UNIVERSITY OF RAJASTHAN
JAIPUR

SYLLABUS

B.Sc. Part-I

EXAMINATIONS – 2018
CONTENTS

Scheme of Examination

SYLLABUS

Compulsory Subjects (Four)
1. General Hindi
2. General English (Essential Language Skills)
3. Environmental Studies
4. Elementary Computer Application
5. Elementary Hindi (in lieu of General Hindi for non-Hindi speaking students only)

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

Additional Optional Subjects
1. Textile Craft
2. Garment Production and Export Management
3. Geology and Mining
4. Environmental Science

Vocational Subjects
1. Biotechnology
2. Industrial Microbiology
3. Computer Applications
SCHEME OF EXAMINATION
B.Sc. (Pass Course) Part-I

The number of paper and the maximum marks for each paper together with the minimum marks required for a pass are shown in the scheme of examination 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%
Second Division 48%

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.

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.
नोट : 36 से कम अंक लाने पर छात्रों को उल्लेख नहीं किया जायेगा। इस प्रश्न-पत्र में प्राप्त अंकों को श्रेणी निर्धारण हेतु नहीं जोड़ा जायेगा।
अंक विभाजन – प्रश्न पत्र में दो भाग होंगे – 1. साहित्य खण्ड एवं 2. व्यक्तिक खण्ड। साहित्य खण्ड में दो भाग होंगे – गद्य भाग एवं पद्य भाग। प्रत्येक खण्ड के लिए 50 अंक निर्धारित है।

50 अंक

क दो व्याख्या पद्धति से (प्रत्येक में विकल्प देश है) 5 x 2 = 10 अंक
ख दो व्याख्या गद्य से (प्रत्येक में विकल्प देश है) 5 x 2 = 10 अंक
ग आलोचनात्मक प्रश्न पद्धति से (विकल्प देश है) $\frac{7}{2} \times 2 = 15$ अंक
घ आलोचनात्मक प्रश्न गद्य से (विकल्प देश है) $\frac{7}{2} \times 2 = 15$ अंक

साहित्य खण्ड – 'क' – गद्य-पद्य की निर्धारित रचनाएं

1. कहानी – प्रेमचंद – वह भाई साहिब
2. संस्मरण – कन्हैयालाल मिश्र 'प्रभाकर' – ब्राह्मिलिस के ज्वार की उन लहरों में
3. रेखाचित्र – रामचंद्र बेंगुरूरी – रूपिया
4. विज्ञान – गुरुपाल कुलेश – शायन सवसे सुन्दर प्रश्न
5. निबंध – अगरचन्द्र नाहटा – राजस्थान की संस्कृतिक धरोहर
6. ब्यंग – शरद जोशी – उल्लेख पर सवार हिलियाँ
7. पत्रिकारण – अनुमुख गिरिरंग – आज भी खड़े हैं तालाब

पद्य भाग – (कबीर ग्रंथावली से सं – श्रीमण्डल दास)

1. कबीर – साहित्य सं – गुरुदेव को अंग – 7,12,26,30
2. सूरदास सूरसागर सार – सं – दों धीरेन्द्र वर्मा – विनय मंत्रित पद सं – 21,33
3. तुलसीदास – विनय पत्रिका, गीताविश्व, गोहरपुर पद सं – 87,98,90,156,158
4. गीताविश्व – सं – नवरत्न साहित्य पद सं – 1,3,4,5,10
5. रवींद्र (यह संहिता) – रक्षाबंधन संपादक विज्ञानिकास मिश्र, गोविन्द रजनीश
6. मेघनाधिशरण सुधा – मनुष्यता, हम राज्य लिए मरते हैं (गीत–साहित्य के नवम सर्ग से)
7. सुगन्धजंद्र पंत – सं – मोक्ष विविधता
8. सुरक्षा दिशातील निर्दया – सं – देवकुंदली पठर
9. राधाकृष्णनंद नंदीनंद वर्त्त्यानंद 'अज्ञात' – विलोकण
10. समस्ती शिंदे दिनकर – विगत्य, समय शेष है
व्याकरण/व्यावहारिक; हिंदी खण्ड

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<td>संक्षेपण</td>
<td>4 अंक</td>
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<td>पत्रलेखन</td>
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<tr>
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<td>शब्द शुद्धि एवं वाक्य शुद्धि</td>
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<tr>
<td>मुहावरे एवं लोकोक्ति</td>
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<tr>
<td>पारिमापिक शब्दावली</td>
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<td>शब्द के प्रकार</td>
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राजस्थान विश्वविद्यालय

Dy. Registrar (Academic)
University of Rajasthan
JODHPUR
2. GENERAL ENGLISH

Duration: 3 hrs.  Max. Marks: 100

Minimum Pass Marks: 36

The syllabus aims at achieving the following objectives:

1. Introducing students to phonetics and enabling them to consult dictionaries for correct pronunciation (sounds and word stress)
2. Reinforcing selected components of grammar and usage
3. Strengthening comprehension of poetry, prose and short-stories
4. Strengthening compositional skills in English for paragraph writing. CVs and job applications.

The Pattern of the Question Paper will be as follows:

Unit A: Phonetics and Translation  (20 marks)
(10 periods)

I Phonetic Symbols and Transcription of Words  (05)
III Translation of 5 Simple sentences from Hindi to English (05)
    from English to Hindi (05)
IV Translation of 05 Words from Hindi to English (2 1/2)
    from English to Hindi (2 1/2)

Unit B: Grammar and Usage  (25 marks)
(10 periods)

I Elements of a Sentence  (05)
II Transformation of Sentences  (05)
a. Direct and Indirect Narration

(b) Active and Passive Voice

II Modals (05)

III Tense (05)

IV Punctuation of a Short Passage with 10 Punctuation Marks (05)

(As discussed in Quirk and Greenbaum)

Unit C: Comprehension (25 marks)

Candidates will be required to answer 5 questions of two lines each to be answered out of 10 questions. There would be two questions from the prescribed text. (10)

Sujata Bhart
Ruskin Bond
M.K. Gandhi
J.L. Nehru
A.P.J. Abdul Kalam

Voice of the Unwanted Girl
Night Train for Deoli
The Birth of Khadi
A Tryst with Destiny
Vision for 2020

The candidates will be required to answer 5 questions from the given unseen passage. (10)

One vocabulary question of 10 words from the given passage. (5)

Unit D: Compositional Skills (30 marks)
(15 periods)

I Letters- Formal and Informal (10)

II CV’S Resume and Job Applications and Report (10)

III Paragraph Writing (10)
Recommended Reading:

Singh, R.P. Professional Communication. OUP. 2004
Judith Leigh. CVs and Job Applications. OUP. 2004
Quirk and Greenbaum: A University Grammar of English Longman, 1973
COMPULSORY PAPER OF ENVIRONMENTAL STUDIES

Compulsory in 1 Year for all streams at undergraduate level

Scheme of examination

<table>
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<tr>
<th>Time</th>
<th>Min Marks</th>
<th>Max. Marks</th>
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<tr>
<td>3 hrs</td>
<td>36</td>
<td>100</td>
</tr>
</tbody>
</table>

This paper will contain 100 multiple choice questions. Each question will carry 1 mark.

Students should be encouraged to visit places of Environmental Importance including Natural and Manmade Habitat.

Note:
1. The marks secured in this paper shall not be counted in awarding the division to a candidate.
2. The candidates will have to clear this compulsory paper in three chances.
3. Non-appearing or absence in the examination of compulsory paper will be counted as a chance.

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance- Relationship between Environmental Studies and other branches of science and social sciences.

Need for Environmental awareness, Environmental education in present day context.

Unit 2: Natural Resources and Challenges

a. Natural resources and associated problems, Classification of resources: renewable resources, non-renewable resources, classes of earth resources, resources regions: Definition and criteria, resource conservation.

b. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

c. Water resources: Use and over-utilization of surface and groundwater, floods, drought conflicts over water, dams-benefits and problems.

d. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
e. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.

f. Energy resources: Growing energy need, renewable and nonrenewable energy sources, use of alternate energy sources. Case studies.

g. Land resources: Land as a resource, Land degradation man induced Landslides, soil erosion and desertification.
   - Role of an individual in conservation of natural resources.
   - Equitable use of resources for sustainable lifestyles.

Unit 3: Ecosystems, Concepts, Structure, Functions and Types
- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types characteristics features, structure and function of the following ecosystem:
  a. Forest ecosystem, Tropical Temperate and Alpine Ecosystem
  b. Grassland ecosystem and Their Types
  c. Desert ecosystem with emphasis on Thar Desert
  d. Aquatic ecosystems(ponds, streams, lakes, rivers, oceans, estuaries) and Wet Lands

Unit 4: Biodiversity and its conservation
- Introduction –Definition, genetic, species and ecosystem diversity
- Biogeographically classification of India
- Value of biodiversity :consumptive use, productive use, social ethical., aesthetic and option values
- Biodiversity at global, National and local level
- India as a mega-diversity nation
- Hot-spot of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts
- Endangered, Threatened and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity
- Red Data Book
Unit 5: Environmental Pollution and Control Measures

Definition:
- Causes, effects and control measures of:
  a) Air Pollution
  b) Water Pollution
  c) Soil Pollution
  d) Marine Pollution
  e) Noise Pollution
  f) Thermal Pollution
  g) Nuclear Hazards

- Solid waste management
- Causes, effects and control measures of urban and industrial wastes
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods earthquake, cyclone and landslides

Unit 6: Social Issues, Environment, Laws and Sustainability

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns.
  - Case studies
- Environmental ethics: Issues and possible solution.
- Climate change, global warming, acid rain ozone layer depletion, nuclear accidents and holocaust. Case studies
- Wasteland reclamation.
- Consumerism and waste product.
- Environmental Protection Act.
- Air (Prevention and Control of Pollution) Act
- Wild life protection Act
- Forest Conservation Act
- Biological Diversity Act
- Issues involved in enforcement of environmental legislation
- Public Awareness.

Unit 7: Human Population and the Environment

- Population growth, variation among nations
- Population explosion-Family Welfare Programme
- Environment and Human health
- Human Rights
- Value Education
- HIV/AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and human health
- Case Studies
Suggested Readings:-

5. Goudie,Andrew. The Human Impact.
4. Elementary Computer Applications

Maximum Marks- 100 (Main University Examinations)
Theory : Max. Marks -60
Practical : Max. Marks- 40

Each Candidate has to pass in Theory and Practical Examinations separately.

Question paper for Elementary Computer Applications, (Compulsory paper-common for B.A. / B.Sc./ B.Com. Part-I) be so set that it has 120 multiple choice questions (Bilingual) of $\frac{1}{2}$ marks each. The question paper will be of duration of 2 hours. The examinees will have to give their answers on OMR Sheet only to be provided by the University whose evaluation will be done based on OMR Scanning Technology. Further the practical examination for this paper will be of 40 marks and its duration will be of 2 hours.

Unit – I

Introduction to information technology: Evolution and generation of computers, type of computers, micro, mini, mainframe and super computer. Architecture of a computer system: CPU, ALU, Memory (Ram, Rom families) cache memory, input/output devices, pointing devices.

Concept of Operating system, need types of operating systems, batch, single user, multi-processing, distributed and timeshared operating systems, introduction of Unix, Linux, Windows, Window NT. Programming languages Low level and high level languages, generation of languages, 3 GL and 4 GL languages Graphic User Interfaces.

