UNIVERSITY OF RAJASTHAN
JAIPUR
SYLLABUS
B.Sc.
Part-III
EXAMINATIONS - 2017

Dy. Registrar (Acad.)
University of Rajasthan
JAIPUR
SCHEME OF EXAMINATION
B.Sc. (Pass Course) Part-III

The number of papers 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 mark in each subject viz. 36%. No division shall be awarded at the Part First and Part Second Examinations.

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University of Rajasthan
JAIPUR
CONTENTS

Scheme of Examination

SYLLABUS

1. Physics
2. Chemistry
3. Zoology
4. Botany
5. Geology
6. Mathematics
7. Geography
8. Applied Statistics
9. Statistics
10. Psychology
11. Environmental Science
12. Electronics
13. Economics

Additional Optional Subjects

14. Textile and Craft
15. Bio Technology
16. Garment Production and Export Management
17. Geology and Mining
18. Economics
### Vocational Subjects
- Computer Applications

### DISTRIBUTION OF MARKS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the Subject</th>
<th>No. of Papers</th>
<th>Duration</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
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<tbody>
<tr>
<td>1.</td>
<td>Physics</td>
<td>Paper I</td>
<td>3 hrs.</td>
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<td>Paper II</td>
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<td></td>
<td>Paper III</td>
<td>5 hrs.</td>
<td>34</td>
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<td></td>
<td></td>
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<td>4 hrs.</td>
<td>50</td>
<td>18</td>
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<td>(Two Experiment's)</td>
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<td>Chemistry</td>
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<td></td>
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<td>Paper II</td>
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<td>Paper III</td>
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<td>18</td>
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<tr>
<td>3.</td>
<td>Mathematics</td>
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<td>Paper II</td>
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<td>54</td>
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<td></td>
<td></td>
<td>Paper III</td>
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<td>Zoology</td>
<td>Paper I</td>
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<td>Paper II</td>
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<td>Paper III</td>
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<td>5.</td>
<td>Botany</td>
<td>Paper I</td>
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<td>Paper II</td>
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<td>Paper III</td>
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<td>Practical (One)</td>
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<td>Geology</td>
<td>Paper I</td>
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<td>Paper II</td>
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<td></td>
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<td>Practical (One)</td>
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<td>7.</td>
<td>Economics</td>
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<td></td>
<td></td>
<td>Paper II</td>
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<td>8.</td>
<td>Geography</td>
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<td>Paper II</td>
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<td>Practical</td>
<td>3 hrs.</td>
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<td>Paper II</td>
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<td>Practical</td>
<td>3 hrs.</td>
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<td>18</td>
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<tr>
<td>10.</td>
<td>Statistics</td>
<td>Paper I</td>
<td>3 hrs.</td>
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<td>Paper II</td>
<td>3 hrs.</td>
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<td></td>
<td></td>
<td>Practical</td>
<td>3 hrs.</td>
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<tr>
<td>11.</td>
<td>Psychology</td>
<td>Paper I</td>
<td>3 hrs.</td>
<td>50</td>
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<table>
<thead>
<tr>
<th>Course</th>
<th>Paper I</th>
<th>Paper II</th>
<th>Paper III</th>
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</thead>
<tbody>
<tr>
<td>12 Sheep &amp; Wool</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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<tr>
<td>13 Livestock &amp; Leather</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td>14 Textile Dyeing &amp; Printing</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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<tr>
<td>15 Forest Resources &amp; their utilisation</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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<tr>
<td>16 Livestock &amp; Dairing</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td>17 Textile &amp; Craft</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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<tr>
<td>18 Crop Prod. Technology</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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<tr>
<td>19 Garment Prod. &amp; Export</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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<tr>
<td>20 Biotechnology</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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<tr>
<td>21 Geology &amp; Mining</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td>22 Crop Science (Wheat &amp; Maize Farming)</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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<tr>
<td>23 Agr. Mech &amp; Marketing</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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<tr>
<td>24 Environmental Science</td>
<td>3 hrs.</td>
<td>50</td>
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<tr>
<td>25 Electronics</td>
<td>3 hrs.</td>
<td>50</td>
<td>36</td>
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</table>

**N.B.**
1. Candidates must pass separately in each of the test Theory and Practical wherever prescribed.
2. Common papers in the subjects of Statistics and Mathematics, Economics and Geography will be set both in the Faculties of Social Science's and Science. The allocation of marks will be different as mentioned in the booklet of Syllabus.

