

Syllabus BSc Part II 2016-17 TO 2019-20

बस्तर विश्वविद्यालय
जगदलपुर (धरमपुरा), जिला-बस्तर (छत्तीसगढ़)



पाठ्यक्रम

बी. एस. सी. - 2, (कोड - 082)
B. Sc. Part - II, (Code - 082)

परीक्षा : 2011

कुलसचिव
बस्तर विश्वविद्यालय, जगदलपुर
छत्तीसगढ़ की ओर से



अधिकृत मुद्रक एवं प्रकाशक :
गीता पब्लिकेशन
महामाईपारा, रायपुर (छत्तीसगढ़)

Subject	Paper	max. Marks	Total Marks	Min. Marks
Compulsory Subject - Foundation Course :				
9. Defence Studies	I	50	100	33
	II	50		
	Practical		50	33
10. Micro Biology	I	50	100	33
	II	50		
	Practical		50	17
11. Computer Sciences	I	50	100	33
	II	50		
	Practical		50	17
12. Information Technology	I	50	100	33
	II	50		
	Practical		50	17
13. Industrial Chemistry	I	34	100	33
	II	33		
	III	33		
14. Bio Chemistry	I	50	100	33
	II	50		
	Practical		50	17
15. Bio Technology	I	50	100	33
	II	50		
	Practical		50	17

USE OF CALCULATORS

The Students of Degree/P.G. Classes will be permitted to use of Calculators in the examination hall from annual 1986 examination on the following conditions as per decision of the standing committee of the Academic Council at its meeting held on 31-1-1986.

1. Student will bring their own Calculators.
2. Calculators will not be provided either by the University or examination centres.
3. Calculators with, memory and following variables be permitted +, -, x, square, reciprocal, exponentials log, square root, trigonometric functions, sine, cosine, tangent etc. factorial summation, xy, yx and in the light of objective approval of merits and demerits of the viva only will be allowed.

आधार पाठ्यक्रम (पेपर कोड 0841)

प्रश्न पत्र - प्रथम

हिन्दी भाषा

पूर्णांक - 75

खण्ड-क निम्नलिखित 5 लेखकों के एक-एक निबंध पाठ्यक्रम में सम्मिलित होंगे -

अंक-30

1. महात्मा गांधी - सत्य और अहिंसा
2. विनोबा भावे - ग्राम सेवा
3. आचार्य नरेन्द्र देव - युवकों का समाज में स्थान
4. वासुदेव शरण अग्रवाल - मातृ-भूमि
5. भगवतशरण उपाध्याय - हिमालय की व्युत्पत्ति
6. हरि ठाकुर - डॉ. खूबचंद बघेल

खण्ड-ख हिन्दी भाषा और उसके विविध रूप

अंक-20

- कार्यालयीन भाषा
- मीडिया की भाषा
- वित्त एवं वाणिज्य की भाषा
- मंशनी भाषा

खण्ड-ग अनुवाद व्यवहार : अंग्रेजी से हिन्दी में अनुवाद

अंक-25

हिन्दी की व्यावहारिक कोटियाँ-

रचनागत प्रयोगगत उदाहरण, संज्ञा, सर्वनाम, विशेषण, क्रिया विशेषण, समास, संधि एवं संक्षिप्तियाँ, रचना एवं प्रयोगगत विवेचन।

ENGLISH LANGUAGE

M.M. 75

(Paper Code - 0842)

The question paper for B.A./B.Sc./B.Com./B.H.Sc., English Language and cultural values shall comprise the following units :

- UNIT-I** Short answer questions to be asked by (Five short answer questions of three marks each) 15 Marks
- UNIT-II** (a) Reading comprehension of an unseen passage 05 Marks
(b) Vocabulary
- UNIT-III** Report-Writing 10 Marks
- UNIT-IV** Expansion of an idea 10 Marks
- UNIT-V** Grammar and Vocabulary based on the prescribed text book. 20+15 Marks

Note : Question on all the units shall be asked from the prescribed text which will comprise specimens of popular creative/writing and the following in any

- (a) Matter & technology
- (i) State of matter and its structure
 - (ii) Technology (Electronics Communication, Space Science)
- (b) Our Scientists & Institutions
- (i) Life & work of our eminent scientist Arya Bhatt, Kaur Charak Shusruta, Nagarjuna, J.C. Bose and C.V. Raman, S. Ramanujam, Homi J. Babha Birbal Sahani.
 - (iii) Indian Scientific Institutions (Ancient & Modern)

Books Prescribed :

Foundation English for U.G. Second Year - Published by M.P. Hindi Granth Academy, Bhopal.

**NEW CURRICULUM OF B.SC. PART II.
CHEMISTRY**

The new curriculum will comprise of three papers of 33, 33 & 34 marks each and practical work of 50 marks. The curriculum is to be completed in 180 working days as per the UGC norms & conforming to the directives of the Govt. of Chhattisgarh. The Theory papers are of 60 hrs. each duration & the practical work of 180 hrs. duration.

**PAPER - I
INORGANIC CHEMISTRY
(Paper Code - 0845)**

M.M. 33

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 & 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 A. OXIDATION AND REDUCTION

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

B. COORDINATION COMPOUNDS

Werner'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 A. CHEMISTRY OF LANTHANIDE ELEMENTS

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

B. CHEMISTRY OF ACTINIDES

General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from uranium, similarities between the later actinides and the later lanthanides.

UNIT-V A. ACID AND BASES

Arrhenius, Bronsted-Lowry, the Lux-flood, solvent system and Lewis concepts of acids and bases.

N. NON-AQUEOUS SOLVENTS

Physical properties of a solvent, types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid ammonia and liquid sulphur dioxide.

06 HRS.

REFERENCE BOOKS :

1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson and P.L. Gaus, Wiley

Concise Inorganic Chemistry, J.D. Lee, ELBS.

Concepts of models of Inorganic Chemistry, B. Douglas, D. Mc Daniel and J. Alexander, John Wiley.

Inorganic Chemistry, D.E. Shriver, P.W. Atkins and C.H. Langford, Oxford.

Inorganic Chemistry, W.W. Porterfield, Addison - Wesley.

Inorganic Chemistry, A.G. Sharp, ELBS.

