



पंडित दीनदयाल उपाध्याय शेखावाटी
विश्वविद्यालय सीकर

SYLLABUS

B.Sc. PART-III

EXAMINATION-2023-24

Scheme of Examination
B.Sc. (Pass Course) Part-III

The number of paper's and the maximum marks for each paper together with the minimum marks required for a pass are shown against each subject separately. It will be necessary for a candidate to pass in the theory part as well as the practical part of a subject/paper. Wherever prescribed separately. Classification of successful candidates shall be as follows :

First Division 60%	}	of the aggregate marks prescribed at (a) Part first Examination excluding those obtained in the compulsory subject (b) Part Second Examination (c) Part Third Examination taken together.
Second Division 48%		

All the rest will be declared to have passed the Examination. If they obtain a minimum pass marks in each subject viz 36% No division shall be awarded at the Part First and Part Second Examinations:

CONTENTS

Optional Subjects :-		PAGE No
1.	Physics	4 - 12
2.	Chemistry	13 - 18
3.	Zoology	19 - 27
4.	Botany	28 - 36
5.	Geology	37 - 39
6.	Mathematics	40 - 44
7.	Economics	45 - 49
8.	Geography	50 - 53
9.	Statistics	54 - 57
10.	Applied Statistics	58 - 59
11.	Psychology	60 - 63
12.	Electronics	64 - 68
13.	Environmental Science	69 - 73
Additional Optional Subjects ;		
1.	Textile Craft	74 - 75
2.	Garment Production and Export Management	76 - 79
3.	Geology and Mining	80 - 82
4.	Bio Technology	83 - 85

PHYSICS

Scheme

Paper I	Exam: 3 hours duration	Min Pass marks: 12	Max. Marks : 33
Paper II	Exam: 3 hours duration	Min Pass marks: 12	Max. Marks : 33
Paper III	Exam: 3 hours duration	Min Pass marks: 12	Max. Marks : 34
Practical	Exam: 4 hours duration	Min Pass marks: 18	Max. Marks : 50

Paper I: Quantum Mechanics and Spectroscopy

Work Load: Two hours Lecture per week

Scheme of Examination: First question will be of nine marks comprising of six short answer type parts each with answer not exceeding half a page. Remaining four questions will be set with one question from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying three marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit - I : Evolution of quantum physics

1. Difficulties of classical mechanics to explain: the black-body emission spectrum, specific heat of solids. Plank quanta concept and radiation law, Photo electric effect and Einstein's explanations. Compton effect, De-Broglie hypothesis, diffraction and interference experiments of particle (Davisson-Germier experiment).
2. Uncertainty principle: position and momentum, angle and angular momentum, energy and time. Application of uncertainty principle: (i) Ground state energy of hydrogen atom, (ii) ground state energy of simple harmonic oscillator, (iii) Natural width of spectral lines, (iv) Non-existence of electron in nucleus.
3. Operators: linear operators, product of two operators, commuting and non-commuting operators, simultaneous eigen functions and eigen values, orthogonal wavefunctions, Hermitian operators, their eigenvalues, Hermitian adjoint operators.

eigenvalues and eigenfunctions; expectation values of operators: position, momentum, energy; Ehrenfest theorem and complementarity, Concept of group and phase velocity, wave packet, Gaussian wave packet, bra-ket notation.

Unit – II : Schrödinger wave equation and its solutions

1. Schrödinger wave equation: general equation of wave propagation, propagation of matter waves, time dependent and time-independent Schrödinger equation, wavefunction representation (ψ), physical meaning of ψ , properties and conditions on ψ , postulates of wave mechanics, operators, observable and measurements; probability current density.

2. Time independent Schrödinger equation, stationary state solution, one dimensional problem: particle in one dimensional box, eigenfunctions and eigenvalues, discrete energy levels, generalization into three dimension and degeneracy of energy levels, concept of a potential well and barrier, step potential, penetration through rectangular barrier, reflection and transmission coefficients, barriers with special shapes (graphical representation), quantum mechanical tunneling (alpha decay).

Unit – III : Schrödinger equation solutions in special cases

1. Symmetric square well potential, reflection and transmission coefficients, resonant scattering; Bound state problems: particle in one dimensional infinite potential well and finite depth potential well, energy eigenvalues and eigenfunctions, transcendental equation and its solution; Simple harmonic oscillator, Schrödinger equation for simple harmonic oscillator and its solution, eigenfunction, eigenvalues, zero point energy, quantum and classical probability density, parity, symmetric and antisymmetric wave functions with graphical representation.

2. Schrödinger equation in spherical coordinates, Schrödinger equation for one electron atom in spherical coordinates, separation into radial and angular variables, solution of radial equation and angular equation, qualitative discussion of spherical harmonics, series solution and energy eigenvalues, stationary state wavefunction.

Wave-functions of H-atom for ground and first

excited states, average radius of H-atom, Bohr correspondence principle, orbital angular momentum and its quantization, commutation relation, eigenvalues and eigenfunctions.

UNIT IV: H-atom, Atomic and Molecular spectroscopy

1. Energy level derivation for H-atom, quantum features of hydrogen spectra and hydrogen like spectra, Stern-Gerlach experiment, electron spin, spin magnetic

moment, spin-orbit coupling, qualitative explanation of fine structure, Franck-Hertz experiment, Zeeman effect, normal Zeeman splitting, Qualitative understanding about Stark effect.

2. Absorption and emission spectroscopy, its block diagram, brief explanation about function of each elements and its limitations; single beam spectrophotometer.

3. Molecular spectroscopy: concept of rigid rotator, rotational energy levels, rotational spectra, selection rules, intensity of spectral lines, isotopic effect; Vibrational energy levels, vibrational spectra, selection rules, isotopic effect, effect of anharmonicity in vibrational spectra, vibrational-rotational spectra of CO and HCl molecules.

Reference books

1. D.J. Griffiths, Introduction to Quantum Mechanics, 2nd edition.

2. R. Shankar, Principles of Quantum Mechanics, 2nd edition.

3. Arthur Beiser, Perspective of modern Physics, 6th edition.

4. AK Ghatak and S Lokanathan, Quantum Mechanics: Theory and application.

5. HS Mani, GK Mehta, Introduction to modern Physics.

6. C.N. Banwell and E.M. McCash, Fundamental of Molecular Spectroscopy, 4th edition.

7. H.E. White, Introduction to atomic physics,

Paper II: Nuclear and Particle Physics

Work Load: Two hours Lecture per week

Scheme of Examination: First question will be of nine marks comprising of six short answer type parts each with answer not exceeding half a page. Remaining four questions will be set with one question from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying three marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

UNIT - I

Properties of Nucleus : Discovery of Nucleus, Rutherford Scattering, Constituents of the Nucleus, Mass, Charge, Size, Nuclear Density, Charge Distribution, Hofstadter's experiment.

Nuclear Angular momentum, Nuclear Magnetic Dipole Moment, Electric Quadrupole Moment, Spin, Isospin, Wave Mechanical Properties: Parity and Statistics, Classification of Nuclei, Mass Defect and Binding Energy, Packing Fraction, Mass Spectrograph.
Nuclear Forces: Properties of Nuclear Forces, Yukawa Meson Theory, Nuclear Potential.
Nuclear Models: Segre Chart, Liquid Drop Model, Semi Empirical Mass Formula, Condition of Stability, Fermi Gas Model, Evidence for Nuclear Shell Structure, Nuclear Magic Numbers and Basic Assumptions of the Shell Model.

UNIT - 2

Radioactive Decays: Alpha Decay-Basics of α -Decay Processes, Theory of β -Emission Spectrum, Gamow Factor, Geiger Nuttal Law, Range of Alpha Particles, Beta Decay- Energy Kinematics for β -Decay, β -Decay Spectrum, Positron Emission, Electron Capture, Pauli's Neutrino Hypothesis.
Gamma Decay- Gamma Ray Emission and Kinematics, Internal Conversion
Applications of Radioactivity
Nuclear Fission and Fusion: Nuclear Fission, Spontaneous Fission and Potential Barrier, its Explanation by Liquid Drop Model, Chain reaction, Controlled chain reaction, Four Factor Formula, Nuclear Reactors, Classification of Nuclear Reactor, Uncontrolled Chain Reaction, Nuclear Fusion. Energy released in Nuclear Fusion, Fusion in stars.
Nuclear Reactions: Types of Reactions, Conservation Laws, Kinematics of Reactions, Q-Value, Threshold Energy, Reaction Rate, Reaction Cross-Section.

UNIT - 3

Interaction of Nuclear Radiation with Matter: Energy Loss by Heavy Charged Particles in Matter, Interaction of Electrons with Matter, Range of Charged Particle, Bremsstrahlung, Cherenkov Radiation, Gamma Ray Interaction With Matter.
Radiation Detectors: Gas filled detector, Avalanche, Geiger Discharge, Ionization Chamber, Proportional Counter, Geiger Muller Counter, Current mode and Pulse Mode Operation of Detector.
Particle Accelerators: Ion source, Van-de-Graff Accelerator (Tandem Accelerator), Linear Accelerator, Cyclotron, Synchrocyclotron, Betatron, Proton Synchrotron

UNIT - 4

Elementary Particles: Necessity of high energy to discover elementary constituents, historical introduction to discovery of elementary particles (electron, positron, neutrinos).

strange mesons, charm quark, intermediate vector bosons, bottom quark, top quark and Higgs boson) Elementary particles and their quantum numbers (charge, spin, parity, isospin, strangeness, etc.), elementary particles included in the standard model.

Fundamental Interactions : Four types of fundamental forces. Symmetries and Conservation Laws, Discrete symmetries C, P, and T invariance. Application of symmetry arguments to particle reactions. Parity non-conservation in weak interaction, CP violation.

Quark Model : Flavor symmetries, Gellmann-Nishijima formula, the eightfold way, Quark model. Octet Diagram for Mesons and Baryons, Concept of Quark model, the November Revolution, Baryon Decuplet, Color Quantum Number and Gluons.

Suggested Books:

1. Nuclear and Particle Physics, W. E. Burcham and M. Jobes, Addison Wesley Longman Inc.
2. Nuclear and Particle Physics, Brian R. Martin, John Wiley & Sons.
3. Introduction to Nuclear and Particle Physics, Das and Ferbal, World Scientific.
4. Elements of Nuclear Physics, Walter E. Meyerhof, McGraw-Hill Book Company.
5. Introductory Nuclear Physics, Kenneth S. Krane, John Wiley & Sons.
6. Introduction to Elementary Particles, David J. Griffiths, John Wiley & Sons.
7. Radiation Detection and Measurement, G.F. Knoll (John Wiley & Sons)
8. Introduction to Nuclear and Particle Physics, V. K. Mittal, R. C. Verma, S. C. Gupta, PHI
9. Concepts of Modern Physics, A. Beiser, McGraw-Hill Book Company.

Paper III: Solid State Physics

Two hours Lecture per week

Scheme of Examination: First question will be of ten marks comprising of five short answer type parts each with answer not exceeding half a page. Remaining four questions will be set with one question from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying three marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit I

Bonding in Solids and Crystal structure:

Force between atoms. Ionic bonds, Covalent and metallic bonds, Vander waal's and Hydrogen bonding. Periodicity in lattices, Basis, lattice point and space lattice, Translation vectors, Unit and primitive cell, Crystal systems, Packing fractions for Simple Cubic (SC), Body Centred Cubic (BCC), Face Centred Cubic (FCC) and Hexagonal lattice structures, Bravais space lattices.

Crystallography and Diffraction:

Direction, planes and miller indices in a crystal lattice, Reciprocal lattice and its significance, Conversion of SC and FCC structures in reciprocal lattice frame, Concept of crystalline, polycrystalline and amorphous materials, X-ray diffraction by solids: Laue and Braggs equation, Study of crystals by X-rays: FWHM, Sherrer formula and Lattice Constants (for simple cubic structure), Electron and Neutron diffraction (qualitative).

Unit II

Band theory of solids:

Formation of bands, Periodic potential and Bloch Theorem, Number of states in the bands, Kroning Penny model, Brilliuon zones, Crystal momentum and physical origin of effective mass, Negative Effective Mass and Holes, Energy dispersion relations: weak and tight binding.

Semiconductors:

Energy band Structures in Insulators, Conductors, Semiconductors. Concept of Direct and Indirect band gap in semiconductors. Generation and recombination of charge carriers, Mobility of charge carriers, Hall Effect in semiconductors: Hall coefficient, Mobility, Charge carrier concentration, Conductivity and Hall angle.

Unit III

Thermal properties of Materials:

Elastic waves, Phonon, Phonon dispersion relations in monoatomic and diatomic linear lattice. Lattice heat capacity, Classical theory of specific heat, Dulong-Petit's law, Einstein and Debye's theory of specific heat of solids and limitations of these models, concept of Thermoelectric Power.

Electrical Properties of Materials:

de-Lorentz theory, Sommerfeld's Model, Thermal conductivity, Electrical conductivity, Wiedemann-Franz relation, Thermionic Emission, Escape of electrons from metals, Hall Effect in Metals, Density of states.

Unit IV

Magnetic Properties of Materials:

Classification of Magnetic Materials. Origin of Atomic Magnetism, Classical Langevin Theory of dia - and Paramagnetic Domains. Quantum theory of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism. Concept of Domain Wall, Magnetostriction, Heisenberg's Exchange Interaction, Relation between Exchange Integral and Weiss Constant.

Superconductivity:

Experimental features of superconductivity: Critical Temperature, Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect. Idea of BCS theory (No derivation); Cooper Pair and Coherence length. Josephson Effect (No derivation)

Reference Books

1. Introduction to Solid State Physics--- Charles Kittel (Wiley Publication)
2. Elementary Solid state Physics----M. Ali Omar (Pearson Education)
3. Elements of X-ray diffraction---B. D. Cullity (Prentice Hall)

Teaching	Practicals	Min. Pass Marks
Max. Marks	4 hrs/week	
50	Duration 5 hrs.	18

Total number of experiments to be performed by the students during the session should be 16 selecting any 8 from each section.

Section-A

1. Determination of Planck's constant by photo cell (retarding potential method using optical filters, preferably five wave length).
2. Determination of Planck's constant using solar cell.
3. Determination of Stefan's constant (Black body method)
4. Study of the temperature dependence of resistance of a semi-conductor (four probe method).
5. Study of Jodine spectrum with the help of grating and spectrometer and ordinary bulb light.
6. Study of characteristics of a GM counter and verification of inverse square law for the same strength of a radioactive source.
7. Study of β -absorption in Al foil using GM Counter.
8. To find the magnetic susceptibility of a paramagnetic solution using Quinck's method. Also find the ionic molecular susceptibility of the ion and magnetic moment of the ion in terms of Bohr magneton.
9. Determination of coefficient of rigidity as a function of temperature using torsional oscillator (resonance method).
10. Study of polarization by reflection from a glass plate with the help of Nicol's prism and photo cell and verification of Brewster law and law of Malus.
11. e/m measurement by helical Method.
12. Measurement of magnetic field using ballistic galvanometers and search coil. Study of variation of magnetic field of an electromagnet with current.
13. Measurement of electric charge by Millikan's oil drop method.