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1. PHYSICS

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Paper I</th>
<th>Exam: 3 hours duration</th>
<th>Min Pass marks: 12</th>
<th>Max. Marks: 33</th>
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<tbody>
<tr>
<td>Paper II</td>
<td>Exam: 3 hours duration</td>
<td>Min Pass marks: 12</td>
<td>Max. Marks: 33</td>
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</tr>
<tr>
<td>Paper III</td>
<td>Exam: 3 hours duration</td>
<td>Min Pass marks: 12</td>
<td>Max. Marks: 34</td>
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<tr>
<td>Practical</td>
<td>Exam: 4 hours duration</td>
<td>Min Pass marks: 18</td>
<td>Max. Marks: 50</td>
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</table>

**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 – 1: Evolution of quantum physics**


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

4. AK Ghatak and S Lokanathan, Quantum Mechanics: Theory and application.
5. HS Mani, GK Mehta, Introduction to modern Physics.
7. H.E. White, Intoduction 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 - 1

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

**Nuclear Forces:** Properties of Nuclear Forces, Yukawa Meson Theory, Nuclear Potential.


**UNIT - 2**


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**


**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.


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:

2. Nuclear and Particle Physics, Brian R Martin, John Wiley & Sons.
3. Introduction to Nuclear and Particle Physics, Das and Ferbal, World Scientific.
5. Introductory Nuclear Physics, Kenneth S. Krane, John Wiley & Sons.
8. Introduction to Nuclear and Particle Physics, V. K. Mittal, R. C. Verma, S. C. Gupta, PHI

Paper III: Solid State Physics

Work Load: 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.

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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, Brillouin 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 current carriers, Hall Effect in semiconductors: Hall coefficient, Mobility, Charge carrier concentration, Conductivity and Hall angle.

Unit III

Thermal properties of Materials:
Elastic waves, Phophon, 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:

Unit IV

Magnetic Properties of Materials:

Superconductivity:

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)
CHEMISTRY
Scheme

Max Marks: 150

<table>
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<tr>
<th>Paper</th>
<th>Duration (hrs)</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
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<td>Paper I</td>
<td>3</td>
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<tr>
<td>Paper-II</td>
<td>3</td>
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<tr>
<td>Paper-III</td>
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<tr>
<td>Practical</td>
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<td>50</td>
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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 μs, and μeff values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

Unit-III

Electron spectra of Transition Metal Complexes:

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 metallophenylic complexes and homogeneous hydrogenation, mononuclear carbinols and the nature of bonding in metal carbinols.

Unit-V

Bioinorganic Chemistry:

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 (1H-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-enoltautomerism in ethyl acetoacetate. Synthetic applications of ethyl acetoacetate and malonic ester.

Unit-II

Heterocyclic Compounds

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


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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.


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 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
\textbf{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 $\sigma, \sigma^*, \pi, \pi^*$ 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.

\textbf{UNIT-III}
\textbf{Spectroscopy}
\textbf{Introduction:} Electromagnetic radiation, spectrum, basic features of different spectrometers, statement of the Born-Openheimer approximation, degrees of freedom.
\textbf{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.
\textbf{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.
\textbf{Raman Spectrum:} Basic principles and applications, concept of polarizability, pure rotational and pure vibrational Raman Spectra of diatomic molecules, selection rules.
\textbf{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 $\sigma, \pi$ and $\pi$ M.O. their energy levels and the respective transitions.

\textbf{UNIT-IV}
\textbf{Photochemistry}
Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus-Drapper law, Stark -Einstein law, Jablonski diagram depicting various processes occurring in the exited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

\textbf{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.

\begin{center}
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\end{center}
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:
  a) Potassium trioxalatoferrate (III), $K_3[Fe(C_2O_4)_3]$
  b) Bis (dimethylglyoximato) nickel (II) complex, $[Ni(DMG)_2]$
  c) Tetraamminecopper (II) sulphate, $[Cu(NH_3)_4]SO_4$
  d) Potassium cis-diaquabis(oxalato)chromate (III) dihydrate, $K[cis-Cr(H_2O)_2(C_2O_4)_2].2H_2O$

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 (+) mendelic 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) Acetylation 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.

Stereochemical 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
(a) To determine the strength of the given acid conductometrically using standard alkali solution.
(b) To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.
(c) To study the saponification of ethyl acetate conductometrically.
(d) To determine the ionization constant of a weak acid conductometrically.
(e) To titrate potentiometrically the given ferrous ammonium sulphate solution using KMnO₄/K₂Cr₂O₇ as titrant and calculate the redox potential of Fe²⁺/Fe³⁺ system on the hydrogen scale.

Refractometry, Polarimetry
(a) To verify the law of refraction of mixture (e.g. of glycerol and water) using Abbe’s refractometer.
(b) To determine the specific rotation of a given optically active compound.

