VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. Semester -V
Chemistry Paper – VI (Inorganic Chemistry)
Proposed syllabus from June 2021

50 Marks (External) **Total: 30 Hrs**
20 Marks (Internal) **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. Discussion of solution of Schrodinger's equation for the rigid rotator.

Topic –2: Boron Hydride: 5 Hrs

Boron hydride and its classification, Wade's Rule, preparation, properties, structure and bonding in diborane, tetra borane (10), penta borane (9), penta borane (11), hexaborane (10) 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 stability of metal complexes. Lability and inertness. Factors affecting lability of metal complexes. Labile and inert complexes on the basis of reaction rate, VBT and CFT.

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 $[CoF_6]^{3-}$, $[Co(NH_3)_6]^{3-}$, $[FeF_6]^{3-}$, $[Fe(CN)_6]^{3-}$, π- bonding in octahedral complexes.

UNIT – III

Topic –1: Metal Carbonyls: 5 Hrs

Definition, classification, nature of bonding in metal carbonyls, structure and IR spectra in $Ni(CO)_4$;$Fe(CO)_5$, $Fe_2(CO)_9$,$Mn_2(CO)_{10}$, $Cr(CO)_6$, $Co_2(CO)_8$.

Topic –2: Corrosion and its Protection: 5 Hrs

Definition and importance of corrosion, Types of corrosion: uniform, pitting, inter crystalline 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.
   Uni. Chemistry by B. H. Mohan
5) Structural Inorganic chemistry by A. F. Wells.
6) Chemical Bonding - an introduction By Rawal, Patel & Patel.
7) Environmental Chemistry by Amritha anand and Sugumar.
8) Basic Inorganic Chemistry by Cotton and Wilkinson
9) A Text book of Inorganic Chemistry by P.L.Soni
10) Introduction to Inorganic Chemistry by Durrant and Durrant
11) Modern Co-ordination Chemistry by R. Lewis and R.G. Wilkinson.
12) Inorganic Chemistry- Principles of structure and reactivity by J.E. Huhhey and E.A. Keiter.
13) Application of Group Theory to Chemistry by P.K.Bhattacharya., Himalaya Publishing House, Mumbai.
14) Quantum Rasayan, University Granth Nirman Board (Gujarat).
15) Environmental Chemistry by A.K. De.
16) The corrosion and oxidation of metals by Evans U.R. (1961), Arnold, London.
17) Corrosion, Causes and Prevention, Speller. F.,Mc Grqw Hill,New york.
18) Dhatvik Ksharan, Part-I & II by M.N. Desai, Uni. Granth Nirman Board (Gujarat).
19) Corrosion and Corrosion Control, Uhlig H., Wiley.
20) Corrosion Engineering by Fontana M.G. and Green N.D., Mc Graw Hi.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. Semester -V
Chemistry Paper – VII (Organic Chemistry)
Proposed syllabus from June 2021

50 Marks (External) **Total: 30 Hrs**
20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT – I

(A) Reaction Mechanism: **7 Hrs**

(a) Different types of mechanism for Esterification and Hydrolysis: B_{AC}^2, A_{AC}^2, A_{AC}^1, A_{AL}^1

(b) Mechanism of formation and hydrolysis of amides.

(c) Pyrolytic elimination : Cope and Chugaev reaction.

(d) Organic Name Reaction: Knoevenagel Reaction, Reformatsky Reaction, Claisen Condensation Reaction.

(B) Aromaticity: **3 Hrs**

Introduction to Aromaticity, Huckel's Rule, Aromatic Character of Arenes, Definition & Examples of Aromatic, Non-Aromatic, Anti-Aromatic Compounds (Benzenoids and Non-Benzenoids).

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) Vitamins and Hormons: **5 Hrs**

General Introduction, Classification, Structural determinations and Synthesis of Pyridoxine, Vitamin – C, Thyroxine and Adrenalene.

UNIT – III

(A) Synthetic Drugs: **5 Hrs**

Classification, based on pharmacological action, synthesis and uses of Amylnitrate, **Chloroquine**, Pyrimethamine, **Sulpha Pyrimidine**, Diazepam, Lidocaine, Chlorpropamide, Dapsone, Isoniazide, 5-Fluoro Uracil.

(B) Polypeptides: **5Hrs**

Definition & only Structures of Amino acid (in Tabular form) , 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.

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) Synthetic Organic Chemistry by O. P. Agarwal
15) Organic Chemistry by Morrison and Boyd.
16) Chemistry of organic Natural Product Vol. I & II by O. P. Agarwal.
17) Chemistry of synthetic drugs by Trivedi
18) Principles of Medicinal Chemistry Vol. I & II by S. S. Kadam, K. R. Mahadik, K. G. Bothara (Nirali Prakashan)
19) Medicinal Chemsitry By Asuthosh kar 4/e
20) Organic reactions & their mechanism by P. S. Kalsi, New age international publishers
21) **Organic Name Reactions by Gautam Brahmachari, Narosa Publishing House, New Delhi.**
22) **Organic Chemistry, 8th edition by Paula Yurkanis Bruice, University of California, Santa Barbara.**

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. Semester -V
Chemistry Paper – VIII (Physical Chemistry)
Proposed syllabus from June 2021

50 Marks (External) **Total: 30 Hrs**
20 Marks (Internal) **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, Dempster's 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

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 Redd
18) Physical Chemistry by D.N. Bajpai.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. Semester -V
Chemistry Paper – IX (Industrial Chemistry)
Proposed syllabus from June 2021

50 Marks (External) **Total: 30 Hrs**
20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT-I

(A) Manufacture with flowsheet & uses of **6 Hrs**

Acrylonitrile (Sohio Process), Bisphenol-A, Styrene, **Industrial manufacture and uses of Polyolifines: Poly ethylene (HDPE & LDPE) and Polypropylene**.

