electrodes, Determination of single electrode potential, Calculation of standard EMF of cell and Determination of cell reaction, Standard Hydrogen Electrode, Calomel electrode and Ag -AgCl electrode.

Numerical problems.

B - CLASIFICATION OF ELECTROCHEMICAL CELL AND THERMODYNAMICS

6 Hrs

Chemical and concentration cell, electrode and electrolyte concentration cell, liquid junction potential (LJP), salt bridge in elimination of LJP, concentration cell with and without transference [with derivation of equation for emf of cell and LJP]

Free energy change and Electrical energy, Prediction of spontaneity of cell reaction, Relation of standard free energy change with equilibrium constant, Temperature coefficient of EMF of a cell, Entropy change and Enthalpy change of cell reaction. **Numerical problems.**

UNIT - III

NUCLEAR CHEMISTRY

10 Hrs

Stable and unstable isotopes, separation of isotopes by different methods, gaseous diffusion, thermal diffusion, distillation, chemical exchange methods, Bainbridge velocity focusing mass spectrograph, Dempsters direction focusing mass spectrograph,

Particle accelerators : Linear accelerator, Cyclotron, Discovery of artificial disintegration, Classification of nuclear reaction based on overall energy transformations and - particles used as projectiles, Merits and demerits of different projectiles, **Numerical problems on Cyclotron**

REFERENCE BOOKS:

1. Elements of physical chemistry by Glasstone and Lewis
2. Physical chemistry by G.M. Barrow
3. Physical chemistry by W. Moore

4. Physical chemistry by Atkins
5. Physical chemistry by G.K.Vemulapalli
6. Physical chemistry by B.K.Sharma
7. Physical chemistry by Gurdeep raj
8. Physical chemistry by Puri, Pathania, Sharma
9. Essential of Physical chemistry by Bahl and Bahl
10. Physical chemistry by Negi and Anand
11. Physical chemistry by K.L. KapoorVol 1-5.
12. Physical chemistry by Baliga,Dhavale and ZaveriVol 1-3.
13. Physical chemistry by Dr. S. Pahari
14. Nuclear chemistry by Arnikar
15. Electro chemistry by S. Glasstone
16. Electrochemistry by B.K.Sharma
17. Modern Electrochemistry by J'omBockris and Reddy

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. (SEM –V)

Chemistry Paper – X (Analytical Chemistry)

50 Marks (External)

Total : 30 Hrs

20 Marks (Internal)

Time : 2 Hrs. (Uni. Exam)

UNIT- I

A. INTRODUCTION TO ANALYTICAL CHEMISTRY :

03 Hrs

Chemical and Instrumental Analysis (advantages and disadvantages)

Overview of methods used in Quantitative analysis (classification of classical and instrumental analysis)

B. TREATMENT OF ANALYTICAL DATA

07 Hrs

Error Definition, Types of errors: Determinate errors, indeterminate errors, constant and proportional errors. Define and explain the following terms – Accuracy and Precision, mean, median, deviation, average deviation, standard deviation, variance, coefficient of variation, relative mean deviation, range, absolute errors, relative errors.

Minimization of determinate errors, Normal error curve. Rejection of result from a set of results, 2.5 d rule, 4.0 d rule and Q-test. **(Problems based on above topics)**

UNIT - II

GRAVIMETRIC ANALYSIS :

10 Hrs

Factors affecting solubility of precipitates. (1) Common ion (2) Diverse ions (3) pH (4) Hydrolysis (5) Complex formation **(With Numerical problems)**

The precipitation process, Nucleation growth. Von Weimarn's theory of relative super saturation. Digestion of precipitates

Factor affecting quality of precipitate: Co-precipitation and post precipitation

Precipitation from homogeneous solution with illustration of Barium and Aluminum.

Thermogravimetry, general principle, application with following two specific examples

(1) $\text{CaC}_2\text{O}_4, \text{H}_2\text{O}$ (2) $\text{MgC}_2\text{O}_4, 2\text{H}_2\text{O}$ [No instrumentation]

UNIT III

TITRIMETRIC ANALYSIS:

A. ACID BASE TITRATION: -

5 Hrs

Calculation of pH at different stages of titrations of monobasic and dibasic acid with strong base
Construction of titration curve, Titration of carbonate mixture.

Problems

B. COMPLEXOMETRIC TITRATIONS: -

5 Hrs

EDTA titration, Absolute and conditional stability constant, Distribution of various species of EDTA as function of pH. Absolute and conditional stability constants. Derivation of factors : α_4 for effect of pH, β_4 for the effect of auxiliary complexing agent.