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

Colorimetry
(a) To verify Beer-Lambert law KMnO₄/K₂Cr₂O₇ and determined the concentration of the given solution of the substance.
Instructions to the Examiner
CH-304 Chemistry Practical (Pass Course)

Max. Marks: 50
Duration of Exam: 5 hrs.
Minimum marks: 18

Inorganic Chemistry
Synthesis and Analysis of one of the four syntheses given in the syllabus.
OR
Separation and estimation of Mg (II) and Fe (II) by solvent extraction method.
OR
Separation and estimation of Mg (II) and Fe (II) by ion exchange method.

10

Organic Chemistry
1) Synthesis of one of the six organic preparations.
2) Analysis of an organic mixture containing two solid components using water / NaHCO₃/ NaOH and preparation of suitable derivatives.

OR

Column chromatography techniques.
Perform one of the three column chromatography experiments given in syllabus.

10

Physical Chemistry
Perform one of the physical chemistry experiments given in the syllabus.

12

Viva-voce
5

Record
5

50

Books Suggested (Theory Course)
2. Concise Inorganic Chemistry, J.D. Lee, ELBS
6. Inorganic Chemistry, A.G. Sharpe, ELBS
Books Suggested (Laboratory Courses)
1. Vogel's Qualitative Inorganic Analysis, revised, Svehla, Orient Longman.

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Scheme:
Max. Marks: 100

| 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, Amphicoete larva.
Section – B

Comparative Anatomy
1. integument including structure and development of placoid scales, feathers and hair.
2. Basic plan of vertebrate endoskeleton.
3. Alimentary canal.
4. Heart and aortic arches.
5. Respiratory system.
6. Urinogenital system.
8. Sense organs (ear and eye).

Section – C

Chordate Adaptations

PAPER –II: Z-302
ECOLOGY AND ENVIRONMENTAL BIOLOGY

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.
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
10. Habitat ecology: Brief account of fresh water, marine, terrestrial and estuarine water ecosystems.
11. Major biomes of the world.

Section - B

Environmental Biology-I
1. Environment and its concepts, global environment, hydrosphere, lithosphere and atmosphere.
2. Natural resources: Present status and future needs.
3. Conservation and management of natural resources: Renewable (forest, wildlife, water) and non renewable (soil, minerals and energy).
4. Environmental pollution I: General outline and various types of pollution of water, air, and soil.
5. Environmental pollution II: Sources and remedies for noise, radiation, industrial chemicals, agrochemicals, insecticides, pesticides and household pollutants.
6. Green House effect, Ozone layer depletion, El-Nino and La I Nina effects.
8. Basic concepts of bioaccumulation, biomagnifications, biodegradation of pollutants.

Section - C

Environmental Biology -II
2. Impact of urbanization: Development and distribution of urban centers, factors, problems and solutions of urbanization, fauna of oriental region.

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.

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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.
7. Pisciculture.

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.
4. Pheromones and their role in alarm spreading
5. Societies: Characteristics and advantage with special reference to honey bee, deer and monkey.
6. Biological rhythms and biological clocks.
7. 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.
7. Hypothesis: Null and alternative; Student’s t-test.

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Zoology Practical
(2016-2017)

Min. Marks: 18  4 Hrs./Week  Max. Marks: 50

I. Anatomy:

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

(b) Rat or any other suitable mammal: Blood vascular, urino-gential and nervous system (brain, cranial nerves). In this exercise CAL (Computer Assisted Learning) May be used with a software COMPURAT.

II. Study of the following through Permanent Slide preparations:
Striped muscle fibers; Smooth muscle fibers, scales of edible fish, hair of man, dog, goat and cow.

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.


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).

### Scheme of Practical Examination and Distribution of Marks

<table>
<thead>
<tr>
<th>Time: 4 Hrs.</th>
<th>Min Pass Marks: 18</th>
<th>Max. Marks: 50</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Regular</td>
<td>Ex./N.C. Students</td>
</tr>
<tr>
<td>1. Anatomy (any system)</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Permanent Preparation</td>
<td>6</td>
<td>6</td>
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<tr>
<td>3. Environmental Biology</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>4. Ethology</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>5. Biostatistics</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>6. Identification and comments on Spots (1 to 8)</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>7. Viva Voce</td>
<td>5</td>
<td>5</td>
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<tr>
<td>8. Class Record</td>
<td>5</td>
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</tbody>
</table>

|              | 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.