Section-B

1. Study of a R-C transmission line at 50 Hz
2. Study of a L-C transmission line
 - (i) at fixed frequency.
 - (ii) at variable frequency.
3. Study of resonance in an LCR circuit (using air core inductance and damping by metal plate)

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- (i) at fixed frequency by varying C, and
- (ii) by varying frequency.
4. Study of the characteristics of junction diode & Zener diode.
5. Study of
 - (i) Recovery time of junction diode and point contact diode.
 - (ii) Recovery time as a function of frequency of operation and switching current.
6. To design Zener regulated power supply and study the regulation with various loads.
7. To study the characteristics of a field effect transistor (FET) and design/study amplifier of finite gain (10).
8. To study the frequency response of a transistor amplifier and obtain the input and output impedance of the amplifier.
9. To design and study of an R-C phase shift oscillator and measure output impedance (frequency response with change of component of R and C).
10. To study a voltage multiplier circuit to generate high voltage D.C. from A.C.
11. Using discrete components, study OR, AND, NOT logic gates, compare with TTL integrated circuits (I.C.'s).
12. Application of operational amplifier (OP-AMP) as : Minimum two of the following exercises—(a) Buffer (for accurate voltage measurement) (b) Inverting amplifier (c) Non Inverting amplifier (d) Summing amplifier.

2. CHEMISTRY Scheme

Max Marks: 150

	Duration (hrs)	Max. Marks	Min. Pass Marks
Paper I	3	33	
Paper-II	3	33	36
Paper-III	3	34	
Practical	5	50	18

Note: Ten (10) questions are to be set taking two (02) questions from each unit. Candidates have to answer any 5 questions selecting at least one question from each unit.

CH-301 Paper-I : Inorganic Chemistry (2 hrs or 3 periods/ week)

Unit-I

Hard and Soft Acids and Bases (HSAB):

Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Unit-II

Metal-ligand bonding in Transition Metal complexes:

Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal-field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

Magnetic properties of Transition Metal Complexes:

Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula, L-S coupling, correlation of μ_s , and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

Unit-III

Electron spectra of Transition Metal Complexes:

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series, Orgel energy level diagram for d^1 and d^9 states, discussion of the electronic spectra of $(Ti(H_2O)_6)^{3+}$ complex ion.

Thermodynamic and Kinetic Aspects of Metal Complexes:

A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

Unit-IV

Organometallic Chemistry:

Definition, nomenclature and classification of organometallic compounds. Preparation,

properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti, a brief account of metallocenes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Unit-V

Bioinorganic Chemistry:

Essential and trace elements to Biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+} . Nitrogen fixation.

Inorganic Polymers:

Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

CH-302 Paper-II : Organic Chemistry (2 hrs or 3 periods/week)

Unit-I

Nuclear Magnetic Resonance (NMR) Spectroscopy:

Proton magnetic resonance ($^1\text{H-NMR}$) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals. Interpretation of NMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using NMR data.

Organic Synthesis via Enolates: Acidity of α -hydrogens in reactive methylene compounds, alkylation of diethyl malonate and ethyl acetoacetate. Claisen condensation, Keto-enol tautomerism in ethyl acetoacetate. Synthetic applications of ethyl acetoacetate and malonic ester.

Unit-II

Heterocyclic Compounds

Introduction: Molecular orbital diagram and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five- and six-membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher-indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis, Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Unit—III

Carbohydrates

Classification and nomenclature, Monosaccharides, mechanism of osazone formation. Epimers, anomers and mutarotation. Interconversion of glucose and fructose, chain lengthening and chain

shortening of aldoses. Erythro and threodiastereomers. Conversion of glucose into mannose. Configuration of monosaccharides. Determination of ring size of monosaccharides. Formation of glycosides, ethers and esters. Cyclic structure of D(+)-glucose and fructose. Structures of ribose and deoxyribose. Nomenclature and structure of disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose); Glycosidic linkage.

Unit-IV

Amino Acids, Peptides, Proteins and Nucleic Acids

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α -amino acids.

Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end-group analysis, selective hydrolysis of peptides. Classical peptide synthesis. Solid-phase peptide synthesis.

Nucleic acids - Introduction, constituents of nucleic acids - nucleosides and nucleotides.

Unit-V

Organosulphur Compounds : Nomenclature, structural features, methods of formation and chemical reactions of thiols, sulphonic acids, sulphonamides and Sulpha drugs: sulphaguanidine, sulphadiazine (sulphapyrimidine), sulphamethoxazole, sulphacetamide.

Synthetic Polymers : Addition or chain-growth polymerization. Free radical and ionic polymerization. Ziegler-Natta Catalyst Condensation or step-growth polymerization. Polyesters, polyamides, phenol-formaldehyde resins, urea-formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubber.

Synthetic Dyes : Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of methyl orange, congo red, malachite green, crystal violet, phenolphthalein, fluorescein, alizarin and indigo.

CH-303 Paper III: Physical Chemistry (2 Hrs. or 3 periods/week)

UNIT-I

Elementary quantum Mechanics:

Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's mode of hydrogen atom (no derivation) and its defects. Compton effect.

De Broglie hypothesis, the Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of

the wave function, postulates of quantum mechanics, particle in a one dimensional box.

Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

UNIT-II

Molecular orbital theory:

Basic ideas-criteria for forming M.O. from A.O. construction of M.O's by LCAO- H_2^+ ion calculation of energy level from wave functions, physical picture of bonding and antibonding wave functions, concept of σ , σ^* , π , π^* orbitals and their characteristics. Hybrid orbitals - sp , sp^2 , sp^3 , calculation of coefficients of A.O.'s used in these hybrid orbitals.

Introduction to valence bond model of H_2 , comparison of M.O. and V.B. models.

UNIT-III

Spectroscopy

Introduction: Electromagnetic radiation, spectrum, basic features of different spectrometers, statement of the Born-Openheimer approximation, degrees of freedom.

Rotational Spectrum: Diatomic molecules, Energy levels of a rigid rotator (semi-classical principles), selection rules, spectral intensity, using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotator, isotope effect.

Vibrational Spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

Raman Spectrum: Basic principles and applications, concept of polarizability, pure rotational and pure vibrational Raman Spectra of diatomic molecules, selection rules.

Electronic Spectrum: Concept of Potential Energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Frank Condon principle. Qualitative description of σ , π and n M.O. their energy levels and the respective transitions.

UNIT-IV

Photochemistry

Interaction of radiation with matter, difference between thermal and photochemical processes.

Laws of photochemistry: Grothus-Drappier law, Stark -Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

Physical Properties and Molecular Structure

Optical activity, polymerization - (Clausius-Mossotti equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment temperature method and refractivity method, dipole moment and structure of molecules, magnetic properties-paramagnetism, diamagnetism and ferromagnetic.

UNIT-V

Solutions, Dilute Solutions and Colligative Properties:

Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient.

Dilute solution, colligative properties, Raoult's law, relative lowering of vapor pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression in freezing point. Thermodynamic derivation of relation between molecular weight and elevation of boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

Practical: CH-304: Laboratory Course – III

(6 hrs/week)

INORGANIC CHEMISTRY

Synthesis and Analysis of:

- Potassium trioxalatoferrate (III), $K_3[Fe(C_2O_4)_3]$
- Bis(dimethylglyoximate) nickel (II) complex, $[Ni(DMG)_2]$
- Tetraamminecopper (II) sulphate, $[Cu(NH_3)_4]SO_4$
- Potassium potassium diaquabis(oxalato)chromate (III) dihydrate, $K[trans-Cr(H_2O)_2(C_2O_4)_2] \cdot 2H_2O$

Instrumentation

Calorimetry

(a) Job's

(b) Mole-ration method

Adulteration-Food stuffs

Effluent analysis water analysis

Solvent Extraction

Separation and estimation of Mg (II) and Fe (II)

Ion Exchange Method

Separation and estimation of Mg (II) and Fe (II)

ORGANIC CHEMISTRY

Laboratory Techniques

Steam Distillation

Naphthalene from its suspension in water

Clove oil from Clove

Separation of o- and p-nitrophenols

Column Chromatography

Separation of fluorescein and methylene blue

Separation of leaf pigments from spinach leaves

Resolution of racemic mixture of (+) mandelic acid

Qualitative Analysis

Analysis of an organic mixture containing two solid components using water, $NaHCO_3$, for separation and preparation of suitable derivatives.

Synthesis of Organic Compounds

(a) Acylation of salicylic acid, aniline, glucose and hydroquinone.

- Benzoylation of aniline and phenol
- (b) Aliphatic electrophilic substitution
Preparation of iodoform from ethanol and acetone
- (c) Aromatic electrophilic substitution
Nitration
Preparation of m-dinitrobenzene
Preparation of p-nitroacetanilide
Halogenation
Preparation of p-bromoacetanilide
Preparation of 2, 4, 6-tribromophenol
- (d) Diazotization / coupling
Preparation of methyl orange and methyl red
- (e) Oxidation
Preparation of benzoic acid from toluene
- (f) Reduction
Preparation of aniline from nitrobenzene
Preparation of m-nitroaniline from m-dinitrobenzene.
- Stereochemistry: Study of Organic Compounds via Models**
R and S configuration of optical isomers.
E, Z configuration of geometrical isomers.
Conformational analysis of cyclohexanes and substituted cyclohexanes.

PHYSICAL CHEMISTRY

Electrochemistry

- To determine the strength of the given acid conductometrically using standard alkali solution.
- To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.
- To study the saponification of ethyl acetate conductometrically.
- To determine the ionization constant of a weak acid conductometrically.
- To titrate potentiometrically the given ferrous ammonium sulphate solution using $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ as titrant and calculate the redox potential of $\text{Fe}^{2+}/\text{Fe}^{3+}$ system on the hydrogen scale.

Refractometry, Polarimetry

- To verify the law of refraction of mixture (e.g. of glycerol and water) using Abbe's refractometer.
- To determine the specific rotation of a given optically active compound.

Molecular Weight Determination

- Determination of molecular weight of a non-volatile solute by Rast method/Beckmann freezing point method.
- Determination of the apparent degree of dissociation of an electrolyte (e.g. NaCl) in aqueous solution at different concentrations by ebullioscopy.

Colorimetry

- To verify Beer-Lambert law $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ and determined the concentration of the given solution of the substance.
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University of Rajasthan
Syllabus: B.Sc. Part-III (Pass Course)
Zoology
(2022-2023)

Scheme:
Max. Marks: 100

Min. Pass Marks: 36

Paper I	: 3 Hrs duration	33 Marks
Paper II	: 3 Hrs duration	33 Marks
Paper III	: 3 Hrs duration	34 Marks
Practicals	: 4 Hrs. duration	50 Marks

NOTE:

1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.
Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, *i.e.*, three from each unit /section out of which candidate will be required to attempt any 4 question selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

PAPER –I: Z-301

STRUCTURE AND FUNCTIONS OF CHORDATE TYPES

NOTE:

1. There will be two parts of this theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 9 very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.
Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part *i.e.* three from each unit /section, out of which candidate will be required to attempt any 4 question selecting at least one question from each unit/section. Each question will carry 6 marks
2. The candidate has to answer all questions in the main answer book only.

Section – A

Chordates

1. Comparison of habit, external features and anatomy of *Herdmania* and *Branchiostoma* (excluding development).
2. Ascidian tadpole larva and its metamorphosis.
3. Affinities of Hemichordata, Urochordata and Cephalochordata
4. Habit, habitat and salient features of *Petromyzon*, Ammocoete larva.

Section – B

Structure, organs and Systems: Brain, endoskeleton, Digestive, Circulatory, Respiratory, Excretory, Nervous & Reproductive

Pisces- Labeo
Amphibian-Frog
Reptile-Varanus
Aves-Pigeon
Mammal- Rat

Section – C

Chordate Adaptations

1. Pisces: Scales and fins, migration and parental care.
2. Amphibia: Parental care.
3. Reptilia: Poisonous and non poisonous snakes, poison apparatus.
4. Aves: Flight adaptations, types of feather, bird migration.
5. Mammals: Adaptive radiation, dentition.

PAPER –II: Z-302

ECOLOGY, ENVIRONMENTAL BIOLOGY AND EVOLUTION

NOTE:

1. There will be two parts of this theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 9 very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part i.e. three from each unit /section, out of which candidate will be required to attempt any 4 question selection at least one question from each unit/section. Each question will carry 6 marks
2. The candidate has to answer all questions in the main answer book only.

Section – A

Ecology

1. Basic concepts in ecology, its meaning and history.
2. Concepts of limiting factors.
3. Ecosystem: Biotic and abiotic factors.
4. Ecosystem: Production, consumption and decomposition in an ecosystem: Concepts of food-chain, food web, trophic structure, ecological pyramids
5. Biogeochemical cycles of O₂, CO₂, H₂O, N, P and role of microbes.
6. Ecosystem: Homeostasis, functional aspects, productivity concepts and determination, ecotone, edge effects, niche.
7. Population ecology: Density and methods of its measurement, natality, mortality, age ratio and distribution, pyramids, fluctuations, biotic potential, dispersal, growth forms, population interactions and propagation, brief idea of demography.
8. Community ecology: Characteristics of natural communities, structure, composition, stratification.
9. Ecological succession: Types and patterns, concept of climax, details of xerosere and hydrosere successions.

10. Habitat ecology: Brief account of fresh water, marine, terrestrial and estuarine water ecosystems.
11. Ecology and human future: Growth rate role of human kind in modifying natural communities in term of public health and welfare with respect to use of pesticides, conservation and pollution.

Section – B

Environmental Biology

1. Environment and its concepts, hydrosphere, lithosphere and atmosphere.
2. Natural resources: Conservation and management of natural resources: Renewable (forest, wildlife, water) and non renewable (soil, minerals and energy).
3. Environmental pollution: General outline and various types of pollution of water, air, and soil. Sources and remedies for noise, radiation.
4. Green House effect, Ozone layer depletion, El-Nino and La Nina effects.
5. Basic concepts of bioaccumulation, biomagnifications, biodegradation of pollutants.
6. Impact of urbanization: Development and distribution of urban centers, factors, problems and solutions of urbanization, fauna of oriental region.
7. Wildlife conservation: Vanishing and threatened animals and plants with special reference in Rajasthan, Wildlife management efforts by Government and non Government organization.
8. Space ecology: Space ecosystem, space problems and their solutions, colonization.

Section - C

Evolution

1. Darwinism and Neo Darwinism, Lamarckism and Neo Lamarckism, natural Selection.
2. Variation, Isolation, Mutations.
3. Concept of Species and Speciation.
4. Adaptations (Desert, freshwater, Deep Sea and Flight), Mimicry.
5. Polymorphism: population genetics, Genetic drift and Hardy-Weinberg Law.
6. Evolution Man, Phylogeny of Horse.
7. Zoogeography: Principles and concepts of Parallelism, endemism etc. and factors influencing animal distribution.
8. Zoogeographical realms and faunal peculiarities, evolution of realms, plate tectonics and continental drifts and Island Zoogeography.