(B) Fluorocarbons **4 Hrs**

Nomenclature of chloro fluoro derivatives of Methane & Ethane, **General methods of preparation, Properties** and Uses of Fluoro carbons, Manufacture of Freon-12 from fluorspar, Manufacture of Freon-12 from Vinylidine 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, Benzene, **Toluene** and Naphthalene.
Artificial perfumes: Musk xylene, Musk ketone, Musk ambrette.
Explosives: Trinitrophenol, Trinitrotoluene, Trinitro glycerine, Emitol.

(B) Amination

Definition, Amination by reduction: Metal - Acid reduction **(strong and weak)**, Metal - Alkali reduction **(strong and weak)**, Catalytic reduction, Sulphide reduction.
Amination by ammonolysis : Amination of Chlorobenzene, Phenol & Benzene sulphonic acid.
Importance of amination in the manufacture of Bismark Brown G dye from m-phenylene diamine, Synthetic fibre (Nylon 6,6) from HMDA, Methyl Red Indicator from Anthranilic acid, Cyclonite explosive from Hexamethylene tetramine.

(C) Sulphonation - Definition, Sulphonating agents, Mechanism of sulphonation. Sulphonation of Benzene, Toluene and **Anthracene, Preparation of Phenol and Resorcinol from benzene**.
Importance of Sulphonation reaction in industry in the manufacture of Saccharine, Chloramine T and Alizarine Red S.

UNIT-III

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

(A) (1) Tungsten (2) Molybdenum (3) Chromium (4) 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) The Chemical Process Industries by R. Norris Shreve; McGraw-Hill Book Company,Ltd.
5) An Introduction to Industrial Chemistry by Peter Wiseman , Applied Science Pub. Ltd. London.
6) Industrial Chemistry by Clerk Ranken; Andesite Press.
7) Industrial Chemistry by B. K. Sharma Goel Pub.
8) Quantitative Analysis by R.A.Day & A L Underwood, 6th ed. Pub. Prentice Hall of India ltd.
9) Vogel's Text Book Inorganic Quantitative Analysis, 6 th ed.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. Semester -V
Chemistry Paper – X (Analytical Chemistry)
Proposed syllabus from June 2021

50 Marks (External) **Total: 30 Hrs**
20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT-I

(A)INTRODUTION TO ANALYTICAL CHEMISTRY: 03Hrs

Chemical and Instrumental Analysis (advantages and disadvantages) Overview of methods used in Quantitative analysis (classification of classical and instrumental analysis), Factors affecting the choice of analytical methods (in brief), **Step in quantitative analysis (Flow diagram), Analytical methods on the basis of Sample size (in brief), Sampling methods. Sampling in different physical states**

(B)TREATMENT OF ANALYTICAL DATA

Significant figures and rules of computation. **07 Hrs**

Error Definition, Types of errors: Determinates 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 determinates 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,

General applications of TGA : Determination of purity and thermal stability of primary and secondary standards, determination of correct drying temperature, determination of curie point, automatic determination of mixtures, analysis of alloys, Specific application in analysis of (1) CaC_2O_4, H_2O (2) MgC_2O_4 , $2H_2O$ [No instrumentation].

UNIT-III **10 Hrs**

TITRIMETRIC ANALYSIS :

(A) ACID BASE TITRATION : **05 Hrs**

Different terms for titrant, titrand, analyte, end point and equivalence point. Theory of acid base indicators. Indicator range. Selection of proper indicators Calculation of pH at different stages of titrations of monobasic and dibasic acid with strong base Construction of titration curve, Titration of carbonate mixture and **amino acids.** Problems

(B) COMPLEXOMETRIC TITRATIONS:

05 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, β4 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) Holler F.J.Instrumental Methods of Analysis by B. K. Sharma
6) Instrumental analysis by R.D.Braun Mc Graw Hill.
7) Analytical Chemistry by Gary Christian Instrumental methods of chemical analysis Dr.H.Kaur. Pragati prakashan Meerut.
8) College Analytical Chemistry by Mangaonkar, Teckchandani, Sathe, Ghalsasi, Jain (Himalaya Publication House)

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. Semester -V
Chemistry Paper – XI (General Chemistry)
Proposed syllabus from June 2021

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] LABORATORY HYGENE AND SAFETY 03 Hrs.

1. Handling of chemicals [Carcinogenic chemical, Toxic and poisonous chemicals], List of Hazardous 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…]
4. Colour codes and symbols for safety in chemical plants (i) classification of colour codes and symbols (ii) colour codes for gas cylinders and (iii) colour codes for pipelines.

[B] CHEMISTRY OF COSMETICS AND PERFUMES 07 Hrs.

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

UNIT- III **10 Hrs.**

UNITS OF SOLUTION AND STANDARD SOLUTION

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. Inter conversion of one unit into another unit. Preparation of solutions of some primary standard substances (e.g. Oxalic acid, succinic acid, KHP, $K_2Cr_2O_7$, 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. $Na_2S_2O_3$ solution.