Inorganic Chemistry, G.L. Miessler and D.A. Tarr, Prentice Hall.

Advanced Inorganic Chemistry, Stayas Prakash.

Advanced Inorganic Chemistry, Agarwal & Agarwal.

0. Advanced Inorganic Chemistry, Puri & Sharma, S. Naginchand

1. Inorganic Chemistry, Madan, S, Chand

2. Aadhunik Akarbanic Rasayan, A.K. Shrivastav & P.C. Jain, Goel Pub.

3. Uchattar Akarbanic Rasayan, Satya Prakash & G.D. Tuli, Shyamal Prakashan

4. Uchattar Akarbanic Rasayan, Puri & Sharma.

5. Selected topic in Inorganic Chemistry by Madan Malik, & Tuli, S. Chand.

**PAPER - II
ORGANIC CHEMISTRY
(Paper Code - 0846)**

60 Hrs. MM. 33

UNIT-I ALCOHOLS

A. Dihydric alcohols - nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$\text{Pb}(\text{OAc})_2$ and HIO_4] and pinacol - pinacolone rearrangement.

B. Trihydric alcohols - nomenclature and methods of formation, chemical reactions of glycerol.

PHENOLS

A. Structure and bonding, in phenols, physical properties and acidic character. Comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols, acylation and carboxylation.

B. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben - Hoesch reaction, Lederer - Manasse reaction and Reimer-Tiemann reaction.

EPOXIDES

Synthesis of epoxides. Catalysed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides. Anti 1,2 dihydroxylation of alkenes via epoxides. Crown ethers.

UNIT-II ALDEHYDES AND KETONES

A. Nomenclature and Structure of the carbonyl group. Synthesis of aldehydes and ketones using 1,3 - dithianes, synthesis of ketones from nitriles.

Mechanism of nucleophilic additions to carbonyl group Benzoin, Aldol, Perkin and Knoevenagel condensations. Condensations with ammonia and its derivatives, Wittig reaction, Mannich reaction.

- B. Use of acetate as protecting group, Oxidation of aldehydes, Baeyer - Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen Condensation, Wolff-Kishner reaction, LiAlH_4 and NaBH_4 reduction. Halogenation of enolizable ketones.

An introduction to α, β unsaturated aldehydes and ketones.

UNIT-III A. CARBOXYLIC ACIDS

05 HRS.

Structure and bonding, Physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Hell-Volhard Zeilinsky reaction. Reduction of carboxylic acids. Mechanism of Decarboxylation.

Methods of formation and chemical reactions of unsaturated mono carboxylic acids. Di carboxylic acids : methods of formation and effect of heat and dehydrating agents.

B. SUBSTITUTED CARBOXYLIC ACIDS

Hydroxy and Halo-substituted Acids.

C. CARBOXYLIC ACID DERIVATIVES

Structure of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Mechanisms of acid and base catalyzed esterification and hydrolysis.

UNIT-IV ORGANIC COMPOUNDS OF NITROGEN

- A. Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reduction in acidic, neutral and alkaline medium.

- B. Reactivity, Structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel - phthalimide reaction, Hofmann bromamide reaction, Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts, azo coupling.

UNIT-V HETEROCYCLIC COMPOUNDS

A. Introduction

Molecular orbital picture and aromatic character of pyrrole, furan, thiophene and pyridine, methods of synthesis and chemical reactions with emphasis on the mechanism of electrophilic substitution. Mechanism and nucleophilic substitution reaction in pyridine derivatives. Comparison of basicity of pyridine, Piperidine and pyrrole.

- B. Preparation and reaction of Indole, quinoline and isoquinoline and with special reference to Fisher Indole synthesis and skraup synthesis and Bisher-Napieralski synthesis, Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Amino acids and Peptides :

- A. Classification, Structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reaction of α -amino acids.
- B. Structure and nomenclature of peptides. Peptide synthesis, solid - phase peptide synthesis.

REFERENCE BOOKS :

1. Organic Chemistry, Morrison and Boyd, Prentice-Hall.
2. Organic Chemistry, L.G. Wade Jr. Prentice-Hall.
3. Fundamentals of Organic Chemistry, Solomons, John Wiley
4. Organic Chemistry, Vol. I, II, III, S.M. Mukherjee, S.P. Singh and R.P. Kapoor, Wiley-Eastern (New-Age)
5. Organic Chemistry, F.A. Carey, McGraw Hill
6. Introduction to Organic Chemistry, Struweiesser, Heathcock and Kosover, Macmillan.
7. Organic Chemistry, P.L. Soni
8. Organic Chemistry, Bahi & Bahi
9. Organic Chemistry, Joginder Singh
10. Carbanic Rasayan, Bahi & Bahi
11. Carbanic Rasayan, R.N. Singh, S.M.I. Gupta, M.M. Bakodia & S.K. Wadhwa
12. Carbanic Rasayan, Joginder Singh

PAPER - III

PHYSICAL CHEMISTRY

60 Hrs. M.M. 34

(Paper Code - 0847)

UNIT-I A. Thermodynamics - I

12 Hrs.

Fundamental of thermodynamics system, surroundings etc. Types of systems, intensive and extensive properties, state and path functions thermodynamic operations Internal energy, enthalpy, Heat capacity of gases at constant volume and at constant pressure and their relationship.

First Law of Thermodynamics limitation of first law. Joule-Thompson expansion, inversion temperature of gases. Calculation of w, q, dU & dH for the liquification expansion of ideal gases under isothermal and adiabatic conditions.

B. Thermo chemistry

Standard state, Hess's law of heat summation. Enthalpy of reaction at constant pressure and constant volume. Enthalpy of neutralizations. Enthalpy of combustion, Enthalpy of formation, Calculation of Bond enthalpy. Eilrchhoff's equation.

UNIT-II A. Thermodynamics-II

Second Law of Thermodynamics : Spontaneous process need of second law, statements of Carnot cycle and efficiency of heat engine, Carnot theorem. Thermodynamic state of temperature.

Concept of entropy : entropy change in a reversible and irreversible process, Entropy change in isothermal reversible expansion of an ideal gas, Entropy

change in isothermal mixing of ideal gases, physical signification of entropy.

- B. Gibbs and Helmholtz free energy variation of G and A with pressure, volume temperature; Gibbs Helmholtz equation.