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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:
5. Grzimek’s Encyclopedia of Ethology.
4. BOTANY

Scheme
Min. Pass Marks: 36

Paper I  3 hrs. duration
Paper II  3 hrs. duration
Paper III  3 hrs. duration

Practical Min. Marks: 18  4 hrs, duration

Max. Marks: 100

Max. Marks 33
Max. Marks 33
Max. Marks 34
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.

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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. Seneescence 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

Suggested readings:


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 primordial.
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, cucurbita stem and roots.
6. Anamolous secondary growth in stem: *Salvadora, Bignonia, Bougainvillia, Bouhaenia, Myrciathes, Leptadenia, Deacena*
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.

[Signature]
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Paper-II

Ecology & Economic Botany
(2 hrs/week)

Unit-1


Unit-2


Unit-3


Unit-4

Spices: General account with an emphasis on those cultivated in Rajasthan (Curcumin, Capsicum, Coriander). Beverages: tea and coffee. Medicinal plants: General accounts with an emphasis on plant species cultivated in Rajasthan.

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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.
10. Find out pH of water sample by pH meter.
11. Find out transparency of a waterbody by Secchidisk.
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).
15. Submit 5 specimens of locally important medicinal plants.

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Paper-III

Angiosperm- Taxonomy and Embryology

(2 hrs/week)

Unit-1


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


Unit-2


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.


Unit-4


Suggested Laboratory Exercises

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(4) Taxonomy:

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

1. Ranunculaceae - Ranunculus, Delphinium.
2. Fabaceae - Psoralea corylifolia, Cassia and Acacia
3. Apocynaceae - Courandia
4. Convolvulaceae - Ipomea, Jacquinouia
5. Apocynaceae - Catharanthus, Thevetia
6. Asclepiadaceae - Calotropis
7. Lamiaceae - Ocimum, Salvia
8. Euphorbiaceae - Euphorbia pulcherrima, Ricinus
9. Acanthaceae - Adhatoda
10. Asteraceae - Helianthus
11. Rhamnaceae - Hamelia
12. Fabaceae - Fruicum

(ii) Types of Inflorescence and Fruits

(iii) Embryology

1. Dissection 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:


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Dy. Registrar (Acad.)
University of Rajasthan
JAIPUR
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Practical</th>
<th>Regular</th>
<th>Ex/NC</th>
</tr>
</thead>
</table>
| 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       | 7     |
|       |           | 3       | 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       | 3     |
|       |           | 4       | 4     |
| 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
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: Archæans, cuddaphs and the Vindhyan with special reference to Rajasthan.

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

Section - C

Triassic Period : Triasic 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.

Siwalik 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.
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**


**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: Model 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.

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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, pyrohite, pyrolusite, psilomelane, chromite, ilmenite, wolframite, chalcopyrite, Cuprite, malachite, azurite, galena, sphalerite, cassiterite. Magnesite, bauxite, beryl, realgar, orpiment, stibnite, molybdenite, 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:
Teaching: 3 Hours per Week per Theory Paper.

Examination:

<table>
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<tr>
<th>Scheme</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
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<td>Science</td>
<td>54</td>
<td>150</td>
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<td>Arts</td>
<td>72</td>
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<td>Paper – I</td>
<td>Algebra</td>
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<td></td>
<td>Duration 3 hrs.</td>
<td>50 (Science)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>66 (Arts)</td>
</tr>
<tr>
<td>Paper – II</td>
<td>Complex Analysis</td>
<td>50 (Science)</td>
</tr>
<tr>
<td></td>
<td>Duration 3 hrs.</td>
<td>66 (Arts)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 (Science)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>44 (Arts)</td>
</tr>
<tr>
<td></td>
<td>Practical 2 hrs.</td>
<td>18 (Science)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 (Arts)</td>
</tr>
</tbody>
</table>

Note:
1. Papers I and II are 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.

2. Paper III is divided in FOUR Units. TWO questions will be set from each Unit. Candidates are required to attempt FOUR questions in all taking ONE question from each Unit. All questions carry equal marks.

3. 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.

4. 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.

5. An Internal/external examiner can conduct Practical Examination of not more than 100 (Hundred) Candidates (20 Candidates in one batch).

6. Each candidate has to pass in Theory and Practical examinations separately.

Dy. Registrar (Acad.)
University of Rajasthan
Jaipur
**Paper -I : Algebra**

**Teaching : 3 Hours per Week**

**Duration of Examination : 3 Hours**

Max. Marks: 50 (Science)

66 (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.