Reference books:

1) Elementary Organic Spectroscopy by Y.L.Sharma.
2) Organic Spectroscopy by K.K.Sharma.
3) Quantitative analysis by R.A. Day and A.L. Underwood.
4) Elements of Analytical Chemistry by R. Gopalan ; P. S. Subramanian and K. Rengarajan.
5) Vogel's qualitative inorganic analysis.
6) Vogel's qualitative organic analysis.
7) Industrial safety management, by L.M. Desmukh, Tata Mc Graw Hill, New Delhi, 2006. **(UNIT-II-[A]-4.)**
8) Industrial safety, Health & Environment management, Sunil S. Rao, R.K. Jain. Khanna Publishers, New Delhi, 2006. **(UNIT-II-[A]-4.)**
9) E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK. **(UNIT-II-[B])**
10) P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi. **(UNIT-II-[B])**
11) Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996). **(UNIT-II-[B])**

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. Semester -V
General elective subject (Petrochemicals)
Proposed syllabus from June 2021

50 Marks (External) **Total: 30 Hrs**
20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT – I

Topic-1: Source of Petrochemicals: **4 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: **6 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: **5 Hrs**

Petrochemicals obtained from **C1** cut of petroleum manufacture and application of Methanol, Synthesis gas, Ammonia, HCN, Formaldehyde, Hexamethylene tetramine, Chlorinated methanes, Perchloro ethylene.

Topic-2: **5 Hrs**

Synthesis and uses of H-acid, J-acid, Neville Winther's acid, DASDA, **Procion Red, Cellitone Scarlet-B, Indanthrene Khakhi GG, Blankophor B, Sulphamylon, Chloramphenicol**

UNIT – III

Topic-1: **7 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: **3 Hrs**

Industrial Fuels: Natural fuels, Synthetic fuels, Hydrogen- Fuel of tomorrow, Fuel for rocket (Hydrazine)

Reference Books:

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.
9) Synthetic dyes by G. R. Chatwal, Himalaya Publishers.
10) Synthetic Drugs by G. R. Chatwal, Himalaya Publishers.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Third Year B. Sc. Semester -V
General elective subject (Dyes)
Proposed syllabus from June 2021

50 Marks (External) **Total: 30 Hrs**
20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT-I

Topic –1: Dyes intermediates: 4 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, Bromamine acid.

Topic –2: Diazotisation and coupling: (Azo dyes) 6 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, Orange - II, 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: 5 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, Benzidine Orange, Pigments Orange VI.

UNIT – III

Vat dyes: 10 Hrs

(a) Definition and general account of vat dyes, Indigo obtained from natural source, Synthesis of Indigo by Heumann process and Sandmeyer 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.

(b) Anthraquinone Vat dyes: Bohn's discovery of Anthraquinone Vat dyes, classification with reference to anthraquinone derivatives synthesis of Caledon Jade Green XBN, Indanthrene Yellow 5GK, Indanthrene Brilliant Scarlet –RK.

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 hand 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. Semester -V
General elective subject (Drugs)
Proposed syllabus from June 2021

50 Marks (External) **Total: 30 Hrs**
20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT-I

Topic – 1: Drugs: Classifications-Terminology 05 Hrs

Definition of the term drug. Drugs obtained from plants. Different class of the drugs. Explanation of the following terms: Agonist, Antagonist, Receptors, Pharmacophore, Pro-drug, Soft-drug, CNS depressants, CNS stimulants, 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).

Topic – 2: Micro-organism and Diseases 05 Hrs

Brief account of microbes: Bacteria, Fungi, Protozoa, Virus. Classification of the bacteria based on shape, Gram staining and Ziehl–Neelsen 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-II

Topic – 1: Antibiotics 05 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, Doxycycline, Cycloserine, Chloramphenicol and Some recent antibiotics. Synthesis of Ampicillin.

Topic – 2: Sulfa drugs 05 Hrs

History of discovery and development of sulfa drugs. Structural variations among sulfonamides. Mode of action of Sulfonamides. Therapeutics uses and antimicrobials activity of sulfonamides. Synthesis and uses of Sulpfadimidine, Sulfaguanidine, Sulfisoxazole (Sulfafurazole), Sulfacetamide, Succinyl sulfathiazole, Sulfanilamide, Sulfadiazine, Sulfapyridine.

UNIT-III

Topic – 1: Coagulants and Anti coagulants 05 Hrs

Definition, 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, Bromindone.

Topic – 2: Analgesics 05 Hrs

Definition, classification and structural variations. Synthesis and uses of Meperidine (Pethidine), Ibuprofen, Aspirin, Meclofenamate sodium, Oxyphenbutazone, Paracetamol, Novalgin.

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. Semester -V
Chemistry Practical
Proposed syllabus from June 2021

120 Marks (External) **Total: 30 Hrs**
60 Marks (Internal) **Time: 7 Hrs. (Uni. Exam) Two days**

1. INORGANIC QUALITATIVE ANALYSIS

LIST OF INORGANIC CHEMICALS USED FOR INORGANIC QUALITATIVE ANALYSIS

CHLORIDES- 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 – 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 –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}
BORATE- Boric Acid

Inorganic qualitative analysis of a 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 (Any Four)

1. Determination of amount of ketone (Acetone)
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 $K_2S_2O_8$ 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 the buffer capacity.
5. pH metry: To determine the dissociation constant of weak acid (CH_3COOH) and weak base (NH_4OH) by different dilutions.
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 0.5N 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 experiment should be performed.)