UNIT-III PHASE EQUILIBRIUM

- A. Gibbs Phase rule, Phase components and degree of freedom, Limitation of phase rule.

Applications of phase rule to one component system - water system, sulphur system.

Application of phase rule to two component systems : pb-Ag system, Zn, Mg system, ferric chloride-water system, desilverization of ____ congruent and incongruent, melting point, eutectic point.

Three component systems : solid solution liquid pairs.

Liquid liquid mixture : (Partially miscible liquids) : phenol-water, trimethylamine-water nicotine systems, constant temperature, azeotropes.

- B. Nerst distribution law, Henry's law, application, solvent extraction.

UNIT-IV ELECTROCHEMISTRY-I

10 HRS.

- A. Electrolytic Conductance : Specific and equivalent conductance, measurement of equivalent conductance, effect of dilution on conductance, Kohlrausch's law; application of Kohlrausch's law in determination of dissociation constant of weak electrolyte, solubility of sparingly soluble electrolyte, absolute velocity of ions, ionic product of water, conductometric titration.

- B. Theories of strong electrolytes : limitations of Ostwald dilution law, weak and strong electrolyte, Debye-Huckel-Onsager (DHO) equation for strong electrolyte, relaxation and electrophoretic effect.

- C. Migration of ions : Transport number, definition and determination by Hittorf method and moving boundary method.

UNIT-V ELECTROCHEMISTRY-II

10 HRS.

- A. Electrochemical cell or Galvanic cell : reversible and irreversible cells conventional representation of electrochemical cells, EMF of the cell, effect of temperature on EMF of the cell, Nernst equation, calculation of ΔG , ΔH and ΔS for cell reaction.

- B. Single electrode potential : standard hydrogen electrode, calomel electrode quinhydrone electrode, redox electrodes, electrochemical series.

- C. Concentration cells with & without transport, liquid junction potential, application of concentration cell in determining valency of ions, solubility product, activity coefficient.

- D. Determination of pH and pKa using hydrogen and quinhydrone electrode potentiometric titrations, buffer solutions; Henderson-Hassel Equation, Hydrolysis of salts, Corrosion : type theories and prevention.

REFERENCE BOOKS :

1. Physical Chemistry, G.M. Barrow, International student edition-McGraw Hill
2. University general chemistry, C.N.R. Rao, Macmillan.

3. Physical Chemistry, R.A. Alberty, Wiley Eastern.
4. The elements of Physical Chemistry, Eastern.
5. Physical Chemistry through problems, S.K. Dogra & S. Dogra, Wiley Eastern.
6. Physical Chemistry, B.D. Khosla.
7. Physical Chemistry, Puri & Sharma
8. Bhoutic Rasayan, Puri, Sharma & Pathania, Vishal Publishing Company.
9. Bhoutic Rasayan, P.L. Soni
10. Bhoutic Rasayan, Baht & Tuli
11. Physical Chemistry, R.L. Kapoor, Vol. I-IV

PAPER - IV LABORATORY COURSE

180 Hrs.

Inorganic Chemistry

Calibration of fractional weights, pipettes and burettes. Preparation of standard solutions, Dilution-0.1 M to 0.01 M. solutions.

Quantitative Analysis

Volumetric Analysis

- (a) Determination of acetic acid in commercial vinegar using NaOH.
- (b) Determination of alkali content-antacid tablet using HCl.
- (c) Estimation of calcium content in chalk as calcium oxalate by permanganometry.
- (d) Estimation of hardness of water by EDTA.
- (e) Estimation of ferrous & ferric by dichromate method.
- (f) Estimation of copper using thiosulphate.

Instrumentation

Colorimetry

- (a) Job's method
 - (b) Mole-ratio method
- Adulteration-Food Stuffs.
Effluent analysis, water analysis

Solvent Extraction

Separation and estimation of Mg (H) and Fe (H).

Ion Exchange Method

Separation and estimation of Mg (H) and Zn (H).

Organic Chemistry

Laboratory Techniques

A. Thin layer Chromatography

Determination of R_f values and identification of organic compounds.

- (a) Separation of green leaf pigments (spinach leave may be used)
- (b) Preparation and separation of 2, 4-dinitrophenyl hydrazones of acetone, 2-butanone, hexan-2 and 3-one using toluene and light petroleum (40:60)
- (c) Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).

B Paper Chromatography : Ascending & Circular.

Determination of R_f values and identification of organic compounds.

- Separation of mixture of phenylalanine and glycine. Alanine and aspartic acid, Leucine and glutamic acid, Spray reagent-ninhydrin.
- Separation of mixture of D, L-alanine, glycine, and L-Leucine using n-butanol : acetic acid : water (4:1:5), Spray reagent-ninhydrin.
- Separation of monosaccharides- a mixture of D-galactose and d-fructose using n-butanol : acetone : water (4:5:1), Spray reagent-aniline hydrogen phthalate.

Qualitative Analysis

Identification of an organic compound through the functional group analysis, determination of M.Pt. and preparation of derivatives. (Aliphatic and Aromatic)

Physical Chemistry

Transition Temperature

Determination of the transition temperature of the given substance by thermometric dilatometric method (e.g. $MnCl_2 \cdot 4H_2O/SrBr_2 \cdot 2H_2O$).

PHASE EQUILIBRIUM

- To study the effect of a solute (e.g. NaCl, Succinic acid) on the critical solution temperature of two partially miscible liquids (e.g. Phenol-water system) and to determine the concentration of that solute in the given phenol-water system.
- To construct the phase diagram of two component system (e.g. diphenylamine, benzophenone) by cooling curve method.

THERMO CHEMISTRY

- To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
- To determine the enthalpy of neutralisation of a weak acid / weak base versus strong base / strong acid and determine the enthalpy of ionisation of the weak acid weak base.
- To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

Reference Book -

- Vogel's qualitative Analysis, revised Svehla, Orient Longman.
- Standard method of chemical analysis, W.W.Scott, the Technical press.
- Experimental Organic Chemistry, Vol. I & II, P.R.Singh, D.S. Gupta and K.S.Bajpai, Tata McGraw Hill.
- Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
- Vogel's Text Book of Practical Organic Chemistry, B.S. Furnis, A.J. Hannaford, V.Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
- Experiments in General Chemistry C.N.R.Rao & U.C. Agrawal.
- Experiments in Physical Chemistry R.C. Das & B.Behra, Tata McGraw Hill.
- Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.

