



VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

S. Y. B.Sc. Microbiology

ENGLISH (Higher Level)

	Text-1 The Threshold -Macmillan
1	PART I SHORT STORIES
	1.1 The Gift of The Magi 1.2 A Duel 1.3 Nitya 1.4 The Fatalist 1.5 The Child
2	PART II ESSAYS
	2.1 MY Financial Career 2.2 Principles of Good Writing 2.3 The Elixir of Life
3	PART III Poetry
	3.1 The World is Too Much With Us 3.2 A Bird Came Down The Walk 3.3 Stopping by Woods On a Snowy Evening 3.4 Palanquin-Bearers
4	GRAMMAR 4.1 Voice, Narration 4.2 Sentence-Structure 4.3 Parts of speech-Nouns 4.4 Parts of Speech-Pronouns, Determiners, Articles etc. 4.5 Parts of speech-Verbs 4.6 Parts of speech-Adjectives, Adverb, Intensifiers 4.7 Parts of speech-Preposition, Conjunction, Interjection 4.8 Phrases 4.9 Clause 4.10 Type of Sentences 4.11 Pronunciation

IDS (Marine Science)

Unit No.	Topic
1	Science and Marine Biology
	1.1 The importance of the oceans and Marine organisms. 1.2 The Study of the sea and its inhabitants. 1.3 Marine Biology – A History of Changing Perspectives. 1.4 Marine Biology and the Human connection – The process of Science 1.5 Marine Biology Today.
2	General Biology
	2.1 Zonation of intertidal organisms. 2.2 Migration of animals from sea to land. 2.3 Marine Pollution.
3	The Seashore
	3.1 Rocky Shore 3.2 Sandy Shore 3.3 Estuaries 3.4 Swamps 3.5 Coral reefs
4	Water: Waves and Tides
	4.1 The Nature of water. 4.2 Salt Water 4.3 Ocean Heating and cooling 4.4 Ocean layers and Vertical mixing 4.5 Winds and currents. 4.6 Waves; Tides
5	Marine Microorganisms
	5.1 Bacteria :- Marine adaptation purple Bacteria : Ecology and the marine environment. 5.2 Multicellular algae, Red algae, Brown algae, Marine Biology & The Human connection Green algae.
6	Marine Animals
	6.1 The fishes:- The Jawless fishes : cartilaginous fishes: Marine Biology and the human connection shark aid in the fight against cancer. 6.1.1 Bony fishes: - Marine adaptations – surviving in Near freezing water. 6.1.2 Marine Reptiles: - Marine adaptation – Voyage of the green sea turtle. 6.1.3 Sea birds and its adaptations. 6.1.4 Marine Mammals – Cetaceans – whales and their relatives.

IDS (Biotechnology)

Unit No.	Topic
1	Biotechnology An overview 1.1 Origin and definition: Old and New 1.2 Development and Scope of Biotechnology in India.
2	Tools in Biotechnology: - 2.1 Recombinant DNA and Gene Cloning. Gene 2.2 Cloning vector, Plasmids, Cosmids 2.3 Application of Gene cloning.
3	Plant Tissue Culture. 3.1 Importance of Tissue Culture. 3.2 Principles of Tissue Culture. 3.3 Plant cell & Organ Culture. 3.4 Application of tissue culture. 3.5 Production of Cybrids and its application. 3.6 Artificial Seeds.
4	4.1 Biotechnology in Medicine and Human health 4.2 Biotechnology in Agriculture.
5	Biotechnology and Environment. 5.1 Pollution A Gobal Problems. 5.2 Biotechnology and Pollution Control. 5.3 Biodiversity and its Conservation.

FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY

Paper III

Unit No.	Topic
1	THE HISTORY AND SCOPE OF MICROBIOLOGY
	1.1 Discovery of microbial world. 1.2 Origin of life. 1.3 Germ theory of disease. 1.4 Biogenesis and Abiogenesis. 1.5 Golden age of Microbiology. 1.6 Protection against diseases. 1.7 Place of microorganisms in the living world. 1.8 Scope of Microbiology.
2	MICROSCOPY AND SPECIMEN PREPARATION
	2.1 Fundamentals of microscope. 2.2 Light microscopy and specimen preparation. 2.2.1 Bright field microscopy, Dark field. microscopy, Fluorescence microscopy, Phase contrast microscopy, Differential interference Contrast microscopy. 2.2.2 Types of aberrations. 2.2.3 Corrected objective lenses and their types. 2.3 Electron microscopy and specimen preparation. 2.3.1 TEM 2.3.2 SEM 2.4 Newer techniques in microscopy. 2.4.1 Confocal scanning Laser microscopy. 2.4.2 Scanning probe microscopy .
3	DYES, STAINS AND STAINING TECHNIQUES
	3.1 Chemistry of dyes and stains. 3.2 Purpose of stains. 3.3 Types of dyes and salts. 3.4 Factors affecting staining process. 3.5 Classification of biological stains. 3.6 Theories of staining. 3.7 Staining bacteria. 3.7.1 Cytological and microchemical stains.
4	PROCARYOTIC CELL STRUCTURE
	4.1 Size, shape and arrangement of bacterial cells. 4.2 Prokaryotic cell organization. 4.3 External structure- cell extension. 4.3.1 Flagella. 4.3.2 Pili. 4.3.3 Fimbriae. 4.3.4 Prosthaecae, Stalks and Sheaths. 4.4 The cell envelope-boundary layer. 4.4.1 Glycocalyx. 4.4.2 Cell wall. 4.4.3 Cell membrane. 4.5 Internal structures. 4.5.1 Cytoplasm. 4.5.2 Ribosomes. 4.5.3 Inclusion bodies. 4.5.4 Nucleoid. 4.6 Spores and cyst
5	EUCARYOTIC CELL STRUCTURE

	<ul style="list-style-type: none"> 5.1 Eucaryotic cell organization 5.2 External structure- cell extension <ul style="list-style-type: none"> 5.2.1 Flagella 5.2.2 Cilia 5.3 The cell envelope-boundary layer <ul style="list-style-type: none"> 5.3.1 Cell wall 5.3.2 Plasma membrane 5.4 Internal structures <ul style="list-style-type: none"> 5.4.1 Cytoplasm 5.4.2 Cytoskeleton 5.4.3 Nucleus and nucleolus 5.4.4 Endoplasmic reticulum 5.4.5 Golgi apparatus 5.4.6 Lysosome 5.4.7 Mitochondria 5.4.8 Chloroplast.
6	TAXONOMY AND DIVERSITY OF PROCARYOTES
	<ul style="list-style-type: none"> 6.1 Introduction to Bergey's manual: Past and Present 6.2 Taxonomic ranks ascending-species, genera: An overview families, order, classes, phyla and domain) ,Binomial system 6.3 Classification systems: An overview families, order, classes, phyla and domain <ul style="list-style-type: none"> 6.3.1 Phenetic classification 6.3.2 Numerical classification 6.3.3 Polyphasic classification 6.4 Major characteristics used in taxonomy <ul style="list-style-type: none"> 6.4.1 Classical characteristics 6.4.2 Molecular characteristics 6.5 Major groups of eubacteria- An overview <ul style="list-style-type: none"> 6.5.1 Gram positive bacteria 6.5.2 Gram negative bacteria 6.5.3 Mycoplasma and L phase variants 6.6 Archaeobacteria: Characteristics, Classification and Habitat
7	DIVERSITY OF EUKARYOTIC MICROORGANISM CHARACTERISTICS, HABITAT, NUTRITION, REPRODUCTION AND IMPORTANCE OF
	<ul style="list-style-type: none"> 7.1 Fungi 7.2 Water and Slime molds 7.3 Algae 7.4 Protozoa
8	VIRUSES – CHARACTERISTICS AND TYPES
	<ul style="list-style-type: none"> 8.1 History of Virology 8.2 Position of viruses in biological spectrum 8.3 Characteristics and Cultivation of bacteriophages 8.4 Modes of phage multiplication : Lytic cycle (T_4) and Lysogenic cycle (λ) 8.5 Characteristics and Cultivation of Plant viruses 8.6 Characteristics and Cultivation of Animal viruses 8.7 Introduction to Viroids and Prions