Unit – II


Power Point: Creating and viewing a presentation, managing slide shows navigating through a presentation using hyperlinks, advanced navigation with action setting and action buttons. Organizing formats with Master Slides applying and modifying designs adding graphics, multimedia and special effects.

Unit - III

Electronic Spreadsheet: Worksheet types of create and open a worksheet. Entering data, text numbers and formula in a worksheet inserting and deleting cells, cell formatting, inserting rows and columns in a worksheet formatting worksheets. Using various formula and inbuilt function. Update worksheet using special tools like spell check and auto correct setup the page.
and margins of worksheets for printing. Format the data in the worksheet globally or selectively, creating charts. Enhance worksheets using charts, multiple worksheets-concepts.

**Unit - IV**

The Internet - History and Functions of the Internet, Working with Internet, Web Browsers, World Wide Web, Uniform Resource Locator and Domain Names, Uses of Internet, Search for Information. Email, Chatting, Instant messenger services, News, Group, Teleconferencing, Video-Conferencing, E-Commerce and M-Commerce.

Manage an E-mail Account, E-mail Address, configure E-mail Account, log to an E-mail, Receive E-mail, Sending mails, sending files an attachments and Address Book, Downloading Files, online form filling, E-Services - E-Banking and E-Learning.

**Unit - V**

Social, Ethical and Legal Matters - Effects on the way we Work Socialise, Operate in other areas, Cyber crime, Prevention of crime, Cyber law: Indian IT Act, Intellectual property, Software piracy, Copyright and Patent, Software licensing, Proprietary software, Free and Open source software.

Network Security - Risk assessment and security measures, Assets and types (data, applications, system and network), Security threats and attacks (passive, active); types and effects (e.g. identity theft, denial of services, computer virus etc.), Security issues and security measures (Firewalls, encryption/decryption), Prevention.

**Question Paper pattern for Main University Practical Examination**

**Max Marks: 40**

**Practical**

The practical exercises will be designed to help in the understanding of concepts of computer and the utilization in the areas outlined in the theory syllabus. The emphasis should be on practical usage rather than on theoretical concepts only.

The practical examination scheme should be as follows:

- Three Practical Exercise (including Attendance & Record performance) 30 marks
  - Operating system
  - MS Word
  - MS Excel
  - MS Power Point
  - Internet

- Viva-voce 10 marks
अंकों का विभाजन
1. पुस्तकों पर आधारित प्रश्न 50 अंक
2. व्याकरण से संबंधित प्रश्न 24 अंक
3. रचना से संबंधित प्रश्न 26 अंक
   (क) लोकोक्तियों मुहावरे
   (ख) पत्र लेखन अथवा निकंद
पाठ्यक्रम
1. गद्य संग्रह
2. व्याकरण : शब्द विचार, वाक्य नियास, वाक्य खण्ड, पद क्रम का झान तथा इमें होने वाली सामान्य तुटियाः का झान।
3. (क) मुहावरों एवं लोकोक्तियों का प्रयोग, वाक्यों में रिक्त स्थानों की पूर्ति, समान दिखने वाले शब्दों का अर्थ भेद अथवा वाक्यों में प्रयोग
   (ख) पत्र लेखन अथवा निकंद
पाठ्य पुस्तकें
1. गद्य—संग्रह—राष्ट्रीय गौरव के चिन्ह— डॉ. हरिकुमार देवसरे प्रकाशक—नेशनल पब्लिशिंग हाउस, नई दिल्ली
2. व्याकरण एवं रचना
   1. आधुनिक हिंदी व्याकरण तथा रचना — लेखक कृष्ण तिलक प्रकाशक—नेशनल पब्लिशिंग हाउस, नई दिल्ली
   2. सुसंदर व्याकरण एवं रचना—समादरक—शारिरिक हदय—संशोधन कार्यालय—डॉ.अम्बा प्रसाद सुमन प्रकाशक— श्रीराम मेहरा एण्ड कंपनी, आगरा

 Dy. Registrar
 University of Jaiwant
1. PHYSICS

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<th>Paper I</th>
<th>Exam. 3 Hours Duration</th>
<th>Min. Pass Marks</th>
<th>Max. Marks.</th>
<th>Paper II</th>
<th>Exam. 3 Hours Duration</th>
<th>Min. Pass Marks</th>
<th>Max. Marks.</th>
<th>Paper III</th>
<th>Exam. 3 Hours Duration</th>
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<th>Practical Exam.</th>
<th>4 Hours Duration</th>
<th>Min. Pass Marks</th>
<th>Max. Marks.</th>
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Paper – I (Mechanics)

Work Load: Two hours lecture per week

Examination Duration: Three hours

Scheme of Examination: First question will be of nine marks comprising of six parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one 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 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit – I: Physical Law and frame of Reference

(a) Inertial and non-inertial frames, Transformation of displacement, velocity, acceleration between different frames of reference involving translation. Galilean transformation and invariance of Newton’s laws.

(b) Coriolis force: Transformation of displacement, velocity and acceleration between rotating frame, Pseudo forces. Coriolis force. Motion relative to earth, Foucl’s pendulum.

(c) Conservative Forces

Introduction about conservative and non-conservative forces. Rectilinear motion under conservative forces. Discussion of potential energy curve and motion of a particle.

Unit – II:

Centre of Mass

Introduction about Centre of Mass, Centre of Mass Frame: Collision of two particles in one and two dimensions (elastic and inelastic), Slowing down of neutrons in a moderator.
Motion of a system with varying mass, Angular momentum concept, conservation and charge particle scattering by a nucleus.

**Rigid body**

Equation of a motion of a rotating body, Inertial coefficient, Case of $J$ not parallel to $\omega$, Kinetic energy of rotation and idea of principal axes, Procesional motion of a spinning top.

**Unit – III: Motion under Central Forces**

Introduction about Central Forces, Motion under central forces, Gravitational interaction, Inertia and gravitational mass, General solution under gravitational interaction, Keplers Laws, Discussion of trajectories, Cases of elliptical and circular orbits.

**Damped Harmonic Oscillations**

Introduction about oscillations in a potential well, Damped force and motion under damping, Damped Simple Harmonic Oscillator, Power dissipation, Anharmonic oscillator and simple pendulum as an example.

**Unit – IV: Driven Harmonic Oscillations**

Driven harmonic oscillator with damping, Frequency response. Phase relation, Quality factor, Resonance, Series and parallel of LCR circuit, Electromechanical system-Ballistic Galvanometer.

**Coupled Oscillations**

Equation of motion of two coupled Simple Harmonic Oscillators. Normal modes, motion in mixed modes, Transient behavior. Dynamics of a number of oscillators with neighbor interactions.

**Reference Books:**

1. Mechanics: Berkeley Physics Course Vol- 1, Charles Kittel
Paper – II (Electromagnetism)

Work Load: Two hours lecture per week

Examination Duration: Three hours

Scheme of Examination: All questions will carry equal marks and will be compulsory. Five questions shall be set. First question will comprise of five parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit. Second to Fifth question will have two parts, namely (A) and (B). Part (A) of Second to Fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit I: Scalar and Vector Fields

Concept of Field, Scalar and Vector Fields, Gradient of scalar field, Physical significance and formalism of Gradient, Divergence and Curl of a vector field in Cartesian co-ordinates system, Concept of Solid angle, Gauss divergence and Stoke’s theorem. Gauss law from inverse square law. Differential form of Gauss law.

Electric field and potential energy

Invariance of charge, Potential energy of system of (i) Discrete N-charges (ii) Continuous charge distribution. Energy required to built a uniformly charged sphere, classical radius of electron, Electric field due to a short electric dipole, Interaction of electric dipole with external uniform and non uniform electric field, potential due to a uniformly charged spherical shell.

Unit II: Electric field in matter

Multipole expansion, definition of moments of charge distribution, Dielectrics, Induced dipole moments, polar non polar molecules, Free and bound charges, Polarization, Atomic polarizability, electric displacement vector, electric susceptibility, dielectric constant, relation between them.

Electric potential and electric field due to a uniformly polarized sphere (i) outside the sphere (ii) at the surface of the sphere (iii) inside the sphere. Electric field due to a dielectric sphere placed in a uniform electric field (a) outside the sphere (b) inside the sphere, Electric field due to a charge placed in dielectric medium and Gauss law, Clausius-Mossotti relation in dielectrics.

Unit III: Magnetostatics and magnetic field in matter

Lorentz force, properties of magnetic field, Ampere’s law, field due to a current carrying solid conducting cylinder (a) outside (b) at the surface and (ii) inside the cylinder. Ampere’s law in differential form. Introduction of Magnetic Vector potential, Poisson’s equation for vector potential. Deduction of Bio-Savart law using Magnetic Vector potentials, Differential form of Ampere’s law.
Unit IV: Maxwell’s equations and electromagnetic waves

Displacement current, Maxwell’s equations, Electromagnetic waves, Electromagnetic waves in isotropic medium, properties of electromagnetic waves, Energy density of e.m. waves, Poynting vector, Radiation pressure of free space, electromagnetic waves in dispersive medium, spectrum of e.m. waves

Reference Books:

2. Introduction to Electrodynamics: David J. Griffith, Prentice Hall
4. Fundamental University Physics Vol II : Fields and Waves ; M. Alonso and E.J. Finn; Addison-Wesley Publishing Company,

Paper III

OPTICS

Work Load : Two hours lecture per week

Examination Duration: Three hours

Scheme of Examination: All questions will carry equal marks and will be compulsory. Five questions shall be set. First question will comprise of five parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit. Second to Fifth question will have two parts, namely (A) and (B). Part (A) of Second to Fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit – 1 Interference:

Concept of Spatial and Temporal Coherence, coherence length, coherence time, Definition and propagation of a wavefront. Huygen’s principle of secondary wavelets. Young’s double slit experiment. Types of interference, interference by division of wavefronts: Fresnel’s Biprism, Measurement of wavelength \( \lambda \) and thickness of a thin transparent sheet, Interference by division of amplitude: Interference in thin films of constant thickness in transmitted and reflected waves. Interference produced by a wedge shaped film, Newton’s rings. Determination of wavelength \( \lambda \) and refractive index \( \mu \) by Newton’s Rings: fringes of equal inclination (Haidinger fringes) and
equal thickness (Fizeau fringes), Michelson’s Interferometer, shape of fringes, Measurement of wavelength, difference between two spectral lines and thickness of a thin transparent sheet.

Unit – 2 Diffraction:

Fresnel’s diffraction, Half period zones, Fresnel’s diffraction at a circular aperture, straight edge and a rectangular slit, Zone plate, Multiple foci of zone plate, comparison between zone plate and convex lens, Fraunhofer diffraction by single slit and a circular aperture, Fraunhofer diffraction by N parallel slits with two slits as a special case, Missing order, Plane diffraction grating and its use in determining wavelength, Dispersion by a grating, Rayleigh’s criterion of resolution, Resolving power of a Telescope and a Grating.

Unit – 3

Polarization : Polarization, Plane, Circular and Elliptically Polarized light, Polarization by reflection, Double refraction and Huygen’s explanation of double refraction, Production and detection of Plane, Circular and Elliptically Polarized light, Quarter wave and half wave plates, optical activity, Specific rotation, Biquartz and half shade Polarimeters and their comparison.

(ii) Laser: Spontaneous and Stimulated emission, Einstein’s A&B coefficients, Energy density of radiation as a result of stimulated emission and absorption, population inversion, Methods of Optical pumping, Energy level schemes, He-Ne, Ruby, CO₂ lasers.