5 Hrs.

PRACTICAL EXAMINATION

M.M. 50

Three Experiments are to be Performed.

- Inorganic - One experiment from synthesis and analysis by preparing the standard solution to be given. 12 marks
- OR One Experiment from instrumentation either by colorimetry / solvent extraction/ion exchange method.
 - Identification of the given organic compound & determine its M.Pt./B.Pt. 6 marks
 - Determination of R_f value and identification of organic compounds by paper chromatography. 6 marks
- Any one physical experiment that can be completed in two hours including calculations. 12 marks
- Viva 10 marks
- Sessional 04 marks

In case of Ex-Students one mark will be added to each of the experiments.

PHYSICS

Objectives :

Present course is aimed to provide ample knowledge of basics of physics which are relevant to the understanding of modern trends in higher physics.

The first paper is aimed at preparing the background of thermodynamics and statistical physics essential for any advanced study of physics of condensed matter and radiations.

The second paper is mainly concerned with a course on geometrical and Physical optics and the laser Physics. It deals with important phenomenon like interference, diffraction and polarisation with stress on the basic nature of light. It also introduces the basics of laser physics with some of its important applications.

The experiments are based mostly on the contents of the theory papers so as to provide comprehensive insight of the subject.

Scheme of Examination :

1. There shall be two theory papers of 3 hours duration each and one practical paper of 4 hours duration. Each paper shall carry 50 marks.
2. Each theory paper will comprise of 5 units. Two questions will be set from each unit and the student will have the choice to answer one out of two.
3. Numerical problems of about 30 percent will compulsorily be asked in each theory paper.
4. In practical paper each student has to perform experiments during examination.
5. Practical examination will be of 4 hours duration. The distribution of practical marks will be as follows :

Experiments	: 15 + 15 = 30
Viva-Voce	: 10
Internal Assessment	: 10

PAPER - I

THERMODYNAMICS, KINETIC THEORY AND STATISTICAL PHYSICS

(Paper Code - 0843)

UNIT-I The laws of thermodynamics : The Zeroth law, concept of path function and point function, various indicator diagrams, work done by and on the system, first law of thermodynamics, internal energy as a state function, reversible and irreversible change, Carnot theorem and the second law of thermodynamics. Different versions of the second law. Clausius theorem inequality. Entropy, Change of entropy in simple cases (i) Isothermal expansion of an ideal gas (ii) Reversible isochoric process (iii) Free adiabatic expansion of an ideal gas. Entropy of the universe. Principle of increase of entropy. The thermodynamic scale of temperature, its identity with the perfect gas scale. Impossibility of attaining the absolute zero, third law of thermodynamics.

UNIT-II Thermodynamic relationships : Thermodynamic variables, extensive and intensive, Maxwell's general relationships, application to Joule-Thomson cooling and adiabatic cooling in a general system, Van der Waals gas, Clausius-Clapeyron heat equation.

Thermodynamic potentials and equilibrium of thermodynamical systems, relation with thermodynamical variables. Cooling due to adiabatic demagnetization, production and measurement of very low temperatures. Blackbody radiation : Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, Special distribution of BB radiation, Wien's displacement law, Rayleigh-Jean's law, the ultraviolet catastrophe, Planck's quantum postulates, Planck's law, complete fit with experiment.

UNIT-III Maxwellian distribution of speeds in an ideal gas : Distribution of speeds and of velocities, experimental verification, distinction between mean, rms and most probable speed values. Doppler broadening of spectral lines.

Transport phenomena in gases : Molecular collisions, mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

Liquifaction of gases : Boyle temperature and inversion temperature. Principle of regenerative cooling and of cascade cooling, liquifaction of hydrogen and helium. Refrigeration cycles, meaning of efficiency.

UNIT-IV The statistical basis of thermodynamics : Probability and thermodynamic probability, principle of equal a priori probabilities, statistical postulates. Concept of Gibbs's ensemble, accessible and inaccessible states. Concept of phase space, canonical phase space, Gamma phase space and mu phase space. Equilibrium between two systems in thermal contact, probability and entropy, Boltzmann entropy relation. Boltzmann canonical distribution law and its applications, law of equipartition of energy. Transition to quantum statistics : 'h' as a natural constant and its implications, cases of particle in a one-dimensional box and one-dimensional harmonic oscillator.

UNIT-V Indistinguishability of particles and its consequences, Bose-Einstein & Fermi-Dirac conditions, Concept of partition function, Derivation of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics Through Canonical partition function. Limits of B.E. and F-D statistics to M-B statistics. Application of BE statistics to black body radiation, Application of F-D statistics to free electrons in a metal.

TEXT AND REFERENCE BOOKS :

1. B.B. Laud, "Introduction to Statistical Mechanics" (Macmillan 1981)
2. F. Reif : "Statistical Physics" (McGraw-Hill, 1998).
3. K. Huang : "Statistical Physics" (Wiley Eastern, 1988).
4. Thermal and statistical Physics : R.K. Singh, Y.M. Gupta and S. Sivraman
5. Physics (Part-2) : Editor, Prof. : B.P. Chandra, M.P. Hindi Granth Academy.

PAPER - II

WAVES, ACOUSTICS AND OPTICS

(Paper Code - 0844)

UNIT-I Waves in media : Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves, typical

measurements. Waves over liquid surface : gravity waves and ripples. Group velocity and phase velocity, their measurements.

Harmonics and the quality of sound ; examples. Production and detection of ultrasonic and infrasonic waves and applications.

Reflection, refraction and diffraction of sound : Acoustic impedance of a medium, percentage reflection & refraction at a boundary, impedance matching for transducers, diffraction of sound, principle of a sonar system, sound ranging.

UNIT-II Fermat's Principle of extremum path, the aplanatic points of a sphere and other applications.

Cardinal points of an optical system, thick lens and lens combinations. Lagrange equation of magnification, telescopic combinations, telephoto lenses.

Monochromatic aberrations and their reductions ; aspherical mirrors and schmidt corrector plates, aplanatic points, oil immersion objectives, meniscus lens.