Microbial Nutrition, Growth and Control
Paper IV

Unit No.	Topic
1	BACTERIAL NUTRITION
	1.1 Nutrition of bacteria: Requirements, metabolic functions and sources of acroelements, microelements and growth factors 1.2 Nutritional types of bacteria 1.3 Applications of the knowledge of bacterial nutrition 1.4 Nutrient transport mechanisms in bacteria
2	CULTIVATION AND ISOLATION OF BACTERIA
	2.1 Aseptic techniques 2.2 Bacteriological media 2.3 Physical conditions required for the cultivation of bacteria: Temperature, Gaseous requirements, Acidity or Alkalinity, Miscellaneous : Illumination and Hydrostatic pressure 2.4 Isolation of pure culture 2.4.1 Natural microbial populations 2.4.2 Selective methods 2.4.3 Methods of isolating pure cultures 2.5 Major characteristics of bacteria: Morphological, Chemical, Cultural 2.5.1 Metabolic, Antigenic, Genetic, Pathogenicity and ecological 2.6 Maintenance and preservation of pure culture 2.7 Role of Culture Collection Centers
3	BACTERIAL REPRODUCTION AND GROWTH
	3.1 Modes of cell division: Binary fission, Budding, Fragmentation, Conidia and sporangiospores production 3.2 Bacterial growth curve and its phases 3.3 Applications of growth curve 3.4 Growth kinetics 3.5 Continuous culture, Synchronous growth and Diauxic growth 3.6 Measurement of bacterial growth 3.6.1 Measurement of Cell number: Viable and Nonviable 3.6.2 Measurement of Cell mass 3.6.3 Measurement of Cell activity 3.7 Counting viable but nonculturable vegetative prokaryotes- Postgate assay 3.8 Quorum sensing and microbial populations
4	PRINCIPLES OF CONTROL OF MICROORGANISMS
	4.1 Definition of terms. 4.2 Exponential death rate, Single Hit Curves, Microbial load 4.2.1 in samples 4.3 Principles of thermal destruction: TDP, TDT, D value, 4.3.1 Z value and F value 4.4 Conditions influencing antimicrobial agent 4.5 Mode of action of antimicrobial agents 4.6 Monitoring the sterilization efficiency
5	CONTROL BY PHYSICAL AGENTS
	5.1 High and low temperatures 5.2 Desiccation and Freeze drying 5.3 Osmotic pressure and Hyperbaric oxygen 5.4 Radiations: Ionizing and Nonionizing 5.5 Filtration 5.6 Ultrasonic waves

6	CONTROL BY CHEMICAL AGENTS
	6.1 Characteristics of an Ideal antimicrobial chemical agent 6.2 Major groups of chemical antimicrobial agents: 6.2.1 Phenol and phenolic compounds 6.2.2 Alcohols 6.2.3 Halogens 6.2.4 Heavy metals and their compounds 6.2.5 Dyes and Detergents 6.2.6 Chlorhexidine 6.2.7 Quaternary ammonium compounds 6.2.8 Aldehydes 6.2.9 Gaseous and plasma sterilizing agents
7	ANTIMICROBIAL CHEMOTHERAPY
	7.1 Chemotherapeutic agents and chemotherapy 7.2 Characteristics of antibiotics 7.3 Source, Structure, Mode of action, Antimicrobial 7.3.1 spectrum and Clinical uses of ... 7.3.2 Antibacterial chemotherapeutic agents 7.3.3 Antifungal chemotherapeutic agents 7.3.4 Antiviral chemotherapeutic agents 7.3.5 Antiparasitic chemotherapeutic agents 7.4 Drug resistance: Origin and Mechanism of transmission 7.5 Non-medical uses of antibiotics
8	EVALUATION OF ANTIMICROBIAL AGENTS
	8.1 Evaluation of chemical antimicrobial agents 8.1.1 Tube dilution technique 8.1.2 Agar diffusion technique 8.1.3 Determination of Phenol coefficient 8.2 Manual methods of drug susceptibility testing 8.2.1 Tube dilution technique: MIC and MBC, Serum Bactericidal Titer and Serum Lethal titer 8.2.2 Disk diffusion technique: Kirby-Bauer method and E-test 8.3 Automated tests for antimicrobial susceptibility of bacteria