PAPER –III: Z-303

APPLIED ZOOLOGY, ETHNOLOGY AND BIostatISTICS

NOTE:

1. There will be two parts of this theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 10 very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part i.e. three from each unit /section, out of which candidate will be required to attempt any 4 question selecting at least one question from each unit/section. Each question will carry 6 marks
2. The candidate has to answer all questions in the main answer book only.

Section – A

Applied Zoology

Principles and Practices of the following:

1. Vermiculture.
2. Sericulture (including ericulture).
3. Lac culture.
4. Apiculture.
5. Prawn culture.
6. Poultry keeping.

Economic Importance of the following:

1. Protozoa.
2. Corals and coral reefs.
3. Helminthes.
4. Arthropods; Insects and their management
5. Mollusca: Outline idea of pearl culture.

Section – B

Ethology

1. Introduction and history of Ethology.
2. Concepts of Ethology : Fixed action pattern, sign stimulus, innate releasing mechanism, action specific energy, motivation imprinting and learning.
3. Pheromones and their role in alarm spreading
4. Societies: Characteristics and advantage with special reference to honey bee & deer.
5. Biological rhythms and biological clocks.
6. Methods of studying animal behavior.

Section – C

Biostatistics

1. Introduction, scope and application of Biostatistics.
2. Understanding the concepts of descriptive and inferential statistics.
3. Frequency distribution.
4. Graphical and tabular presentation of data.
5. Mean, median, mode and their significance.
6. Standard deviation, standard error and their significance.
7. Hypothesis: Null and alternative; Student's t- test.

Syllabus: B.Sc. Part-III (Pass Course)

Zoology Practical

(2022-2023)

Min. Marks: 18

4 Hrs. / Week

Max. Marks: 50

I. Anatomy:

Any edible fish (*Wallago, Labeo*): External features, general viscera, afferent and efferent branchial blood vessels, eye muscles and their innervations, brain, cranial nerves and internal ear.

II. Study of the following through Permanent Slide preparations:

Striped muscle fibers; Smooth muscle fibers, scales of edible fish, hair of man, balled film of any vertebrate.

III. Study of Microscopic Slides: Whole mounts of oral hood, velum and pharyngeal wall of *Amphioxus*; T. S. of *Amphioxus* through various regions; tadpole larva of *Ascidia*; whole mounts of *Salpa*, *Doliolum* and *Oikopleura*, V. S. of skin of fish, T. S. body of fish through various regions, V. S. of skin of bird, V. S. mammalian skin, T. S. mammalian liver, kidney, stomach, intestine, bone, spinal cord, lung, duodenum, pancreas, testis and ovary.

IV. Study of Museum Specimens: *Ascidia*, *Ciona*, *Botryllus*, Ammocoete larva, *Petromyzon*, *Myxine* or *Bdellostoma*, *Zygaena (Sphyrna)*, *Torpedo*, *Chimaera*; *Acipenser*, *Amia* or *Lepidosteus*, *Labeo*, *Clarias*, *Anguilla*, *Hippocampus*, *Exocoetus*, *Echeneis*, any flat-fish, Protopterus, *Ichthyophis* or any blind-worm, *Proteus*, *Ambystoma*, Axolotl, Siren, *Alytes*, *Hyla*, *Testudo*, *Chelone*, and Fresh Water Tortoise, *Sphenodon*, *Hemidactylus*, *Phrynosoma*, *Draco*, *Chameleon*; *Eryx*, *Hydrophis*, *Naja*, *Viper*, *Crocodilus*, *Alligator*, *Archaeopteryx*, any Running Bird, *Pavo cristatus*, *Choriotis nigriceps*, *Ornithorhynchus*, *Tachyglossus*, *Didelphys*, *Macropus*, Bat, *Loris*, Scaly anteater.

V. Osteology: A comparative study of articulated and disarticulated bones of skull, vertebrae, limb bones and girdles of any amphibian, reptile, bird and mammal with the help of models/ charts/ artificial skeleton/bones.

VI. Environmental Biology:

Analysis of Environment:

1. Soil pH
2. Water analysis: pH, alkalinity, acidity, dissolved O₂ and free CO₂, Salinity (Chloride).
3. Qualitative estimation of zoo-plankton in given sample of water.

VII. Ethology:

1. Study of any stored insect pest (food preference and response to light)
2. Antennal grooming in cockroach.
3. Chemical communication: Ants/earthworm.
4. Visit to a Zoo/ Museum of Natural History /Wild life Sanctuary and/or Study of local faunal biodiversity (Candidates are expected to submit a detailed report of such visit).

VIII. Biostatistics:

1. Construction of frequency table, bar diagram, line diagram, histogram, frequency polygon and pie chart.
2. Exercises on mean, median and mode (direct, short –cut and step-deviation methods).
3. Standard deviation and standard error.

B.Sc. Part - III**Scheme of Practical Examination and Distribution of Marks****Time: 4 Hrs.****Min Pass Marks: 18****Max. Marks: 50**

	Regular	Ex. /N.C. Students
1. Anatomy	6 (4+2)	7 (5+2)
2. Permanent Preparation	5	6
3. Environmental Biology	5	5
4. Ethology	3	5
5. Biostatistics	5	6
6. Identification and comments on Spots (1 to 8)	16	16
7. Viva Voce	5	5
8. Class Record	5	-
	50	50

Notes:

1. With reference to anatomy and study of museum specimens, candidates must be well versed in the study of various systems with the help of charts/models/CD- ROMs, multimedia computer based simulations including computer assisted learning (CAL) and other softwares.
2. With reference to permanent preparations and microscopic slides, in case of non-availability, the exercise should be substituted with diagrams, photographs, models, charts, etc.
3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
4. The candidates may be asked to write detailed methodology wherever necessary and separate marks may be allocated for the same.
5. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.
6. It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.

Recommended Books:

1. Ahsan J and Sinha SP: A Hand book on Economic Zoology. 9th edition S. Chand & Co. Ltd., 1981.
2. Alcock J: Animal Behavior: An Evolutionary Approach. Sinauer Associates 2013.
3. Animal Societies and Evolution. Scientific American Publications.
4. Alexander R. M: The Chordates, Cambridge University Press. 1975.
5. Bailey NTJ: Statistical Methods in Biology. English Universities Press, 1964.
6. Breed MD and Moore J: Animal Behavior. Academic Press. 2015.
7. Grizimek's Encyclopedia of Ethology.
8. Gurumani N: An Introduction to Biostatistics. MJP Publishers, 2011.
9. Hand book of Ethological Method. Laharen Publications Garland STPM Press.
10. Kotpal RL: Modern Text Book of Zoology: Vertebrates. Global Media Publications 2010.
11. MacFarland D: Animal Behavior: Psychobiology, Ethology and Evolution 3rd edition Longman 1998.
12. Mahajan BK: Methods in Biostatistics. 7th edition Jaypee Publishers, 2010.
13. Manning A, Dawkins MS: An Introduction to Animal Behavior. Cambridge University Press 2012.
14. Mathur R: Animal Behavior. Rastogi Publications 2010.
15. Odum: Fundamentals of Ecology. Thomson Books/Cole 2005.
16. Odum: Ecology: A Bridge Between Science and Society Sinauer Associates 1997.
17. Prasad SN and Kashyap V: A Textbook of Vertebrate Zoology. 13th edition Wiley Eastern Ltd. 2011.
18. Primrose S. B. and Twyman R. M: Principles of Gene Manipulation and Genomics. John Wiley & Sons, 2013.
19. Rana S. V. S: Environmental Studies. 4th edition. Rastogi Publications 2012.
20. Rastogi VB Organic Evolution 6th edition Kedar Nath Ram Nath Publications, Meerut, Delhi. 1993.
21. Rastogi VB and Jayaraj MS Animal Ecology & Distribution of Animals Kedar Nath Ram Nath Publications, Meerut, Delhi, 1983.
22. Sharma P. D: Environmental Biology and Toxicology. 3rd edition Rastogi Publications, 2013
23. Sunder Rao PSS and Richard J: Introduction to Biostatistics and Research Methods .PHI Publishers, 2012.
24. Sharma P. D: Ecology and Environment. 12th revised edition, Rastogi Publications 2014-2015.
25. Werlace RA: Animal Behavior. Good Year Publishing Co., Inc.
26. Young JZ: The Life of Mammals. Oxford University Press 1970.
27. Young JZ: The life of Vertebrates. 2nd edition Oxford University Press. London 1962.

BOTANY
B. Sc. Part III (Pass Course Syllabus)

Scheme

Min. Pass Marks : 36

Paper I

3 hrs. duration

Max Marks: 100

Max. Marks 33

Paper II

3 hrs. duration

Max. Marks 33

Paper III

3 hrs. duration

Max. Marks 34

Practical Min. Marks: 18

4 hrs, duration

Max. Marks 50

3 hours

4 hours

Duration of examination of each theory paper-

Duration of examination of practicals-

Note:

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only.
2. Q.No. will have 20 very short answer type Questions(not more than 20 words) of half marks each covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

Paper I

PLANT MORPHOLOGY AND ANATOMY

(2 hrs /week)

Unit-1

The basic body plan of flowering plant-modular type of growth. Diversity of Plant form in annuals, biennials and perennials; branching pattern; monopodial and sympodial growth; canopy architecture; meristematic, simple, complex and secretory tissues, tissue systems.

Unit-2

The Shoot system: The shoot apical meristem and its histological organization; vascularisation of primary shoot in monocotyledons and dicotyledons; cambium and its functions; formation of secondary xylem; a general account of wood structure growth rings; sapwood and heartwood; secondary phloem-structure and function; periderm. Anomalous secondary growth.

Unit-3

The Leaf; origin, development, arrangement and diversity in size and shape; Stomata-Structure and types, stomatal index, vascularisation of leaf-nodal structure and venation. Senescence and abscission.

The root system: Root apical meristem; differentiation of primary and secondary tissues and their functions; structural modification for storage, respiration, reproduction and root- microbe interaction.

Unit-4

Morphology and anatomy of seed (monocotyledons and dicotyledons). Significance of seed-suspended animation; dispersal strategies. Vegetative propagation.

Suggested readings :

Cutter, E.G. 1969. Part I Cells and Tissues. Edward Arnold, London.

Cutter, E.G. 1971. Plant Anatomy : Experiment and interpretation, part-II, organs. Educated Arnold; London.

Esau, K. 1977. Anatomy of Seed Plants, 2nd edition, John Wiley & Sons, New York.

Fahn, A. 1985. Plant Anatomy, Pergamon Press, Oxford.

Hartman, H.T. and Kestler, D.E. 1976. Plant Preparation : Principles and of India Pvt. Ltd., New Delhi.

Manseth, J.D. 1988. Plant Anatomy. The Benjamin/Cummings Publishing Co. Inc. Menlo Park, California. USA.

Raven, P.M. Evert, R.F. and Eichlen, S.E. 1999. *Biology of Plants*, W.H. Freeman and Co. Worth Publishers, New York.

Thomas, P. 2000. *Trees Their National History*. Cambridge University Press, Cambridge.

Suggested Laboratory Exercises:

1. Study of any commonly occurring dicotyledonous plant to understand the body plan and modular type of growth.
2. Life forms exhibited by flowering plants (by visit to a forest or a garden).
3. L.S. of shoot tip to study the organization of meristem and origin of leaf primordia.
4. Monopodial and sympodial types of branching in monocots & dicots.
5. Anatomy of primary and secondary growth in monocots and dicots using hand out sections of sunflower, maize, cucurbit stem and roots.
6. Anomalous secondary growth in stem: *Salvadora*, *Bignonia*, *Bougainvillea*, *Bauhinia*, *Nyctanthes*, *Leptadenia*, *Dracena*.
7. Study of diversity in leaf shape and size. Internal structure of leaf-Dorsiventral and isobilateral leaves; study of stomatal types.
8. Examination of seed (monocot and dicot). Structure, seed viability test.
9. Specimen study of modifications of plant parts for Vegetative reproduction.

Paper-II
Ecology & Economic Botany
(2 hrs /week)

Unit-1

Plants and Environment: Atmosphere (four distinct zone viz, stratosphere, troposphere, mesosphere and thermosphere). Adaptation (Morphological, anatomical and physiological responses) of plants to water (Hydrophytes and Xerophytes).

Light (global radiation, photosynthetically active radiation. Zonation in water body: littoral, limnetic and profundal zones; photoperiodism, heliophytes and sciophytes)

Temperature (Raunkier's classification of plants: megatherm, mesotherm, microtherm, heikistotherm; themoperiodicity and vernalisation).

Soil (soil profile, development-weathering and maturation). Soil texture, soil types, role of pH, organic matter, soil water, soil nutrients. Interactions among organisms (neutralism, amensalism, allelopathy), competition, predation, parasitism, protocoeperation, mutualism. Environmental protection act.

Unit-2

Community, Ecosystem and Phytogeography: Community characteristics: stratification, life forms and biological spectrum, frequency density and cover. Ecological succession: types (primary and secondary) mechanism nudation, migration, ecesis, reaction and climax: xerosere, hydrosere,

Ecosystems: Structure-abiotic and biotic components, trophic level, food chain, food web, ecological pyramids, energy flow (Box and Pipe model of Odum). Biogeochemical cycles of carbon, and phosphorus, Vegetation types of Rajasthan, Endangered plants of Rajasthan.

Unit-3

Basic concept of center of origin of cultivated plants. Food plants-rice, wheat, maize, potato, sugarcane. Vegetables : General account with a note on radish, onion, garlic, cabbage, spinach, cauliflower, cucumber, tomato, lady finger and pea. Fruits: General account with a note on apple, banana, ber, mango, mulberry, jamun, watermelon, muskmelon, guava and orange. Vegetable oil: groundnut, mustard and coconut.

Unit-4

Spices: General account with an emphasis on those cultivated in Rajasthan

(*Cumin, Capsicum, Coriander*). Beverages: Tea and coffee. Medicinal plants: General accounts with an emphasis on plant species cultivated in Rajasthan (*Senna, Isabgol, Safedmusli*). Fibers: Cotton and jute. Wood: General account of sources of firewood, timber and bamboos; Rubber. Ethnobotany: a general account.

Practical Exercises:

1. Study frequency and density, abundance of plant species of campus vegetation by quadrat method.
2. Variation in soil moisture in relation to depth.
3. To estimate bulk density of grassland and woodland soil.
4. To estimate the porosity of grassland and woodland soil sample.
5. To determine moisture content of grassland and woodland soil.
6. To measure dissolved oxygen content in polluted and unpolluted water samples.
7. To measure temperature of different water bodies.
8. Water holding capacity of the soil.
9. Find out pH of soil sample by Universal Indicator method.
10. Find out pH of water sample by pH meter.
11. Find out transparency of a waterbody by Secchi disk.
12. Study morphology (external and internal) of hydrophytes (*Hydrilla* stem, *Typha* leaf and *Nymphaea/Eichhornia* petiole) and xerophytes (*Calotropis, Capparis* and *Casuarina* stem, *Nerium* leaf) with special reference to their adaptations.
13. Study following specimen with special reference to:
 1. Botany of the economically important part.
 2. Processing, if any involved.
 3. Specimen of cereals, pulses, spices beverage (tea & coffee) beans, sugar, oil seeds (mustard, groundnut).
14. Study of starch grain in potato and pea. Histochemical test Cellulose, lignin, starch, fat, protein and tannin.
15. Submit 5 specimens of locally important medicinal plants.

