



Re-Accredited by NAAC with 'A' Grade

VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.

વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી

યુનિવર્સિટી કેમ્પસ, ઉદ્ધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

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-: પરિપત્ર :-

વિજ્ઞાન વિદ્યાશાખા હેઠળની ગણિતશાસ્ત્ર વિષય ચલાવતી સંલગ્ન સ્નાતક આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ : ૨૦૨૧-૨૨ થી અમલમાં આવનાર ટી.વાય. બી.એસ.સી. રસાયણશાસ્ત્ર સેમેસ્ટર-૫ ના અભ્યાસક્રમ અંગે ચર્ચા કરતા રસાયણશાસ્ત્ર વિષયની અભ્યાસસમિતિની તા. ૧૧/૦૬/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંક:૨ અન્વયે નીચે મુજબ કરેલ ભલામણ વિજ્ઞાન વિદ્યાશાખાની તા. ૧૭/૦૬/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંક: ૧૭ અન્વયે મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલે તેની તા.૨૫-૨૬/૦૬/૨૦૨૧ ની સભાના ઠરાવ ક્રમાંક: ૧૭ અન્વયે સ્વીકારી મંજૂર કરેલ છે. તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્દુપરાંત તેનો અમલ કરવો.

રસાયણશાસ્ત્ર વિષયની અભ્યાસસમિતિની તા. ૧૧/૦૬/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંક:૨

- :: આથી ઠરાવવામાં આવે છે કે, જુન-૨૦૨૧-૨૨ થી અમલમાં આવનાર ટી.વાય. બી.એસ.સી. રસાયણશાસ્ત્ર સેમેસ્ટર-૫ નાં અભ્યાસક્રમને સર્વાનુમતે મંજૂર કરી તે મંજૂર કરવા વિજ્ઞાન વિદ્યાશાખાને ભલામણ કરવામાં આવે છે.

વિજ્ઞાન વિદ્યાશાખાની તા. ૧૭/૦૬/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંક: ૧૭

- :: આથી ઠરાવવામાં આવે છે કે, રસાયણશાસ્ત્ર વિષયની અભ્યાસસમિતિની તા. ૧૧/૦૬/૨૦૨૧ ની સભાનાં ઠરાવ ક્રમાંક:૨ અન્વયે મંજૂર કરેલ જુન-૨૦૨૧-૨૨ થી અમલમાં આવનાર ટી.વાય. બી.એસ.સી. રસાયણશાસ્ત્ર સેમેસ્ટર-૫ નાં અભ્યાસક્રમ મંજૂર કરી એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૨૫-૨૬/૦૬/૨૦૨૧ ની સભાનાં ઠરાવ ક્રમાંક: ૧૭

- :: આથી ઠરાવવામાં આવે છે કે, રસાયણશાસ્ત્ર વિષયની અભ્યાસસમિતિની તા. ૧૧/૬/૨૦૨૧ ની સભાના ઠરાવ ક્રમાંક : ૨ અન્વયે ભલામણ કરેલ અને વિજ્ઞાન વિદ્યાશાખાની તા. ૧૭/૬/૨૦૨૧ ની સભાનાં ઠરાવ ક્રમાંક : ૧૭ અન્વયે સ્વીકારેલ જુન ૨૦૨૧-૨૨ થી અમલમાં આવનાર ટી.વાય. બી.એસ.સી. રસાયણશાસ્ત્ર સેમેસ્ટર-૫ નો અભ્યાસક્રમ મંજૂર કરવામાં આવે છે.

બિડાણ: ઉપર મુજબ

ક્રમાંક : એકે./પરિપત્ર/૮૨૬૪/૨૧

તા.૦૧-૦૭-૨૦૨૧

ઈ.ચા. કુલસચિવ

પ્રતિ,

- ૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની રસાયણશાસ્ત્ર વિષય ચલાવતી સંલગ્ન કોલેજોના આચાર્યશ્રીઓ.
- ૨) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા
- ૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....તરફ જાણ તેમજ અમલ સારૂ.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Third Year B. Sc. Semester -V

Chemistry Paper – VI (Inorganic Chemistry)

Proposed syllabus from June 2021

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 . 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 $[\text{CoF}_6]^{3-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{FeF}_6]^{3-}$, $[\text{Fe}(\text{CN})_6]^{3-}$, 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 $\text{Ni}(\text{CO})_4$; $\text{Fe}(\text{CO})_5$, $\text{Fe}_2(\text{CO})_9$, $\text{Mn}_2(\text{CO})_{10}$, $\text{Cr}(\text{CO})_6$, $\text{Co}_2(\text{CO})_8$.

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)

20 Marks (Internal)

Total: 30 Hrs

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)

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, 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 α - 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. Kapoor Vol 1-5.
- 12) Physical chemistry by Baliga, Dhavale and Zaveri Vol 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'om Bockris 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)

20 Marks (Internal)

Total: 30 Hrs

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 flourspar, 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)

20 Marks (Internal)

Total: 30 Hrs

Time: 2 Hrs. (Uni. Exam)

UNIT-I

(A)INTRODUCTION 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 , $2\text{H}_2\text{O}$ [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:

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) 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)
20 Marks (Internal)

Total: 30 Hrs
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.

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)

20 Marks (Internal)

Total: 30 Hrs

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)

20 Marks (Internal)

Total: 30 Hrs

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)

20 Marks (Internal)

Total: 30 Hrs

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 Sulphadimidine, 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)

60 Marks (Internal)

Total: 30 Hrs

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
1 st 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
2 nd Day	10.30 P.M to 1.30 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