5. Viva Based on Above Practicals :

Day	Time	Group A	Group B
1st Day	10:00 A.M. to 1:30 P.M.	Inorganic Qualitative	Physical Exercise
	2.00 P.M. to 5.30 P.M.	Organic Estimation	Paper Chromatography & Viva-Voce
2nd Day	10.30 P.M to1.30 P.M.	Physical Exercise	Inorganic Qualitative
	2.00 P.M. to 5.30 P.M.	Paper Chromatography & Viva-Voce	Organic Estimation

No.	Exercise	Marks
1.	Inorganic Qualitative Analysis	35
2.	Organic Estimation	30
3.	Physical Exercise	35
4.	Paper Chromatography	10
5.	Viva-Voce	10
	Total Marks	120

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. Semester -VI Chemistry

Paper-VI (Inorganic Chemistry)

Proposed syllabus from July 2021

50 Marks (External) **Total: 30 Hrs**

20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT - I

Topic-1: Molecular Symmetry: **10Hrs**

Introduction and importance of symmetry, Symmetry elements and Symmetry operations, Classification of molecules in to point groups. Point group of simple molecules like CO_2, HCl, H_2O, NH_3, BF_3, $[PtCl_4]^{-2}$, PF_5, C_6H_6, $C_5H_5^-$, CH_4, SF_6,**Bromo benzene(C_6H_5Br), Cyclobutane, Boric acid (H_3BO_3),** Cis and Trans Dichoroethylene ($C_2H_2Cl_2$), Staggered and Eclipsed Ethane (C_2H_6). Law of multiplications, Construction of multiplication table for C_{2v}, C_{3v},C_{2h}

UNIT - II

Topic-1: Metal Complexes (Inorganic Reaction Mechanism): **6 Hrs**

Reaction mechanisms of ligand substitution in octahedral complexes (i) SN_1 (ii) SN_2 Acid hydrolysis &Base hydrolysis -Redox (Single Electron Transfer) reactions,**Substitution reaction without breaking M-L bond.**

Topic-2: Hybridization: **4 Hrs**

Introduction. Rules for hybridization, Bond angles, bond strength, and co-efficientinsp, sp^2 and sp^3 hybrid orbital using wave function (fully mathematical calculations).

UNIT-III

Topic-1: Organo-metallic compounds: **5 Hrs**

Definition, classification, Structure and bonding in ferrocene, dibenzene chromium, Zeise ion andgaseous dimethyl beryllium,**Tetramethyl lead.**

Topic-2: Water Pollution: **5 Hrs**

Types of water pollutants, Trace elements in water and their effects; Determination ofBOD, COD, DO, Total hardness, Total dissolved solids, Ozonetreatment process for wastewater.

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

(4) Advanced Inorganic Chemistry by Cotton and Wilkinson, John Wiley

(5) Uni. Chemistry by B. H. Mahan

(6) Structural Inorganic chemistry by A. F. Wells.

(7) Chemical Bonding- an introduction By Rawal, Patel & Patel. Sugumar.

(8) Environmental Chemistry by Amritha Anand

(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. Huhhey and E.A. Keiter.

(14) Application of Group Theory to Chemistry by P.K.Bhattacharya., Himalaya Pub. House, Mumbai.

(15) Quantum Rasayan, University Granth Nirman Board (Gujarat).

(16) Environmental Chemistry by A.K. De. U.R. (1961), Amold, London.

(17) The corrosion and oxidation of metals by Evans

(18) Corrosion, Causes and Prevention, Speller. F., Mc Graw Hill, New york.

(19) DhatvikKsharan, 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.
Publ. Pvt. Ltd.

(22) Wiley online library.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. Semester -VI Chemistry

Paper-VII (Organic Chemistry)

Proposed syllabus from July 2021

50 Marks (External) **Total: 30 Hrs**

20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT - I

Topic : 1 : MolecularRearrangements **6Hrs**

Mechanism of rearrangements involving C to C migrations as illustrated by Wagner – Meerwein and Pinocol-Pinacolonerearrangements.

Mechanism of rearrangements involving C to N migrations as illustrated by Hoffmann, Curtius, and Beckmann rearrangements.

Topic : 2 : Catalysis andGreenChemistry **4Hrs**

Catalysis in organic reaction, nucleophilic catalysis, Metal-ion catalysis, Intermolecular catalysis, Phase transfer catalysis. Green Chemistry: Fundamental Principle of GreenChemistry.

Green synthesis of(i)Ibuprofen (ii) Paracetamol

UNIT-II

Topic : 1 : Terpenoids (Isoprenoids) : **5 Hrs**

Their occurrence , classification , isoprene and special isoprene rule , general methods to determine their structure , analytical and synthetic evidences for the structure of Camphor &Citral.

Topic : 2 : Polymers: **5 Hrs**

1. Synthetic Polymer:Basic concepts, Degree of polymerization, Classification of polymerization reaction. Mechanism of Additionor chain growth polymerization, free radical vinyl polymerisation and Ionic vinyl polymerisation, Ziegler – Natta Polymerisation and Vinyl polymers, Condensation or step growth Polymerization, Polyesters, Polyamides,
2. Biodegradable polymers- Introduction, classification and application.Polylatic acid and polyglycolic acid.

UNIT-III

Topic : 1 Plant pigments : 5 Hrs

(a) Classification.

(b) General introduction of Carotenoids. Analytical and synthetic evidence of B-carotene.

(c) General introduction of anthocynines and anthocyanidines. Analytical and Synthetic evidences of cyanidine chloride.

(d) Introduction of flavones and flavonols. General method of determining. Structure of flavones. Synthesis of flavones. Analytical and synthetic evidences of quercetin.