Holography: Basic concepts of holography, Principle, Theory, Construction and reconstruction of image, Application of holography

Unit – 4

Wave motion: 1D and 3D wave equation, Transverse waves in a stretched string, elastic waves in solids, Pressure waves in a gas column, spherical waves, Fourier’s Theorem and its application to square and saw tooth waves, Phase and group velocities, Dispersion of waves, Electromagnetic waves, Energy density of Electromagnetic waves, Electromagnetic waves in an Isotropic and Dispersive medium, Spectrum of Electromagnetic waves.

Reference Books:
1. Optics by Brij Lal & Subramanium, S. Chand.
2. Optics by D. P. Khandelwal.
Practical

Work Load: Four hours laboratory work per week

Examination Duration: Four hours

Minimum Experiments: Total sixteen taking eight from each section.

The colleges are free to set new experiments of equivalent standard. This should be intimated and approved by the Convener, Board of Studies before the start of academic session. It is binding on the college to have experimental set up of at least sixteen experiments listed below (8 from each section). In case number of experiment performed by the student is less than sixteen, his marks shall be scaled down in final examination on pro rate basis. Laboratory examination paper will be set by the external examiner by making pairs of experiments taking one from each section out of sixteen or more experiments available at the center. Different combinations shall be given for different batch.

Section A

1. To study the variation of power transfer by two different loads by a DC source and to verify maximum power transfer theorem.
2. To study the variation of charge and current in a RC circuit with a different time constant (using a DC source).
3. To study the behavior of a RC circuit with varying resistance and capacitance using AC mains as a power source and also to determine the impedance and phase relations.
4. To study the rise and decay of current in an LR circuit with a source of constant emf.
5. To study the voltage and current behavior of an LR circuit with an AC power source. Also determine power factor, impedance and phase relations.
6. To study the characteristics of a semi-conductor junction diode and determine forward and reverse resistances.
7. To study the magnetic field along the axis of a current carrying circular coil. Plot the necessary graph and hence find radius of the circular coil.
8. To determine the specific resistance of a material and determine difference between two small resistance using Carey Fosters Bridge.
9. To convert a galvanometer into a ammeter of a given range
10. To convert a galvanometer into a voltmeter of a given range.

Section B

1. To study the random decay and determine the decay constant using the statistical board.
2. Using compound pendulum study the variation of time period with amplitude in large angle oscillations.
3. To study the damping using compound pendulum.
4. To study the excitation of normal modes and measure frequency splitting using two coupled oscillators.
5. To study the frequency of energy transfer as a function of coupling strength using coupled oscillators.
6. To study the viscous fluid damping of a compound pendulum and determining damping coefficient and Q of the oscillator.
7. To study the electromagnetic damping of a compound pendulum and to find the variation of damping coefficients with the assistance of a conducting lamina.
8. To find J by Callender and Barne’s Method.
9. To determine Young’s modulus by bending of beam.
10. To determine Y, σ and η by Searle’s method.
11. To ensure Curie temperature of Monel alloy.
12. To determine modulus of rigidity of a wire using Maxwell’s needle.
13. Study of normal modes of a coupled pendulum system. Study of oscillations in mixed modes and find the period of energy exchange between the two oscillators.
14. To study variation of surface tension with temperature using Jaegger’s method.
15. To study the specific-rotation of sugar solution by polarimeter.
2. CHEMISTRY

Scheme:
Max Marks: 150

<table>
<thead>
<tr>
<th>Duration (hrs.)</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
</tr>
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<tbody>
<tr>
<td>Paper I</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Paper-II</td>
<td>3</td>
<td>33</td>
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<tr>
<td>Paper-III</td>
<td>3</td>
<td>34</td>
</tr>
<tr>
<td>Practical</td>
<td>5</td>
<td>50</td>
</tr>
</tbody>
</table>

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-101 Paper I: Inorganic Chemistry
(2 hrs or 3 periods/week)

Unit-I

Ionic Solids: Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Pajin’s rule.

Metallic bond: free electron, valence bond and band theories.

Weak Interactions: Hydrogen bonding, van der Waals forces.

Unit-II

Covalent Bond: Valence bond theory and its limitations, directional and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH₃, H₂O⁺, SF₄, CIF₃, ICl₂, H₂O.

Molecular Orbital Theory: homonuclear and heteronuclear (CO and NO) diatomic molecules. Multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Unit-III

s-Block Elements: Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls.

Periodicity of p-block elements: Periodicity in properties of p-block elements with special reference to atomic and ionic radii, ionization energy, electron affinity, electronegativity, diagonal relationship, catenation.

UNIT-IV

Some Important Compounds of p-block Elements: Hydrides of boron, diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.
Chemistry of Noble Gases: Chemical properties of the noble gases, chemistry of Xenon, structure and bonding in Xenon compounds.

Unit V

Nuclear Chemistry: Fundamental particles of nucleus (nucleons); Concept of nuclides and its representation; Isotopes, Isobars and Isotones (with specific examples); Forces operating between nucleons (n-n, p-p, & n-p); Qualitative idea of stability of nucleus (n/p ratio).

Radiochemistry: Natural and artificial radioactivity; Radioactive disintegration series; Radioactive displacement law; Radioactivity decay rates; Half life and average life; Nuclear binding energy, mass defect and calculation of defect and binding energy; Nuclear reactions, Spallation, Nuclear fission and fusion.

CH-102 Paper II: Organic Chemistry
(2 hrs or 3 periods/week)

Unit I


Unit II

Stereochemistry of Organic Compounds: Concept of isomerism, Types of isomerism, Difference between configuration and conformation, Flying wedge and Fischer projection formulae.


Relative and absolute configuration, sequence rules, D / L and R / S systems of nomenclature.

Geometric Isomerism: Determination of configuration of geometric isomers - cis / trans and E / Z systems of nomenclature. Geometric isomerism in oximes and alicyclic compounds.

Conformational Isomerism: Newman projection and Sawhorse formulae, Conformational analysis of ethane, n-butane, cyclohexane.

Unit III


Alkenes, Cycloalkenes, Dienes and Alkynes: Methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides. Regioselectivity in alcohol dehydration - the Saytzeff rule, Hoffmann elimination. Physical properties and relative stabilities

Unit-IV


Unit-V

Alkyl and Aryl Halides: Methods of formation of alkyl halides, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides Sₙ2 and Sₙ1 reactions with energy profile diagrams.

Polyhalogen compounds: Chloroform, carbon tetrachloride.

Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl, allyl, vinyl and aryl halides.

CH-103 Paper III: Physical Chemistry
(2 hrs. or 3 Periods/week)

UNIT-I

Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs and calculations of slopes, differentiation of functions like kₓ, eˣ, xⁿ, sin x and log x; maxima and minima, partial differentiation and reciprocity relations, integration of some useful/relevant functions; permutations and combinations, factorials, probability.

Liquid State: Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholesteric phases. Thermography and seven segment cell.
UNIT II

Gaseous States: Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state.

Critical Phenomenon: PV isotherms of real gases, continuity of states, the isotherms of van der Waals equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

Molecular velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect.)

UNIT III

Solid State: Definition of space lattice, unit cell.

UNIT IV

Colloidal State: Definition of colloids, classification of colloids.
Solids in liquids (sols) properties- kinetic, optical and electrical, stability of colloids. Protective action, Hardy-Schulze law, gold number.
Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids.
Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier

UNIT V

Chemical Kinetics: Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction, concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions - zero order, first order, second order, pseudo order, half-life and mean-life. Determination of the order of reactions - differential method, method of integration, method of half-life period and isolaion method.
Radioactive decay as a first order phenomenon.
Experimental methods of chemical kinetics: conductometric, potentiometric, optical methods, polarimetry and spectrophotometry. Theories of chemical kinetics. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.
Simple collision theory based on hard sphere model transition state theory (equilibrium hypothesis). Expression for the rate constant bases on equilibrium constant and thermodynamic aspects.

Practical: CH-104: Laboratory Course - I
(4 hrs or 6 periods / week)

INORGANIC CHEMISTRY

Separation and identification of six radicals (3 cations and 3 anions) in the given inorganic mixture including special combinations.
ORGANIC CHEMISTRY
Laboratory Techniques
(a) Determination of melting point (naphthalene, benzoic acid, urea, etc.); boiling point (methanol, ethanol, cyclohexane, etc.); mixed melting point (urea-cinnamic acid, etc.).
(b) Crystallization of phthalic acid and benzoic acid from hot water, acetaldehyde from boiling water, naphthalene from ethanol etc.; Sublimation of naphthalene, camphor, etc.

Qualitative Analysis

PHYSICAL CHEMISTRY
(One of the following experiments should be given in the examination)
(i) Chemical Kinetics:
(a) To determine the specific reaction rate of the hydrolysis of methyl acetate/ ethyl acetate catalyzed by hydrogen ions at room temperature.
(b) To study the effect of acid strength on the hydrolysis of an ester.
(c) To compare the strengths of HCl and H₂SO₄ by studying the kinetics of hydrolysis of ethyl acetate.
(d) To study kinetically the reaction rate of decomposition of iodide by H₂O₂.

(ii) Viscosity, Surface Tension:
(a) To determine the viscosity/surface tension of a pure liquid (alcohol etc.) at room temperature. (using the Ostwald viscometer/stenhagmometer).
(b) To determine the percentage composition of a given binary mixture by surface tension method (acetone & ethyl methyl ketone).
(c) To determine the percentage composition of a given mixture (non-interacting systems) by viscosity method.
(d) To determine the viscosity of amyl alcohol in water at different concentration and calculate the excess viscosity of these solutions.

(Instructions to the Examiners)
CHY 104: Chemistry Practical (Pass course)

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

Inorganic Chemistry
Ex. 1 Separation and identification of 3 cations and 3 anions in the mixture 15

Organic Chemistry
Ex. 2 Laboratory Techniques 3
Ex. 3 Qualitative Analysis
Detection of element and detection of functional group 10

Physical Chemistry
Ex. 4 Perform one of the experiments mentioned in the syllabus. 12
Ex. 5 Viva-voce 5
Ex. 6 Record 5

Total 50
### 3. Zoology

Scheme:
Max. Marks: 100

<table>
<thead>
<tr>
<th>Paper I</th>
<th>3 Hrs duration</th>
<th>33 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper II</td>
<td>3 Hrs duration</td>
<td>33 Marks</td>
</tr>
<tr>
<td>Paper III</td>
<td>3 Hrs duration</td>
<td>34 Marks</td>
</tr>
<tr>
<td>Practical</td>
<td>4 Hrs. duration</td>
<td>50 Marks</td>
</tr>
</tbody>
</table>

Min. Pass Marks: 36

**NOTE:**
1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of 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 the 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 questions 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-101

**DIVERSITY OF ANIMALS**

**Section – A**

**Biosystematics and Taxonomy**
1. General principles of taxonomy, concept of five kingdom scheme, international code of nomenclature, cladistics, molecular taxonomy.
2. Concept of Protozoa and Metazoa, and levels of organization.
4. Detailed classification of Non-chordata and Chordata (up to suborders with examples).

**Section – B**

Habitat, Habit, Morphology, Structure, *Locomotion, Organs and Systems (Digestive, Excretory, Respiratory, Osmoregulation, Nervous & Reproductive), Life Cycle, Affinities and Adaptations.