Paper-III
Angiosperm- Taxonomy and Embryology
(2 hrs /week)

Unit-1

Introduction of Taxonomy, Units of classification, Concept of genus and species. Botanical Nomenclature, International Code of Botanical Nomenclature.

Taxonomic literature: Floras, Gardens, Herbaria, Monographs, Icones, Library.

Types of systems of Classification: Bentham and Hooker's, Engler and Prantle's system.

Diversity of flowering plants illustrated by members and economic importance of the following families: Ranunculaceae, Brassicaceae, Papaveraceae, Malvaceae, Fabaceae, Caryophyllaceae and Apiaceae.

Unit-2

Rubiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Solanaceae, Acanthaceae, Lamiaceae, Chenopodiaceae, Euphorbiaceae, Liliaceae, Arecaceae and Poaceae.

Unit-3

Ontogeny of the flower parts-development and variations. Structure of anther, microsporogenesis, Tapetum types and functions, development of male gametophyte, structure of pollen grains.

Types of ovule, Megasporogenesis, development of female gametophyte(Embryosac). Pollination, Pollination types, Fertilization, double fertilization, significance of double fertilization.

Unit-4

Development of dicot and monocot embryo. Formation of embryo. Types of Embryo. Endosperm, Types of Endosperm, Endosperm haustoria, Polyembryony, Induced polyembryony, Parthenocarpy, Apomixis and adventive embryony.

Suggested Laboratory Exercises

(A) Taxonomy:

(I) The following genera are suitable for study of families:

1. Ranunculaceae-*Ranunculus*, *Delphinium*.
2. Fabaceae-*Pisum sativum*, *Cassia* and *Acacia*.
3. Apiaceae:*Coriandrum*
4. Convolvulaceae-*Ipomea*, *Jacquemontia*.
5. Apocynaceae-*Catharanthus*, *Thevetia*
6. - Asclepiadaceae-*Calotropis*.
7. Lamiaceae-*Ocimum*, *Salvia*.
8. Euphorbiaceae-*Euphorbia pulcherrima*, *Ricinus*.
9. Acanthaceae-*Adhatoda*.
10. Asteraceae-*Helianthus*
11. Rubiaceae-*Hamelia*
12. Poaceae-*Triticum*

(II) Types of Inflorescence and Fruits:

(III) Embryology

1. T. S. of anther, to study the wall layers and pollen sac with pollen grains.
2. Study the various types of ovule, draw the diagrams.
3. Study the various types of placentations.
4. Study the germination of pollen grain *in situ* and observe the path of pollen tube.
5. Study of various stages of embryo (*Raphanus* fruit)

Suggested Readings:

1. Taxonomy of Angiosperms-V.N. Nair (1995) TMH Publishing Company Limited, New Delhi

o. l. t. a.

2. Introduction to the Principles of Plant Taxonomy V.V.Sivarajan (1984) Oxford & IBH Publishing Co. Pvt.Ltd., New Delhi.
3. Plant Taxonomy-SushellaM.Das (2003) Dominant Publishers and Distributors, New Delhi.
4. Plant systematics. Gurcharan Singh (2001) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Trivedi, P.C.: N. Sharma and J.L. Sharma (2003) Structure, Development and Reproduction in Flowering Plants. Ramesh Book Depot, Jaipur.
6. Bhojwani, S.S. and Bhatnagar, S.P. (2000) The embryology of Angiosperms 4th Edition Vikas Publishing House, New Delhi.
7. An Introduction to the Embryology of Angiosperm. Maheshwari, P.(1950) New Delhi.
8. Recent Advances in the Embryology of Angiosperms. Ed. Maheshwari, P.(1963) New Delhi.

BOTANY PRACTICAL EXAMINATION B.Sc PART-III**SKELETON PAPER****M.M. 50****TIME: 4 Hours**

S.No.	Practical	Regular	Ex/NC
1	(a)Plant Taxonomy Describe vegetative and reproductive parts of flower in semi-technical language.Give floral diagram and floral formula and Identify the family giving reasons. (b)Comment on the embryological exercise.	7 3	7 3
2	(a). Anatomical exercise on anomalous secondary growth. (b). Anatomy of root/leaf/study of stomatal types	5 5	5 5
3	(a) Ecological exercise based on quadrat method/Exercise related to soil (b) Ecological Anatomy (c)Histochemical Test / Economic Botany	3 4 3	3 4 3
4	Comment upon spots (1-5).	10	15
5	Viva- Voce	5	5
6	Practical record	5	-
	TOTAL	50	50

5. Geology

Scheme :
Min. Pass Marks : 36
Paper-I : Stratigraphy and geology of India :
Paper-II : Economic Geology & Mineral Economics :

Max. Marks : 100

Marks : 50

Marks : 50

Marks : 50

Practical Marks : 50

PAPER-I : Stratigraphy and Geology of India

Section-A

Stratigraphy and its relation with other branches, aims and principles of stratigraphy, environment of deposition facies, Lithology, Homotaxis and contemporaneity.

Standard stratigraphical scale.

Imperfection in geological records, principles of correlation.

Palaeogeography of India in Permo-carboniferous period, Physiographic subdivisions of India.

Stratigraphical divisions in India and their equivalents.

Section-B

Stratigraphy, distribution, lithology, structure, correlation and Mineral riches of the following: Archaeans, cuddaphs and the Vindhya with special reference to Rajasthan.

Distribution, succession, climate, sedimentation, correlation, fossil content and mineral resources of the Gondwana Supergroup.

Section-C

Triassic Period : Triassic of Spiti—lithology, succession and fossil content.

Jurassic Period : Jurassic of Kachchh, Western Rajasthan—Bagh Beds and Lameta Ghat Series—lithology, succession and fossil content.

Deccan traps—origin, composition, distribution and age; Intertrappean beds—succession, lithology fossils content and distribution.

Tertiary Period : Subdivisions, lithology, distribution, succession, and fossils.

Sivalik Supergroup—distribution, lithology, depositional environment and fossils; typical vertebrate fossils.

Pleistocene of Assam. Peninsular India and Kashmir Pleistocene and Recent glaciation.

Tectonic frame work of India.

Practical

Neat drawing of the standard stratigraphical scale, showing against each division or division of the typical lithographic units, the type fossils, the faunal assemblages, their population and ranges etc.

Syllabus : B.Sc. Part-III.

Neat drawings of the paleogeographical maps of India during Permo- Carboniferous period. Plotting of various geological formation in outline map of India.

Neat drawing of the structural and tectonic map of India.

Identification and description of the following rocks; Banded Hematite, Quartzite, Khondalite, Charnockite, Gondite, Vindhyan Sandstone, Products Limestone, Barakar Sandstone, Golden Oolite, Dhosa Oolite, Nummulitic Limestone, Fenestella Shale, Gondwana Shales with plant impressions.

PAPER-II : Economic Geology and Mineral Economics

Note : The paper will contain nine questions having three questions in each section. Candidates are required to attempt five questions in all, selecting at least one question from each section.

Section-A

Economic Geology and its relationship with various branches of Geology, Magma and its relationship with mineral deposits, Ore and gangue minerals. Historical development of Economic Geology, Processes, of Mineral formation : Magmatic, Hydrothermal, Contact metasomatic, Evaporation, Oxidation and supergene enrichment, Sedimentation, Mechanical concentration, Residual concentration and Metamorphism.

Section-B

Classification of mineral deposits : outlines of Lindgren's and Bateman's classification, Important ores, Composition physical properties, mode of occurrence, association, origin, distribution in India & uses of the following metals, gold, silver, copper, lead iron, manganese, chromium and aluminum. Examples from Indian stratigraphic record. Environmental implications of exploitation of mineral resources.

Section-C

Important industrial minerals : Mode of occurrence, physical properties, chemical composition and distribution in India—Refractory, Abrasives, Ceramics, Cement, Gemstones, Glass, Paint, and Fertilizers.

Coal, petroleum and radioactive minerals : their occurrences, distribution and origin-oil traps.

Building stones : characters, distribution and mode of occurrence.

University of Rajasthan

Mineral wealth of Rajasthan.

Strategic, Critical & essential minerals; National Mineral policy; Conservation and substitution.

Mineral concession rules; marine mineral resources; and Law of Sea.

Practical

Drawing of neat diagram depicting the following :

(a) Gossan Oxidation zone and supergene enrichment zone.

(b) Structural traps for oil accumulations.

(c) Stratigraphical trap for oil accumulation.

Systematic study, identification, description, mode of occurrences and uses of the following minerals -

Haematite, magnetite, limonite, siderite, pyrites, pyrrhotite, pyrolusite, psilomilane, chromite, ilmenite, wolframite, chalcophyrite, Cuprite, malachite, azurite, galena, sphalerite, cassiterite. Magnesite, bauxite, beryl, realgar, orpiment, stibnite, molybanite, cinabar, barite, Pitchbende, asbestos, muscovite, graphite, sillimanite, Kyanite, zircon, clays, garnet, corundum, gypsum, talc, apatite, rock phosphate, calcite, coal and its varieties.

In an outline map of India plotting of occurrence of the following minerals :

Copper ore, Pb-Zn Ag ore, Chrome ore, Manganese ore, Aluminum ore, Atomic minerals, rock-phosphate, Mica, diamond, Iron, ore, coal, Gold :

Distribution of important minerals in the outline map in Rajasthan. Plane table and chain survey.

Field training : Field work for at least 10 days duration at the places of geological interest pertaining to the theory papers in the states of Rajasthan/Gujarat/Madhya Pradesh and report thereon along with the submission of field specimens.

Book Recommended :

1. Batman, A.M. : Introduction to economic mineral deposits.
2. Wadia, M.D. : Minerals of India, Book Trust of Publ.
3. Rao, T.C. and Gokhle, K.V.G.K. : Ore deposits of India, their distribution and processing.
4. Krishna Swamy, S. : India's Economic Oxford & I.B.H. Publishing Co., New Delhi.

6. MATHEMATICS

B.Sc. Part III

Teaching : 3 Hours per Week per Theory Paper.

Examination Scheme :

Min.Pass Marks			Max. Marks
Science – 54			150
Arts – 72			200
		Duration	Max.Marks
Paper – I	Algebra	3 hrs.	40 (Science) 53 (Arts)
Paper – II	Complex Analysis	3 hrs.	40 (Science) 53 (Arts)
Paper – III	Mechanics	3 hrs.	40 (Science) 54 (Arts)
Practical		2 hrs.	30 (Science) 40 (Arts)

Note:

1. Common paper will be set for both the Faculties of Social Science and Science. However, the marks obtained by the candidate in the case of Faculty of Social Science will be converted according to the ratio of the maximum marks of the papers in the two Faculties.
2. Each candidate is required to appear in the Practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University and internal examiner will be appointed by the Principal in consultation with Local Head/Head, Department of Mathematics in the college.
3. An Internal/external examiner can conduct Practical Examination of not more than 100 (Hundred) Candidates (20 Candidates in one batch).
4. Each candidate has to pass in Theory and Practical examinations separately.

Paper -I : Algebra

Teaching : 3 Hours per Week

Duration of Examination : 3 Hours

**Max. Marks: 40 (Science)
53(Arts)**

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE Question from each Unit. All questions carry equal marks.

Unit 1: Definition and simple properties of Groups and Subgroups. Permutation group, Cyclic group. Cosets, Lagrange's theorem on the order of subgroups of a finite order group.

Unit 2: Morphism of groups, Cayley's theorem. Normal subgroups and Quotient groups. Fundamental theorems of Isomorphism.

Unit 3: Definition and simple properties of Rings and Subrings. Morphism of rings. Embedding of a ring, Integral domain and field. Characteristics of a Ring and Field.

Unit 4: Ideals and Quotient Ring. Maximal ideal and Prime ideal. Principal Ideal domain. Field of quotients of an integral domain. Prime fields. Definition, Examples and Simple properties of Vector spaces and Subspaces.

Unit 5: Linear combination, Linear dependence and Linear independence of vectors. Basis and Dimension. Generation of subspaces. Sum of subspaces. Direct sum and Complement of subspaces. Quotient space and its dimension.

Reference Books:

1. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House, New Delhi, 1999.(IX Edition 2010).
2. S Lang, Introduction to Linear Algebra (2nd edition), Springer, 2005.
3. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.
4. S. Kumaresan, Linear Algebra- A Geometric Approach, Prentice Hall of India, 1999.
5. Kenneth Hoffman, Ray Alden Kunze, Linear Algebra 2nd Ed., Prentice-Hall Of India Pvt. Limited, 1971.

Paper – II: Complex Analysis

Teaching : 3 Hours per Week

Duration of Examination : 3 Hours

Max. Marks: 40 (Science)

53 (Arts)

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Complex plane. Connected and Compact sets. Curves and Regions in complex plane. Jordan curve Theorem (statement only). Extended complex plane. Stereographic projection. Complex valued function – Limits, Continuity and Differentiability. Analytic functions, Cauchy-Riemann equations (Cartesian and polar form). Harmonic functions, Construction of an analytic function.

Unit 2: Complex integration, Complex line integrals, Cauchy integral theorem, Indefinite integral, Fundamental theorem of integral calculus for complex functions. Cauchy integral formula, Analyticity of the derivative of an analytic function, Morera's theorem, Poisson integral formula, Liouville's theorem.

Unit 3: Taylor's theorem. Laurent's theorem. Maximum modulus theorem.

Power series – Absolute convergence, Abel's theorem, Cauchy-Hadamard theorem, Circle and Radius of convergence, Analyticity of the sum function of a power series.

Unit 4: Singularities of an analytic function, Branch point, Meromorphic and Entire functions, Riemann's theorem, Casorati-Weierstrass theorem.

Residue at a singularity, Cauchy's residue theorem. Argument principle. Rouché's theorem. Fundamental theorem of Algebra.

Unit 5: Conformal mapping. Bilinear transformation and its properties. Elementary mappings: $w(z) = \frac{1}{2} \left(z + \frac{1}{z} \right)$, z^2 , e^z , $\sin z$, $\cos z$, and $\log z$.

Evaluation of a real definite integral by contour integration.

Analytic continuation. Power series method of analytic continuation.

Reference Books:

1. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications (Eighth Edition), McGraw – Hill International Edition, 2009.
2. Joseph Bak and Donald J. Newman, Complex analysis (2nd Edition), Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.

Paper – III: Mechanics

Teaching : 3 Hours per Week

Duration of Examination : 3 Hours

Max. Marks: 40 (Science)

54 (Arts)

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Velocity and acceleration – along radial and transverse directions, along tangential and normal directions. S.H.M., Hooke's law, motion along horizontal and vertical elastic strings.

Unit 2: Motion in resisting medium– Resistance varies as velocity and square of velocity. Work and Energy. Motion on a smooth curve in a vertical plane. Motion on the inside and outside of a smooth vertical circle. Projectile.

Unit 3: Central orbits – p-r equations, Apses, Time in an orbit, Kepler's law of planetary motion. Moment of inertia – M.I. of rods, Circular rings, Circular disks, Solid and Hollow spheres, Rectangular lamina, Ellipse and Triangle. Theorem of parallel axis. Product of inertia.