**Paper – II: Complex Analysis**

**Teaching : 3 Hours per Week**

**Duration of Examination : 3 Hours**

Max. Marks: 50 (Science)

66 (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 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’ 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 5: Conformal mapping, Bilinear transformation and its properties. Elementary mappings: \( w(z) = \frac{1}{2} \left( \frac{1}{z} + \frac{1}{z^2} \right), z^2, e^z, \sin z, \cos z, \text{ and } \log z. \) Evaluation of a real definite integral by contour integration. Analytic continuation. Power series method of analytic continuation.

Paper – III: Dynamics and Computer Programming in C
Teaching: 3 Hours per Week
Duration of Examination: 2½ Hours
Max. Marks: 32 (Science) 44 (Arts)

Note: This paper is divided into FOUR Units. TWO questions will be set from each Unit. Candidates are required to attempt FOUR 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.


Unit 4: Programming languages and problem solving on computers, Algorithm, Flow chart, Programming in C- Constants, Variables, Arithmetic and logical expressions, Input-Output, Conditional statements, Implementing loops in Programs, Defining and manipulation arrays and functions.

Dy. Registrar (Acad.)
University of Rajasthan
JAIPUR
Practical:
Teaching: 2 Hours per Week per Batch
(20 Candidates in each Batch)

Examination:

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Science</th>
<th>Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max.Marks</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>Min.Pass Marks</td>
<td>06</td>
<td>08</td>
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</tbody>
</table>

Distribution of Marks:

Two Practicals of

6 Marks each = 12 Marks (08 Marks each) 16
Practical Record = 03 Marks 04
Viva-voce = 03 Marks 04
Total Marks = 18 Marks 24

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

Programming in C and execution for the result of
1. Solution of linear algebraic equations by Gauss elimination method
2. Solution of algebraic and transcendental equations by Bisection, False position and Newton – Raphson Methods
3. Solution of ordinary differential equations by Euler’s and Runge-Kutta 4th order method
4. Numerical integration by Trapezoidal and Simpson’s one third rule

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.

Dy. Registrar (Acad.)
University of Rajasthan
JAIPUR
Paper - XII: Statistics

Teaching : 3 Hours per Week
Duration of Examination : 3 Hours
Max. Marks: 100

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

Unit 1: Frequency distributions and measures of location, Measures of dispersion, Skewness and Kurtosis, Moments of frequency distributions.

Unit 2: Mathematical expectation, Moment generating and Cumulative functions. Discrete probability distributions (Binomial, Poisson, Geometric and Hypergeometric).

Unit 3: Continuous probability distributions (Rectangular and Normal distributions).

Unit 4: Methods of least squares and curve fitting. Correlation and Regression, Multiple and partial correlation.

Unit 5: Theory of probability.


**7. Geography**

**Scheme of Examination**

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts/Social Science</td>
<td>72</td>
<td>200</td>
</tr>
<tr>
<td>Science</td>
<td>54</td>
<td>150</td>
</tr>
<tr>
<td>Paper I</td>
<td>Geography of Asia</td>
<td>Arts 75</td>
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<td></td>
<td></td>
<td>Science 50</td>
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<td>Paper II</td>
<td>Geography of India</td>
<td>Arts 75</td>
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<tr>
<td></td>
<td></td>
<td>Science 50</td>
</tr>
<tr>
<td>Practical</td>
<td>18</td>
<td>Science 50</td>
</tr>
</tbody>
</table>

**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.

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[Signature]

University of Rajasthan
SYLLABUS

Paper I: Geography of Asia

Section A

Asia in the context of the world, geological structure, relief, drainage system, climate and climatic regions based on Koppen and Thronthwaite. Natural vegetation and soil regions, population: distribution, density and growth; trends of urbanization.

Section B

Agriculture: main characteristics and problems of Asian agricultural; distribution and production of major crops: rice, wheat, cotton, tea, coffee, sugarcane, rubber; problems and solutions of Asian agriculture, fisheries: distribution and production; mineral resources: distribution, deposits and production of iron ore, copper, mica, aluminium; power resources: distribution, deposits and production of coal, petroleum and natural gas. Industries: distribution and production iron and steel industry, cotton textile and paper industry; transport network and international trade in Asia.

Section C

Regional geography of Japan, China, Pakistan, Turkey and Indonesia in terms of physiography, climate, drainage pattern, soils, vegetation, minerals, agriculture, industry, human resources, trade, commerce and major geographical regions.