**Note:** * indicates wherever required
1. **Protozoa**: Amoeba, Entamoeba, Paramecium, Euglena, Plasmodium, Trypanosoma and Leishmania.
2. **Porifera**: Sycon and Leucosolenia.
3. **Coelentrata**: Obelia and Aurelia.

Section - C


Note: * indicates wherever required

1. **Ctenophora**: Beroe
2. **Platyhelminthes**: *Fasciola hepatica* and *Taenia solium*.
3. **Aschelminthes**: *Ascaris, Dracunculus* and *Wuchereria*.
4. **Annelida**: Neries and Leech.

**PAPER – II: Z-102**

**CELL BIOLOGY AND GENETICS**

Section – A

**Cell Biology**

1. Introduction to cell: Morphology, size, shape, characteristics and structure of prokaryotic and eukaryotic animal cell; basic idea of virus and cell theory.
3. Cell membrane transport: Passive (diffusion and osmosis, facilitated, mediated) and active transport.
4. Cytoplasmic organelles:
   (i) Structure and biogenesis of mitochondria; electron transport chain and generation of ATP molecules.
   (ii) Structure and functions of endoplasmic reticulum, ribosome (prokaryotic and eukaryotic) and Golgi complex.
   (iii) Structure and functions of lysosome, microbodies and centrioles.
   (iv) Structure and functions of cilia, flagella, microvilli and cytoskeletal elements.

Section – B

1. **Nuclear Organization**:
   (i) Structure and function of nuclear envelope, nuclear matrix and nucleolus.
   (ii) Chromosomes: Morphology, chromonema, chromомерes, telomeres, primary and secondary constrictions, chromatids, prokaryotic chromosome.
   (iii) Giant chromosome types: Polytene and Lampbrush.
   (iv) Chromosomal organization: Euchromatin, heterochromatin and folded fiber model and nucleosome concept.
2. **Nucleic Acids:**
   (i) DNA structure, polymorphism (A, B and Z types) and replication (semi conservative mechanism) experiments of Messelson and Stahl: elementary idea about polymerases, topoisomerases, single strand binding proteins, replicating forks (both unidirectional and bidirectional), leading and lagging strands, RNA primers and Okazaki fragments, elementary idea about DNA repair.
   (ii) RNA structure and types (mRNA, rRNA and tRNA) and transcription.

3. **Genetic code and translation:** Triplet code, characteristics of triplet code, protein synthesis (translation).

4. **Cell in reproduction:**
   (i) Interphase nucleus and cell cycle: S, G-1, G-2 and M phase.
   (ii) Mitosis: Different stages, structure and function of spindle apparatus; anaphasic movement.
   (iii) Meiosis: Different stages, synapses and synaptonemal complex, formation of chiasmata and significance of crossing over.

**Section – C**

**Genetics**
1. Mendelism: Brief history of genetics and Mendel’s work; Mendelian laws, their significance and current status, chromosomal theory of inheritance.
2. Chromosomal mutations: Classification, translocation, inversion, deletion and duplication; Variations in chromosome numbers; haploid, diploid, polyploid, aneuploid, euploid and polysomy.
3. Linkage and crossing over, elementary idea of chromosome mapping.
4. Genetic interaction: Supplementary genes, complementary genes, duplicate genes, epistasis, inhibitory and polymorphic genes.
5. Multiple gene inheritance: ABO blood groups and Rh factor and their significance.
6. Cytoplasmic inheritance.
7. Sex determination in *Drosophila* and man, pedigree analysis.
8. Genetic disorders: Down’s, Turner’s and Klinefelter’s syndromes, color blindness, Hemophilia, Phenylketonuria.

**PAPER – III: Z-103**

**GAMETE AND DEVELOPMENTAL BIOLOGY**

**Section – A**

**Developmental Biology: Scope and Early Events**
1. Historical review, types and scope of embryology.
2. Gametogenesis:
   (i) Formation of ova and sperm.
   (ii) Vitellogenesis.
3. Fertilization: Activation of ovum, essence of activation: Changes in the organization of the egg cytoplasm.
4. Parthenogenesis.
Section – B

Developmental Biology: Pattern and Processes
1. Cleavage: Definition, planes and patterns of cleavage among non chordates and chordates, significance of cleavage, blastulation and morulation.
2. Fate maps, morphogenetic cell movements, significance of gastrulation.
3. Embryonic induction, primary organizer, differentiation and competence.
4. Development of chick up to 96 hours stage.
5. Embryonic adaptations:
   (i) Extra embryonic membranes in chick, their development and functions.
   (ii) Placentation in Mammals: Definition, types, classification on the basis of morphology and histology, functions of placenta.
   (iii) Paedogenesis and neoteny.

Section – C

Dimensions in Developmental Biology
1. Regeneration.
2. Various types of stem cells and their applications.
3. Cloning of animals:
   (i) Nuclear transfer technique.
   (ii) Embryo transfer technique.
4. Teratogenesis (Genetic and Induced).
5. Biology of aging.

Practical – Zoology

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

1. Microscopic Techniques:


   2. General methods of microscopic slide preparations; narcotization; fixing and preservation; washing; staining; destaining; dehydration; clearing and mounting

   3. General idea of composition, preparation and use of:

   (i) Fixatives: Formalin, Bouin’s fluid.


   (iii) Common reagents: Normal saline, Acid water, Acid alcohol and Mayer’s albumin.
4. Collection and Culture Methods:

(i) Collection of animals from their natural habitat during field trips such as Amoeba, Paramecium, Euglena, Daphnia, Cyclops, etc.

(ii) Culture of Paramecium in the laboratory and study of its structure, life processes and behavior in live state.

II. Study of Microscopic Slides and Museum Specimens:

Protozoa: Amoeba, Euglena, Trypanosoma, Giardia, Entamoeba, Elpidium (Polystomella), Foraminiferos shells, Monocystis, Plasmodium, Paramecium, Leishmania, Paramecium showing binary fission and conjugation, Opalina, Nyctotherus, Balantidium, Vorticella.

Porifera: Leucosolenia, Euplectella, Spongilla, T. S. Sycon, Spicules, Spongion fibers, Gemmules.

Coelenterata: Millepora, Physalia, Velella, Aurelia, Alcyonium, Gorgonia, Pennatula, Sea anemone, Stone corals, Obelia colony and medusa.

Ctenophora: Any Ctenophore

Platyhelminthes: Taenia, Planaria, Fasciola (WM), T. S. body of Fasciola, Miracidium, Sporocyst, Redia and Cercaria Larvae of Fasciola, Scolex, T. S. mature proglottid of Taenia, gravid proglottid, Cysticercus larva.

Aschelminthes: Ascaris, Wuchereria, Dracunculus

Annelida: Neries, Heteroneries.

III. Anatomy:

Earthworm: External features, general viscera, alimentary canal, reproductive system and nervous system.

Leech: External features, alimentary canal, reproductive and nervous system.

IV. Study of the Following Through Permanent Slide Preparation: Paramecium, Euglena, Foraminiferous shells, Sponge spicules, Spongion fibres, Gemmule, Hydra, Obelia colony and Medusa; Parapodium of Nereis and Heteronereis, Leech: testicular nephridia.

V. Exercises in Cell Biology:

1. Squash preparation for the study of mitosis in onion root tip, permanent slides of mitosis (all stages).

2. Squash preparation for the study of meiosis in grasshopper or cockroach testes, permanent slide of meiosis (all stages).

3. Study of giant chromosomes in salivary glands of Chironomous or Drosophila larva.

4. Study of cell permeability using mammalian R.B.C.
VI. Exercises in Genetics:

A. Study of *Drosophila*:

1. Life cycle and an idea about its culture
2. Identification of male and female
3. Identification of wild and mutants (yellow body, ebony, vestigial wing and white eye)
4. Study of permanent prepared slides: Sex comb and salivary gland chromosomes.

B. Numerical problems based on monohybrid and dihybrid cross.

C. Identification of blood groups (A, B, O & Rh factor)

VII. Developmental Biology:

1. Study of development of frog/toad with the help of Charts/Slides/Models:
   
   (i) Eggs, cleavage, blastula, gastrula, neurula, tail-bud, hatching, mature tadpole larvae, metamorphic stages, toadlet / froglet.
   
   (ii) Histological slides: Cleavage, blastula, gastrula, neurula and tail-bud stage.

2. Study of development of chick with the help of whole mounts/Charts/Slides/Models
   
   (i) 18 hrs, 21 hrs, 24 hrs, 33 hrs, 48 hrs, 72 hrs and 96 hrs of incubation.
   
   (ii) Primitive streak stage in living embryo, if possible, after removal of the blastoderm from the egg.
   
   (iii) Study of the embryo at various stages of incubation *in vivo* by making a window in the egg-shell may also be demonstrated.
   
   (iv) Study of various foetal membranes in a 10-12 day old chick embryo.

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:</th>
</tr>
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<tbody>
<tr>
<td>50</td>
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<table>
<thead>
<tr>
<th></th>
<th>Regular</th>
<th>Ex./N.C. Students</th>
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<tbody>
<tr>
<td>1. Anatomy (any system)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>2. Permanent Preparation</td>
<td>4</td>
<td>6</td>
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</tbody>
</table>
3. Cell Biology and Genetics 4+4 6+6
4. Developmental Biology 6 5
5. Identification and comments on Spots (1 to 8) 16 16
6. Viva Voce 5 5
7. Class Record 5 -

50 50

Notes:

1. With reference to anatomy (Dissection), study of prescribed types and developmental biology (charts/models) candidates must be well versed in the study of various system.CD ROMs multimedia computer based simulations including computer assisted learning (CAL) and other soft wares may be used.

2. With reference to permanent preparations and microscopic slides, in case of non-availability, the exercise should be substituted with diagrams, photographs, models, charts, etc.

3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.

4. The candidates may be asked to write detailed methodology wherever necessary and separate marks may be allocated for the same.

5. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.

6. It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.

Recommended Books:
8. De Robertis EDP and De Robertis Jr EMF. Cell and Molecular Biology. 8th edition Lippincot Williams & Wilkins. 2006.
Scheme

Min. Pass Marks: 36
Paper I                  3 hrs. Duration            Max. Marks: 100
Paper II                 3 hrs. Duration            Max. Marks 33
Paper III                3 hrs. Duration            Max. Marks 33
Practical Min. Marks: 18  4 hrs, duration      Max. Marks 34
Duration of examination of each theory paper-
Duration of examination of practical's-

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. 1 will have 18 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.

3. Each paper is divided into four units. There will be one question from each unit. These Q. No. 2 to 5 will have internal choice.
Paper-I
Cell Biology, Genetics and Plant Breeding
(2 hrs /week)

Unit-1

Cell organelles and Nuclear material: Ultrastructures and functions of different cell organelles (cell wall, plasma membrane, nucleus, mitochondria, chloroplast, ribosome, peroxisomes, Lysosome, Golgi bodies and Endoplasmic Reticulum). Chromatin structure & Chromosome organization: eukaryotic and prokaryotic. Chromosome morphology; specialized types of chromosomes (Sex chromosomes, lampbrush Chromosome, Polytenic chromosome); transposons.

Unit-2

Cell divisions: Cell cycle, mitosis: stages, structure and functions of spindle apparatus; anaphasic chromosome movement; Meiosis: its different stages- Meiosis I, Meiosis II, synaptonemal complex, chiasmata formation and crossing over.