BIOCHEMISTRY AND ENZYMOLOGY
Paper V

Unit No.	Topic
1	BIOCHEMISTRY OF MICROORGANISMS
	1.1 Structure of atom 1.2 Elements of Living organisms 1.3 Molecules and chemical bonds 1.4 Different chemical reactions in living system 1.5 Biomolecules of living system 1.6 pH, pk and Buffers
2	CARBOHYDRATES AND THEIR DERIVATIVES
	2.1 Definition, Occurrence, General structure, Properties and Classification of Monosaccharide 2.2 Definition, Occurrence, General structure, Properties and Classification of Disaccharide 2.3 Definition, Occurrence, General structure, Properties and Classification of Polysaccharide 2.4 Derived Carbohydrates 2.5 Biological importance of Carbohydrates
3	AMINO ACIDS AND PROTEINS
	3.1 Amino acids: 3.1.1 Amino acids and their properties 3.1.2 Structure and classification of Standard amino acids 3.1.3 Structure and properties of Non Standard and Non proteinic amino acids 3.1.4 Biological importance of Amino acids 3.2 Proteins: 3.2.1 Definition Classification, Properties of Proteins 3.2.2 Structure of Proteins 3.2.3 Biological importance of proteins 3.2.4 Basic principles of Separation and purification of proteins
4	LIPID
	4.1 Lipids: 4.1.1 Definition, Classification, Properties of Lipids 4.1.2 Structure of Lipids 4.2 Fatty acids: 4.2.1 Definition, Classification, Nomenclature, Properties of Fatty acids 4.2.2 Structure of Fatty acids 4.3 Biological importance of Lipid
5	NUCLEOTIDES AND NUCLEIC ACIDS
	5.1 Introduction to nucleosides and nucleotides 5.2 Structure and function of nucleotides 5.3 Structure of DNA-Watson and Crick model 5.4 Different forms of DNA 5.5 Structure of RNA 5.6 Types of RNA 5.7 Biological functions of nucleic acids
6	PRINCIPLES OF ENZYMOLOGY

	6.1 Chemical nature properties and occurrence of enzymes 6.2 Specificity of enzymes 6.3 Active site 6.4 Mechanism of enzyme action 6.5 Co-enzymes and Co-factors 6.6 Factors affecting enzymatic activity 6.7 Enzyme classification (IUB) and nomenclature
7	ENZYME REGULATION
	7.1 Allosteric Regulation: 7.1.1 Definition, Properties and types of Allosteric enzymes 7.2 Enzyme inhibition and its types 7.3 Control of enzyme synthesis- An Overview
8	BASIC PRINCIPLES OF BIOENERGETICS
	8.1 Energy and Work 8.2 The laws of thermodynamics 8.3 Free energy and reactions 8.4 The role of ATP in metabolism 8.5 The role of other high energy compounds in metabolism 8.6 Oxidation-Reduction reactions and Standard Reduction Potential

MICROBIOLOGY PRACTICAL

No.	Topic
1	Study of Microscope
2	Examination of hay infusion by wet mount technique.
3	Study of bacterial motility by Hanging drop technique
4	Study of bacterial motility by Agar stab technique
5	Measurement of Fungal spore dimensions by Ocular and stage Micrometer
6	Introduction to various Laboratory Apparatus viz. Incubator, Hot air oven, Autoclave, Centrifuge, Colorimeter, pH meter, Inspissator, Anaerobic jar, Bacteriological filter assembly (Membrane, Seitz)
7	Study of morphological characteristics of fungi/Protozoa by Dark field microscopy.
8	Study of morphological characteristics of yeast/Protozoa by Phase Contrast microscopy.
9	Monochrome staining by basic stain
10	Monochrome staining by acidic stain
11	Gram staining by modified Huckle's method
12	Staining of Acid fast & Non-acid fast bacteria – Zeihl Nelson's method
13	Spirochetes staining – Fontana's method
14	Endospore staining – Dorner's method
15	Observation of capsule in bacteria by Maneval's method
16	Cell wall staining – Cetyl pyridinium chloride method
17	Bacterial flagella staining- (Any method)
18	Metachromatic granules staining-Albert's method
19	Nucleus Staining - Robinow's method (Yeast)
20	Cleaning, neutralization and preparation of glassware for sterilization.
21	Disposal of Laboratory waste and cultures.
22	Preparation of nutrient broth / agar.
23	pH adjustment by Lovibond/ Hellige comparator.
24	Preparation of Biochemical media.
25	Preparation of Bacteriological media.
26	Preparation of Mycological media.
27	Preparation of media for enzymatic reactions.
28	Growth of bacteria in Broth media
29	Growth of bacteria on Agar slant media
30	Growth of bacteria in Agar deep media
31	Isolation of bacteria by streak plate method
32	Isolation of bacteria by spread plate method
33	Isolation of bacteria by Pour Plate method
34	Measurement of fungal growth: Mycelial weight determination
35	Enumeration of bacteria by Heterotrophic plate count method (TVC)
36	Enumeration of yeast cells by counting chamber