Recommended Readings:

मोहनसिंह एवं अनानद 2012: एशिया का भूगोल। साहित्य भवन, आगरा।
राम, बी.पी. एवं सतपदी, दी.पी. 2002: एशिया की भौगोलिक समीक्षा। वसुधारा प्रकाशन, गोरखपुर।
सतपदी, दी.पी. 1995: चीन की भौगोलिक समीक्षा। वसुधारा प्रकाशन, गोरखपुर।
सक्सेना, एच.एम. 2010–11: विश्व का प्रादेशिक भूगोल। रस्तोगी पब्लिकेषन्स, भोपाल।

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:

Gopal Krishnan, R. 2001: Geography of India, Jawaher Publishers & Distributions, New Delhi, 2nd Edition

गुर्जर, आर.के. एवं जाट, धी.सी. 2013: भारत का भूगोल, पंचरील प्रकाशन, जयपुर।
Khullar, D.R. 2006. India a comprehensive Geography; Kalyani Publishers, New Delhi
मामोरिया, सी. 1999: आधुनिक भारत का वृहत भूगोल। साहित्य भवन पब्लिकेशन्स, आगरा।


Tirtha, R 2000: Geography of India, Rawat Publications, Jaipur 2nd Edition (India)

तिवार, आर.सी. 2012: भारत का भूगोल। प्रयाण पुस्तक भवन, इलाहाबाद।

Practicals

Scheme of Examination

Min. Pass Marks: 18

Written test
Field survey and viva voce
Record and viva voce

Max. Marks: 50

Bifurcation of Marks

24
10+04
08+04

Time
3 hrs.
2½ hrs.

[Signature]

Dy. Registrar (Acad.)
University of Rajasthan
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:

चौहान, पी.अ. 2005: प्रायोगिक भूगोल। वसुन्धरा प्रकाशन, गोरखपुर।
Singh, L.R. 2006: Practical Geography. Prayag Pustak Publisher, Allahabad U.P.
शानी, जे.पी. 2010–11: प्रायोगिक भूगोल की रूपरेखा। रस्तोगी प्रकाशन, मेरठ।
Subject: Applied Statistics

Marks Scheme

<table>
<thead>
<tr>
<th>Paper</th>
<th>Nomenclature</th>
<th>Marks</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Paper I</td>
<td>Sample Survey</td>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td>Paper II</td>
<td>Design of Experiment and Computational</td>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Techniques</td>
<td></td>
<td></td>
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<tr>
<td>Paper III</td>
<td>Practical based on Paper I,II</td>
<td>50</td>
<td>70</td>
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<td>Total</td>
<td>150</td>
<td>200</td>
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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)

Dy. Registrar (Acad.)
University of Rajasthan
Subject: Statistics

Marks Scheme

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<th>Nomenclature</th>
<th>Marks</th>
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<td>Paper I</td>
<td>Sample Survey</td>
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<td>Design of Experiment and Computational Techniques</td>
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<td>Paper III</td>
<td>Practical based on Paper I,II</td>
<td>Science: 50 mark</td>
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<td><strong>Total</strong></td>
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</table>

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.

Dy. Registrar (Acad.)
University of Rajasthan
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


REFERENCES:


ADDITIONAL REFERENCES:

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

REFERENCES:
1. Das M.N. & Giri N.C. (1986): Design and Analysis of Experiments. Springer Verlag

ADDITIONAL REFERENCES
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(S²) = S² 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.
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 2² & 2³ factorial design.
10. **PSYCHOLOGY**

**SCHEME OF EXAMINATION :**

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Max. Marks</th>
<th>Min. Passing Marks</th>
</tr>
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<tbody>
<tr>
<td>Arts</td>
<td>200</td>
<td>72 (Th.54 Pr.18)</td>
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<tr>
<td>Science</td>
<td>150</td>
<td>54 (Th.36 Pr.18)</td>
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<th>Duration</th>
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<tr>
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<td></td>
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<td>Arts</td>
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<tr>
<td>I</td>
<td>Positive Psychology</td>
<td>3 Hrs.</td>
<td>75</td>
</tr>
<tr>
<td>II</td>
<td>Psychological Testing</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>and Assessment</td>
<td></td>
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<tr>
<td>III</td>
<td>Practicals</td>
<td>3 Hrs.</td>
<td>50</td>
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</table>

**NOTE :**

1. There will be three papers in Psychology. It will be common for Arts and Science. Each paper will be of 3 hours and would contain 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.

Dy. Registrar (Acad.)
University of Rajasthan
Jaipur
For clarification the distribution of marks is tabulated as below:

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<th>Arts</th>
<th>No. of Questions</th>
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<tr>
<td>A</td>
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<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>B</td>
<td>5 (Out of 7)</td>
<td>03</td>
<td>15</td>
</tr>
<tr>
<td>C</td>
<td>3 (with internal choice)</td>
<td>15</td>
<td>45</td>
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<tr>
<td><strong>Total Marks</strong></td>
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<td></td>
<td><strong>75</strong></td>
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<th>No. of Questions</th>
<th>Marks</th>
<th>Total</th>
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<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>01</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>5 (Out of 7)</td>
<td>02</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>3 (with internal choice)</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td></td>
<td></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

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 Eudaemonist Viewpoint; Positive and Negative Affect; Theoretical Viewpoints; Determinants and Sources; Authentic Happiness; Enhancement of Happiness and Wellbeing.