Basis of genetic material: Griffith's transformation experiment and The Hershey and Chase blender experiment to demonstrate DNA as the genetic material. Concept of Gene: Neurospora genetics: one gene one enzyme hypothesis; An idea about Prokaryotic and eukaryotic structure of gene – operon concept, exons and introns.

Extra nuclear genome: mitochondrial and Chloroplast genome, plasmids;
Chromosomal aberrations: Deletion, duplication, translocation, inversion, Aneuplody and polyploidy.

Unit-3

Genetic inheritance: Mendel's laws of inheritance and their exceptions; allelic (incomplete and co-dominance, lethality) and non-allelic interactions (complementary genes, epistasis and duplicate genes). Quantitative inheritance: grain color in wheat, corolla length in Nicotiana tabacum.

Cytoplasmic inheritance-maternal influence, shell coiling in snails, Kappa particles in Paramecium, Multiple allelism: ABO blood groups in men

Unit-4

Plant breeding work done on wheat and rice in India, Green revolution.

Suggested Laboratory Exercises:

- Study of cell structure from *Onion*, *Hydrilla* and *Spirogyra*.
- Study of cyclosis in *Tradescantia* spp.
- Study of plastid for pigment distribution in *Lycopersicon*, *Cassia* and *Capsicum*.
- Study of electron microphotographs of eukaryotic cells for various cell organelles.
- Study of electron microphotographs of virus, bacteria and eukaryotic cells for comparative study of cellular organization.
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.
- To solve genetic problems based upon Mendel's laws of inheritance: Monohybrid, Dihybrid, Back cross and test cross.
- Permanent slides/photographs of different stages of mitosis and meiosis, sex chromosomes, polytene chromosome and salivary gland chromosomes.
- Emasculation, bagging & tagging techniques
- Cross pollenation techniques

Suggested Readings:

Paper II

Microbiology, Mycology and Plant Pathology

(2 hrs/week)

Unit-1

Microbiology: Meaning and Scope, history and development in the field of microbiology. Concept of quorum sensing and biofilm

Eubacteria: general account, occurrence, morphology (structure, shapes), flagella, capsule, nutritional types, endospore, reproduction (binary fission, transformation, conjugation, transduction), economic and biological importance.

Mycoplasma: occurrence, morphology, reproduction and importance.

Unit-2

Virus: General characteristics and importance. Structure of TMV and Pox virus. Structure and multiplication of Bacteriophage.

Fungi: General characteristics, occurrence, thallus organization, reproduction, economic importance. Classification of fungi (Alexopoulos and Ainsworth's).

Plant diseases: Biotic and abiotic diseases, important symptoms caused by fungi, bacteria, viruses and MLOs (blights, mildews- downy and powdery, rusts, smuts, canker, mosaic, little leaf, galls etc.).

Unit-3

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Albugo and white rust: Sclerospora and Downy mildew/Green ear disease of Bajra; Aspergillus; Claviceps and Fugot; Peziza.

Unit-4

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Puccinia and Black rust of wheat; Ustilago and loose smut of wheat and covered smut of barley; Agaricus; Alternaria and early blight of potato

Suggested Laboratory Exercises:

1. Study of bacteria using curd or any other suitable material, Gram’s staining of bacteria.

2. Study of Mycoplasma. TMV, Poxvirus bacteriophage (photographs/3-D models)

3. Study of symptoms of plant diseases: Downy mildew of Bajra, Green ear of bajra, Powdery mildew, mosaic of blight
4. Study of specimen, permanent slides and by making suitable temporary slides: Albugo - white rust; Sclerospora - downy mildew, green ear; Aspergillus; Claviceps - ergot; Ustilago - loose smut of wheat, covered smut of barley. Puccinia - Black rust of wheat; Agaricus; Peziza and Alternaria - early blight of potato.

5. Media preparation: potato dextrose agar, Nutrient agar

6. Culture techniques of fungi and bacteria.

Suggested Books:


Paper III
Algae, Lichens and Bryophyta
(2 hrs/week)

Unit-1
General characters, Classifications (Smith); Diverse Habitat. Range of thallus structure, photosynthetic pigments and Food reserves. Reproduction (Vegetative, Asexual, Sexual). Types of the life cycle: Economic importance.

Unit-2
Type Studies
Cyanophyceae - Oscillatoria, Nostoc
Chlorophyceae - Volvox, Chara
Xanthophyceae - Vaucheria
Phaeophyceae - Ectocarpus
Rhodophyceae - Polysiphonia

Unit-3
General characters, Origin, and evolution of Bryophyta. Classification (Eichler); Habitat, Range of thallus structure, Reproduction (Vegetative and Sexual); Alternation of generations; Economic importance.
Type Studies: Hepaticopsida - Riccia, Marchantia

Unit-4
Type Studies: Anthocerotopsida - Anthoceros; Bryopsida - Funaria
Lichens - General characters, habitat. Structure, reproduction and economic and Ecological importance of lichens.

Suggested Laboratory Exercises
1. Study of class work material by making suitable temporary slides and study of permanent slides of; Oscillatoria, Nostoc, Volvox, Chara, Vaucheria, Ectocarpus, Polysiphonia.
2. Study of external morphology and preparation of suitable sections of vegetative/reproductive parts of Riccia, Marchantia, Anthoceros, Funaria.
Suggested Readings


## Botany Practical Examination B. Sc Part-I

**Skeleton Paper**

**M.M. 50**

**TIME: 4 Hours**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Practical</th>
<th>Regular</th>
<th>Ex NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Prepare the acetocarmine stained slide of the material “A” provided to</td>
<td>5</td>
<td>5</td>
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<tr>
<td></td>
<td>you. Draw a well labelled diagram of any one stage of nuclear division.</td>
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<td></td>
<td>Identify it giving reasons.</td>
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<tr>
<td>1(b)</td>
<td>Comment and solve the problem on Genetics allotted to you along with</td>
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<td>5</td>
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<tr>
<td></td>
<td>reasons.</td>
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<tr>
<td>2</td>
<td>Make suitably stained glycerine-preparation of any one alga from the</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>given mixture “B”. Draw its labelled diagrams; assign it to its</td>
<td></td>
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<tr>
<td></td>
<td>systematic position giving reasons.</td>
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<tr>
<td>3</td>
<td>Make suitable preparation of the reproductive structure of material “C”</td>
<td>5</td>
<td>5</td>
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<tr>
<td></td>
<td>(Fungi). Draw labelled diagrams. Identify giving reasons.</td>
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<tr>
<td>4</td>
<td>Make suitable stained preparation of material “D” (Bryophyta (vegetative/</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>reproductive). Draw labelled diagrams. Identify giving reasons.</td>
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<tr>
<td>5</td>
<td>One Microbiology experiment for comments. Or Gram’s staining.</td>
<td>5</td>
<td>5</td>
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<tr>
<td>6</td>
<td>Comment upon spots (1-5)</td>
<td>10</td>
<td>15</td>
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<tr>
<td>7</td>
<td>Viva-Voce</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Practical record</td>
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<td><strong>TOTAL</strong></td>
<td><strong>50</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

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*Signature*

**Dy. Registrar**

(Administrative)

University of Rajasthan

JAIPUR
5. GEOLOGY

Scheme:
Theory
Max. Marks 100

Min. Pass Marks: 36
Paper I: Physical Geology 3 hrs. duration  Max. Marks 50
Paper II: Crystallography 3 hrs. duration  Max. Marks 50
and Mineralogy
Practical (One)  4 hrs. duration  Max. Marks 50

Note: Each 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.

Paper I: Physical Geology

Section-A

Earth system science- its sub disciplines, their mutual relationship and relationship with other subjects; scope and relevance to society. Earth history and solar system. Shape, size and origin of earth, internal structure, constitution and composition of earth. Earthquake and volcanism.

Section-B

Elements of continental drift, sea floor spreading, plate tectonics, magnetic area, mid oceanic ridges and transform fault. Geosyncline, Mountain building and Isostasy.

Section-C

Geological time scale and time record; Natural water cycle and ground water, weathering and erosion, geological work of river, wind, groundwater, glacier and ocean.

Books Recommended

Paper II Crystallography and Mineralogy

Section-A

Definition of mineral and crystal-crystaline, cryptocrystalline and amorphous state. Geometric properties of crystals- Faces, edges, solid angle. Interfacial angle, use of contact goniometer. Elements of symmetry, axial ratio, crystal structures-unit cell, crystal notation and zones.

Tetrahedrite type or hexatetrahedral class; Tetragonal- Zircon type or ditetragonal bipyramidal class; Hexagonal- Beryl type or...
Dihexagonal bipyramidal class, calcite type of ditrigonal scalenohedral class. Tourmaline type of ditrigonal pyramidal (hemimorphic class), Quartz type or trigonal trapezohedral class; Orthorhombic-Barytes types or bipyramidal class; Monoclinic Gypsum type or prismatic class and Triclinic system-Axinite type or pinacoidal class.

Section-B


Optical Mineralogy- Construction of petrological microscope, pleochroism, extinction angle, refractive index, interference colours, Optical properties of Quartz, Biotite, Hornblende, Hypersthene and Feldspars.

Section-C

Classification of silicates. Description of following rock forming mineral groups; Quartz, Feldspar, Felspathoid, Pyroxene, Amphibole, Mica and Garnet.


Concept on twinning in crystals, laws of twinning and important types of twinning.

Practical

Min. Pass Marks 18  4 hrs duration  Max. Marks 50

Crystallography and mineralogy:
Crystallography: Determination of symmetry in crystal models and measurement of interfacial angles with contact goniometer.
Drawing of crystals of cubic system by Clinographic Projection.
The study of the symmetry, forms and combination of forms in crystals given below.
Cubic system- Galena, Flourite Magnetite and Garnet, Pyrite Tetrahedrite.

Tetragonal system- Zircon, Rutile, Cassiterite, Hexagonal system- Beryl, Calcite, Tourmaline and Quartz.
Orthorhombic system- Barite, Olivine, Staurolite, Sulphur.
Monoclinic system- Gypsum, Orthoclase, Augite, Hornblende, Epidote.
Triclinic system- Axinite, albite, Study of simple twinning in crystals.
Study of Hardness: Luster, Fracture, Cleavage and streak of minerals.
Study of the Physical properties and diagnostic features of the following minerals:
Opal, hematite, magnetite, halite, calcite, fluorite, tourmaline, magnetite, orthoclase, microcline, plagioclase, hypersthene, augite, Tourmaline, tremolite, hornblende, asbestos, beryl, nepheline, sodalite, garnet, olivine, zircon, topaz, sillimanite, kyanite, quartz and its varieties, chalcedony, flint and jasper; epidote, staurolite, muscovite, biotite, nantrolite, talc, chlorite, serpentine, kaoline, sphene, apatite, garnet, wollastonite and augite.
Study of petrological microscope and its parts inclusive of polarizer and their function, observation of Becke line and relative refractive index. Study of pleochroism in biotite, hornblende, tourmaline, hypersthene, andalusite and staurolite; study of twinkling in calcite.

Books Recommended:
4. Sharma, N.L. : Determinative Table, ISM, Dhanbad.

