FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR
SUBJECT- CHEMISTRY
PAPER-I (PHYSICAL CHEMISTRY)
CODE- BSCMB(Y- 201A)

UNIT-I

Thermodynamics: Definition of thermodynamics, First Law of Thermodynamics, Seconds Law of Thermodynamics: Need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature. Concept of entropy : entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions ; Gibbs function (G) and Helmholtz function (Z) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change.

Thermochemistry: standard state, standard enthalpy of formation-Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant

UNIT-II

Phase Equilibrium : Statement and meaning of the terms - phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria ofone component system - water, CO2 and S systems. Phase equilibria of two component system - solid -liquid equilibria, simple eutectic - Bi-Cd, Pb-Ag systems, desilverisation of lead.

Solid solutions - compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H2O), Fecl3-H2O) and CuSO4-H2O) system. Freezing mixture, acetone-dry ice.

Liquid - liquid mixtures - Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system-azeotropes - HCl-H2O and ethanol - water systems.

Partially miscible liquids - Phenol-water, trimethylamine-water, nicotine-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature. Immiscible liquids, steam distillation. Nernst distribution law – thermodynamic derivation, applications.

UNIT-III

Electrochemistry – I : Conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific coductance with dilution. Migration of ions and Kohlrausch law Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR

UNIT-IV

Electrochemistry - II : Types of reversible electrodes - gas - metal ion, metal-metal ion, metal - insoluble salt - anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes- standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells - reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements. Computation of cell EMF. Calcuation of thermodynamic quantities of cell reactions (DG, DH and K), polarization, over potential and hydrogen overvoltage. Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations. Definition of pH and pKa determination of pH usinghydrogen, quinhydrone and glass electrodes, by potentiometric methods.

Buffers - mechanism of buffer action, Henderson - Hazel equation. Hydrolysis of salts. Corrosion - types, theories and methods of combating it

UNIT-V

Surface Chemistry: Adsorption**,** adsorption and adsorption, types of Adsorption, Adsorption of gases and Liquids in solid adsorption, Freundlich and Langmuir adsorption isotherms surface area and determination of the surface area.

Catalysis: Characteristics of Catalyzed reactions, classification of Catalysis, application of Catalysis.

Suggested Readings:

1. **ADVANCED PHYSICAL CHEMISTRY, Gurdeep Raj, 2014.**

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR
SUBJECT- CHEMISTRY
PAPER-II (INORGANIC CHEMISTRY)
CODE- BSCMB(Y- 201B)

UNIT-I

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.

UNIT-II

Chemistry of Elements of Second and Third Transition Series: General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

UNIT-III

Oxidation and Reduction: Use of redox potential data-analysis of redox cycle, redox stability in water - Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements.

Coordination Compounds: Warner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.

UNIT-IV

Chemistry of Lanthanide Elements: Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide com pounds.

Chemistry of Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides.

UNIT-V

Acids and Bases: Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.

Non-aqueous Solvents : Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference toliquid NH3 and liquid SO2

Suggested Readings:

1. **A Text-Book Inorganic Chemistry, G. S. Newth**
2. **Physical Inorganic Chemistry: A Coordination Chemistry Approach, 1996, S.F.A. Kettle**
3. **Industrial Inorganic Chemistry, Werner Büchner**

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR
SUBJECT- CHEMISTRY
PAPER-III (ORGANIC CHEMISTRY)
CODE- BSCMB(Y- 201C)

UNIT-I

Electromagnetic Spectrum : Absorption Spectra Ultraviolet (UV) absorption spectroscopy - absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transition, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones.

Infrared (IR) absorption spectroscopy--molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

UNIT-II

Alcohols: Classification and nomenclature. Monohydric alcohols -- nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols.

Dihydric alcohols -- nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [Pb(OAc)4and HlO4] and pinacol-pinacolone rearrangement. Trihydric alcohols -- nomenclature and methods of formation, chemical reactions of
glycerol.

Phenols: Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols --electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gaterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

UNIT-III

Aldehydes and Ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1, 3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Witting reaction. Mannich reaction. Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolf f-Kishner, LiAlH4and NaBH4reductions. Halogenation of enolizable ketones. An introduction to α, β unsaturated aldehydes and ketones.

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR

UNIT-IV

Carboxylic Acids : Nomenclature, structure and bonding, physical prop erties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: methods of formation and effect of heat and dehydrating agents.

UNIT-V

Organic Compounds of Nitrogen: Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid. Halonitroarenes : reactivity. Structure and nomenclature of amines, physical properties. Stereo chemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salt as phase-transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction. Hofmann bromoamide reaction. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts, azo coupling..