[Signature]

Registrar (Acad.)
University of Rajasthan
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.


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.


Books Recommended:

Paper-II:

Psychological Testing and Assessment

Section-A

1. Human Assessment: Nature and Scope

2. Theories of Measurement: Campbell’s Theory, Steven’s Contribution, Problems in Psychological Measurement.


Section-B

4. Reliability: Meaning, Types and Methods of Calculating Reliability.

5. Validity: Meaning, Types and Methods of Calculating Validity.


Section-C


Books Recommended:


Paper-III

Practicals

1. Measurement of Subjective Wellbeing
2. Measurement of Forgiveness
3. Measurement of Emotional Intelligence
4. Measurement of Attributional Styles
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
<table>
<thead>
<tr>
<th>Scheme: Theory</th>
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<tbody>
<tr>
<td>Max Marks: 100</td>
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<tr>
<td>Paper 1</td>
</tr>
<tr>
<td>Paper 2</td>
</tr>
<tr>
<td>Practical</td>
</tr>
</tbody>
</table>

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 \( \frac{1}{2} \) marks each.
   - Fill in the blanks/one word/true or false type questions: 10 questions of \( \frac{1}{2} \) mark each.
   - Very short answer type questions: 5 questions of 1 mark each.
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, Sox, Nox, 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; Sox
5. Control of gaseous air pollutants; NOₓ and CO
Suggested Readings

- Environmental Management and Planning
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 Programmes
8. Role of National and International Organizations in Conservation of Environment
9. Role of Media in Environmental Conservation

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
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
Suggested Readings

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 Sox around
3. Estimation of NOx
4. Estimation of CO and CO2.
5. Impact of air pollutants from Industries on Soil.
6. Impact of air pollutants from Industries on vegetation.

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12. ELECTRONICS

Scheme:
Min Pass. Marks : 36
Max. Marks-100

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Syllabus: B.Sc. Part-III

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 λ/4 and λ/2 lines

Unit—4
Impedence matching and Radiation of EM Waves

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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
4. Electromagnetic waves and radiative systems—E.L. Jordan.
5. Electron tube circuits—Samuel 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

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, Exstoff 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.

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Syllabus: B.Sc. Part-III

Depth of focus. Pick-ups for motion picture films. The type RCA-185 OA Iconoscope.

Limiting sensitivity of pick-up devices. The two sided target.

Unit-4

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


Unit-5


Reference Books-suggested
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.

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Unit-2

Power Electronics

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 temperative Transducers, Self generating Inductive Transducer, Linear variable Differential Transformer (LVDT).

Unit-5

Thermal and optical transducer

Reference Books Suggested
Syllabus: B.Sc. Part-III

Experiments For Practical Work

Note: A candidate has to perform at least sixteen experiments in all taking 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 size 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.

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10. To design and study voltage comparator using operational amplifier.

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13. TEXTILE-CRAFT

SCHEME: BA/BSc/BCom PART-III

<table>
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<th>Max mark</th>
<th>Min mark</th>
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<tr>
<td>1. Theory:</td>
<td>Paper-I</td>
<td>3Hrs</td>
<td>30</td>
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<tr>
<td></td>
<td>Paper-II</td>
<td>3Hrs</td>
<td>22</td>
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<tr>
<td>2. Practical:</td>
<td>Paper-I</td>
<td>6Hrs</td>
<td>35</td>
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<tr>
<td></td>
<td>Paper-II</td>
<td>6Hrs</td>
<td>25</td>
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<tr>
<td>3. Submission:</td>
<td>Paper-I</td>
<td></td>
<td>35</td>
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<tr>
<td></td>
<td>Paper-II</td>
<td></td>
<td>25</td>
</tr>
</tbody>
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_Syllabus (Theory):

Paper-I: Weaving Theory:

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

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4. 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

5. Spinning of Silk and Wool
Life cycle of silk worm, process of silk spinning, different types of silk. Classification of wool, wool spinning process, difference between woollen and worsted fabric

6. Concept of Mixing and Blending, Basic difference between mixing and blending. Concept of Staple and Filament fibre; difference between staple fibre and filament fibre

7. Derivatives of Twill weave: Broken weave, Herringbone weave and Diamond weave

8. Towel weaves: Huckaback and Honeycomb; quality of yarn and weave selected for towels

9. Concept of shedding mechanism; Dobby and Jacquard shedding mechanism
Paper-II: Dyeing Theory

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.