Optical instruments : Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces. (Ramsdon and Hygen's eyepieces)

UNIT-III Interference of light : The principle of superpositions, two slit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringes, Rayleigh refractometer Localised fringes ; thin films. Haldinger fringes : fringes of equal inclination. Michelson interferometer, its application for precision determination of wavelength, wavelength difference and the width of spectral lines, Twyman. Green interferometer and its uses, intensity distribution in multiple beam interference. Tolansky fringes, Fabry-Perot interferometer and etalon.

UNIT-IV Fresnel half-period zones, plates, straight edge, rectilinear propagation, Fraunhofer diffraction : Diffraction at a slit, half-period zones, phasor diagram and integral calculus methods, the intensity distribution, diffraction at a circular aperture and a circular disc, resolution of images, Rayleigh criterion, resolving power of telescope and microscopic systems.

Diffraction gratings : Diffraction at N parallel slits, intensity distribution, plane diffraction grating, reflection grating and blazed gratings, Concave grating and different mountings, resolving power of a grating and comparison with resolving powers of prism and of a Fabry-Perot etalon.

Double refraction and optical rotation : Refraction in uniaxial crystals, Phase retardation plates, double image prism. Rotation of plane of polarisation, origin of optical rotation in liquids and in crystals.

UNIT-V Laser system : Purity of a spectral line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion, Types of Laser : Ruby and, He-Ne and Semiconductor lasers.

Application of lasers : Application in communication, Holography and non linear optics. (Polarization P including higher order terms in E and generation of harmonics).

TEXT AND REFERENCE BOOKS :

1. A.K. Ghatak, 'Physical Optics'
2. D.P. Khandelwal, 'Optical and Atomic Physics' (Himalaya Publishing House, Bombay,

1988)

K.D. Moltev ; 'Optics' (Oxford University Press)

Sears : 'Optics'

Jenkins and White : 'Fundamental of Optics' (McGraw-Hill)

B.B. Laud : Lasers and Non-linear Optics (Wiley Eastern 1985)

Smith and Thomson : 'Optics' (John Wiley and Sons)

Berkely Physics, Courses : Vol.-III, 'Waves and Oscillations'

I.G. Main, 'Vibrations and Waves' (Cambridge University Press)

0. H.J. Pain : 'The Physics of Vibrations and Waves' (MacMillan 1975)

1. Text Book of Optics : B.K. Mathur

2. B.Sc. (Part III) Physics : Editor : B.P. Chandra, M.P. Hindi Granth Academy.

3. F. Smith and J.H. Thomson, Manchester Physics series : optics (English language book society and Jehu wiley, 1577)

4. Bern and Woif : 'Optics'.

PRACTICALS

Minimum 16 (Sixteen) out of the following or similar experiments of equal standard.

Study of Brownian motion

Study of adiabatic expansion of a gas.

Study of conversion of mechanical energy into heat.

Heating efficiency of electrical kettle with varying voltages.

Study of temperature dependence of total radiation.

Study of temperature dependence of spectral density of radiation.

Resistance thermometry.

Thermoemf thermometry.

Conduction of heat through poor conductors of different geometries.

0. Experimental study of probability distribution for a two-option system using a coloured dice.

1. Study of statistical distributions on nuclear disintegration data (GM Counter used as a black box)

2. Speed of waves on a stretched string.

3. Studies on torsional waves in a lumped system.

4. Study of interference with two coherent sources of sound.

5. Chladni's figures with varying excitation and loading points.

6. Measurement of sound intensities with different situation.

7. Characteristics of a microphone-loudspeaker system.

8. Designing an optical viewing system.

9. Study of monochromatic defects of images.

20. Determining the principal points of a combination of lenses.

21. Study of interference of light (biprism or wedge film)
22. Study of diffraction at a straight edge or a single slit.
23. Study of F-P elaton fringes.
24. Use of Dofraction grating and its resolving limit.
25. Resolving limit of a telescope system.
26. Polarization of light by reflection ; also cos-squared law.
27. Study of Optical rotation for any systems.
28. Study of laser as a monochromotor coherent sourec.
29. Study of a divergence of a Laser beam.
30. Calculation of days between two dates of a year.
31. To check if triangle exists and the type of the triangle.
32. To find the sum of the sine and cosine series and print out the curve.
33. To solve simultaneous equations by elimination method.
34. To prepare a mark-list of polynomials.
35. Fitting a straight line or a simple curve to a given data.
36. Convert a given integer into binary and octal systems and vice-versa.
37. Inverse of a matrix.
38. Spiral array.

TEXT AND REFERENCE BOOKS :

- D.P. Khandelwal : "Optics and Atomic Physics" (Himalaya Publishing House, Bombay 1988)
- D.P. Khandelwal : "A Laboratory Manual for Undergraduate Classes" (Var Publishing House, New Delhi)
- S. Lipschutz and A Poe : "Schaum's Outline of Theory and Problems of Programming with Fortran" (McGraw-Hill Book Company 1986)
- C. Dixon : "Numerical Analysis".

MATHEMATICS

There shall be three compulsory papers. Each paper of 50 marks is divided into five units and each unit carry equal marks.

**PAPER - I
ADVANCED CALCULUS**

(Paper Code - 0848)

- UNIT-I** Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms. Comparison tests, Cauchy's integral test, Ratio tests, Raabe's, logarithmic, De Morgan and Bertrand's tests. Alternating series, Leibnitz's theorem. Absolute and conditional convergence.
- UNIT-II** Continuity, Sequential continuity, Properties of continuous functions, Uniform continuity, Chain rule of differentiability, Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives Taylor's theorem with various forms of remainders.
- UNIT-III** Limit and continuity of functions of two variables, Partial differentiation Change of variables, Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Jacobians.
- UNIT-IV** Envelopes, Evolutes, Maxima, minima and saddle points of functions, two variables, Lagrange's multiplier method.
- UNIT-V** Beta and Gamma functions, Double and triple integrals, Dirichet's integrals, Change of order of intergration in double integrals.