Unit 4: Equilibrium of coplanar force, moments and friction.

Unit-5: Virtual work and Catenary.

Reference Books :

1. I.H. Shames and G. Krishna Mohan Rao, Engineering Mechanics: Statics and Dynamics (4th Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2009.
2. R.C. Hibbeler and Ashok Gupta, Engineering Mechanics: Statics and Dynamics (11th Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi.
3. S.L. Loney - An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies, Kalyani Publishers, New Delhi.
4. J.L. Synge & B.A. Griffith - Principles of Mechanics, Tata McGraw-Hill, 1959.

Practical

Teaching: 2 hours per week per batch not more than 20 students.

Examination:

Duration: 2 Hours

Scheme	Science	Arts
Max.Marks	30	40
Min.Pass Marks	11	15

Distribution of Marks:

Two Practicals one from each group

10 Marks each	=	20 Marks	(13 Marks each)	26
Practical Record	=	05 Marks		07
Viva-voce	=	05 Marks		07
Total Marks	=	30 Marks		40

The paper will contain TWO practicals. The candidates are required to attempt both practicals.

Practicals with Computer Programming in C Language.

Group A:

1. Solution of algebraic and transcendental equations by Bisection method, Regula-falsi method and Newton-Raphson method.
2. Solution of Initial value problems by Euler's method and Runge-Kutta(third and fourth order) method.

Group B:

1. Matrix operations: addition, subtraction, multiplication, Rank of a matrix, inverse of a matrix.
2. Solution of linear algebraic equations by Gauss elimination method, Matrix method, Gauss Jordan method.

Note:

1. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record.
2. Each Candidate has to pass in Practical and Theory examinations separately.

7. ECONOMICS

B.Sc. Part III

Scheme:	Min. Pass Marks	Max. Marks
Arts	72	200
Science	54	150
Paper-I	3 hours duration	Arts 100 Science 75
Paper- II	3 hours duration	Arts 100 Science 75

Note:

1. There shall be two papers in each class. Each paper shall have 3 questions from every unit. In Addition to these nine questions (3 questions for each unit) there shall be one multiple choice/objective type/ short answer question in each of the two papers
This question shall be compulsory.
2. The student shall be required to attempt five questions in all in each paper selecting atleast one question from each unit and one compulsory multiple choice/objective type/ short answer question
3. The multiple choice/ objective type\short answer questions shall consist of 20 questions in B.A. Examination and 15 questions in B. Sc. Examination of one mark each.

ECONOMICS

Note: There will be two papers of Economics. Each paper shall consist of three parts. Part A shall contain question No.1 consisting of very shot type –X (Ten) question. The candidate is required to answer each question in 20 words. Part –B shall contain question No 2 consisting of V (five) questions. The candidate is required to answer each question in 100 words. Part C shall contain three essay type questions (one from each section) with internal choice.

A candidate will be required to attempt five questions in all. All questions of part A and part B are compulsory while rest 3 questions are to be attempted from parts C selecting one question from each section. All question carry equal marks.

Paper 1: Introduction To International Trade, Development And Public Economics

Section – A

Features of International Trade, Gains from Trade. Trade Theories: Adam Smith, Ricardo, Harberler, Mill and H O Theory (Elementary treatment). Free Trade and Protection, foreign Exchange Market and Exchange Rate. Balance of Trade And Finance of payment: Definition And Structure, International Monetary Fund, WTO scope and Impact.

Section –B

Economic Growth and Development: Factors affecting Economic Growth, Measures of Development , Lewis Theory of Unlimited Supply of Labor, Balanced V/S Unbalanced Growth Model, Harrod Domer and Solow Models, Concept of Poverty and Inequality. International Bank for Reconstruction and Development, Asian Development bank.

Section – C

Nature and Scope of Public Finance. Role of Government in the Economy. Public Goods and Private Goods. Theory of Maximum Social Advantage, Optimal Budgeting. Public Revenue: Canons of Taxation, Impact, Incidence and Shifting of Taxation. Direct and Indirect Taxation, GST, Public Expenditure: Canons of Public Expenditure, Classification and Effects on Production and Distribution. Public Debt: Meaning Objectives and Burden Theories. Fiscal Policy: Meaning, Objectives and Anti-Inflationary Policy.

Books Recommended :

1. R.N Musgrave and P.B Musgrave. Public Finance in Theory & Practice, McGraw Hill Publication.
2. S. Ganguly, Public Finance, The World Press Pvt. Ltd.
3. H.L. Bhatia, Public Finance, Vikas Publishing House Pvt. Ltd.
4. John Callas and Philip Jones, Public Finance and Public Choices, Oxford University Press.
5. D. Salvatore: International Economics.
6. K.C Rana And K.N Verma: International Economics. (Hindi/English Edition)
7. B.O. Souderton & G. Reed: International Economics.
8. Michael P. Todaro, Economic development, Macmillan.
9. A.P Thirlwal, Growth and Development, Macmillan.
10. Debraj Ray, Development Economics, Oxford University Press.
11. S.k. Misra and V.K Puri, Economics of Development and Planning Theory Himalya Publishing House.

Paper –II (a): Application of Mathematics in Economics

Section – A

Differential Calculus and integral Calculus: Application in Economics: Matrix and Determinants: Solution of Simultaneous Equations: Mixima and Minima: Convexity and Concavity.

Theory of Consumer Behaviour Nature of a Utility function: Properties of an Indifference Curve. Maximization of Utility. Demand Functions. Ordinary and Compensated, Price and Income Elasticity, Elasticity Relation in demand Analysis, Slutsky Equation in two Commodity Case, Elasticity Form and Important Results: Income and Leisure – Derivation of Labour Supply Function and its Properties.

Section –B

Theory of firm: Production Function- Properties of a Well Behaved and Homogenous Production Functions- Cobb- Douglas and CES Production Functions: Product Curves: Output Elasticity of Factor input; Properties of an Isoquant; Elasticity of Substitution of a Homogeneous Production Function –Linearly Homogeneous and Cobb-Douglas Production Functions : Optimization Behaviour of a Firm – Constrained Cost Minimization, Constrained Output Maximization and Profit Maximization; Input Demand Functions Properties and Derivation of Producer's Input Demand functions ; Cost Functions- Properties and Derivation of Short Run and Long Run Cost functions; Consumer's and Producer's Surplus.

Section-C

Linear Programming: Graphical and Simplex Method (Maximization Problem Only): Input Output Analysis: Concepts of Static, Dynamic, Closed and Open Input – Output Models, Hawkins-Simon Conditions of Viability, Determination of Gross Output, and Value Added in Open Input –Output Model; Theory of Games: Two-person Constant Sum Games, Zero-Sum Game, Maximin and Minimax, Dominant Strategies and Saddle Point Solution; First Order Difference Equation- Cobweb Model.

Note: Use of Non-programmable Calculator is permitted

Books Recommended :

1. J.M. Henderson and R.L. Quandt: Micro Economic Theory: A Mathematical Approach, McGraw- Hill London.
2. RGD Allen. Mathematical Economics, McMillan
3. B.C. Mehta: Mathematical Economics: Micro Economic Models, Sultan Chand & Sons, New Delhi.
4. Alpha C Chiang: Fundamental Methods of Mathematical Economics. McGraw-Hill, Kagakusha. Tokyo.

Paper- II (b): Environmental Economics

Section –A

Environmental Economics: An Introduction; Review of Microeconomics and Welfare Economics; The Theory of Externalities: Pareto Optimality and Market Failure in the Presence of Externalities; Property Rights and the Coase Theorem; Sustainable Development: Concepts and Measurement.

Section-B

Development and Environment: The Environment Kuznets Curve; Trade and Environment; Environmental Problems; Trans-boundary Environmental Problems: Global Warming and Climate Change; Methods of Environment Valuation: Hedonic Pricing, Contingent Valuation Method and Travel Cost Method.

Section-C

International Environmental Policy: Conventions and Treaties, UN Effort to Protect the Environment, Stockholm, Rio, Johansberg, Agenda 21, OECD Environmental Committee Report, Kyoto, Convention on Biodiversity, Paris Climatic Conventions; Environmental Governance in India; WTO and Environment.

Recommended Books:

1. Charles Kolstad, Intermediate Environmental Economics, Oxford University Press. 2nd Edition, 2010
2. Robert N. Stavins (ed.), Economics of the Environment: selected Readings, W.W.Norton, 5th edition, 2005.
3. Roger Perman, Yue Ma, James McGilvray and Michael Common, Natural Resource and Environmental Economics, Pearson Education/ Addison Wesley, 3rd edition, 2003.
4. Maureen L. Cropper and Wallace E. Oates, 1992, "Environmental Economics: A Survey", Journal of Economic Literature, Volume 30, pp. 675-740.

Paper-II (C): Economy of Rajasthan

Section-A

Position of Rajasthan in Indian Economy: Population, Area, Agriculture, Industry and Infrastructure. Population: Size and Growth, District Wise Distribution of Rural and Urban Population, Demographic Features, Occupational Structure and Human Resource Development (Literacy, Health and Nutrition Indicators). Natural Resources Endowments: Land, Water, Livestock and Wild Life, Minerals and Mineral Policy of the State. State Domestic Product: trends and Composition. Agriculture: land Reforms, Land Utilization, Cropping Pattern, Production and Productivity, Agriculture Finance, Marketing and Insurance, Importance of Livestock and Animal Husbandry, Dairy Development Programmes, Famines and Droughts in Rajasthan.

Section-B

Infrastructure in the State (Irrigation, Power, Road), Industrial Development of the State (Agricultural and Mineral Based Industries, Small Scale and Cottage Industries, Export Based Units, Rajasthan Handicrafts). Growth Centres and Development of Industrial areas. Enterprises in Rajasthan. Role of Different Corporations in Industrial Development (RIICO, RFC & RAJSICO), Industrial Finance, Service Sector: Education, Health, Tourism Development in Rajasthan.

Section-C

Economic Planning and Development in Rajasthan. Constraints in The Economic Development of Rajasthan. Special Area Development Programmes in Rajasthan. Woman Empowerment and Child Development. Problems of Poverty and Unemployment in Rajasthan. Panchayati Raj and Rural Development in Rajasthan. Budgetary Trends in Rajasthan. Centre State Financial Relations.

Books Recommended:

1. Economic Review, Directorate of Economics And Statistics, Department of Planning, Rajasthan Jaipur. (Hindi & English.)
2. Statistical Abstract Directorate Of Economics And Statistics. Department of Planning, Rajasthan Jaipur.
3. लक्ष्मीनारायण नाथूराम का राजस्थान की अर्थव्यवस्था, रमेश बुक डिपो, जयपुर।

B. Geography.

Scheme of Examination

Faculty	Min. Pass Mars	Max. Marks
Arts/Social Science	72	200
Science	54	150
Paper I	World Regional Geography	Arts 75 Science 50
Paper II	Geography of India	Arts 75 Science 50
Practical	18	Arts 50 Science 50

Notes

1. Students are permitted to use the stencils, simple calculator and log tables wherever needed in both theory and practical examinations.
2. There will be a common paper for Arts and Science.
3. Q.1 will be compulsory and will cover the entire course of the paper.
Q.No. 1 of 20% marks of the maximum marks be set in two parts.
 - (a) Part (a) will have ten items for locating on a map (to be supplied by examination centre) carrying 10% marks of the maximum marks and candidates shall attempt any five items.
 - (b) Part (b) will have 10 short answer questions carrying 10% marks of the maximum marks and candidates shall attempt any five items.
4. Remaining 9 questions carrying equal marks will be set with three questions from each section of the syllabus.
5. Candidate will attempt 5 questions in all including question No. 1 selecting at least one question from each section.
6. Practical examination will be conducted by the board of examiners.
7. The candidate will have to pass in theory and practical separately.
8. The non-collegiate candidates will have to attend a practical training camp of 48 hours at a college affiliated to the University of Rajasthan, Jaipur notified by the University from time to time in which Geography subject is taught on payment of fee fixed by the University. The candidates appearing at examination from any examination centre located in Jaipur City will attend the practical camp at the University Post Graduate Department on payment of fee fixed by the University. The candidate will procure Certificate of successful completion of practical training camp from the College/Department of Geography and produce the same at the time of practical examinations.

Paper 1: World Regional Geography

Section A

Asia: Terrain Pattern, Drainage, Climate, Natural Vegetation, Soils, Population and Economic Base of the Continent In General. Regional Study of South-East and South-West Asia.

Europe: Terrain Pattern, Drainage, Climate, Natural Vegetation, Soils, Population and Economic Base of the Continent In General ; Regional Study of British Isles, France and Germany.

Section B

North and South America: Terrain Pattern, Drainage, Climate, Natural Vegetation, Soils, Population and Economic Base of the Continent In General; Regional Study of New England and Brazil.

Section C

Australia and New Zealand: Terrain Pattern, Drainage, Climate, Natural Vegetation, Soils, Population and Economic Base of Australia and New Zealand In General.

Recommended Readings:

- Cole, J., 1996. A Geography of the World's Major Regions, Routledge, London.
- Deblin, H.J., 1994, Geography : Regions and Concepts, John Wiley, New York.
- Dickenson, J.P. et al. 1996. The Geography of the Third World, Routledge, London.
- Gourou, P., 1980. The Tropical World, Longman, London.
- Jackson, R.H. and Hudman, L.E., 1991. World Regional Geography : Issues for Today, John Wiley, New York.
- Kolb, A., 1977. East Asia - Geography of a Cultural Region, Methuen, London.
- Minshull, G.N., 1984 Western Europe, Hodder & Stoughton, New York.
- Patterson, J.H., 1985. Geography of Canada and the United States. Oxford University Press.
- Songquiao, Z., 1994. Geography of China, John Wiley, New York.
- Ward, P.W. and Miller, A. 1989. World Regional Geography : A Question of Place. John Wiley, New York.

Paper II: Geography of India

Section A

India in the context of South and Southeast Asia, geological structure, physiographic divisions, climate, seasons, mechanism of Indian monsoon, major climatic regions, vegetation, major soils and regions, drainage system, water resources and irrigation projects, forests, mineral and power resources: their utilization policy and conservation strategies.

Section B

Agriculture: typology, major crops, changing pattern of crops, agricultural growth during plan period and green revolution, livestock resources and their development, industrial growth and development; industrial localization with reference to iron and steel, cotton, textile, cement and chemical industries, industrial regions; population growth, distribution, problems, policy implication, trends of urbanization and human resource development.

Section C

Regional disparities in economic development, planning and economic regions of India, multilevel planning, problems and prospects of linking of rivers, environmental issues in India, transport development: rail, road, air and waterways, foreign trade: challenges and prospects.