Topic : 2 Synthetic dyes: (Colour and constitutionelectronicconcepts) **5 Hrs**

Definition and difference between dyes and pigments, classification of dyes, color and constitution – Witt's theory, synthesis and uses of Crystal violet, Indigo, Alizarine,Phenolphthalein, Tetrazine, Acriflavine, Procoin Brilliant Red M-2B

Reference Books:

(1) Mechanism and Structure in organic chemistry-Goulde.S.
(2) Reaction mechanism in organic chemistry by Mukhejee&Singh
(3) Principles of reaction mechanism in organic chemistry by Dharmaraha&Chawla
(4) Organic reaction mechanism by Bansal Tata Mac.Hill
(5) Organic Chemistry by Hendrickson, Cram &Hammond
(6) Organic Chemistry by Brown R.F.
(7) Organic Chemistry by Solomon W.Graham
(8) Principles of Organic Synthesis- R. O. C.Norman
(9) Basic Principles of Organic chemistry, by R. Y. Caserio, W. A.Benjamin
(10) May's Chemistry of synthetic Drugs byDyson.
(11) Chemistry of drugs, Ener and Caldwell
(12) Synthetic drugs by TyagiandYadav.
(13) Chemistry of synthetic Dyes Vol. I & II byVenkatraman
(14) Synthetic Organic Chemistry by O. P.Agarwal
(15) Synthetic Dyes by Chatwal &Anand
(16) Chemistry of synthetic Dyes by I. G.Vashi
(17) Organic Chemistry by Morrison andBoyd.
(18) Chemistry of organic Natural Product Vol. I & II by O. P.Agarwal.

(19) Chemistry of synthetic drugs byTrivedi

(20) Green Chemistry, Environmentally Vergin Reactions by V. K. Ahuwalia pub. by AnebooksIndia.

(21) PrinciplesofMedicinalChemistryVol.I&IIbyS.S.Kadam,K.R.Mahadik,K.G.Bothara (NiraliPrakashan)

(22) Medicinal Chemsitry By Asuthosh kar4/e

(23) Organic reactions & their mechanism by P. S. Kalsi, New age internationalpublishers.

(24) Polymer Science Gowariker

(25) Handbook of biodegradable polymer, isolation, synthetic charactrisation and application by Andras, Lendiein and adamsissom.

(26) Stereochemistry Conformation and Mechanisam, 10^{th} Ed. by P. S. Kalsi, New age internationalpublishers

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. Semester -VI Chemistry

Paper-VIII (Physical Chemistry)

Proposed syllabus from July 2021

50 Marks (External) **Total: 30 Hrs**

20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT - I

Topic : 1 : PHASE EQUILIBRIA **6Hrs**

Statement and meaning of the terms phase, component, degree of freedom, phase rule, phase equilibria, of one component system- water, CO_2,Sulphur system, phase equilibria of two component system- simple eutectic-, Pb-Ag systems, desilverisation of lead, KI- Water system, freezing mixtures. Solid solutions: compounds with congruent and incongruent melting point (Only definition and example), Three component solid-liquid systems p.no 690-691*

Topic : 2 : BINARY LIQUID MIXTURES **4Hrs**

Liquid-liquid mixtures, ideal liquid mixtures, Raoult's law, non-ideal orreal solutions, positive and negative deviations from Raoult's law, temperature composition curves for ideal and non-ideal binary solutions of miscible liquids, azeotropes, partially miscible liquids: Phenol-water systems, immiscible liquids, steam distillation. Chemical Potential of Ideal and non-ideal solutions, p.no 756-757* **Numerical problems.**

57 th edition, Principal of physical Chemistry, By Puri, Sharma, Pathania

Vishal Publishing co.

UNIT-II

Topic:1: APPLICATION OFELECTROMOTIVEFORCE **10 Hrs**

Application of measurements of EMF in the determination of

(1) Solubility product and solubility of sparingly solublesalts

(2) Ionic product of water by galvaniccell

(3) Transport number of ions

(4) Equilibrium constant

(5) pH by Hydrogen, Glass and Quinhydroneelectrodes

(6) Energy sources Ni-Cd Cell and Li- ion Cell, Lithium - Polymer Cell,

Numericalproblems.

UNIT-III

Topic:1:APPLICATIONS OFNUCLEARCHEMISTRY **10 Hrs**

Application of radio isotopes as tracers in medicines, agriculture, in studying reaction mechanism in photosynthesis and age determination by Carbon- Dating method.Geiger Muller Counter, Q-value of nuclear reactions, Chemical and physical atomic weight scale, Mass defect and Binding energy, Packing fraction and its relation with the stability of the nucleus, Nuclear fission, Atom bomb, Nuclear reactor for power generation and Critical mass,Nuclear fusion,Stellar energy and Hydrogen bomb, Hazards of nuclear radiation. **Numerical problems on** Q- value, Binding energy, Packing fraction, and Energy released during nuclear reactions.

Reference Books:

(1) Elements of physical chemistry by Glasstone andLewis

(2) Physical chemistry by G.M.Barrow

(3) Physical chemistry by W.Moore

(4) Physical chemistry byAtkins

(5) Physical chemistry byG.K.Vemulapalli

(6) Physical chemistry byB.K.Sharma

(7) Physical chemistry by Gurdeepraj

(8) Physical chemistry by Puri, Pathania,Sharma

(9) Essential of Physical chemistry by BahlandBahl

(10) Physical chemistry by NegiandAnand

(11) Physical chemistry by K.L. KapoorVol1-5.

(12) Physical chemistry by Baliga,Dhavale and ZaveriVol1-3.

(13) Physical chemistry by Dr. S.Pahari

(14) Nuclear chemistry byArnikar

(15) Electro chemistry by S.Glasstone

(16) Electrochemistry by B.K.Sharma

(17) Modern Electrochemistry by J'omBockrisandRedd

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. Semester -VI Chemistry

Paper-IX (Industrial Chemistry)

Proposed syllabus from July 2021

50 Marks (External) **Total: 30 Hrs**

20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT - I

Topic:1 : Fermentation Industry **6 Hrs.**

Definition, condition favorablefor fermentation process (pH, temperature, presence of othersubstances, absence of preservatives, concentration). Manufacture of ethanol, citric acid, acetone andbutanol, Acetic acid, Lactic acid from molasses, manufacture of penicillin-G.