4. Different stages of dyeing- fibre dyeing, yarn dyeing and fabric dyeing

5. Process of Padding mangle dyeing machine

6. Methods of direct printing: Screen printing and Stencil printing

7. Discharge and Resist printing; different styles of discharge and resist printing

8. Factors affecting colour fastness: composition of fibre, chemical structure of dye, techniques of dyeing/printing, addition of other useful additives

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Practical (Paper-I&II):

1. Samples of weaves using coloured threads
2. Concept of repeat
3. Calculation of EPI and PPI in given piece of fabric
4. Table cover preparation by screen printing
5. Screen preparation (simple tracing method)
6. Design development for curtain and bed sheet

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14. 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, erythropoietin etc.)
Bioreactors for large-scale culture of cells.
Transplanting cultures cells.

Section – B

Renewable and non-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

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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 microorganisms
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 live species (Micropropagation) exillary bud, shoot-tip and meristem culture.

Section –B
Haploids and their applications, Somaclonal variations and applications (Tackle 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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Isolation of variants/mutants with or without mutagen 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

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SECTION-A INTRODUCTION 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 machine-
   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. fastners, loops
vi. seam binding and tapes
vii. shoulder pads, eyelets

SECTION-C
DYEING AND PRINTING

Application of design:

   ii. Styles of printing - direct, discharge and resist.

10. Dyeing - Introduction to natural and synthetic dyes
      (acid, basic, sulphur, vat, reactive and direct dyes)


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B.SC./B.A./B.COM.PART – III

PAPER-II

INTERNATIONAL MARKETING

B.A./B.COM.-M.M. 50

B.SC.-M.M. 60

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.
B.SC./B.A./B.COM.PART-III

PRACTICAL – 1

FASHION ILLUSTRATIONS

B.A./B.COM.-M.M. 50

B.SC.-M.M. 25

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:

   Types of patterns include -
   
   i) Structural
   ii) Geometrical
   iii) Stripes and plaid
   iv) Floral

5. Design and prepare an adult dress for fashion shows

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B.SC./B.A./B.COM.PART – III

PRACTICAL – II

DYEING AND PRINTING

B.A./B.COM.-M.M. 60

B.SC.-M.M. 25

1. Prepare and article of each:
   
i) Dyeing – tie and dye, batik.
   
ii) Printing – block, screen, stencil

2. Field trips to Export houses and mass production centers.

3. Exhibition:

References:

   
   2. Ireland, fashion designing drawing and presentation.
   
   3. Prayag: technology of textile printing.

Shenai: technology of dyeing
16. Geology and Mining

Scheme:

<table>
<thead>
<tr>
<th>Theory:</th>
<th>Max Marks 100</th>
<th>Minimum Pass marks: 36</th>
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</thead>
<tbody>
<tr>
<td>Paper I: Mineral Resources</td>
<td>3 hrs duration</td>
<td>Max Marks 50</td>
</tr>
<tr>
<td>Paper II: Mineral Exploration &amp; Mining Geology</td>
<td>3 hrs duration</td>
<td>Max Marks 50</td>
</tr>
<tr>
<td>Practical (one)</td>
<td>4 hrs duration</td>
<td>Max Marks 50</td>
</tr>
</tbody>
</table>

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


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.

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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, chalcopryite, cuprite, malachite, galena, sphelerite, 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
Geological field work and collection of samples. Visit of at least one open cast mine.
18. 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 short type X (Ten) questions. 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 questions carry equal marks.

Paper I: Introduction to International Trade, Development and Public Economics

Section – A


Section B


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Section – C


Books Recommended:


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

Section-A

Differential Calculus and Integral Calculus: Applications in Economics; Matrix and Determinants; Solution of Simultaneous Equations; Maxima and Minima; Convexity and Concavity.

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 Homogeneous Production Functions - Cobb-Douglas and CES Production Functions; 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:

2. RGD Allen, Mathematical Economics, McMillan
Paper –II (b): Environmental Economics

Section –A


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


Recommended Books:

Paper -II (C): Economy of Rajasthan

Section-A


Section-B


Section-C

Books and Readings:

1. लक्ष्मीनारायण नाथूरामका, राजस्थान की अर्थव्यवस्था, समेत बुक डिपो, जयपुर
2. Economic Review, Directorate of Economics and Statistics, Jaipur

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