Recommended Readings:

- Gautam, Alka, 2010: Geography of India. Rastogi Publications, Meerut.
Gopal Krishnan, R. 2001: Geography of India, Jawahar Publishers & Distributions, New Delhi, 2nd Edition
Khullar, D.R. 2006. India: a comprehensive Geography: Kalyani Publishers, New Delhi
गणेशिया, सी. 1999: आधुनिक भारत का वृहत भूगोल। साहित्य भवन प्रब्लिकेशन्स, आगरा।
Sdasjuk, G. and Sengupta, 1968: Economic Regionalisation of India, Census of India Publication, New Delhi.
Singh, G. 1998: A Geography of India, Atma Ram & Sons, Delhi, Sixth Edition
Singh, R.L. (ed.) 1971: India: A Regional Geography. NGSI, Varanasi.
Spence, G.H.K. and Learmonth, A.T.A. 1967: India and Pakistan, Land, People and Economy, Methuen and Co., London.
Tirtha, K. 2000: Geography of India, Rawat Publications, Jaipur 2nd Edition (India)
शिवार, आर.सी. 2012: भारत का भूगोल। प्रयाग पुस्तक भवन, इलाहाबाद।

Practicals

Scheme of Examination

Min. Pass Marks: 18		Max. Marks: 50
	Bifurcation of Marks	Time
Written test	24	3 hrs.
Field survey and viva voce	10+04	2 1/2 hrs.
Record and viva voce	08+04	

- N.B. 1. There shall be 6 questions in written paper selecting at least two questions from each section. Candidates are required to attempt 3 questions selecting 1 question from each section. All questions carry equal marks.

SYLLABUS

Section A

Definition, classification, uses and characteristic of map projection: (graphical constructions).

Conical projections:

1. with the one standard parallel
2. with two standard parallels
3. Bonne's
4. Polyconic

Cylindrical projections:

1. Equidistant
2. Equal Area
3. Mercator's, Universal Transverse Mercator (UTM)
4. Gall's Stereographic

Section B

Zenithal Projections: (Only Polar Case)

1. Equidistant
2. Equal Area
3. Gnomonic
4. Stereographic
5. Orthographic

Three dimensional diagrams: sphere, block pile, cube.

Section C

Plane table surveying: Equipments, procedure, traversing – open and closed traverse, methods- radial and intersection, concept of resectioning.

Height calculation using Indian pattern clinometer.

Recommended Readings:

दीक्षान, पी.आर. 2005: प्रायोगिक भूगोल। वसुन्धरा प्रकाशन, गोरखपुर।

Raisz, E. 1962: General Cartography. John Wiley and Sons, New York. 5th edition.

Rampal, K.K. 1993: Mapping and Conflation: Methods and Techniques Concept Publishing Company, New Delhi (Reprint 2009)

Robinson, A.H. et al. 2004. Elements of Cartography. John Wiley & Sons, Inc., New York (Sixth Edition)

Singh, L.R. 2006: Practical Geography. Prayag Pustak Publisher, Allahabad U.P.

Singh, R.L. and Singh, R.P. 1991: Elements of Practical Geography. Kalyani Publishers, New Delhi (Reprint 2002)

एन.बी. 1. There shall be 6 questions in written paper selecting at least two questions from each section. Candidates are required to attempt 3 questions selecting 1 question from each section. All questions carry equal marks.

9. STATISTICS

Subject: Statistics

Marks Scheme

Paper	Nomenclature	Marks	
		Science	Arts
Paper I	Sample Survey	50 mark	65 marks
Paper II	Design of Experiment and Computational Techniques	50 mark	65 marks
Paper III	Practical based on Paper I,II	50 mark	70 marks
Total		150	200

Note:

In each of the Question Papers, 10 (ten) questions will be set having 2 having 2(Two) from each unit. Candidates have to answer questions in all, taking not more than one from each unit.

Subject: Statistics

Paper -I (Sample Surveys)

(Also common with Subject- Applied Statistics)

Unit-I

Concepts of population and sample, need for sampling, census & Sample surveys. Advantages of sample survey over complete enumerations. Principle steps in a sample survey. Principles of sample survey, Sampling and non-sampling errors.

Unit-II

Probability and non-probability sampling: Methods of drawing a random sample from finite population, accuracy and precision of an estimator. Simple random sampling with and without replacement, probability of selecting any specified unit in the sample, simple random sampling of attributes, size of simple random sample for a specified precision.

Unit-III

Stratified random sampling: Meaning and advantages of Stratified Random Sampling, Estimation of the population mean and its variance. Optimum and proportional allocation and their comparison with SRS & SRS WOR.

Unit-IV

Systematic Sampling: Meaning and sample selection procedures, advantage and disadvantages, variance of the estimated mean. Comparison of systematic with (i) SRSWOR and (ii) stratified random sampling. Cluster sampling (of equal size): Meaning, advantages and disadvantages, estimation of population mean.

Unit-V

Ratio Method of estimation (first approximation only): Meaning, bias of ratio estimators, variance, efficiency of ratio estimate with SRSWOR estimate. Regression method of estimation (first approximation): Meaning, Simple Regression Estimate, expected value and variance of simple regression estimate. Comparison with SRSWOR and ratio estimators.

REFERENCES:

1. Des Raj(2000) : Sample Survey Theory. Narosa Publishing House.
2. Murthy, M.N.(1967): Sampling Theory and Methods. Statistical Publishing Society, Calcutta.
3. Singh, Daroga and Chaudhary. F.S.(1989): Theory and Analysis of Sample Surveys Designs. Wiley Eastern Ltd.
4. Sukhatme et al .(1984): Sampling Theory of Surveys with Applications. Indian Society of Agricultural Statistics
5. Goon A.M, Gupta M.K. Das Gupta B (1986) . Fundamentals of Statistics. Vol II World Press Kolkata
6. Gupta S.C. Kapoor V.K. Fundamentals of Applied Statistics . Sultan Chand & Sons. New Delhi

ADDITIONAL REFERENCES:

Sampath S. (2000) Sampling Theory and Methods. Narora Publishing House

Subject: Statistics

Paper II

Design Of Experiments and Computational Techniques (Also common with Subject- Applied Statistics)

Unit-I

Analysis of Variance: Linear model & its different types (only introduction). Analysis of Variance technique. ANOVA for one-way and two-way classified data (with one observation per cell & fixed effects model); Least Square Estimates of Sum of squares, Effects of violations of basic assumptions of ANOVA; Transformations, Critical Difference.

Unit-II

Design of Experiments: Need for design of experiments, fundamental principles of design of experiments, Uniformity Trials, Choice of size and shape of plots, Basic designs (with one observation per cell & fixed effects model)-Completely randomized design(CRD), Randomised block design(RBD)- Their advantages and disadvantages & usage. Efficiency of RBD over CRD.

Unit-III

Latin square design (LSD)- Analysis; least square estimates; expectation of sum of squares; efficiency of LSD over CRD & RBD, Missing plot technique- Estimation of single missing value in RBD & LSD. Factorial experiments- 2^2 , 2^3 experiments, illustrations, main effects, interaction effects & their analysis.

Unit-IV

Computer Application and Data-Processing: Basics of Computer: Operations of a computer, Different units of a computer system like central processing unit, memory unit, arithmetic and logical unit, input unit, output unit etc. Hardware including different types of input, output and peripheral devices, Software, system and application software, number systems, Operating systems, packages and utilities, Low and High level languages, Compiler, Assembler, Memory- RAM, ROM, unit of computer memory (bits, bytes etc.).

Unit-V

Network - LAN, WAN, internet, intranet, basics of computer security, virus, antivirus, firewall, spyware, malware etc. Basics of Programming: Algorithm, Flowchart, Data, Information, Database, overview of different programming languages, frontend and backend of a project, variables, control structures, arrays and their usages, functions, modules, loops, conditional statements, exceptions, debugging and related concepts.

REFERENCES :

1. Das M.N. & Giri N.C (1986) : Design and Analysis of Experiments Springer Verlag
2. Goon A.M, Gupta M.K, Das Gupta B (1986) : Fundamentals of Statistics, Vol-II World Press Kolkata
3. Gupta S.C., Kapoor V.K. Fundamentals of Applied Statistics, Sulhan Chand & Sons, New Delhi
4. Nagpal D.P. Computer Fundamentals, Wheeler Publishing, New Delhi
5. Norton Peter : Peter Norton's Introduction of Computers, Tata McGraw hills
6. Stallings, Operating Systems PHI

ADDITIONAL REFERENCES

1. Kaupthorne Q. (1963) : The Design and Analysis of Experiments, Wiley Eastern
2. Cochran W.G. and Cox G.M. (1957) : Experimental Design, John Wiley and sons

Raj / Das

Subject: Statistics

Paper III Practical Paper

(Also Common with Subject- Applied Statistics)

1. To draw a SRS with and without replacement to obtain an estimate of the population total along with the estimates of their variances. Comparing the efficiency of SRSWR with SRSWOR. Finding of confidence interval for the population mean.
2. To draw all the possible samples by SRS-technique and that to show that expected value of the sample mean equals the population mean to show expected value, $E(\bar{S}^2) = S^2$ in SRSWOR.
3. Stratified sampling (i) estimate the sample sizes by (a) proportional allocation (b) Neyman optimum allocation (ii) estimate the mean to the population under the above scheme (iii) calculation of the sampling variance (iv) Comparison of efficiencies of the allocation scheme amongst themselves as well as with SRS.
4. Systematic sampling
5. Cluster sampling.
6. Ratio & Regression methods of estimation.
7. Analysis of one way classification (CRD).
8. Analysis of two way classification (RBD).
9. Analysis of LSD.
10. Efficiency of RBD over CRD.
11. Efficiency of LSD over CRD & RBD.
12. Analysis of 2^2 & 2^3 factorial design.
13. Construction of Flowcharts and Algorithms for Statistical Problems.

10. APPLIED STATISTICS

Subject: Applied Statistics

Marks Scheme

Paper	Nomenclature	Marks	
		Science	Arts
Paper I	Sample Survey	50 mark	65 marks
Paper II	Design of Experiment and Computational Techniques	50 mark	65 marks
Paper III	Practical based on Paper I,II	50 mark	70 marks
	Total	150	200

Note:

In each Theory Question Papers . 10 (ten) questions will be set having 2 having 2(Two) from each unit. Candidates have questions in all, taking not more than one from each unit.

Subject: Applied Statistics

**Paper -I
(Sample Surveys)**

(Course Contents are same as that of Subject- Statistics)

**Paper II
Design Of Experiments and Computational Techniques**

(Course Contents are same as that of Subject- Statistics)

**Paper III
Practical Paper**

(Course Contents are same as that of Subject- Statistics)

11 Psychology

B.Sc. Part III

SCHEME OF EXAMINATION:

Faculty	Max. Marks	Min. Passing Marks
Arts	200	72 (Th.54 Pr.18)
Science	150	54 (Th.36 Pr.18)

Paper	Nomenclature	Duration	Max. Marks	
			Arts	Science
I	Positive Psychology	3 Hrs.	75	50
II	Psychological Testing and Assessment	3 Hrs.	75	50
	Practical	3 Hrs.	50	50

NOTE:-

1. There will be three papers in Psychology. Each paper will be of 3 hours. There will be a common paper for Arts and Science. In I and II Papers there will be 3 Sections A, B and C and will cover the entire course content of the paper.

Section-A Will contain 10 questions of 20 words each. Each question will be of 1.5 marks for Arts students and 1 mark for Science students. Thus, Part-A will be of 15 marks for Arts students and of 10 marks for Science students.

Section-B Will contain 7 questions of 50 words each, out of which students are required to attempt 5 questions. Each question will be of 3 marks for Arts students and of 2 marks for Science students. Thus, Part-B will be of 15 marks for Arts student and of 10 marks for Science students.

Section-C Will contain 3 long questions each with internal choice. Each question will be of 15 marks for Arts students and 10 marks for Science students. Thus, Part-C will be of 45 marks for Arts students and 30 marks for Science students.

For clarification the distribution of marks is tabulated as below:-

Arts			
Section	No. of Questions	Marks	Total
A	10	1.5	15
B	5 (out of 7)	03	15
C	3 (with Internal Choice)	15	45
		Total marks	75
Science			
Section	No. of Question	Marks	Total
A	10	01	10
B	5 (Out of 7)	02	10
C	3 (with internal choice)	10	30
		Total Marks	50

2. Use of simple calculator will be allowed for statistical portions of all papers.

Paper I -Positive Psychology

Section A

1. Introduction : Definition, Goals and Assumptions of Positive Psychology; Relationship with other Branches of Psychology
2. Happiness: Meaning; Hedonic and Eudaemonic Viewpoint; Positive and Negative Affect; Theoretical Viewpoints; Determinants and Sources; Authentic Happiness; Enhancement of Happiness and Wellbeing.
3. Positive Cognitive States and Processes: Self-Efficacy, Optimism, Hope, Mindfulness, Flow and Spirituality.

Section B

4. Virtues and Strengths of Character: Classification and Measures of Human Strengths, Gallup's Clifton Strength Finder; VIA Classification; Identifying Personal Strengths.
5. Resilience: Meaning and Sources; Developmental and Clinical Perspective; Successful Aging and Growth through Trauma.
6. Self-Regulation and Self-Control: Meaning and Theories; Planning for Self-Regulation Success; Self-Regulation Problems – Goal Conflict, Goal Difficulty and Goal Disengagement.

Section C

7. Mental Health and Well-Being: Subjective Well-Being and Life Satisfaction, Social Well-Being and Psychological Well-Being, Complete State Model.
8. Emotional Intelligence: Meaning, Components and Theories; Enhancement of Emotional Intelligence.
9. Pro-Social Behavior: Empathy, Altruism, Gratitude and Forgiveness.

Books Recommended:

- Snyder, C.R. & Lopez, S.J.(2007). *Positive Psychology*. New Delhi: Sage.
- Snyder, C.R. & Lopez, J.(2005). *Handbook of Positive Psychology*. New York: Oxford.
- Baumgardner, S. & Crothers, M. (2019). *Positive Psychology* . Noida: Pearson Education India.

Paper II - Psychological Testing and Assessment

Section-A

1. Psychological Testing and Assessment:- Definition, Difference between Testing and Assessment , Tools of Psychological Assessment Interview, Case History Data, behavioral Observation, Computers as tools.
2. Psychological Test: Nature, Functions and Uses of Psychological Test, Problem of test
Administration, History of Psychological Testing, Characteristics of good Psychological test
3. Psychological Test Development:- Conceptualization, Test Construction, Item analysis.

Section-B

4. Reliability: Meaning, Types and Methods of Calculating Reliability.
5. Validity: Meaning, Types and Methods of Calculating Validity.
6. Norms: Meaning and Types of Norms.

Section-C

7. Types of Psychological Tests: Group and Individual, Verbal, Non-verbal and Performance Test, Self-Report Inventories, Projective Techniques, Ethical Consideration in Assessment
8. Application of Psychological Testing: Educational, Counseling and Guidance, Clinical and Organizational Setting.
9. Assessment of Personality- Big Five, 16 PF, MMPI, TAT and Rorschach. Test. Assessment of Intelligence- Binet, WAIS, SPM.