Topic: 2: Pulp and Paper industry **4 Hrs**

Type of pulp, Manufacture of chemical pulp by Sulphate pulp process, Sulphite pulp process, manufacture ofpaper (conversion of pulp into paper, beating process, importance of fillings, sizing, colouring materials inmanufacture of paper and calendaring).

UNIT-II

Topic : 1 : Insecticides and Fungicides **5 Hrs.**

Introduction,Inorganicinsecticides,Naturalandsyntheticinsecticides,organicinsecticides ,Eldrin,Dieldrin, BHC, Tetra ethyl pyrophosphate (TEPP), Introduction of Fungicides likeBordeauxmixture, Dithiocarbamates, Baygon , Termik, Zineb

Topic : 2 : Detergents:

Introduction, Principles detergency, classification of surface active agents, Anionic detergents,Cationicdetergents,Non-ionicdetergents,Amphotericdetergents,Sudsregulators,BuildersandAdditives.

UNIT-III

Topic : 1 : SugarIndustry **5 Hrs.**

Introduction,Manufactureofsugarfromsugarcane:Extractionofjuice,Purificationofjuice, Concentration&crystallizationofpurifiedjuice,Refiningof sugar.

Topic : 2 : Industrial manufacturing process with flow diagram & their uses 5 Hrs.

(1) Preparationofmethanolfromsynthesisgas.

(2) PreparationofIsopropanolfrompropylene.

(3) Preparationofacetonefromisopropanol.

(4) Preparationofformaldehydefrommethanolbyoxidationdehydrationprocess.

(5) Acetylenefromnaturalgas.

Reference Books:

(1) Shreve Chemical Process Industries, 5ed., George.T. Austin. MacGraw 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&ALUnderwood, 6^{th} 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 -VI Chemistry

Paper-X (Analytical Chemistry)

Proposed syllabus from July 2021

50 Marks (External) **Total: 30 Hrs**

20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT - I

SPECTROSCOPY: **10 Hrs**

Types of spectrum, Process involved in interaction with matter (Fluorescence, Phosphorescence), Components of Spectrophotometer-Sources, Grating and Prism as dispersing device, Sample handling, Detectors- Photo tube, Photomultiplier tube. Block diagram and working of single beam and double beam spectrophotometer. Terms involved in Beer's law (no derivation). Causes of deviation from Beer's law. Analysis of unknown by calibration curves method, standard addition method, and ratio method.

Determination of Cu^{+2}, Fe^{+3}, $NO2^{-1}$, using spectrophotometer. (Only principles - no detailed method), Problems based on quantitative analysis.

UNIT-II

SEPARATION TECHNIQUE **6 Hrs.**

Topic : 1 : Gas Chromatography:

Classification of chromatography, Principles of GC separation. Components of GC, **Sample introduction system, Columns: Packed column Capillary Column (WCOT, SCOT),** Carrier gas and its selection - stationary phases: Solid adsorbents, Inert supports **(Selection criteria, Diatomaceous earths)** and liquid stationary phases, Detectors: FID, TCD.Qualitative and quantitative analysis using GC.

Topoic : 2 : Liquid Chromatography: **4 Hrs.**

Limitation of conventional liquid chromatography (no detail method).Technique of HPLC. Elementary idea about technique and layout diagrams of instrument. Components of instrument of HPLC technique,

Elementary idea of TLC.

UNIT-III

Topic : 1 : Precipitation Titrations: **5 Hrs.**

Titrations involving Silver salts.

Detection of end points by Mohr's method, Volhard's method, Adsorption indicators.Construction of titration curves. Problems.

Topic : 2 : Redox Titrations: **5 Hrs.**

Formal Potential, Redox reaction: $FeSO_4$-$KMnO_4$, Fe^{+2} – Ce^{+4},Principle of redox indicators, Structural chemistry of indicators (Diphenyl amine, Ferroin). Construction of titration curves for titration of Fe^{2+} with Ce^{4+}

Calculation of equilibrium constants for redox system, Types of indicators, Theory of true Redox indicators.(Numericals)

Oxidants – KMnO4, $K_2Cr_2O_7$. Reductants – Sodium thiosulphate , Sodium arsenite.

Reference Books:

(1) Quantitative Analysis by R. A. Day & A. L. Underwood, 6th ed. Pub. Prentice Hall of India ltd

(2) Vogel's Text Book Inorganic Quantitative Analysis, 6th 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. Sharma

(6) Instrumental analysis by R.D.Braun Mc Graw Hill.

(7) Analytical Chemistry….Gary Christian

(8) Analytical Chemistry….Day and Underwood.

(9) **Modern Analytical Chemistry by David Harvey, McGraw Hill Higher Education**

(10) **College Analytical Chemistry, Mangaonkar, Teckchandani, Sathe, Ghalsasi, Jain, Himalaya Publishing House**

(11) **Analytical Chemistry by Alka L. Gupta, PragatiPrakashan.**

(12) **Instrumental Methods of Chemical Analysis by H. Kaur, PragatiPrakashan.**

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. Semester -VI Chemistry

Paper-XI (General Chemistry)

Proposed syllabus from July 2021

50 Marks (External) **Total: 30 Hrs**

20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT-I

Topic : 1 : ChemistryinConsumerProtection: **10 Hrs.**

DefineAdulteration;ReasonsofAdulteration,Typesof Adulterants,DiscussionMethods for detection of different adulterants in some common food items

(1) Milk

(2) Milk products: Sweet curd, Rabdi, Khoa& its product, Chhana or Paneer, Ghee, Cottage cheese,condensedmilk, Khoa,Ghee,Butter