37	Cultivation of Anaerobic bacteria using Thioglycolate broth medium.
38	Effect of temperature on microbial growth.
39	Effect of pH of the medium on microbial growth.
40	Effect of osmotic pressure on microbial growth.
41	Study of some important biochemical reactions
42	Study of extracellular enzymatic activity : Amylase, Caseinase, Gelatinase, Lipase
43	Study of intracellular enzymatic activity : Deaminase, Decarboxylase, Catalase, Dehydrogenase (Resazurin indicator), Oxidase
44	Qualitative analysis of carbohydrates
45	Qualitative analysis of proteins
46	Action of antiseptics and disinfectants
47	Lethal action of U.V. rays
48	Oligodynamic action of heavy metals
49	Comparative study of lethal effect of heat on vegetative cells and spores of microorganisms at Pasteurization temperature
50	Evaluation of alcohol and betadine effectiveness as a skin antiseptic
51	Determination of phenol coefficient by Rideal-Walker method (Demonstration)
52	Pure culture study of <i>E. coli</i> and <i>Klebsiella mobilis</i> (formerly <i>Enterobacter aerogenes</i>)
53	Pure culture study of <i>Proteus vulgaris</i> , <i>Serratia marcescens</i> and <i>Pseudomonas aeruginosa</i>
54	Pure culture study of <i>Bacillus megaterium</i> , <i>B. subtilis</i> , <i>B. cereus</i>
55	Pure culture study of <i>Staphylococcus aureus</i> , <i>S. epidermidis</i>
56	Pure culture study of yeasts
57	Identification of economical important fungi. (9 genera)
58	Isolation of protozoa from mud.
59	Study of permanent slides of algae (<i>Volvox</i> , <i>Spirogyra</i> , Diatoms), Blue green algae (<i>Nostoc</i> , <i>Anabena</i>) and Protozoa (<i>Amoeba</i> , <i>Paramecium</i> , <i>Euglena</i>).
60	Demonstration of lysis of bacteria by bacteriophage.

**Inorganic Chemistry
Paper III**

Unit No.	Topic
1	1.1 Chemistry of Elements of first transition series Characteristic properties of d-block elements, properties of the elements of the first transition series, Their binary compounds and complexes illustrating relative stability of their oxidation states, Coordination number and geometry
	Electronic Configuration of atom L-S coupling :
	1.2.1 Introduction, 1.2.2 L-S coupling, 1.2.3 JJ coupling (introduction), 1.2.4 Term Symbol, 1.2.5 Determination of microstate of P_2 , P_3 system. 1.2.6 Term Symbol of C, N, O, Ni, Ni^{2+} , Fe, Fe^{2+} , Fe^{3+} , Cr, Cr^{3+} and Co^{2+} , V, V^{+3} , Cl
2	Theory of Bonding in Metal Complexes
	2.1 Theory of bonding in metal complexes (CFT) 2.2 CFSE and its calculations. 2.3 Factors affecting. 2.4 Application of CFT 2.4.1 Magnetic Properties. 2.4.2 Spectral Properties.
	Paper Chromatography :
	2.1 Principle, chromatography. 2.2 Classification of chromatography. 2.3 Types of paper chromatography, one dimensional, two dimensional And radial paper chromatography, R_f value, Use of paper chromatography in Inorganic analysis (I, IIA, IIIB, IV and halides.
3	3.1 Quantum Mechanics :
	3.1.1 Derivation of the time independent Schrodinger equation, wave function and probability function, well behaved wave function. 3.1.2 Particle in one - dimensional box and its importance. 3.1.3 Operators (definition and derivation), Linear Operators, Commutator Operators, Vector Operators, Laplacian Operators, Hamiltonian Operators, Hermitian Operators. 3.1.4 Derivation of Hamiltonian equation, 3.1.5 Hamiltonian Operators for H-atom H_2^+ , He_2^+ and Li.
	3.2 Electron absorption Spectroscopy
	3.2.1 Principle of electronic spectroscopy (Frank-Condon Principle). 3.2.2 Instruments and their working of visible spectrometer. 3.2.3 Selection rule (without deviation). 3.2.4 Spectra of some complex compounds Ti^{+3} , Cu.
	3.3 Ion-exchange chromatography :
	3.3.1 Synthesis and Characterization of ion exchanger, Types of ion- exchange resin. 3.3.2 Ion exchange equilibria, Technique of ion exchange, Application of ion exchange for Separation
4	4.1 Chemistry of Lanthanide and Actinide Elements :
	4.1.1 Lanthanide and Actinide Elements, Electronic configuration, Sources. 4.1.2 Occurrence, Extraction by solvent and ion exchange, Properties (Spectral and Magnetic). 4.1.3 Lanthanide contraction, Use of Lanthanide compounds. 4.1.4 Industrial use Uranium and Plutonium, Misch metal