Construction of Titration curves: Theory of metallochromic indicators, Masking, Demasking and kinetic masking. Types of EDTA titrations. **Problems**

Reference Books:

1. Quantitative Analysis by R. A. Day & A. L. Underwood, 6 th ed. Pub. Prentice Hall of India ltd.
2. Vogel's Text Book Inorganic Quantitative Analysis, 6 th ed.
3. Analytical Chemistry (Principles & Technique) by Lary G. Hargis.
4. Fundamental of Analytical Chemistry by Skoog D. A. & West D. M.
5. Instrumental Methods of Analysis by B. K. Sharm.a
6. Instrumental analysis by R.D.Braun Mc Graw Hill.
7. Analytical ChemistryGary Christian
8. Analytical ChemistryDay and Underwood.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. (SEM –V)

Chemistry Paper – XI (General Chemistry)

50 Marks (External)

Total : 30 Hrs

20 Marks (Internal)

Time : 2 Hrs. (Uni. Exam)

UNIT - I

IR spectroscopy

10 Hrs.

IR absorption spectroscopy: Terms, Instrumentation , Molecular vibrations, Hook's law, Selection rules, Intensity and position of IR bands. Measurement of IR spectrum, Finger print region, Characteristics absorption of various functional groups. Application of IR spectra. Factors influencing IR vibrational frequency.

UNIT- II

[A] BASIC PRINCIPLE OF QUALITATIVE ANALYSIS

10 Hrs.

1. Dry reaction: theory behind borax bead test with equation, Flame test [Theory, structure of non luminous Bunsen flame]
2. Analysis of cation: (a) Application of Common ion effect and Solubility product constant.
(b) Complexometric reaction involved in qualitative analysis
 1. For identification [Reaction between Cu(II) ion with ammonia, Fe(III) with thiocyanide, NH_4^+ with Nessler reagent.
 2. For masking [Cd^{+2} , Cu^{+2}]
 3. Separation of two ion [Ag-Hg, Zn^{+2} , Mn^{+2}]

[B] ORGANIC QUALITATIVE ANALYSIS

1. Elemental analysis[Lassaign's test with equation]
2. Solubility of organic compounds [Ref : Vogel's qualitative organic analysis]

[C] LABORATORY HYGENE AND SAFETY

1. Handling of chemicals [Carcinogenic chemical, Toxic and poisonous chemicals]
2. General procedure for avoiding accidents [Apron, Safety goggles, Gloves pipetting process]
3. First aid technique [Organic substance in skin, Acid on clothing, Burns in eyes, Inhalation of toxic vapors etc...]

UNIT- III

10 Hrs.

Definitions of terms: Solute, Solvent, and Solution Composition of solution- normal solution, molar solution, molal solution, mole fraction, % solution, saturated, unsaturated and supersaturated solution and solubility. Effect of temp. on various units of concentration. Interconversion of one unit into another unit.

Preparation of solutions of some primary standard substances(e.g. Oxalic acid, succinic acid, KHP, $\text{K}_2\text{Cr}_2\text{O}_7$, As_2O_3)

Standardisation of the following solution using primary standard solutions/ standardised solution.

1. NaOH/KOH
2. I_2 solution
3. KMnO_4
4. Acids
5. $\text{Na}_2\text{S}_2\text{O}_3$ solution.

Reference books:

1. Quantitative analysis by R.A. Day and A.L. Underwood
2. Elements of Analytical Chemistry by R. Gopalan ; P.S.Subramanian and K. Rengarajan
3. Elementary Organic Spectroscopy by Y.L.Sharma
4. Organic Spectroscopy by B.K.Sharma
5. Environmental Chemistry by H.Kaur.
6. <http://www.fssi.gov.in/Portals/0/pdf/Final-test-manual-part-II>
7. Vogel's qualitative inorganic analysis.
8. Vogel's qualitative organic analysis.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. Semester -V

Chemistry Practicals

Proposed syllabus from July 2013

120 Marks (External)

Total : 30 Hrs

60 Marks (Internal)

Time : 6 Hrs. (Uni. Exam) Two Days

1. INORGANIC QUALITATIVE ANALYSIS

LIST OF INORGANIC CHEMICALS USED FOR INORGANIC QUALITATIVE ANALYSIS

CHLORIDES- Bi^{+3} , Cu^{+2} , Cd^{+2} , Fe^{+3} , Mn^{+2} , Co^{+2} , Ni^{+2} , Ca^{+2} , Ba^{+2} , Sr^{+2} , Na^{+1} , K^{+1} , NH_4^{+1} .