Books Recommended:

- Anastasi, A. (1997). *Psychological testing*. New York: MacMillan Co.
- Chadha, N.K. (2009). *Applied Psychometry*. New Delhi: Sage.
- Kaplan, R.M. & Saccuzzo, D.P. (2009). *Psychological Testing and Assessment*. New Delhi: Cengage Learning.
- Cohen, R.J, Swerdlik, M. & Struman, E.D. (2015). *Psychological Testing and Assessment*. New Delhi: McGraw Hill.
- अरुण कुमार सिंह (2002) : मनोविज्ञान में मापन एवं मूल्यांकन, नई दिल्ली मोतीलाल बनारसीदास।

D. 1. 1. 1.

Practical

1. Measurement of Subjective Wellbeing
2. Measurement of Forgiveness
3. Measurement of Emotional Intelligence
4. Measurement of Hope
5. Measurement of Resilience
6. Measurement of Intelligence (SPM)
7. Personality Assessment through HSPQ
8. Reaction Time
9. Mullar Lyer Illusion
10. Measurement of Level of Aspiration

12. ELECTRONICS

Scheme :

Min Pass. Marks : 36

Max. Marks-100

Paper-I	3 hrs.	33
Paper-II	3 hrs.	33
Paper-III	3 hrs.	34
Practical Min. Pass. Marks: 18	5 hrs.	50

Paper-I-Communication and Radio Electronics

Note: The paper will be divided into five units. Two questions will be set from each unit. Five questions are required to be attempted in all. The candidate is required to attempt one question from each unit.
Max.Marks : 33 Time: 3 hrs.

Unit-1

Modulation

Need of a carrier frequency, AM, FM, PM, AM: side bands, power consideration, Collector and base modulations, SSB transmission FM by reactance variation using Semiconductor devices. The Armstrong FM system. Block diagram of AM and FM transmitters: Merits of FM transmission over AM transmission.

Unit-2

Demodulation:

Demodulation of AM signals, Square law demodulation. Linear envelope deduction AGC demodulation of FM signals. Amplitude limiter. Foster seeley frequency discriminator and ratio detector.

Unit-3

Transmission lines and Associated distributive parameters

Propagation of voltage and current waves on the line (Differential equations and their solution). Characteristic impedance. Propagation constant and losses, Reflection coefficient, Standing wave ratio (SWR), resonant $\lambda/4$ and $\lambda/2$ lines

Unit-4

Impedance matching and Radiation of EM Waves

Single stub matching, Smith chart and its uses. Elementary idea of transmission of microwave signal and wave guides. Dipole antenna Radiation resistance and directivity of an antenna. Radiation from a quarter wave monopole or half wave dipole linear arrays. Propagation of EM wave in space. Types of wave propagation through ionosphere, Critical angle ground wave range. Skip distance and skip zone. Different layers in ionosphere

Unit-5

Radio Receivers and Tape Recorders

AM radio receiving systems. Superheterodyne, FM receivers and their measurements. Stereo transmission and reception. Characteristics of various types of recording tapes. Recording head, Principles of recording playback and erasing tape transport system Hi-Fi and stereophony recording tune-table.

Reference Books suggested

1. Gordon J. King, The Hi-Fi and taperecorder handbook. N Butter-worths, London.
2. G.K. Mithal-Elements of Electronics, Khanna Publishers, Delhi.
3. Handbook of Electronics by Kumar & Gupta-Pragati Prakashan, Meerut.
4. Electromagnetic waves and radiative systems-E.L. Jordan.
5. Electron tube circuits-Sammuel Seeley.

Paper-II : Television Electronics

Note : The paper will be divided into five units. Two questions will be set from each unit. Five questions are required to be attempted in all. The candidate is required to attempt one question from each unit.

Max. Marks-33

Time : 3 Hrs.

Unit-1

Picture scanning, Broadcast channels, Frequency band and resolution, camera tubes, Block diagram of transmitter and explanation of each block, colour transmission.

Television receiver : Scanning sequence and interlacing, synchronization and blanking.

Unit-2

Block diagram of colour and monochrome receivers and explanation of each block.

Sound system, Transient response of TV receivers.

Mosaic, Exhaust and activation schedule performance tests. Theory of operation, characteristics of the Mosaic, potential distribution of the mosaic. The Mosaic under the influence of a height in age. The formation of the video signal. Line sensitivity.

Black spot performance of the Iconoscope. Limiting sensitivity.

Syllabus : B.Sc. Part-III

Depth of focus. Pick-ups for motion picture films. The type RCA.
Iconoscope.
Limiting sensitivity of pick-up devices. The two sided target.
Low velocity scanning. The orthicon. The image iconoscope multi-
stage. Image multiplier pick-up tubes, signal multiplication image
orthicon. Performance of the image orthicon.

Unit-4

The Isocon. Photoconductive pick-up tubes. The storage tube.
The monoscope. Conclusion.

Requirement of the Kinescope. Construction of the Kinescope
bulbs, round glass tubes, metal tube-bulbs, rectangular tubes. The
electron gun. The fluorescent. Screening procedure. Metal backing
of Kinescope screens. Processing of the Kinescope. Tests and per-
formance. Contrasts. Direct view Kinescope. Projection Kinescope.

Unit-5

Colour signals. Colour addition. Definition of colour TV sig-
nals. I, R- Y. and GY signal, desaturated colours, the transmitted
chrominance signal. Matrix circuits. Colour subcarrier frequency.
Colour synchronization. Colour pleased composite video signal wave-
forms. Vector addition of colour signals. Colour picture tubes.

Reference Books suggested

1. M. Glasford : Fundamentals of television engineering.
2. M. Kive-Television simplified 6th edition.
3. B. Goobi-Basic television principles and servicing.

Paper-III-Electronic Instruments and Measurements.

Note : The paper will be divided into five units. Two questions will
be set from each unit. Five questions are required to be attempted in
all. The candidate is required to attempt one question from each-unit.
Max. Marks : 34

Time : 3 hrs.

Unit-1

Measuring and test instruments, Fabrication Technique

AC Voltmeter, ammeter, Ohm meter (Shunt and series type).
Multimeter, Analog and digital voltmeter, Watt meter, Frequency
meter, Q meter, C.R.O. as test instrument.

Fabrication of PN Junction Diode, PNP transistor, Fabrication
of an I.C. transistor, Equivalent circuit, integrated diode. Inte-
grated capacitor, junction capacitor, thin film capacitor. Inte-
grated resistor, Thin film resistor. Three pin regulators. Timing
concept and Timer 555.

Unit-2

Power Electronics

Silicon controlled rectifier (SCR), working of SCR, Equivalent circuit of SCR, V-I characteristic of SCR, SCR Half wave and full wave rectifier. Applications of SCR. The triac, Triac construction and operation, Triac characteristics, Application of Triac, The Diac, Application of Diac, Unijunction Transistor (UJT). Equivalent circuit of UJT, Characteristics of UJT, Application of UJT.

Unit-3

Tape Recorder:

Mechanism of Recording, various head of the tape recorder, Record/Play back head, Erase head, High frequency erase head, low frequency erase, Bulk erase, Practical Tape recorder, Tape machines, Fault finding in the tape recorder, Care and maintenance.

Unit-4

Transducer

Classification, Strain gauge, Displacement transducers, capacitive transducers, Photoelectric, Piezoelectric and temperature transducers, Self generating Inductive Transducer, Linear variable Differential Transformer (LVDT),

Unit-5

Thermal and optical transducer

Resistance thermometer: Thermocouple, thermistors and their applications.

Optical transducers—Vacuum phototube, Gasfilled phototube, Photomultiplier tube, Photoconductive cell, Photovoltaic Cell. Various Types of Microphones.

Reference Books Suggested

1. Electronic Circuits—Discrete and Integrated, Shilling and Belon, McGraw Hill.
2. J. Glaser and J. Subak Sharpe, Integrated Circuit Engineering Addison Westley 1978.
3. Principle of Electronics, V.K. Mehta.
4. Basic Electronics & Solid State, B.L. Theraja.
5. Radio & Television; N.C. Goyal and S.K. Mukherjee.

Syllabus : B.Sc. Part-III

Experiments For Practical Work

Note : A candidate has to perform at least sixteen experiments including eight experiments from each section 'A' and 'B'. In practical examination, the candidate will be required to perform two experiments : one from section 'A' and the other from section 'B'. The distribution of Marks will be as follows -

Time duration-5:00 hrs Expts. (Two)-30 (15 for each expt.) marks	
Viva Voce	10 marks
Practical record	10 Marks
Total	50 marks.
	Max. Marks-50

Section-A

1. To design and study free running multivibrator (transistorised) of given frequencies.
2. To design active band pass filter of given cut off frequencies and study its frequency response.
3. To study regulated power supply using a Zener diode and an electronic SCR voltage regulator.
4. To design and study thyatron-sawtooth wave generation.
5. To design and study single stage RC coupled transistor amplifier of given cutoff frequencies and mid frequency gain.
6. To design and study UJT sweep circuit.
7. To design and study Hartley oscillator (transistorised) of given frequencies.
8. To design and study pulse coincidence circuit using ICs.
9. To design and study a precision timer circuit using IC 555 chip.
10. To design and study clipping and clamping circuits.

Section-B

1. To study binary adder and subtractor.
2. To study AM signals.
3. To study Darlington pair.
4. To study fourier analysis of square and clipped sine wave.
5. To study Variable reactance modulator.
6. To find out CMRR of differential amplifier.
7. To study the characteristics of SCR.
8. To design and study a precision linear gate using operational amplifier and FET.
9. To find out solutions of simple problems using analog computer.
10. To design and study voltage comparator using operational amplifier.

13. ENVIRONMENTAL SCIENCE

B.Sc. Part III

Scheme:
Theory

Max Marks: 100		Min. Marks:36
Paper 1	3 hours duration	Max Marks:50
Paper 2	3 hours duration	Max Marks:50
Practical	4 hours duration	Min. Marks:18 Max Marks:50

Note:

1. Two types of Question papers for each theory paper will be applicable. Total duration of 3 hours for each paper. One question paper will comprise of the objective questions and the other will be of descriptive type question.
2. Descriptive type question paper (to be given during 1st 2 hours of examination) will have 9 questions,3 from each section out of which a student is supposed to attempt 4 questions selection at least 1 from each section. This portion of the paper will carry maximum 30 marks. Each descriptive question will be of 7.5 marks.
3. The objective question paper will be given after 2 hours of commencement of descriptive type paper and will have 35 questions of the objective type. This portion of the paper will carry 20 marks. The objective type questions will be of the following types:
 - Multiple choice type questions :20 questions of ½ marks each.
 - Fill in the blanks/one word/true or false type questions:10 questions of ½ mark each.
 - Very short answer type questions:5 questions of 1 mark each

Paper –I Environmental Management and Planning

Section –A

1. Air Pollution Abatement; Study of metrological parameters.
2. Vertical motion of air, and atmospheric stability;
3. Wind direction, frequency, and lapse rates.
4. Temperature inversion
5. Dispersal of pollutants in the air
6. Air pollution with respect to distance from source of emissions of pollutants

Section-B

1. Types of pollutant sampling and measurement.
2. Ambient air sampling
3. Collection of Gaseous air pollutants
4. Collection of particulate pollutants
5. Stack sampling
6. Analysis of air pollutants, SO_x, NO_x, CO₂, CO and SPM.

Section-C

1. Control methods; source correction method
2. Cleaning of Gaseous effluents
3. Air pollution control equipments, Gravitational settling chambers, cyclone separators, Fabric filters, Electrostatic precipitators, wet samplers.
4. Control of gaseous air pollutants; SO_x
5. Control of gaseous air pollutants; NO_x and CO

Suggested Readings:

- ❖ Baldwin, J.H.1985.Environmental Planning and Management. International Book Distribution, Dehradun
- ❖ Bandhu, D. and Ramnath, N.L.1982.Education for Environmental Planning and observation. Natraj publishers, Dehradun.
- ❖ Cornwell, D.A and Davis, M.L.2000.Introduction to Environmental Engineering. McGraw Hill. International Edition.
- ❖ De Nevers, N.L.2000.Pollution Control Engineering. McGraw Hill. International Edition.Mexico.
- ❖ Environmental Management and Planning
- ❖ Liu, D.H.F. and Liptak, B.G.2000.Air Pollution. Lewis Publishers. Washington, D.C.
- ❖ Mohan, I, 1989.Environmental pollution and Management, Ashish Publishing House, New Delhi.

- ❖ Pillai, K.M.1987, Water Management and Planning. Himalaya Publishing House, New Delhi.
- ❖ Reible, D.D.1998.Fundamentals of Environmental Engineering. Lewis Publishers. Washington, D.C.
- ❖ Sapru, R.K.1990.Environmental planning and Management in India. Ashish Publishing House, New Delhi.
- ❖ Singh, P.1985.Environmental pollution and Management .ChughPublications,Allahbad

Paper-II Environmental Impact Assessment and Sustainable Development

Section-A

1. Basic Concepts of Sustainable Development
2. Sustainable Industrialization.
3. Sustainable Agriculture
4. Sustainable Tourism
5. Sustainable Mining
6. Sustainable Transportation and Sustainable housing
7. Environmental awareness Programs
8. Role of National and International Organizations in Conservation of Environment
9. Role of Media in Environmental Conservation
10. Significance of International Conference on Human Environment, Stockholm, 1972; Earth Summit, Rio de Janeiro, 1992; EarthSummit – II, Johannesburg, 2002; Earth Summit-III-2012.

Section-B

1. Environmental Impact Assessment, Processes in different developing and Developed Countries.
2. Environmental Impact Assessment: Methods; Adhoc, Simple Checklists, Overlays, Matrices, Networks.
3. Environmental Economics
4. Environmental Management Systems (EMS)
5. Environmental Policy of India
6. Environmental policy of Rajasthan.

Section-C

1. Concept of Environmental Audit
2. Setting up of an Audit programme.
3. Environmental Audit process.
4. Benefits of Environmental audit
5. Various methods of Environmental audit
6. Environmental Laws- Indian Forest Act, 1927, (The air prevention and control of pollution) Act, 1981, The Water (prevention and control of pollution) Act, 1974, The Wildlife Protection Act, 1972, Forest Conservation Act, 1980, The Environmental (Protection) Act, 1986, The Biodiversity Act, 2002.

Suggested Readings:

- ❖ Canter, L.W.1997. Environmental Impact Assessment. McGraw Hill, New York
- ❖ Clarck, B.D., Biset, R. and Wathern, P.1980. Environmental Impact Assessment, Mansell, London.
- ❖ Davies, G.S. and Mueller, F.G.1983. A handbook on Environmental Impact Assessment for use in developing countries. UNEP, Nairobi. WCESD.1987. Our Common Future oxford university press. Oxford U.K. Archibugi, F and Nijkamp. P.1989. Economy and Ecology; Towards Sustainable Development. Kluwer Academic Publishers. London.
- ❖ Shashtri, S., Bakre, P.P. and Khan, T.I.1996. Industry, Environment and Law, RBSA publishers, Jaipur
- ❖ Wathersn, P.1998. Environmental Impact Assessment Theory and Practice. Unwin Hyman. London.

Suggested field and laboratory exercises :

It will be divisible into two parts:

Part A – 25 Marks – Field Report

Part B – 25 Marks – Experiments

Part – A: A candidate is supposed to write a field reports on some environmental problems based upon his/her personal observation. It may be a case study of river, mining, deforestation, and desertification, suffering of human beings due to local environmental pollution, textile or some other Industries. Report is to be written on the basis of analysis carried out in laboratories and personal observations. A presentation will be made on the day of practical examination.