	4.2 Non-aqueous solvents :
	Physical properties of solvents, Types of solvents and their general characteristics, Reaction in non-aqueous solvents with reference to liquid NH ₃ and liquid SO ₂ .
5	5.1 Hydrogen Bonding :
	Theory of hydrogen bonding, Classification Importance of hydrogen bonding in ice, Effect of hydrogen bonding in various fields
	5.2 Bio-Inorganic : Role of metal Complexes in Biological systems :
	5.2.1 Introduction, Role of metal ion in different biological processes, 5.2.2 Essential, beneficial and toxic metals, 5.2.3 Metallo - Porphyrins, 5.2.4 Hemoglobin - as Carrier of O ₂ and as Carrier of CO ₂ . 5.2.5 Myoglobin, Chlorophyll, Vitamin B-12
	5.3 Purification of Water :
	5.3.1 Different methods of purification of water for potable and industrial purposes. 5.3.2 Soft and hard water. 5.3.3 Desalination of sea water by reverse osmosis and electro dialysis. Permissible limit for potable and industrial water (WHO, IS).

**Organic Chemistry
Paper IV**

Unit No.	Topic
1	1.1 Investigation of Reaction Mechanism :
	1.1.1 Organic reaction mechanism 1.1.2 Transition state theory 1.1.3 Kinetics 1.1.4 Non-kinetics reaction investigation 1.1.5 Isotopic labelling 1.1.6 Stereochemical studies
	1.2 The General nature, Reaction mechanism of applications of following reaction :
	1.2.1 Bayer-Villger oxidation 1.2.2 Wolf-Kishner reduction 1.2.3 Wittig reaction 1.2.4 Fridel-Craft reaction 1.2.5 Mannich reaction 1.2.6 Benzoin reaction (condensation) 1.2.7 Reimer-Tiemann reaction 1.2.8 Michael reaction
	1.3 Elimination Reaction :
	1.3.1 Beta-elimination, E2 mechanism, E1 mechanism 1.3.2 Stereo chemistry of elimination reactions, 1.3.3 Elimination Vs substitution. 1.3.4 Alpha elimination : Generation of carbenes and ketenes.
2	2.1 Heterocyclic Compound :Classification And nomenclature:
	2.1.1 Benzopyrrole (Indole) : Occurrence, synthesis (Fischer Indole synthesis, Madelung synthesis, Reissert synthesis, Electrophilic substitution (nitration, sulfonation, halogenation, reactions). Gattermann reaction Reimer Tiemann reaction, Mannich reaction, synthesis of indigo. 2.1.2 Benzofuran (Coumarone) : Occurrence, synthesis, substitution reactions (nitration, sulfonation, halogenation, acylation reduction, reactions with ozone and sodium. 2.1.3 Benzothiophene (thionaphthene) occurrence, synthesis, substitution reactions (nitration, sulfonation, bromination acylation, chloromethylation), reactions with phenyl lithium, carbondioxide diazodiacetate, sodium and other sulfur, Raneynickel. 2.1.4 Quinoline : Synthesis (Skraups synthesis, Friedlander method) reduction and oxidation of Quinoline, electrophilic substitution reactions, nitration sulfonation, halogenation, Friedel Craftt's reaction and nucleophilic substitution reactions. 2.1.5 Isoquinoline : Synthesis (by heating Oxime of cinnamaldehyde with P ₂ O ₅ and Bichler-Naieralsky reaction) electrophilic and nucleophilic reactions, oxidation and Reduction reactions of isoquinoline.
	2.2 Polycyclic Aromatic Hydrocarbons: Classification and nomenclature.