Field Training : Geological Field work for at least 7 days duration and report thereon. The field work would be carried out locally including collection of specimens.
# Mathematics

Teaching: 3 Hours per Week per Theory Paper.  
2 Hours per Week for Practicals

<table>
<thead>
<tr>
<th>Examination</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheme</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science - 54</td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>Arts - 72</td>
<td></td>
<td>200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paper</th>
<th>Duration</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper – I</td>
<td>3 hrs.</td>
<td>40 (Science)</td>
</tr>
<tr>
<td>Discrete Math.</td>
<td></td>
<td>53 (Arts)</td>
</tr>
<tr>
<td>Paper – II</td>
<td>3 hrs.</td>
<td>40 (Science)</td>
</tr>
<tr>
<td>Calculus</td>
<td></td>
<td>53 (Arts)</td>
</tr>
<tr>
<td>Paper – III</td>
<td>3 hrs.</td>
<td>40 (Science)</td>
</tr>
<tr>
<td>Analytic Geometry</td>
<td></td>
<td>54 (Arts)</td>
</tr>
<tr>
<td>and Optimization Theory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical</td>
<td>2 hrs.</td>
<td>30 (Science)</td>
</tr>
<tr>
<td>Optimization Techniques</td>
<td></td>
<td>40 (Arts)</td>
</tr>
</tbody>
</table>

Note:

1. Common paper will be set for both the Faculties of Social Science and Science. However, the marks obtained by the candidate in the case of Faculty of Social Science will be converted according to the ratio of the maximum marks of the papers in the two Faculties.

2. Each candidate is required to appear in the Practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University and internal examiner will be appointed by the Principal in consultation with Local Head/Head, Department of Mathematics in the college.

3. An internal/external examiner can conduct Practical Examination of not more than 100 (Hundred) Candidates.

4. Each candidate has to pass in Theory and Practical examinations separately.
Paper - 1: Discrete Mathematics
Teaching: 3 Hours per Week
Duration of Examination: 3 Hours

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

Note: This paper is divided into FIVE Unites. 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: Sets, Cardinality, Principal of inclusion and exclusion, Mathematical induction.
        Relations and Functions- Binary relations, Equivalence relations and Partitions, Partial ordered relations and Lattices, Chains and Antichains, Pigeon Hole principle.

Unit 2: Boolean Algebra- Lattices and Algebraic structure, Duality, Distributive and Complemented Lattices. Boolean Lattices, Boolean functions and expressions.
        Fundamental theorem of arithmetic, Divisibility in Z, Congruences, Chinese Remainder Theorem, Euler's φ-function, primitive roots.

Unit 3: Logic and Propositional Calculus, Propositions, Simple and compound, Basic Logial operations, Truth tables, Tautologies and contradictions, Propositional Functions, quantifiers.
        Discrete numeric functions and Generating functions. Recurrence relations and Recursive Algorithms – Linear Recurrence relations with constant coefficients. Homogeneous solutions.
        Particular solution. Total solution. Solution by the method of generating functions.


Unit 5: Trees – Properties, Spanning tree, Binary and Rooted tree.
        Digraphs – Simple digraph, Asymmetric digraphs, Symmetric digraphs and complete digraphs.
        Digraph and Binary relations. Matrix representation of graphs and digraphs.

Reference Books:
2. N. Deo, Graph Theory with Applications to Computer Science, Prentice-Hall of India.
Paper II: Calculus
Teaching: 3 Hours per Week
Duration of Examination: 3 Hours

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

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

Unit 1: Series – Infinite series and Convergent series. Tests for convergence of a series –
Comparison test, D’Alembert’s ratio test, Cauchy’s n-th root test, Raabe’s test, De-
Morgan-Bertrand’s test, Cauchy’s condensation test, Gauss’s test, (Derivation of tests is not
Power series expansion of a function. Power series expansion of sinx, cosx, e^x, log(1+x), (1+x)^n.

Unit 2: Derivative of the length of an arc. Pedal equations. Curvature – Various formulae, Centre
of curvature and Chord of curvature. Partial differentiation. Euler’s theorem for homogeneous
functions. Chain rule of partial differentiation. Total differentiation, Differentiation of implicit
functions.

Unit 3: Envelopes and evolutes, Maxima and Minima of functions of two variables. Lagrange’s
method of undetermined multipliers. Asymptotes. Multiple points. Curve tracing of standard
curves (Cartesian and Polar curves).

Unit 4: Beta and Gamma functions, Reduction formulae (simple standard formulae). Double
integrals in Cartesian and Polar Coordinates, Change of order of integration. Triple integrals.
Dirichlet’s integral.

Unit 5: Areas, Rectification, Volumes and Surfaces of solids of revolution.

Reference Books:

1. Chandrika Prasad and Gorakh Prasad, A Text Book on Differential Calculus, Pothishala
   (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
Paper-III: Analytic Geometry and Optimization Theory
Teaching: 3 Hours per Week
Duration of Examination: 3 Hours
Max. Marks: 40 (Science) 54 (Arts)

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

Unit 1: Polar equation of conics, Polar equation of tangent, normal and asymptotes, chord of contact, auxiliary circle, director circle of conics

Unit 2: Sphere, Cone.

Unit 3: Cylinder, Central Conicoids – Ellipsoid, Hyperboloid of one and two sheets, tangent lines and tangent planes, Direct sphere, Normals.

Unit 4: Generating lines of hyperboloid of one sheet and its properties. Reduction of a general equation of second degree in three dimensions to standard forms.


Reference Books:
Practical: Optimization Techniques
Teaching: 2 Hours per Week

Examination:  

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Science</th>
<th>Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Marks</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Min Pass Marks</td>
<td>10</td>
<td>13</td>
</tr>
</tbody>
</table>

Distribution of Marks:

Two Practicals one from each group

<table>
<thead>
<tr>
<th>10 Marks each</th>
<th>20 Marks</th>
<th>(13 Marks each)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Record</td>
<td>05 Marks</td>
<td>07</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>05 Marks</td>
<td>07</td>
</tr>
<tr>
<td>Total Marks</td>
<td>30 Marks</td>
<td>40</td>
</tr>
</tbody>
</table>

Group A: Modelling of industrial and engineering problems into LPP and its dual and their solution by Simplex Method.

Group B: Modelling of industrial and engineering problems into Assignment Problems and Transportation Problems and their solutions.

Note:
1. Problems will be solved by using Scientific Calculators (non-Programmable)
2. Candidates must know about all functions and operations of Scientific Calculator.
3. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record.
4. Each Candidate has to pass in Practical and Theory examinations separately.
ECONOMICS

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>72</td>
<td>200</td>
</tr>
<tr>
<td>Science</td>
<td>54</td>
<td>150</td>
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<tr>
<td>Paper - I 1 hour duration</td>
<td>Micro Economic Theory</td>
<td>Arts 100</td>
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<tr>
<td></td>
<td></td>
<td>Science 75</td>
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<tr>
<td>Paper - II 3 hours duration</td>
<td>Indian Economy</td>
<td>Arts 100</td>
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<tr>
<td></td>
<td></td>
<td>Science 75</td>
</tr>
</tbody>
</table>

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. Each question will carry 20 marks for Arts students and 15 marks for Science students.

U. Registrar
Academic
University of Rajasthan
Jaipur
7. ECONOMICS

paper 1- Micro Economic Theory

Section – A


Section – B


Section – C

Marginal Productivity Theory of Distribution Factor Pricing under Perfect and Imperfect Competition in labour Market. Ricardian Theory of Rent. Modern Theory of Rent and Quasi-

Books Recommended:

4. एच एल आहूजा उच्चतरआर्थिकशिप्रायत्न, एस. चांड एण्ड कंपनी, नई दिल्ली।
5. लक्ष्मीनारायण नागौरामका व्यवस्थापनशास्त्र, रोयलबुकिंग्जो जयपुर।

Reference Books:


**Paper – II Indian Economy**

**Section – A**


**Section – B**

Foreign Trade: Size, Composition and Direction; Recent Trends in India's Foreign Trade; Foreign Trade Policy.

Section – C


Books and References:

1. Rudra Datt and K.P.M. Sundaram: Indian Economy (Hindi & English), S. Chand, New Delhi.
8. **GEOGRAPHY**

**Scheme of Examination**

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Min. Pass Marks</th>
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<tr>
<td>Arts/Social Science</td>
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<td>200</td>
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<tr>
<td>Science</td>
<td>54</td>
<td>150</td>
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<tr>
<td>Paper I</td>
<td>Physical Geography</td>
<td>Arts 75</td>
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<td></td>
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<td>Science 50</td>
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<tr>
<td>Paper II</td>
<td>Geography of Rajasthan</td>
<td>Arts 75</td>
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<td></td>
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<td>Science 50</td>
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<tr>
<td>Practical</td>
<td>18</td>
<td>Arts 50</td>
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<tr>
<td></td>
<td></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. Each theory paper will have a teaching of 4 hours per week.

2. There will be a common paper for Arts and Science.

3. Q.1 will be compulsory and will cover the entire course of the paper.

   Q. No. 1 of 20% marks of the maximum marks be set in two parts.

   (a) Part (a) will have ten items for locating on a map (to be supplied by examination centre) carrying 10% marks of the maximum marks and candidates shall attempt any five items.

   (b) Part (b) will have 10 short answer questions carrying 10% marks of the maximum marks and candidates shall attempt any five items.

4. Remaining 9 questions carrying equal marks will be set with three questions from each section of the syllabus.

5. Candidate will attempt 5 questions in all including question No. 1 selecting at least one question from each section.

6. Practical examination will be conducted by the board of examiners.

7. The candidate will have to pass in theory and practical separately.

8. The non-collegiate candidates will have to attend a practical training camp of 48 hours at a college affiliated to the University of Rajasthan, Jaipur notified by the University from time to time in which Geography subject is taught on payment of fee fixed by the University. The candidates appearing at examination from any examination centre located in Jaipur City will attend the practical camp at the University Post Graduate Department on payment of fee fixed by the University. The candidate will procure Certificate of successful completion of practical training camp from the College/Department of Geography and produce the same at the time of practical examinations.
Paper I: Physical Geography

Section A

Definition, scope and development of physical geography, geological history of the Earth; zoning of Earth's interior, rocks, origin of continents and oceans, continental drift theory and plate tectonics; concept of isostasy: views of Airy, Pratt, Joly and Holmes. Earth movements: epeirogenic and orogenic; mountain building theories: Kober, Jeffreys, Daly, Joly and Holmes and plate tectonics; denudation, cycle of erosion: views of W.M. Davis and W. Penck, erosional and depositional topographies: river, under groundwater, glacier, wind and oceanic waves.

Section B

Composition and structure of the atmosphere, insolation, air temperature, air pressure, pressure belts and planetary winds, monsoon and local winds, humidity, classification of clouds and precipitation, air masses, fronts and cyclones: tropical and temperate, classification of the world climates: Koppen and Thormaite, general climatic classification.

Section C

Surface configuration of oceans bottom: Pacific, Atlantic and Indian oceans, ocean deposits, horizontal and vertical temperature of oceans, oceanic salinity, tides, oceanic waves and currents, coral reefs, and their origin: views of Darwin and Dana, W.M. Davis, Murray, classification of marine resources, biosphere and its components, ecosystems, plant community and animal kingdom, biomes: equatorial rainforest, monsoon, savanna and temperate grasslands.