BROMIDES- Sr^{+2} , Na^{+1} , K^{+1} , NH_4^{+1}

IODIDE – K^{+1}

NITRITE – Na^{+1} , K^{+1}

NITRATE – Pb^{+2} , Bi^{+3} , Co^{+2} , Ni^{+2} , Ba^{+2} , Sr^{+2} , Na^{+1} , K^{+1} , NH_4^{+1}

SULPHITE – Na^{+1}

SULPHIDE – Zn^{+2} , Sb^{+3}

SULPHATE – Cu^{+2} , Cd^{+2} , Al^{+3} , Fe^{+2} , Zn^{+2} , Mn^{+2} , Co^{+2} , Ni^{+2} , Mg^{+2} , Na^{+1} , K^{+1} , NH_4^{+1}

CARBONATE – Pb^{+2} , Bi^{+3} , Cu^{+2} , Cd^{+2} , Zn^{+2} , Mn^{+2} , Co^{+2} , Ni^{+2} , Ca^{+2} , Ba^{+2} , Sr^{+2} , Mg^{+2} , Na^{+1} , K^{+1} , NH_4^{+1}

PHOSPHATE - Cu^{+2} , Al^{+3} , Fe^{+3} , Zn^{+2} , Mn^{+2} , Co^{+2} , Ni^{+2} , Ca^{+2} , Ba^{+2} , Sr^{+2} , Mg^{+2} , Na^{+1} , K^{+1} , NH_4^{+1}

OXIDE – As^{+3} , Sb^{+3}

BORATE- Boric Acid

CHROMATE – Na^{+1} , K^{+1}

Inorganic qualitative analysis of mixture containing six radicals. The mixture may be soluble in water or dilute hydrochloric acid or concentrated hydrochloric acid including Chromate and Borate.

N. B. Candidate should perform the analysis of at least 08 mixtures.

2. ORGANIC ESTIMATIONS

1. Determination of percentage purity of Vitamin-C
2. Determination of saponification value of an oil
3. Determination of percentage purity of Aspirin
4. Determination of amount of Formaldehyde in given solution
5. Determination of amount of Ethyl acetate in the given solution
6. Determination of amount of Glycine in the given solution

(Instead of sample weighing, solutions to be given)

3. CHROMATOGRAPHY

Chromatographic separation of amino acid mixture by ascending paper chromatography

1. Glycine + Methionine
2. Alanine + Methionine
3. Alanine + Valine

4. PHYSICAL EXERCISE

1. To investigate rate of reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI , $a = b$, $a \neq b$

2. To investigate rate of reaction between H_2O_2 and KI, $a = b$
3. Polarimetry: Determination of angle of rotation of given substance using three different dilutions and determination of concentration of unknown solution.
Sugar, Glucose, Tartaric acid.
4. pH metry: To measure pH of different buffer solution and to study their buffer capacity.
5. pH metry: To determine the degree of ionization and ionization constant of Acetic acid by different dilution.
6. Conductometry: To determine the amount of BaCl_2 in the given solution using K_2CrO_4 solution.
7. Conductometry: To determine the amount of NaCl in the given solution using AgNO_3 solution.
8. Potentiometry: To determine the normality of given HCl solution using 0.5^{N} NaOH .
9. Potentiometry: To determine the solubility and solubility product of sparingly soluble salt AgCl by the titration of AgNO_3 and NaCl . (**Any SIX including one Kinetic expt. should be performed.**)

5. Viva based on above practicals.

Day	Time	Group-A	Group-B	Group-C
1st Day	10.30am to 1.00pm And 1.30pm to 3.30pm	Inorganic Qualitative Analysis	Organic Estimation & Viva	Physical Exercise & Paper Chromatography
2nd Day	10.30am to 1.00pm And 1.30pm to 3.30pm	Organic Estimation & Viva	Physical Exercise & Paper Chromatography	Inorganic Qualitative Analysis
3rd Day	10.30am to 1.00pm And 1.30pm to 3.30pm	Physical Exercise & Paper Chromatography	Inorganic Qualitative Analysis	Organic Estimation & Viva

No.	Exercise	Marks
1	Inorganic Qualitative Anal.	35
2	Organic Estimation	30
3	Physical Exercise	35
4	Paper Chromatography	10
5	VIVA	10
Total		120