Suggested Readings:

1. **ORGANIC CHEMISTRY, VOL. 1 - DR. SULTANAT**
2. **Advanced Organic Chemistry, Vol IV - S.P. Bhutani**
3. **TEXTBOOK OF ORGANIC CHEMISTRY, VOL.III - V. K. AHLUWALIA**

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR
CHEMISTRY (PRACTICAL)

Inorganic Chemistry

- Analysis of inorganic mixture containing five radicals with at least on interfering radical.
- Determination of acetic acid in commercial vinegar using NaOH
- Redox titrations
- Estimation of hardness of water by EDTA.

Physical Chemistry Determination of transition temperature of given substance by thermometric method.

- To determine the enthalpy of neutralization of strong acid, strong base.
- Verification of Beer's- Lambert law.
- To study the phase diagram of two component system by cooling curve method.

Organic Chemistry (Any Two)

- Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.
- Use of paper chromatography/ Thin layer chromatography: determination of R1 Values, separation and identification of organic compounds.

a) Separation of green leaf pigments (Spinach leave may be used)
b) Separation of dyes.

SUBJECT- BOTANY

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR
PAPER-I (STRUCTURE DEVELOPMENT AND REPRODUCTION OF FLOWERING PLANTS)
CODE- BSCMB(Y- 202A)

UNIT I

Tissue system- Types of Vascular bundles, Apical meristems, classification of meristems, The root system root apical meristem, anatomy of monocot and dicot root.

UNIT II

Shoot system, monocot systems of vascular cambiums and their functions, heart and sap wood, sec. growth in nyctanthus, dracaena , leptadenia, bohravia, salvadora.

UNIT III

Leaf system- Origin and development of leaf, diversity in size, arrangement and shape, internal structure of mono and dicot leaf. adaptation to photosynthesis and water stress, senescence ,abscission.

UNIT IV

Embryology: concept of flower as a modified shoot, structure of anther, microsporogenesis, megasporogenesis, gametophyteand its types, pollination –mechanism and agencies, pollen pistil interaction and self incompatibility.

UNIT V

Embryology ; Double fertilization, development and types of endosperm, development of embryo in monocot and dicot plants, fruit development and maturation ,seed structure and dispersal, Mode of vegetative propagation

Suggested readiing;

1 Gangulee,H.C, Das,K.s , Collllege Botany- central boo; agency

2 Singh, v. , Pande P.C & Jain- Structure and dev in angiosperms

3. Maheswari,P- Plant Embryology

SUBJECT- BOTANY
PAPER-II (PLANT ECOLOGY BIODIVERSITY & PHYTOGEOGRAPHY)

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR
CODE- BSCMB(Y- 202B)

UNIT I

Ecosystems-Structure and types ,biotic and abiotic concept, Trophic levels, food chain, food web, ecological pyramids, biogeo chemical cycles- carbon,nitrogen,sulphur

UNIT II

Ecological adaptations- Morphological and anatomical adaptations, physiological responses water, adaptation (hydrophyte and xerophytes) temp. adapotation (thermoperiodism,vernalization0light adaptation (photoperiodism) sucession, types of sucession- hydroxere, xerosere.

UNIT III

Biodiversity and Population ecology – Distribution pattern, Density, natality, moratality, growth curves, ecotypes, ecads, community ecology, biodiversity conservation, ex situ and in situ conservation, national parks and sanctuaries of mp , Red data book

UNIT IV

Soil and pollution- physical and chemical properties of soil, soil formation and development, soil profile ,soil classification, composition, pollution types-causes, global warming, acid rain, climate change, ozone hole and ozone layer.

UNIT V

Phytogeography- phytogeographical regions of india,vegetation types of M.P., National parks and sanctuaries of M.P,NATURAL RESOURES and types, conservation of natural resourses, Land resourse management, water and wet resourse management.

Suggested readings :

1 **kumar, v.k, Bio diversity conservation, agrobotanica, Bikaner**
2 **P.D. Sharma, Ecology and Enviornment, Rastogi Publication**

SUBJECT- BOTANY
PRACTICAL

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR

Section cutting- Root/stem/leaf - 10
on ecology- 10
Exercise based on phytogeography/national parks- 05
Spotting-05 Embryology-anther/ovule/placentation-05
Exercise based
VIVAVOICE- O5
Sessional-05

SUBJECT- MICROBIOLOGY

PAPER-I (BIO CHEMISTRY AND MICROBIAL PHYSIOLOGYS)

CODE- BSCMB(Y- 203A)

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR

UNIT-I

Gen properties, classification and function of carbohyfdrate, lipids, proteins, GEN properties and classification of enzyme, factors affecting enzyme activity.