Recommended Readings:

Josheon, V.E.S., V. Goyal, et al., 2005, भौतिक भूगोल (जीवंति भूगोल सहित)। सरसोगी प्रक्षेपण, मेरठ।
Goyal, V., 2012, भौतिक भूगोल। सरसोगी प्रक्षेपण, नई दिल्ली।
Goyal, A., 2012: भौतिक भूगोल। सरसोगी प्रक्षेपण, मेरठ।
H. Sekhon, 2005: मूलाधारी विज्ञान। ताता परिवर्तन, वायुगति।
H. Sekhon, 2011: भौतिक भूगोल का विज्ञान। प्रथम पुस्तक भवन, इंडियाल।
.. A.K. & H. A. A. 2008: भौतिक भूगोल। पंचाडोल प्रकाशन जयपुर।
Paper II: Geography of Rajasthan

Section A

Physical aspects of Rajasthan: geological structure, relief, climate, drought, drainage, natural vegetation. Environmental pollution - causes and types; desertification, soils, soil erosion and conservation; availability, problems and conservation of water resources.

Section B

Mineral resources: distribution and production; Power and energy resources: distribution and production (hydro-electricity, coal, petroleum, solar energy and bio-energy) irrigation sources, irrigation intensity, crop wise irrigation, quality of irrigation water problems; irrigation projects: detailed study of Indira Gandhi canal project, Chambal valley project, Mahi Bajaj Sagar projects on physical and socio-economic aspects; agriculture: development under five year plans, problems of agriculture development, general land use, live stock and dairy development, minerals. Industries: textile, sugar, cement, marble and granite; fertilizer, zinc and copper smelting. Transport & trade, development of tourism, desert development programme, tribal areas development programme, Aravalli hill development programme.

Section C

Cultural and development aspects: population-number, growth, distribution and density, rural and urban, male and female population, literacy status, occupational structure, schedule castes and schedule tribes; population problems, study of bhil, meena and garasia. Settlement pattern: types of settlements, building materials and house types in Rajasthan with examples, factors affecting settlement.

Recommended Readings:


Odha, R. & Maheshwari, D. 2001: Geography of Rajasthan. Shahitya Bhawan Publication, Hospital Road, Agra


Sharma, M.K. 2012.13: राजस्थान की अर्थव्यवस्था। कॉलेज तुक होमस. जयपुर।

Iqbal, S. 2012: राजस्थान का मूर्खोल। कॉलेज तुक हाइस. जयपुर।

Iq, R.L. 1971 (ed.): India A Regional Geography NGSI. Varanasi.


Sena, A. et al., 2012: राजस्थान का मेलाब। राजस्थान विश्वविद्यालय आगरा।
Practicals

Scheme of Examination

Min. Pass Marks: 18

Written test
Field Survey and Viva voce
Record and Viva voce

Bifurcation of Marks
24
10+04
08+04

Max. Marks: 50

Time
3 hrs.
2½ hrs.

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 question carry equal marks. Each practical batch of 30 students will be allotted a teaching of 4 hours per week for practicals.

SYLLABUS

Section A

Definition and types of scale: simple, comparative, diagonal. Graph: line graph, bar graph, combined line and bar graph, hythergraph and climograph; climograph, water budget graph, wind rose. Weather maps: weather symbols, representation of atmospheric features, interpretation of Indian daily weather maps (july and january), weather instruments.

Section B

Methods of showing different relief features: hachures, hill shading, bench mark, spot heights, formlines, contours and drawing of cross sections (conical hill and plateau, types of slopes, valleys, ridge and saddle, gorge, waterfall and rapids, escarpment, lake, spur, col, meanders and cliff) Profiles- serial, superimposed, projected and composite.

Section C

Surveying: meaning, classification and significance. Chain and tape surveying: open and closed traverse.

Recommended Readings:

. आ, पी.आर. 2008: प्रायोगिक भूगोल। प्रसंग प्रकाशन, गोरखपुर।
. जी. की. जी. 2011: प्रायोगिक भूगोल की अपेक्षा। रस्तों की पहिली शान्ति, मेरठ।
9. STATISTICS

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Duration</th>
<th>Max Marks</th>
<th>Min. Pass Marks</th>
</tr>
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<tr>
<td></td>
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<td>Sc.</td>
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<td></td>
<td>Sc.</td>
<td>Arts</td>
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<tr>
<td>Paper-I</td>
<td>3 hrs.</td>
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<td>Paper-II</td>
<td>3 hrs.</td>
<td>50</td>
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<tr>
<td>Practical</td>
<td>3 hrs.</td>
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<td>54</td>
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<td>200</td>
<td>72</td>
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</table>

Note: In each question paper, 10 (ten) questions will be set having 2 (two) from each unit. Candidates have to answer five questions in all, taking not more than one from each unit.

Paper I Probability Theory


Unit V. Univariate Continuous Distributions and their Properties: Rectangular Distribution, Normal Distribution Idea of Exponential Distribution, Cauchy Distribution, Gamma Distribution, Beta Distribution. 18 hours

References

Additional References

Paper II: Descriptive Statistics

Unit I. Types and Presentation of Data: Concepts of a statistical population and data. Qualitative and Quantitative data; discrete and continuous data; frequency and non-frequency data. Geographical & Chronological Data. Primary Data and Secondary Data. Tabular presentation of data-Construction of tables, Types of tables. Frequency distribution - Discrete, grouped, continuous and cumulative. Graphical presentation of data-Histogram, frequency polygon, frequency curve and ogives. 18 hours

Unit II. Statistical analysis of Quantitative Data: Different types of scales-nominal, ordinal, intervals and ratio, Univariate Data- Measures of central tendency, dispersion, moments and its computation.
from data. Absolute and relative measures of skewness and kurtosis based on quantiles and moments. Sheppard’s Correction for moments (without Proof).

Unit III. Curve fitting and Theory of Attributes: Principle of least squares, fitting of straight line, parabola and curves reducible to straight line (exponential and power curve). Class frequency, order of a class frequency, ultimate class frequency, consistency of data, independence and association of attributes. Various measures of association.

Unit IV. Statistical Analysis of Bivariate Data: Correlation analysis-scatter diagram, Karl-Pearson’s coefficient of correlation and its properties. Correlation of bivariate frequency distribution, Spearman rank correlation. Regression analysis-Fitting of regression lines, regression coefficients and their properties.

Unit V. Finite Differences: Operators $E$, $\Delta$, $\nabla$, their relationship, and properties, factorial notation. Difference table and fundamental theorem of finite differences. Estimation of one and two missing terms, meaning of interpolation and extrapolation. Newton’s forward and backward formulas for equal intervals, Lagrange’s Formula and numerical problems.

References
5. Gupta S P.: Statistical Methods, Sultan Chand and Sons, N. Delhi.

Additional References

Paper III. Practical Paper:
1. Exercise on mathematical expectations and finding Mean, Variance, Skewness and Kurtosis of univariate probability distributions.
2. Fitting standard univariate discrete and continuous probability distributions.
4. Presentation of data through Frequency Table, and Graphs.
5. Calculation of Measures of Central tendency, Dispersion, Moments and Skewness and Kurtosis.
6. Computation of Correlation Coefficient of bivariate data and bivariate frequency distribution table.
7. Regression of two variables.
8. Fitting of curves by the least square method.
11. Interpolation Problems based on Newton and Langrange's Formulas.
10. APPLIED STATISTICS

<table>
<thead>
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<th>Min. Pass Marks</th>
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<tr>
<td></td>
<td>3 hrs.</td>
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<td>18 Sc.</td>
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<tr>
<td>Paper-I</td>
<td>3 hrs.</td>
<td>65 Arts</td>
<td>24 Arts</td>
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<tr>
<td>Paper-II</td>
<td>3 hrs.</td>
<td>50 Sc.</td>
<td>18 Sc.</td>
</tr>
<tr>
<td>Paper-III (Practical) 3 hrs.</td>
<td>70 Arts</td>
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<td>25 Arts</td>
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<td>Total</td>
<td>150</td>
<td>200</td>
<td>54 72</td>
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Note: In each question paper, 10 (Ten) questions will be set having 2 (Two) from each unit. Candidates have to answer five questions in all taking not more than one from each unit.

**Paper I: Probability Theory**


Unit II. Maxima and Minima. Integral Calculus: Definition and meaning of integration. General laws of integration, Integration of a continuous function. Definite integration. 18 hours


References

Additional References:

Paper II: Descriptive Statistics
(The course contents are same as that of Subject: Statistics)

Paper III: Practical Paper
(The course contents are same as that of Subject: Statistics)
# PSYCHOLOGY

## Scheme of Examination:

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<th>Faculty</th>
<th>Max. Marks</th>
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<tr>
<td>Science</td>
<td>150</td>
<td>54 (Th.36 Pr.18)</td>
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<table>
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<th>Paper</th>
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<th>Duration</th>
<th>Max. Marks</th>
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<tr>
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<td></td>
<td></td>
<td>Arts</td>
</tr>
<tr>
<td>I</td>
<td>Basic Psychological Processes</td>
<td>3 Hrs.</td>
<td>75</td>
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<tr>
<td>II</td>
<td>Social Psychology</td>
<td>3 Hrs.</td>
<td>75</td>
</tr>
<tr>
<td>III</td>
<td>Practicals</td>
<td>3 Hrs.</td>
<td>50</td>
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**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 students 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.
2. Use of simple calculator will be allowed for statistical portions of all papers.

Paper-I

Basic Psychological Processes

Section-A

1. Introduction: Definition and Goals of Psychology; History- Structuralism, Functionalism, Behaviourism, Gestalt and Psychoanalysis; Modern Perspectives- Biological, Psychodynamic, Behavioural, Cognitive, Humanistic, Evolutionary and Socio-cultural; Methods- Observation, Case Study, Surveys and Experimental.


Section-B


5. Memory: Definition; Encoding, Storage and Retrieval Processes; Models- Level of Processing, Parallel Distributed Processing and Information Processing- Sensory, Short Term and Long Term Memory; Forgetting- Nature and Causes.


Section-C


8. Intelligence: Definition and Theories- Spearman, Guilford, Cattell, Sternberg, Gardner; Meaning of IQ; Intelligence Tests.

9. Personality: Definition; Type Theories and Trait Theories - Allport, Cattell, McCrae and Costa; Personality Assessment- Self-report Inventories, Projective Tests and Behavioural Assessments.

Books Recommended:


• सिंद्र, आशुकलाम (2002). आशुकलाम सामाजिक मानसिकता अभिप्रेरित. नई दिल्ली, मोहलोद
Section-A


Section-B


5. Interpersonal Attraction: Proximity and Affective basis, Acquaintance and Need to Affiliate; Effects of Observable Characteristics, Similarity and Mutual liking.

6. Leadership: Definition and Functions; Types of Leadership. Trait, Situational and Contingency Approaches.

Section-C


Books Recommended:

- अरुण कुमार सिंह (2002) : समाज मनोविज्ञान की रूपरेखा' मोतीलाल बनारसीदास, दिल्ली।

Paper-III

Practicals

1. Human Maze Learning
2. Measurement of Intelligence (Performance Test)
3. Experiment of Memory (Meaningful and Non-sense Syllables through Memory Drum)
4. Experiment on Figure Ground Reversal
5. Measurement of Emotions by Facial Expression
6. Measurement of Attitude
7. Measurement of leadership
8. Measurement of Aggression
9. Measurement of Altruism
10. Assessment of Social Support
12. ELECTRONICS

Scheme:

Min. Pass Marks: 36

Max. Marks: 100

Part-I

3 hrs. duration

Max. Marks: 33

Part-II

3 hrs. duration

Max. Marks: 33

Part-III

3 hrs. duration

Max. Marks: 34

Practical

Min. Pass Marks: 18

5 hrs. duration

Max. Marks: 50

Paper-I-Circuit Analysis

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

Time: 3 hrs.