Part- B: Industrial Pollution based experiments:

1. Estimation of SPM around Industries.
2. Estimation of SO_x around
3. Estimation of NO_x
4. Estimation of CO and CO₂.
5. Impact of air pollutants from Industries on Soil.
6. Impact of air pollutants from Industries on vegetation.

1. TEXTILE CRAFT

B.Sc. Part III

SCHEME: BA/B.Com PART-III

		Duration	Max mark	Min mark
1. Theory:	Paper-I	3Hrs	30	
	Paper -II	3Hrs	30	22
2. Practical:	Paper -I	3Hrs	35	
	Paper-II	3Hrs	35	25
3. Submission:	Paper -I		35	
	Paper-II		35	25

Paper-I : Weaving Theory II

UNIT-I

1. Types of Spinning: Mechanical and Chemical
Mechanical spinning process: picking, ginning, combing/carding, drawing etc. Types of chemical spinning-melt spinning, dry spinning and wet spinning.
2. Types of Yarns: Simple and Fancy
Simple yarn: single and double/plied/folded yarn
3. Calculation of resultant count for folded yarn

UNIT-II

1. Manmade and Synthetic fibres
Man-made fibres: Basic methods of producing rayon fibre, Different types of man-made fibres
Synthetic fibres: Different types of synthetic/chemical fibre, method of their production, properties of polyester fibre, nylon fibre, glass fibre.
2. Silk and Wool
Production, spinning, properties and uses of silk, different types of silk
Classification of wool, wool spinning process, difference between woollen and worsted fabric
3. Concept of Mixing and Blending, Basic difference between mixing and blending.
Concept of Staple and Filament fibre; difference between staple fibre and filament fibre

UNIT-III

- 1 Derivatives of Twill weave: Broken weave, Herringbone weave and Diamond weave
- 2 Towel weaves: Huckaback and Honeycomb; quality of yarn and weave selected for towels
- 3 Concept of shedding mechanism; Dobby and Jacquard shedding mechanism

Paper-II: Dyeing Theory II

UNIT-I

1. Dye molecule; Concept and Importance of Chromophores and Auxochrome in a dye
2. Objectives of Fabric finishes; different mechanical and chemical fabric finishes; Determinants of finishes
3. Different types of natural and synthetic dyes.

UNIT-II

4. Method of direct printing: Screen printing; colour preparation and screen preparation
5. Discharge and Resist printing; different styles of discharge and resist printing
6. Factors affecting colour fastness: composition of fibre, chemical structure of dye, techniques of dyeing/printing, addition of other useful additives

UNIT-III

7. Importance of fabric finishes
8. Different types of chemical finishes- crease resistant finish, water proof finish, fire proof finish, moth proofing finish and absorbency finish.
9. Determinants of fabric finishes.

Practical (Paper-I)

1. Concept of yarn twist(S twist and Z twist) and plied yarn(single and double yarn)
2. Calculation of Ends and Picks per inch in given piece of fabric
3. Towel weaves preparation using paper strips

Practical (Paper-II)

1. Screen preparation (simple tracing method)
2. Table cover preparation by screen printing

Submission (paper-I)

1. Assessment of yarn and fabric samples
2. Assessment of weave samples

Submission (paper-II)

1. Assessment of samples
2. Any one article using screen printing

Practical Examination Scheme:

Major Problem: 20 Marks

Minor Problem: 15 Marks

Reference books:

Booth, J.E. (1996) Principles of Textile Testing, 1st edition, CBS publishers & distributors PVT.Ltd. New delhi

Sahnai, V.A. (1980) Technology of Dyeing, Sevak publications. Mumbai

Sahnai, V.A. (1979) Technology of printing, Sevak publications. Mumbai

Sahnai, V.A. (1999) Technology of finishing, Sevak publications. Mumbai



GARMENT PRODUCTION & EXPORT MANAGEMENT

B.Sc. Part III

PAPER – 1 : APPAREL TECHNOLOGY

B.A./B.Com. – M.M 40

B.Sc.- M.M. 50

Hrs. – 3

OBJECTIVES:

1. To create awareness on the basics of Fashion
2. To study the psychological effects of clothing on the individual in social situation.
3. To develop understanding of manufacturing technology of the garment Industry.
4. To understand the fundamental concepts of dyeing and printing.

SECTION-A : INTRODCUTION TO FASHION

1. Fashion terminology, sources of fashion, factors influencing fashion.
2. Fashion forecasting and fashion cycle.
3. India and international fashion designers (five each).
4. Sociological and psychological significance of clothing.

SECTION-B : MANUFACTURING TECHNOLOGY

5. Product development, design development, developing a sample garment.
6. Apparel production
 - I. Costing a garment
 - II. Purchasing pattern making
 - III. Production scheduling
 - IV. Spreading and cutting procedure
 - V. Contracting
 - VI. Garment assembly
7. Introduction to industrial machines-
 - I. cutting : round , straight and band
 - II. fusing: collars, facing
 - III. sewing: chain stitch, lock stitch, button hole, blind stitching
8. Use of components and trims –
 - (i) Performance and properties of components and trims.
 - (ii) labels and motifs
 - (iii) linings and interlinings
 - (iv) face, braids, elastics
 - (v) fasteners; loops
 - (vi) seam binding and tapes
 - (vii) shoulder pads, eyelets

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SECTION –C : DYEING AND PRINTING

Application of design:

- 7) i. Printing methods – block, screen, stencil, roller.
- ii. Styles of printing – direct, discharge and resist.
8. Dyeing – introduction to natural and synthetic dyes (acid, basic, sulphur, vat, reactive and direct dyes)
9. Stages of dyeing : Fiber, yarn and fabric

References:

1. Rouse Blizabeth, 1999, Understanding Fashion, Blackwell science.
2. Carr Harold and John pomerory, 1996. Fashion design and product development. Blackwell science.
3. Jain Ruby and Rathore Girja, Design, Fashion and Garment Production, CBH publication Jaipur 2019.

PAPER- II : INTERNATIONAL MARKETING

B.A./ B.Com.- M.M. 40

B.Sc. – M.M. 50

Hrs. -3

OBJECTIVES:

1. To study the importance of marketing to the global economy
2. To develop insight into the development of marketing strategies for international markets
3. To Identify business opportunities in an international business environment

SECTION –A

1. International Marketing: nature and scope of international marketing.
2. International marketing v/s domestic marketing.
3. Importance of international marketing.
4. Problems and challenges of international marketing.
5. Selection of agents.

SECTION – B

6. Identification of markets for readymade garments.
7. Market entry conditions.
8. Channels of distribution.
9. Direct and indirect export
10. Trade fair and Exhibitions.

SECTION – C

11. Pricing, role of price and non price factors, factors influencing pricing, price quotation, information needed for export pricing.
12. Role of trading and export houses.

13. Institutional segments and packaging for exports: packing material, boxing and pressing department, machinery and equipments used in packaging department.
14. Quality control
15. Labeling and consumer protection meaning and its role.

References :

1. R. K. Kothari, B. S. Rathore, P. C. Jain (2009) International Marketing (2009) 1st ed. Ramesh Book Depot, Jaipur, New Delhi
2. R. Kothari and P. C Jain (2009) International Management 1st ed. Ramesh Book Depot, Jaipur, New Delhi
3. M. J. Methew International Marketing (Procedures and practices) 1st ed. RBSA publishers, Jaipur

PRACTICAL – 1 : APPAREL PRODUCTION

B.A/B.Com.-M.M.60

B.Sc.-M.M. 25

Hrs.- 4

OBJECTIVES :

1. To develop basic adult drafts of bodice, sleeve and collar.
2. To develop various patterns of textile techniques
3. Guidance for preparation of portfolio

CONTENT

1. Prepare an adult's bodice and sleeve block.
2. Sketching and designing of men/women garments (5 each)
3. To prepare with specific details of necklines and sari blouses. (20)
4. To identify patterns and its application for women designer dress on fashion figures:
5. Types of patterns include –
 - I. Structural
 - II. Geometrical
 - III. Stripes and plaids
 - IV. Floral
6. Design and prepare an adult dress for fashion shows.

Examination Scheme:

B.A.\B.Com. -Max Marks:-60

1.Major Problems :-30

2.Minor Problems:-20

Internal :-10

B.Sc:-Max Marks:-25

1.Major Problems :-10

2.Minor Problems:-10

Internal :-5

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PRACTICAL – II : DYEING AND PRINTING

B.A./B.Com.-M.M. 60

B.Sc.- M.M. 25

Hrs.- 4

OBJECTIVES:

1. To learn the various types of skills in dyeing
2. To develop various textile printing techniques
3. Guidance of practical knowledge of export houses

Contents

1. Prepare and article of each: Tie and dye, stencil printing, block printing and batik
2. Field trips to Export houses and mass production centers.
3. Exhibition ;

References:

1. Bhargava, Ritu, 2005, fashion illustration and rendering, Jain Publications Pvt. Ltd. New Delhi.
2. Ireland, fashion designing drawing and presentation.
3. Prayag: Technology of textile printing.
4. Shenai: Technology of dyeing

Examination Scheme :

B.A.\B.COM:-Max Marks:-60

1.Major Problems :-30

2.Minor Problems:-20

Internal :-10

B.SC:-Max Marks:-25

1.Major Problems :-10

2.Minor Problems:-10

Internal :-5

3

Geology and Mining.

Scheme:

Theory: Max Marks 100 Minimum Pass marks: 36

Paper I: Mineral Resources ——— 3 hrs duration Max Marks 50

Paper II: Mineral Exploration & 3 hrs duration Max Marks 50

Mining Geology

Practical (one) 4 hrs duration Max Marks 50

Paper I: Mineral Resources

Note: The paper will contain nine questions having three questions in each section. Candidates are required to attempt five questions in all, selecting at least one question from each section.

Section –A

Economic Geology: Definition; Magma and its relationship with mineral deposits. Ore and gangue minerals. Processes of Mineral formation: Magmatic, Hydrothermal, Contact metasomatic, Evaporation, Oxidation and supergene enrichment, Sedimentation.

Section –B

Classification of mineral deposits: outline of Lindgren's and Bateman's classification, Important ores, Composition physical properties, mode of occurrence, association, origin, distribution in India & uses of the following metals: copper, lead, iron, manganese, and aluminum.

Section –C

Important industrial minerals: Mode of occurrence, Physical properties, chemical composition and distribution in India-Refractory, Abrasives, Ceramics, cement and Fertilizers.

Coal, petroleum and radioactive minerals: their occurrences & distribution in India and origin.

Paper II: Mineral Exploration & Mining Geology

- Note: The paper will contain nine questions having three questions in each section. Candidates are required to attempt five questions in all, selecting at least one question from each section.

Section-A

Ore reserves and resources: definition and outline of classification of mineral reserves and resources. Methods of ore reserve estimation; concept of sampling, Assaying, bore hole drilling

Section-B

- Outline of geophysical and geochemical exploration. Explosives: types, storage and precautions in handling of explosives; blasting: various patterns of blast holes and methods of their charging and blasting.

Section-C

Elements of mining: Factors controlling selection of open cast and underground mining. Alluvial and opencast Mining methods. Underground mining methods

with special referees to sub-level stoping Coal mining methods: room and pillar method, long wall method.

Practical

Systematic study, identification, description, mode of occurrence and uses of the following minerals: haematite, magnetite, limonite, siderite, pyrite, pyrrohtite, pyrolusite. Psilomelane, chromite, ilmenite, wolframite, chalcopyrite, cuprite, malachite, galena, sphalerite, magnesite, bauxite, realgar, orpiment, stibnite, cinnabar, asbestos, graphite and other important industrial minerals.

In an outline map of India plotting of occurrence of important ore minerals

Plane table and prismatic compass survey

78

Geological field work and collection of samples. Visit of at least one open cast mine.

4.

BIO-TECHNOLOGY

14. Bio Technology

Paper – I : Animal Cell Biotechnology & Environmental Biotechnology
Max. Marks–50

Section – A

General metabolism

Special secondary metabolites/products (Insulin, Growth hormone, Interferon, plasminogen activator, factor VIII etc.)

Expressing cloned proteins in animal cells. Over production and processing of chosen protein.

The need to express in animal cells

Production of vaccines in animal cells

Production of monoclonal antibodies

Growth factors promoting proliferation of animal cells (EGF, FGF, PDGF, IL-1 IL-2, NGF, erythropietin etc.)

Bioreactors for large-scale culture of cells.

Transplanting cultures cells.

Section – B

Renewable and no-renewable resources

What is renewable should be bioassimilable/biodegradable.

Major consumer items: Food, fuel and fibres

Conventional fuels and their environmental impacts;

- Firewood
- Plant and animal
- Coal
- Gas
- Animal oils

Modern fuels and their environmental impacts:

- Methogenic bacteria and biogas
- Microbial hydrogen production
- Conversion of sugars to ethanol. The gasohol experiment.
- Solar energy converters—Hopes from the photosynthetic pigments

Syllabus : B.Sc. Part III

- Plant based petroleum industry?
- Cellulose degradation for combustible fuel

Section – C

Biotechnological inputs in producing good quality natural fibres
Transgenic sheep and transgenic plants
Microbiological quality of food and water
Treatment of municipal waste and industries effluents
Degradation of pesticides and other toxic chemicals by micro-organisms
Thuringiensis toxin as a natural pesticide
Biological control of other insects swarming the agricultural fields
Enrichment of ores by microorganisms
Biofertilizers, Nitrogen fixing microorganisms enrich the soil with assimilable nitrogen.

Paper—II : Plant Biotechnology

Max.Marks—50

Section—A

Introduction to in vitro methods. Terms and definitions. Use of growth regulators.
Beginning in-vitro cultures in our country (Over and ovule culture, in vitro-pollination and fertilization.
Embryo culture, embryo rescue after wide hybridization and its applications
Introduction to the processes of embryogenesis and organogenesis and their practical applications.
Clonal multiplication of lite species (Micropropagation) axillary bud, shoot-tip and meristem culture.

Section –B

Haploids and their applications, Somaclonal variations and applications (Treasure your exceptions).
Endosperm culture and production of triploids.
Practical applications of tissue and organ culture (summarizing the practical applications of all above mentioned techniques).
Single-cell suspension cultures and their applications in selec-

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tion of variants/mutants with or without nutagen treatment (of haploid culture preferably).

Introduction to protoplast isolation: Principles and applications.

Testing of viability of isolated protoplasts.

Various steps in the regeneration of protoplasts.

Somatic hybridization-an introduction.

Section -C

Various methods for fusing protoplasts. Chemical, electrical.

Use of markers for selection of hybrid cells.

Practical applications of somatic hybridization (hybrids vs cybrids)

Use of plant cell, protoplasts and tissue culture for genetic manipulation of plants. Introduction to *A. tumefaciens*.

Tumor formation on plants using *A. tumefaciens* (Monocots vs Dicots).

Root-formation using *A. rhizogenes*.

Practical application of genetic transformation.

Practical-Based on theory syllabus

Max.Marks-50