UNIT-II

Growth and measurement of growth, mathematical expression of growth, growth yield, growth curve, factorsaffecting, effect of nutrient, temp, oxygen, Ph,

UNIT-III

Energy production in aerobic and anaerobic process, glycolysis, PPP,ENTER Duodoroff pathway, fermentation, glycose fermentation in E .COLI,TCA cycle, glyoxylate cycle

UNIT-IV

Utilization of energy, methods of studying microbial bio synthesis, assimilation of ammonia, nitrogen and sulphate utilization of energyin non bio synthetic and bio synthetic process ,diffusion, osmosis, plasmolysis

UNIT-V

Energy production by photosynthesis, photo chemical reaction, cyclic and non cylic photophosporylation, role of reducing power in metabolism, ETC concept

Suggested Reading:

SUBJECT- MICROBIOLOGY
PAPER-II (MICROBIAL GENETICS AND MOLECULAR BIOLOGY)
CODE- BSCMB(Y- 203B)

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR

UNIT-I

Structure and genetic material of microbes, nucleic acid as a genetic material, physical and chemical structure and different forms of DNA, melting curve of DNA, Tm value, types of RNA, m RNA, Rrna, Trna, gene structure and function,.

UNIT-II

Types of DNA replication, DNA replication in prokaryotes and eukaryotes, semiconservative, conservative and dispersive mode of replication.
Mechanism of replication, meselson and stahl experiment, DNA topology, super coiling of DNA AND linking number, enzyme involved in replication of DNA

UNIT-III

Basic features of genetic code, Wobble hypothesis, poly cristonic RNA, overlappinggenes, gene translocation, ribosomes and role in protein synthesis, Trna initiation, elongation and termination of protein synthesis in prokaryotes..

UNIT-IV

Genetic recombination in bacteria,transformation, conjugation, Ffactor, Hfr strains ,plasmids and binary vectors ,transposons ,use of bacteria and virus in genetic engineering

UNIT V

DNA mutation and repair,Types of mutation evidence of spontaneous nature of mutation ,fluctuation,new combs sxperiment,replica testing,mpde of action of physical,chemical,and biologicalmutagens-uv rays,nitrous acid.,5 bromo uracil,EMS

Suggested Reading:

1. Text book of Microbiology –Dubey,h.c, and maheswari, S .chand & comp

2. Elementary microbiology- Modi, H.A, Ekta prakashan

Practical

1. To determine the ph. of solution
2. To prepare buffer solution

3. Qualitative analysis of amino acid –nin hydrine test, bieuret test
4. Study conjugation in bacteria
5. Estimate of protein-folin lowry method

FOUNDATION COURSE (MORAL VALUE AND LANGUAGE-II)
Code: FC(Y--204A)
UNIT-I

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR

हिन्दी भाषा:

1. वह तोड़ती पत्थर)कविता - (सूर्यकांत त्रिपाठी निराला
2. दिमागी गुलामी)निबंध - (राहुल सांक्रत्यायन
3. वर्ण -विचार) स्वर -व्यंजन, वर्गीकरण, उच्चारण स्थान

UNIT-II

हिन्दी भाषा

1. नारीत्व का अभिशाप)निबंध - (महादेवी वर्मा
2. चीफ की दावत)कहानी - (भीष्म साहनी
3. विराम चिन्ह) -संकलित(

UNIT-III

हिन्दी भाषा: नैतिक मूल्य

1. शिकागो व्याख्यान)व्याख्यान - (स्वामी विवेकानंद
2. धर्म और राष्ट्रवाद) -लेख (महर्षि अरविन्द
3. सादगी)आत्मकथा -(महात्मा गांधी
4. चित्त जहां भय शून्य)कविता -(रवीन्द्रनाथ टैगोर

UNIT IV

English:

1. Tree: Tina Morris
2. Night of the Scorpion : Nissim Ezekiel
3. Idgah : Premchand (translated by Khushwant singh
4. Letter to God : G.L. Swanteh (translated by Donald a Yates
5. My Bank Account : Stephen Leacock
6. God sees the Truth but waits : Leo Tolstoy

UNIT V

English:

1. Short Essay on given topics
2. Correspondence skills (format & Informal letters and Application)
3. Translation of sentences/passage English to Hindi and Hindi to English.

Suggested Readings: Madhya Pradesh Hindi grant academy, Bhopal published book.

FOUNDATION COURSE (ENVIRONMENTAL STUDIES)
Code: FC(Y—204B)

FACULTY OF SCIENCE AND COMPUTER SCIENCE
CLASS: B.Sc. (MICROBIOLOGY) SECOND YEAR

UNIT I

Study of Environment and ecology: Definition and Importance of Environment and Ecology, Public participation and Public awareness.

UNIT II

Environmental Pollution : Air Pollution, water Pollution, noise Pollution, heat and nuclear pollution- Definition, Causes, effect and prevention of pollution, Disaster management – Flood, Earthquake, cyclones and landslides.

UNIT III

Environment and social problems: Sustainable development- Introduction, Energy problems of cities, solar energy, biogas and wind energy, Water conservation – rain-water harvesting.

UNIT IV

Role of mankind in conserving natural resources: Food resources – World food problem , Energy resources – increasing demand for energy.

UNIT V

Environment conservation laws: Conservation laws for air and water pollution, Wildlife conservation laws, Role of information technology in protecting environment & health.

Suggested Readings:

- **Madhya Pradesh Hindi grant academy, Bhopal published book.**