REFERENCES :

1. Gabriel Klaumber, Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.
2. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
3. R.R. Goldberg, Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970.
4. D. Soma Sundaram and B. Choudhary, A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
5. P.K. Jain and S.K. Kaushik, An introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.
6. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad.
7. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Co., New York.
8. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd., Allahabad.
9. S.C. Malik, Mathematical Analysis. Wiley Eastern Ltd., New Delhi.
10. O.E. Stanaitis, An Introduction to Sequences, Series and Improper Integrals, Holden-Dey, Inc., San Francisco, California.
11. Earl D. Rainville, Infinite Series, The Macmillan Company, New York.
12. Chandrika Prasad, Text Book on Algebra and Theory of Equations, Pothishala Pvt. Ltd., Allahabad.

13. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.
14. Shanti Narayan, A Course of Mathematical Analysis, S.Chand and Company, New De

PAPER - II
DIFFERENTIAL EQUATIONS

(Paper Code - 0849)

- UNIT-I.** Series solutions of differential equations- Power series method, Bessel and Legendre Functions and their properties-convergence, recurrence and generating relation Orthogonality of functions, Sturm-Liouville problem, Orthogonality of eigen-function Reality of eigen values, Orthogonality of Bessel functions and Legendre polynomial
- UNIT-II** Laplace Transformation - Linearity of the Laplace transformation, Existence theorem for Laplace transforms, Laplace transforms of derivatives and integrals, Shifting theorems, Differentiation and integration of transforms, Convolution theorem, Solution of integral equations and systems of differential equations using the Laplace transformation.
- UNIT-III** Partial differential equations of the first order, Lagrange's solution, Some special types of equations which can be solved easily by methods other than the general method, Charpit's general method of solution.
- UNIT-IV** Partial differential equations of second and higher orders, Classification of linear partial differential equations of second order, Homogeneous and non-homogeneous equations with constant coefficients, Partial differential equations reducible to equations with constant coefficients, Monge's methods.
- UNIT-V** Calculus of Variations - Variational problems with fixed boundaries- Euler's equation for functionals containing first order derivative and one independent variable. External, Functionals dependent on higher order derivatives, Functionals dependent on more than one independent variable, Variational problems in parametric form, invariance of Euler's equation under coordinate transformation.
- Variational Problems with Moving Boundaries - Functionals dependent on one or two functions, One sided variations.
- Sufficient conditions for an Extremum - Jacobi and Legendre conditions, Second Variation, Variational principle of least action.

REFERENCES :

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999.
2. D.A. Murray, Introductory Course on Differential Equations, Orient Longman, (India), 1968.
3. A.R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd., London.
4. Lan N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill Book Company, 1988.
5. Francis B. Hilderbrand, Advanced Calculus for Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 1977.
6. Jane Cronin, Differential equations, Marcel Dekkar, 1994.

7. Frank Ayres, Theory and Problems of Differential Equations, McGraw-Hill Book Company, 1972.
8. Richard Bronson, Theory and Problems of Differential Equations, McGraw-Hill, Inc., 1973.
9. A.S. Gupta, Calculus of variations with Applications, Prentice-Hall of India, 1997.
10. R. Courant and D. Hilbert, Methods of Mathematical Physics, Vols. I & II, Wiley-Interscience, 1953.
11. I.M. Gelfand and S.V. Gomin, Calculus of Variations, Prentice-Hill, Englewood Cliffs (New Jersey), 1963.
12. A.M. Arthurs, Complementary Variational Principles, Clarendon Press, Oxford, 1970.
13. V. Kornkov, Variational Principles of Continuum Mechanics with Engineering Applications, Vol. I, Reidel Publ. : Dordrecht, Holland, 1985.
14. T. Oden and J.N. Reddy, Variational Methods in Theoretical Mechanics, Springer-Verlag, 1976.

PAPER - III
MECHANICS
(Paper Code - 0850)

STATICS

- UNIT-I** Analytical conditions of Equilibrium, Stable and unstable equilibrium, virtual work, Catenary.
- UNIT-II** Forces in three dimensions, Poinot's central axis, Null lines and planes, Dynamics.
- UNIT-III** Simple harmonic motion, Elastic strings, velocities and accelerations along radial and transverse directions, Projectile, Central orbits.
- UNIT-IV** Kepler's laws of motion, velocities and acceleration in tangential and normal directions, motion on smooth and rough plane curves.
- UNIT-V** Motion in a resisting medium, motion of particles of varying mass, motion of a particle in three dimensions, acceleration in terms of different co-ordinate systems.

REFERENCES :

1. S.L. Loney, Statics, Macmillan and Company, London.
2. R.S. Verma, A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad.
3. S.L. Loney, An Elementary Treatise on the Dynamics of a particle and of rigid bodies, Cambridge University Press, 1956.

**BOTANY
PAPER - I**

**DIVERSITY OF SEED PLANTS AND THEIR SYSTEMATICS
(Paper Code - 0861)**

M.M. : 50

- UNIT-I.** 1. Characteristics of seed plants ; evolution of the seed habit ; seed plants with (angiosperms) and without (gymnosperms) fruits ; fossil and living seed plants.
2. General features of gymnosperms and their classification ; evolution and diversity of gymnosperms ; geological time scale, fossilization and fossil gymnosperms.
- UNIT-II** 3. Morphology of vegetative and reproductive parts ; anatomy of roots, stem and leaf, reproduction and life cycle of Pinus, Cycas and Ephedra.
- UNIT-III** 4. Angiosperms : origin and evolution, some examples of primitive angiosperms.
- UNIT-IV** 7. Classification of angiosperms ; salient features of the systems proposed by Bentham and Hooker and Engler and Prantl.
8. Major contributions of cytology, phytochemistry and taximetrics to taxonomy.
- UNIT-V** 9. Diversity of flowering plants : General account of the families Ranunculaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae, Apiaceae, Acanthaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Chenopodiaceae, Euphorbiaceae, Liliaceae and Poaceae.