(3) OilandFatsOilandFats,Mustardoil,Edibleoil,Coconutoil

(4) Sweeteningagents:Sugar,Pithisugar,Honey,Jaggery,Burasugar

(5) Foodgrainandtheirproduct:(Wheat,Rice, Maize,Jowar,Bajra,ChhanaandBarleyetc.), Maida,Wheatflour,Besan,Suji(Rawa)DalwholeandSpilt,pulses

(6) Spices:Wholespices,BlackPepper,Cloves,MustardseedandPowderedspices

(7) TurmericwholeandTurmeric powder

(8) Chillipowder,Asafoetida,

(9) MiscellaneousProduct:Commonsalt,Tea,Coffeepowder,

UNIT-II

Topic: 1 : Nanoparticles:/ Industrial Safety **04 hours**

Introduction of nano particles, properties of nano particles, Semiconductors, Ceramic nano particles,Catalyticaspects ofnano particles, Carbonnano tubes.Applicationsof nanoparticles,

Topic : 2 : Environmentalpollution: **06hours**

IntroductiontypesofPollutions(1)Gaseouspollutioninair,Acidrain,Greenhouseeffectandozonedepletion.(2) radiation pollution cause, effect and control, (3) Noise pollution and their effect andcontrol(4) Oilpollution and their control.

UNIT-III

Topic : 1 : NMRspectroscopy **10 Hrs.**

NuclearMagneticResonanceSpectroscopy–ProtonMagneticResonance(^{1}HNMR) Spectroscopy - Nuclear Shielding and Deshielding – Chemical Shift and Molecule Structure, Spin-Spinsplitting and Coupling constants- Intensities of signals – Interpretation of NMR spectra of simple organicmolecule such as Ethyl bromide, Acetaldehyde, 1,1,2-tribromoethane,Ethylacetate, Toluene,Acetophenone,Nitrobenzene,Cyclopropane, IsomersofPentane, Hexane and Dibromo propane.

Reference Books:

(1) QuantitativeanalysisbyR.A.DayandA.L.Underwood

(2) ElementsofAnalyticalChemistrybyR.Gopalan;P.S.SubramanianandK.Rengarajan

(3) ElementaryOrganicSpectroscopybybyY.L.Sharma

(4) OrganicSpectroscopybybyB.K.Sharma

(5) EnvironmentalChemistryby H.Kaur.

(6) .http://www.fssi.gov.in/Portals/0/pdf/Final-test-manual-part-II

(7) Vogel'squalitativeInorganicanalysis

(8) Vogel'squalitative Organicanalysis

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. Semester -VI Chemistry

Chemistry-Generic elective subject–Petrochemicals

Proposed syllabus from July 2021

50 Marks (External) **Total: 30 Hrs**

20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT - I

Topic : 1 : Petrochemicals obtained from C3-cut of petroleum. **6 Hrs.**

Manufacture and industrial applications of chemicals obtained from Propylene: Isopropyl alcohol, Acetone (Wacker-Chemieprocess), Propyleneoxide (Halcon process), Acrylonitrile, Glycerol and Isoprene, Propylene tetramer, Acrylic acid, n-Butyraldehyde (Oxoprocess), Methyl isobutyl ketone, Methylmethacrylate.

Topic : 2 : **4 Hrs.**

General account of petrochemicals used as monomers in the manufacture of polyester fibers,manufacture of DMT, Terphthalic acid, Phthalic anhydride, Maleic anhydride, 1:4 Butanediol and othermonomerslike Pentaerithritol and Di-isocyanates.

UNIT-II

Topic : 1 : The method for the large scale production with flow diagram and uses of: **5 Hrs.**

(i)Acetoacetanilide (ii) Anthraquinone (iii) β-naphthol from naphthalene (iv) Bon acid (v) Aspirin (vi) Chloramphenicol (vii) Paracetamol (viii) p-Aminophenol.

Topic : 2 : Miscellaneous petrochemicals **5 Hrs.**

Definition of synthetic detergents, hard and soft detergents. Synthesis of DDBS. Synthesis of Fluoresein, Malachite Green, Chrysoidine and Indigo. Definition of Explosive, list of basicraw materials for explosives and list of explosives derives from these raw materials. Synthesis of Tetryl, PETN and Dynamite. Definition insecticides, classification of insecticides on basis of mode of action. Synthesis of Methoxychlor, Captan, Parathion, Malathion.

UNIT-III

Topoic : 1 : Chemicals obtained from C4 & C5 cut of petroleum. **4 Hrs.**

Manufacture and industrial applications of Butadiene, Butylalcohols, Methylterbutyl ether (MTBE), Cyclopentadiene, Sulpholane.

Topic : 2 : BTX aromatic : **6 Hrs.**

Recovery process of BTX, manufacture and industrial applications of benzene, toluene, xylene,naphthalene,phenol, styrene.

Reference Books:

(1) Introduction to petrochemicals by SukumarMaiti, 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) PetrochemicalsdigestbyMGKManon(AsiaPublishinghouseBombay)

(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. Semester -VI Chemistry

Chemistry-Generic elective subject–Drugs

Proposed syllabus from July 2021

50 Marks (External) **Total: 30 Hrs**

20 Marks (Internal) **Time: 2 Hrs. (Uni. Exam)**

UNIT - I

Topic – 1: Sedatives, Hypnotics and Anticonvulsant drugs **5 Hrs.**

Definition; Introduction; Classification and Structural variations of Sedatives, Hypnotics and Anticonvulsant drugs; Synthesis and Therapeutic Uses of Luminal (Phenobarbital), Diazepam, Meprobamate, Imipramine, Veronal.