	<p>2.2.1 linear orthofused polycyclic hydrocarbons : Occurrence, synthesis of tetracene, pentacene and hexacene.</p> <p>2.2.2 Nonlinear orthofused polycyclic hydrocarbons Occurrence synthesis of 1, 2 - benzanthracene, 1, 2, 5, 6-dibenzanthracene, 1,2-benzphenanthrene.</p> <p>2.2.3 ortho and perifused polycyclic hydrocarbons Occurrence and synthesis of pyrene, perylene and coronene.</p> <p>2.2.4 carcinogenic properties of polycyclic hydrocarbons.</p>
	<p>2.3 Vitamins and Hormones : Their definitions, classification, analytical and synthetic evidences to prove the structure of Ascorbic acid and Adrenaline.</p>
3	3.1 Carbohydrates :
	<p>3.1.1 Determination of configuration of D (+) glucose D (-) fructose - method of ascending and descending sugar series.</p> <p>3.1.2 (b) Objections against open chain structure of D (+) glucose & D (-) fructose-ring structure of them, determination of size of the ring of glucose and fructose.</p> <p>3.1.3 Method of methylating sugars.</p> <p>3.1.4 Structure of sucrose.</p>
	3.2 Use of Reagents :
	<p>3.2.1 Anhydrous aluminium chloride.</p> <p>3.2.2 Grignard reagents.</p> <p>3.2.3 Aluminium isopropoxide.</p> <p>3.2.4 Diborane.</p> <p>3.2.5 NBS.</p> <p>3.2.6 Selenium dioxide.</p> <p>3.2.7 Lithium aluminium hydride.</p>
	3.3 Compound Containing Reactive Methylene Group :
	<p>3.3.1 Malonic ester : preparation and its synthetic applications.</p> <p>3.3.2 Acetoacetic ester (ethylacetoacetate) preparation and synthetic applications.</p> <p>3.3.3 Keto-enol tautomerism : factors affecting Keto-enol tautomerism and its mechanism.</p>
4	4.1 Diazonium Salts :
	<p>4.1.1 Mechanism of diazotisation, reagents for checking completion of diazotisation.</p> <p>4.1.2 Nomenclature of Diazonium salts.</p> <p>4.1.3 Reactions of Diazonium salts, replacement reactions in which nitrogen is eliminated, its application in the synthesis of aromatic compounds, reaction in which nitrogen atom are retained.</p> <p>4.1.4 Laws of coupling, coupling agents, synthesis of diazamine and aminoazo compounds.</p> <p>4.1.5 Benzidine rearrangement</p>
	4.2 Carboxylic acid and its derivatives :
	Structure and nomenclature of acid chloride, ester, amides and acid anhydrides; method of formation carboxylic acid derivatives and chemical reactions.
	4.3 Organic nitrogen compounds :

	<p>4.3.1 Preparation and physical properties and chemical reactions of nitriles, isonitriles, cyanates, isocyanates, carbanates, semi carbazides and their application in synthetic org. chemistry.</p> <p>4.3.2 Structure and nomenclature of amines, preparation of alkyl and aryl amines, physical properties and chemical reactions. Gabriel-phthalimide reaction, Hofmann Bromamide reaction.</p>
5	5.1 Purines :
	<p>5.1.1 Structure of Uric acid and its synthesis by Traube's method.</p> <p>5.1.2 Synthesis of Purines.</p> <p style="padding-left: 40px;">5.1.2.1 Purines from Uric acid</p> <p style="padding-left: 40px;">5.1.2.2 Adenine from Traube method</p>
	5.2 Organic Sulfur Compound :
	<p>5.2.1 Aliphatic sulfur compounds : nomenclature, general methods of preparation and reaction of mercaptans, thioethers, sulfinic and sulfonic acid, sulfonic acid.</p> <p>5.2.3 Aromatic sulfonic acid : nomenclature, preparation, reactions and uses of sulfonic acids of benzene, toluene, naphthalene.</p>
	5.3 Electromagnetic Spectrum :
	<p>5.3.1 UV and visible spectroscopy, ultraviolet absorption spectroscopy,</p> <p>5.3.2 Absorption laws (Beer-Lambert law)</p> <p>5.3.3 Terminology used in UV and visible spectra, molar absorptivity,</p> <p>5.3.4 Types of electronic transitions,</p> <p>5.3.5 Effect of conjugation, concept of Chromophore and Auxochrome and Hypsochromic shifts</p> <p>5.3.6 UV spectra of conjugated enes and enones,</p> <p>5.3.7 Effect of solvent substitution on electronic transition.</p> <p>5.3.8 Problems based on calculation of λ_{max} for conjugated dienes and α,β-unsaturated carbonyl compounds and substituted Benzene derivatives using relevant rule.</p>