PAPER - II

**STRUCTURE DEVELOPMENT AND REPRODUCTION
IN FLOWERING PLANTS
(Paper Code - 0862)**

M.M. 50

- UNIT-I.** 1. The basic body plan of a flowering plant : modular type of growth.
2. Diversity in plant form in annuals, biennials and perennials ; convergence of evolution of tree habit in gymnosperms, monocotyledons and dicotyledons ; trees-largest and longest-lived organisms.
- UNIT-II** 3. The shoot system : the shoot apical meristem and its histological organization ; vascularization of primary shoot in monocotyledons and dicotyledons ; formation of internodes, branching pattern ; monopodial and sympodial growth ; canopy architecture ; cambium and its functions ; formation of secondary xylem, a general account of wood structure in relation to conduction of water and minerals ; characteristics of growth rings, sapwood and heart wood ; role of woody skeleton ; secondary phloem - structure-function relationships, periderm.
- UNIT-III** 4. Leaf : origin, development, arrangement and diversity in size and shape ; internal structure in relation to photosynthesis and water loss ; adaptations to water stress ; senescence and abscission.
5. The root system : the root apical meristem ; differentiation of primary and secondary tissues and their roles ; structural modification for storage, respiration, reproduction and for interaction with microbes.
- UNIT-IV** 6. Flower : a modified shoot ; structure, development and varieties of flower, functions, structure of anther and pistil, the male and female gametophytes ; types of pollination ; attractions and rewards for pollinators ; pollen-pistil inter-

action, self incompatibility, double fertilization, formation of seed-endosperm and embryo ; fruit development and maturation.

UNIT-V

7. Significance of seed : suspended animation ; ecological adaptation ; unit of genetic recombination and replenishment, dispersal strategies.
8. Vegetative reproduction : vegetative propagation, grafting, economic aspects.

PRACTICAL SCHEME

M.M. : 50

Time : 4 Hrs.

- | | |
|---------------------------------------------------------------|----|
| 1. Plant Description | 08 |
| 2. Gymnosperm | 07 |
| 3. Anatomy | 07 |
| 4. Embryology | 04 |
| 5. Spotting (1-5 Spots) | 10 |
| 6. Field Report
(Local Flora : Rainy/Winter/Summer Season) | 04 |
| 7. Viva-Voce | 05 |
| 8. Sessional | 05 |

Total Marks : 50

**BOTANY (PRACTICAL)
SUGGESTED LABORATORY EXERCISES**

ANGIOSPERMS

The following species are suitable for study. This list is only indicative. Teachers may select plants available in their locality.

- Ranunculaceae : Ranunculus, Delphinium
- Brassicaceae : Brassica, Alyssum, Iberis, Coronopus
- Malvaceae : Hibiscus, Abutilon
- Rutaceae : Murraya, Citrus
- Fabaceae : Faboideae : Lathyrus, Cajanus, Melilotus, Trigonella, Caesalpinioideae ; Cassia, Caesalpinia ; Mimosoideae : Prosopis, Mimosa, Acacia.
- Apiaceae : Coriandrum, Foeniculum, Anethum
- Acanthaceae : Adhatoda, Poristrophe
- Apocynaceae : Vinca, Thevetia, Nerium
- Asclepiadaceae : Calotropis
- Solanaceae : Solanum, Withania, Datura
- Euphorbiaceae : Euphorbia, Phyllanthus
- Lamiaceae : Ocimum, Salvia
- Chenopodiaceae : Chenopodium, Beta
- Liliaceae : Asphodelus, Asparagus
- Poaceae : Avena, Triticum, Hordeum, Poa, Sorghum

GYMNOSPERMS

CYCAS

- Habit, armour of leaf bases on the stem (if specimen is not available show photograph), very young leaf (circinate vernation) and old foliage leaves, scale leaf, bulbils, male cone (specimen), microsporophyll, megasporophyll, mature seed.
- Study through permanent slides - normal root (T.S.), stem (T.S.) (if sections are not

- available show photographs), ovule (L.S.).
- iii. Study through hand sections or dissections - coralloid root (T.S.), rachis (T.S.), leaf (V.S.), microsporophyll (V.S.), pollen grains (W.M.).

PINUS

- i. Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. wood showing growth rings, male cone, 1st year, 2nd year female cones, winged seed.
- ii. Study through permanent slides - root (T.S.), female cone (L.S.), ovule (L.S.), embryo (W.M.) showing polycotyledonous condition.
- Study through hand sections or dissections - young stem (T.S.), old stem (wood) (T.L.S. and R.L.S.), needle (T.S.), male cone (L.S.), male cone (T.S.), pollen grains (W.M.).

EPHEDRA

- i. Habit and structure of whole male and female cones.
- ii. Permanent slides - female cone (L.S.)
- iii. Hand sections/dissections - node (L.S.), internode (T.S.), macerated stem to see vessel structure, epidermal peel mount of vegetative parts to study stomata, male cone (T.S. and L.S.), pollen grains.

SUGGESTED LABORATORY EXERCISES :

- Embryology, Anatomy and Vegetative Propagation etc.
- Study of commonly occurring dicotyledonous plant (for example *Solanum nigrum* or *Kalanchoe*) to understand the body plan and modular type of growth.
 - Life forms exhibited by flowering plants (by a visit to a forest or a garden), study of tree like habit in cycads, bamboos, banana, traveller's tree (*Ravenala madagasariensis*) or yucca and comparison with true trees as exemplified by conifers and dicotyledons.
 - L.S. shoot tip to study the cytohistological zonation and origin of leaf primordia.
 - Monopodial and Sympodial types of branching in stems (especially rhizomes).
 - Anatomy of primary and secondary growth in monocots and dicots using hand sections (or prepared slides), structure of secondary phloem and xylem, Growth rings in wood. Microscopic study of wood in T.S., T.L.S. and R.L.S.
 - Field study of diversity in leaf shape, size, thickness, surface properties, internal structure of leaf, structure and development of stomata (using epidermal peels of leaf).
 - Anatomy of the root, Primary and secondary structure.
 - Examination of a wide range of flowers available in the locality and methods of their pollination.
 - Structure of anther, microsporogenesis (using slides) and pollen grains (using whole mounts), pollen viability using in vitro pollen germination.
 - Structure of ovule and embryo sac development (using serial sections)
 - Test of self-incompatibility (using *Petunia axillaris*, *Brassica campestris*, *B. oleracea* or suitable available material) using field pollinations.
 - Nuclear and cellular endosperm, embryo development in monocots and dicots (using slides/dissections).
 - Simple experiments to show vegetative propagation (leaf cuttings in *Bryophyllum*, *Sansevieria*, *Begonia*, stem cuttings in rose, salix, money plant, sugarcane and *Bougainvillea*).
 - Germination of non-dormant and dormant seeds.