Topic – 2: Anaesthetics **5 Hrs.**

Definition; Introduction of General and Local Anaesthetics, Name and Structures of different General Anaesthetics, Classification and Structural Variation among Local Anaesthetics; Synthesis and Therapeutic Uses of Alpha-Eucaine, Benzocaine, Orthocaine, Lidocaine, Halothane.

UNIT-II

Topic – 1: Antihistamines (Anti-allergic drugs) **4 Hrs.**

Definition; Introduction; General account of Histamine and Anti-allergic drugs; Classification and Structural Variations among Antihistamines; Synthesis and Therapeutic Uses of Antergan, Benadryl (Diphenhydramine), Promethazine (Phenergan), Pyribenzamine, Chlorpheniramine.

Topic – 2: Antidiabetic Drugs (Hypoglycemic agents) **3 Hrs.**

Definition; Introduction; Hypoglycemia; Role of insulin in diabetes; Oral Hypoglycemic agents; Structural Variations among Biguanide and Sulfonylurea derivatives showing Hypoglycemic activity; Synthesis and Therapeutic Uses of Tolbutamide, Metformin.

Topic – 3: Antitubercular and Antileproticdrugs **3 Hrs.**

Definition; Introduction; General account of Tuberculosis and Leprosy; Structural Variations among Antitubercular and Antileprotic Drugs; Synthesis and Therapeutic Uses of Isoniazid, Ethambutol, Dapsone (DDS).

UNIT-III

Topic – 1: Antimalarial drugs **4 Hrs.**

Definition; Introduction; Name and modes of transition of Plasmodium Parasites responsible for Malaria in Human;GeneralClassification of Antimalarial Drugs; Synthesis and Therapeutic Uses of Chloroquine, Mafloquine, Amodiaquine (Camoquine), Primaquine.

Topic – 2: Antiseptics and Disinfectants **3 Hrs.**

Definition;Introduction; Classification and Structural variations among Antiseptics and Disinfectants; Synthesis and Therapeutic Uses of Mercurochrome (Merbromin), *n*-Hexylresorcinol, Halazone, Dichloramine-T.

Topic – 3: Diuretics **3 Hrs.**

Definition; Introduction; Classification and Structural Variations of Diuretics; Mercurial Diuretics and Non-Mercurial Diuretics; Synthesis and Therapeutic Uses of Sorbitol, Acetazolamide, Hydroflumethiazide.

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) Medicinal Chemistry by V.K.Ahluwalia Pub. Ane Books Pvt. Ltd.

(7) Medicinal Chemistry by AshutoshKar, New Age International Publisher.

(8) Medicinal Chemistry by BalkishanRazdan, Pub. CBS Publishers.

(9) Pharmaceutical Organic Chemistry by S.K.Dewan, Pub. Narosa.

(10) Medicinal Chemistry - a Molecular and Biochemical Approach, by Thomas Nogrady&Donald F Weaver

(11) Pharmaceutical Organic Chemistry by Shyam Singh Pub. Himalaya Publishers.

(12) Medicinal Chemistry by G Patrick. Pub. Viva Books.

(13) Burger's Medicinal Chemistry & Drug Discovery. Ed. by D. J. Abraham.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. (SEM –VI)

Chemistry - Generic elective subject – DYES

Proposed syllabus from November/December - 2021

50 Marks (External) **Total: 30 Hrs**

20 Marks (Internal) **Time: 2 Hrs (Uni. Exam)**

UNIT – I

Topic –1: Fluorescent brightening agents: **7 Hrs**

General account, classification of FBA base on chemical constitution with examples, Stillbene and Coumarin derivatives of FBA, synthesis of Tinopal BV, Blankophor-B, Blankophor-G , 3-Phenyl-7-methoxy coumarin, 4 Methyl –3 phenyl-7-amino coumarin, Brilliant Yellow, 3-Phenyl 7-Acetylamino coumarin, 4-Acetylamino-N-butyl Naphthalimide.

Topic –2: Sulphur dyes: **3 Hrs**

General account of Sulphur dyes. (a) Sulphur Black (b) Sulphur Brown (c) Sulphur Red (d) Sulphur Blue.

UNIT – II

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Topic –1: Reactive dyes: **5 Hrs**

Definition, general account of reactive dyes based on monochlorotriazinyl, dichlorotriazinyl and vinyl sulphone system. Application of reactive dyes, Synthesis of Procion Brilliant red H-3B ,Procion Brilliant Yellow M-6G, Remazole Black B, Procion Brilliant – Blue M-R, Reactive Red-B.

Topic –2: Mordant dyes: **5 Hrs**

(i) Definition, classification of mordant dyes with examples, application of mordant dyes synthesis of alizarin and Mordant yellow 2 G

(ii) Heterocyclic Dyes: Introduction Azine dyes, Thiazine dyes, and Cyanine dyes. Synthesis of Safranine – T, Methylene blue, Astrazone pink-FG.

UNIT – III

Topic –1: Azoic dyes: **4 Hrs**

Definition, general account of azoic dyes, fast bases, fast salts, rapid fast colors, rapidogens and rapidazole, synthesis of naphthol AS, Fast blue B base (Dianisidine), Fast Orange GGD, Naphthol ASRL, Fast Orange LG- Base.

Topic –2: Non-textile application of dyes: **6 Hrs**

Food colors, Cosmetic dyes , Dyes for paper and printing inks , Dyes for paints, Dyes for leather and polishes, synthesis of Amaranth , LitholRubine, Lithol Red, Crystal violet, Bismark brown G, Eosin, Orange-I, Prontosil, Pyridium, Neutral Red, Mercurochrome. General account of medicinal dyes.

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 hand 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.