CHEMISTRY PRACTICAL

Sr. No.	Topic
A	INORGANIC QUALITATIVE ANALYSIS LIST OF INORGANIC CHEMICALS USED FOR INORGANIC QUALITATIVE ANALYSIS
1	CHLORIDES - Bi ⁺³ , Cu ⁺² , Cd ⁺² , Fe ⁺³ , Mn ⁺² , Co ⁺² , Ni ⁺² , Ca ⁺² , Ba ⁺² , Sr ⁺² , Na ⁺¹ , K ⁺¹ , NH ₄ ⁺¹ .
2	BROMIDES - Sr ⁺² , Na ⁺¹ , K ⁺¹ , NH ₄ ⁺¹
3	IODIDE - K ⁺¹
4	NITRITE - Na ⁺¹ , K ⁺¹
5	NITRATE - Pb ⁺² , Bi ⁺³ , Co ⁺² , Ni ⁺² , Ba ⁺² , Sr ⁺² , Na ⁺¹ , K ⁺¹ , NH ₄ ⁺¹
6	SULPHITE - Na ⁺¹
7	SULPHIDE - Zn ⁺² , Sb ⁺³
8	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
9	CARBONATE - Pb ⁺² , Bi ⁺³ , Cu ⁺² , Zn ⁺² , Mn ⁺² , Co ⁺² , Ni ⁺² , Ca ⁺² , Ba ⁺² , Sr ⁺² , Mg ⁺² , Na ⁺¹ , K ⁺¹ , NH ₄ ⁺¹
10	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
	Inorganic qualitative analysis of mixture containing four radicals. The mixture may be soluble in water or dilute hydrochloric acid or concentrated hydrochloric acid excluding Arsenite, Aresnate, Chromate and Borate. N.B. Candidate should perform the analysis of at least <u>10</u> mixtures.
B	ORGANIC SPOTTING Organic spotting & preparation of derivative only
1	Acid - Salicylic acid, Cinnamic acid, Phenyl acetic acid, Anthranilic acid, Sulphanilic acid, Hippuric acid.
2	BASE - o-Nitroaniline, m-Nitroaniline, p-Nitroaniline, p-Chloroaniline, Dimethylaniline, Diethylaniline, Diphenylamine, p-toludine.
3	PHENOL - Alpha naphthol, Beta naphthol, o-Nitro phenol
4	NEUTRAL-ALDEHYDE - Glucose, Benzaldehyde
5	KETONE - Methyl Ethyl ketone, Acetophenone
6	ESTER - Ethylacetate, Butylacetate
7	ALCOHOL - Ethanol, Butanol
8	HYDROCARBON - Anthracene, Panhthalene, Diphenyl
9	NITRO HYDROCARBON - m-Dinitro benzene, Nitro benzene
10	HALOGENATED HYDROCARBON - Carbon tetrachloride, Chlorobenzene, Bromobenzene, p-Dichlorobenzene
11	AMIDE - Benzamide, Thiourea
12	ANILIDE – Acetanilide
13	QUINONE – Anthraquinone
	N.B. Candidate should perform the analysis of at least <u>12</u> substances.
C	ORGANIC ESTIMATIONS
1	To determine the amount of Acetamide in the given solution – NaOH
2	To determine the amount of Glucose in the given solution by hypiodite

3	To determine the amount of Aniline in the given solution – bromination
4	To determine the amount of Phenol in the given solution bromination