ZOOLOGY

PAPER - I

ANATOMY & PHYSIOLOGY

(Paper Code - 0863)

M.M. : 50

- UNIT-I** Comparative Anatomy of various organ systems of vertebrates.
- Integument and its derivatives : structure of scales, hair and feathers.
 - Alimentary canal and digestive glands in vertebrates.
 - Respiratory Organs
Gills and lung, Air-Sae in birds
- UNIT-II**
- Endoskeleton-Limbs, girdles and vertebrae.
 - Circulatory System - Evolution of heart and aortic arches.
 - Urino-genital System - Kidney and excretory ducts.
- UNIT-III**
- Nervous System - General plan of brain and spinal cord.
 - Endocrine glands - classification and histology.
 - Gonads and genital ducts.
- UNIT-IV**
- Digestion and absorption of dietary components.
 - Physiology of heart, Cardiac cycle and ECG.
 - Blood Coagulation.
 - Respiration-Mechanism and control of breathing.
- UNIT-V**
- Excretion-Physiology of excretion, Osmoregulation.
 - Physiology of Muscle contraction.
 - Physiology of nerve impulse, Synaptic transmission.
 - Ear and Eye - structure and function.

LIST OF RECOMMENDED BOOKS :

- Conn, Stumpy RK, Bruening and D.C. : Outlines of Biochemistry.
- Gaviong : Review of Medical Physiology.
- Eckest, R. : Animal Physiology (W.H. Freeman)
- Hildbrand : Analysis of Vertebrate structure
- Kingsley : Outlines of Comparative Anatomy (Central Book Depot)
- Rouer & Parsons : The Vertebrate Body, (Saunders)
- Walta & Gyles : Biology of the Vertebrates (Macmillan)

PAPER - II

VERTEBRATE ENDOCRINOLOGY, REPRODUCTIVE BIOLOGY BEHAVIOUR, EVOLUTION AND APPLIED ZOOLOGY

(Paper Code - 0864)

- UNIT-I**
- General Characters of Hormones.
 - Hormone Receptor
 - Biosynthesis and secretion of thyroid, Adrenal; Ovarian and testicular hormones.
 - Endocrine disorder due to hormones and other gland.
- UNIT-II**
- Reproductive cycle in vertebrate.
 - Menustration, Lactation and pregnancy.
 - Mechanism of parturition.
 - Hormonal regulation of gametogenesis.
 - Extra embryonic membrane.

- UNIT-III**
1. Evidences of organic evolution.
 2. Theories of organic evolution.
 3. Variation, Mutation, Isolation and Natural selection.
 4. Evolution of Horse.
- UNIT-IV**
1. Introduction to Ethology.
 2. Patterns of Behaviour Taxes, Reflexes, Drives and Stereotyped Behaviour.
 3. Reproductive Behavioural Patterns.
 4. Hormones, Drugs and Behaviour.
- UNIT-V**
1. Aquaculture
 2. Sericultural
 3. Apiculture
 4. Pisciculture
 5. Poultry keeping
 6. Elements of Pest Control -
 1. Chemical control
 2. Biological Control

PRACTICAL WORK

The practical work in general shall be based on the syllabus prescribed in theory. The students will be required to show the knowledge of the following.

1. Study of the representative examples of the different chordates (Classification and character)
2. Dissection of various systems of scoliodon-Afferent and Efferent branchial vessels, cranial nerves, internal ear.
3. Simple microscopic technique through unstained or stained permanent mounts.
4. Study of prepared slides histological, as per theory papers.
5. Study of limb girdles and vertebrae of frog, varanus, fowl and Rabbit.
6. Identification of species and individuals of honey bee.
7. Life cycle of honey bee and silkworm.

PRACTICAL WORK - DISTRIBUTION OF MARKS

1. Major dissection (Cranial nerves/Efferent branchial vessel)	12
2. Minor dissection (Afferent branchial/Internal ear)	08
3. Permanent mount	09
4. Spotting-8 (Slides-4, bones-2, specimens-2)	16
5. Viva	05
6. Sessional marks	
Total : 50	

MICROBIOLOGY B.S.C. PART II SCHEME OF EXAMINATION

Paper	- Title	50
First	- Microbial Physiology and Genetics	50
Second	- Principles of Bioinstrumentation and Techniques	50
Practical		50
	Total : 150	

PAPER - I MICROBIAL PHYSIOLOGY AND GENETICS (Paper Code - 0869) M.M. : 50

- UNIT-I** Plasma membrane and transport across membrane, Energy transformation, Physiology of bacterial growth, phases of growth, growth conditions, differentiation in bacterial cells-sporulation, germination; bacterial cell division replication of chromosome, partition of chromosome into daughter cell.
- UNIT-II** Primary and Secondary metabolism.
- UNIT-III** Bacterial plasmids; structure and properties, replication, incompatibility, plasmid amplification. Bacteriophages; lytic development cycle - T4; lytic and lysogenic development of phage, single stranded DNA phage. Transposition; Structure of bacterial transposons, types of bacterial transposons. Mechanism of antibiotic resistance and spread of antibiotic resistance.
- UNIT-IV** Genetic recombination; requirements, molecular basis, genetic analysis of recombination in bacteria.
- UNIT-V** DNA Repair and restriction; Types of repair systems, restriction endonuclease, various types of restriction enzymes, dam and dcm methylases.

Text Book :

1. Gene Cloning by T.A. Brown.
2. General Microbiology by Power and Daganiwala.
3. Zinssers Microbiology by KJ Wolfgang, McGraw- Hill Company.
4. Microbial Genetics by RM Stanley, F David and EC John.
5. Bacteriological Techniques by FJ Baker.

PAPER II PRINCIPLES OF BIONSTRUMENTATION AND TECHNIQUES (Paper Code - 0870) M.M. : 50

- UNIT-I** Colorimetry and spectrophotometry. Spectrofluorimoty, turbidometry, nephelometry, luminometry. pH metery.
- UNIT-II** Chromatography; adsorption partition, column, gas, ion-exchange, gel filtration, and affinity, Chromatography, HPLC, FPLC.
- UNIT-III** Centrifugation and ultracentrifugation. Microscopy- light, phase-contrast, fluorescence, dark field, electron microscopy. Laser, confocal, microscopy and digital image analysis