Unit-I

Difference between linear and non-linear devices. Resistance and inductance of their types and behaviour with D.C. and A.C. sources, colour codes.

Transient growth and decay of current in L-R circuit and time constant. Measurement of inductance by Rayleigh's method.

Unit-II

Capacitance, their types on the basis of size and medium and behaviour with D.C. source, colour codes. Charging and discharging of capacitance through resistance.


Unit-III


Reduction of a complicated circuit into T and π equivalent, conversion between T and π configurations. Two port analysis, its h, y and z parameters. Actions equivalent of Z-port network, input and output impedances

Unit-IV

- Superposition theorem, Reciprocity theorem. Thevenin theorem,
  Maximum power transfer theorem, coupled circuits, mutually inductively coupled circuit, reflected impedance Q, impedance Q matching.

Unit-V

Concept of filters, Low-, high, band pass and band elimination filters, M derived filters, L and π configuration of filters, Cascading of filters, Short circuit and open circuit impedances. Design consideration of filters.
Fourier analysis of periodic wave. Analysis of square, triangular wave forms. Analysis of output wave forms of half and full wave rectifiers. Experimental determination of the Fourier components of a square wave.

Reference:
1. Hand Book of electronics by Gupta & Kumar.
2. Basic Electronics by Bernard Grov.

Paper-II Semiconducting and Opoto electronic devices
Note: The paper will be divided into five units. Two questions will be set from each unit. Five questions are to be attempted in all. The candidates are required to attempt one question from each unit.
Max. Marks: 33
Time: 3 hrs.

Unit-I
Metal, insulators and semiconductors, intrinsic semiconductors, mobility and conductivity, extrinsic semiconductor (N-type and P-type), Physical concepts of carrier concentration, carrier life time, diffusion, continuity equation and hall effect.
Dipolar space charge region and potential barrier, voltage and current equation, forward and reverse bias characteristics, DC and AC resistance.

Unit-II
Transistor fabrication, N-P-N and P-N-P transistors, CB, CE and CC configurations α, β and γ gains. Z, Y and h equivalents of transistors in various configurations (both in static and dynamic equivalents), characteristics of transistors in various configurations, AC and DC load line.

Unit-III
Transistor parameters and factors effecting the transistor parameters. Transistor as an amplifier, comparison among three transistor amplifier configurations (single stage). Amplifier and its graphical analysis.

Unit-IV
Field effect transistors (FET), Junction Field Effect Transistor (JFET) and MOSFET, Uni-junction transistors (UJT): construction working and their characteristics.

Unit-V
Varactor diode, tunnel diode and their characteristics, photo
Syllabus: B.Sc. Part-I

Conductivity cell, P-N photodiodes, PIN photodiodes, avalanche photodiodes, simple applications of photodiodes, photo voltaic effect, solar cell LED, photo-multiplier tubes.

Reference Books:
3. Engineering electronics by Ryder.

Paper-III Digital Computer Electronics

Note: The paper will be divided into five units. Two questions will be set from each unit. Five questions are to be attempted in all. The candidates are required to attempt one question from each unit.
Max. Marks: 34
Time: 3 hrs.

Unit-I

Number system—Introduction to digital computer. Number systems—decimal, binary, octal, hexa-decimal and their inter conversion, signed binary numbers, binary arithmetic addition, subtraction, multiplication and division. Meaning of bit, nibble, byte, BCD code, excess three code, other four bit codes, five bit code, gray code alfameric displays (ASCII code).

Unit-II


Unit-III

Arithmetic and Sequential logic—Introduction to ALU (Arithmetic Logic Unit), exclusive OR gate, half adder, excess-3 adder, half and full subtractor, signed binary numbers, 2's compliment adder-subtractor. Simple conventional circuit designs.
RS flip-flop, flip flop, RST flip flop, D flip flop, J.K. flip flop, Schimet trigger.

Unit-IV

Shift Register/Bistable multivibrator as binary counter (Elementary) shift counter, Four bit binary counter, decade counter, gating a counter, BCD counter, ring counter, up down counter.
Unit-V

SSI & MSI integrated circuits, magnetic core, Magnetic core logic, Magnetic memory, Addressing Semiconductor memories, bipolar, MOS, magnetic drum storage, ROM, PROM, EPROM, RAMS.

Digital clock, Decimal decoder, Seven segment decoder, dot matrix decoder.

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 other from section ‘B’.

The distribution of marks will be as follows:

Expts (two) - 30
(15 for each expt) marks
Viva Voce 10 marks
Practical record 10 marks
Total 50 marks

Section-A

1. To draw the characteristic curves of transistors (common base)
2. To study the characteristic of various diodes.
3. To study the characteristic of Solar cell.
4. To study the characteristic of photodiodes and LED's.
5. To study the phase relationship between voltage and current in LR circuit.
6. To study the phase relationship between voltage and current in CR circuit.
7. To study the phase relationship between voltage and current in LCR circuit.
8. To study the LCR series resonance circuits and find the quality factor.
9. To study the LCR parallel resonance circuit.
10. To study the Fourier analysis of square wave voltage.

Section-B

1. To study the RS flip-flop circuit and verify its truth table.
2. To study the half adder and substractor.
3. Verification of superposition theorem.
4. Verification of Norton’s theorem.
5. Verification of Thevenin theorem.
6. Verification of DeMorgan's theorem.
7. To study the arithmetic logical unit (ALU).
8. To design AND, OR and NOT logic gates and verify their truth tables.
9. To design and study 4-bit up-down counter.
10. To study decoders and encoder.
1. TEXTILE-CRAFT

Scheme:

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<th>(i)</th>
<th>Theory: One paper</th>
<th>DURATION</th>
<th>3Hrs</th>
<th>MAX.MARK</th>
<th>50</th>
<th>MIN.MARK</th>
<th>22</th>
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<tr>
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<td>3Hrs</td>
<td>MAX.MARK</td>
<td>50</td>
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<tr>
<td>(iii)</td>
<td>Submission: Two</td>
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<td>MAX.MARK</td>
<td>50</td>
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Syllabus (Theory): Introduction to Textile Craft

UNIT-I

1. Introduction to Textiles

2. Definition of fibre, Properties of textile fibres, Primary & Secondary properties.

3. Classification of fibres

4. Production, manufacturing, properties and uses of Natural vegetable fibres cotton, linen and jute

5. Yarn manufacture by Takli and Charkha

UNIT-II

1. Warp and Weft, Difference between warp and weft

2. Handloom, Parts of Handloom
3. Warp path on Handloom

4. Motion of Handloom (primary & secondary)

5. Elementary Weaves (Basic weaves): Plain, Twill, Satin & Sateen

UNIT-III

1. Concept of colours, Colour Wheel, Colour schemes, Achromatic & Monochromatic colours

2. Dyes and Pigments (colourless dyes)

3. Classification of Dyes

4. Dyeing of cotton fabric by Tie and Dye process

5. Fabric finishes- Introduction and Importance, basic finishes- bleaching, scouring, singeing, mercerising

**Syllabus (Practical):**

**Samples preparation**

(i) Tie and Dye (Marbling, pleating & folding, laheria and bandhej)

(ii) Elementary weaves (plain, twill, satin and sateen) on graph paper

(iii) Primary colour, secondary colour, colour scheme, achromatic & monochromatic colour

(iv) Hand painting

(v) Stencil Preparation and Painting
Submission:
Develop any two products
(i) Dupatta / scarf/table cover using tie and dye
(ii) Cushion cover or table mats using hand painting or stencil painting

Examination Scheme:

Major Problem: 50 Marks
Tie and dye/ stencil printing / hand painting on a product

Minor Problem: 30 Marks
Preparation of any weave or colour scheme

Reference books:


### 2. Garment Production & Export Management

<table>
<thead>
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<th>B.A./B.Com. Part</th>
<th>Nomenclature</th>
<th>Teaching hrs. per week</th>
<th>Max. marks</th>
<th>Min. pass marks</th>
<th>Duration (hrs.)</th>
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<td>60</td>
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<td>Business and Industry accounting</td>
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(Signed)

Registrar
B.COM./B.A./B.SC. PART -I

PAPER- I : UNDERSTANDING TEXTILE

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

HRS. 3

B.SC. M.M. 50

SECTION A: Textile Technology

1. General properties of : Natural Fibers – cotton, wool, silk,
   Regenerated -Rayon, Acetate
   Synthetic Fibers – Nylon, Acrylic

2. Fibers to yarn : The basic processes involved in making
   Yarns including Blending, carding, combing, mechanical and chemical spinning

3. Fabric construction : Weaving: plain, Twill, & satin weave

4. Fabric Finishes : Elementary knowledge of calendaring, mercerization and tentering

SECTION B: Traditional Textile

5. Knowledge of hand woven fabrics : Dacca muslin, jaundani, chanderi, brocade
   baluchari, kashmiri shawls, doria, kanjivaram


7. Printed Fabric : kalamkari, madhubani

3. Traditional emboidaries of india :
   a) kashida of Kashmir
   b) kasuti of karnataka
   c) Manipuri
   d) Chamba rumal
(e) Kantha of Bengal
(f) Phulkari of Punjab
(g) Chikankari of Lucknow

SECTION - C

SELECTION CRITERIA

9. Selection of suitable fabrics for infants, toddlers, pre school children, school going children, adolescents, adults and special needs

10. Buying criteria for readymade garments, definition, origin & evolution of ready to wear garments

References:

1. Corbman, textiles fibre to fabric
2. Phyllis G. Tortora, understanding textile.
3. Naik, traditional embroideries of India.
4. Bhatnager, Paul, traditional Indian costumes and textiles.
5. Dhantyagi Sushila, fundamentals of textile and their care.

B.Sc./B.A./B.Com. Part - I

PAPER-II

BUSINESS AND GARMENT INDUSTRIES

B.A./B.Com. - M.M. 60
B.Sc. - M.M. 50

HRS. 3
SECTION A

1. Meaning and scope of business with special reference to garment export trade in India

2. The important factors to be considered at the same time of commencement of business—legal, economical, and social.

3. Different types of business:
   (a) individual organization
   (b) partnership
   (c) co-operative
   (d) public sector
   (e) company

4. Objectives, importance and utility of bookkeeping.

SECTION B

MERCHANDISING THEORY

5. Introduction to fashion merchandising: merchandising planning, scheduling, buying and evaluation


7. Careers in Apparel industries.

SECTION C

GARMENT INDUSTRY

8. Project planning for garment production unit.

9. Production and storage space, laundry area of garment industry.

10. Site selection for unit.


References:
2. Frings Stephens Gim, fashion from concept to consumer, Prentice Hall, Inc.
3. Jindal, Ritu, Handbook of Fashion

B.A./B.COM./B.SC. PART -I
PRACTICAL -I

BASICS OF SEAMS AND EMBROIDERIES

B.A./B.COM. — M.M. 80
B.S.C. — M.M. 50
HRS. 4

1. Decorative samples:
   Lace edging - (machine)
   Gathers - (machine), darts
   Pleats - knife, box, inverted box
   Frills - one side, two sided
   Tucks - pin, cross, shell
   Fasteners - hook, tich button, shirt button, kaaj, loop with button, zip
   Basic seams - Basting, (even, uneven, bakhiya, blanket)
   Hems - visible, invisible
   Plackets - continuous, two piece
   Pockets - patch, bound, inseam, kurta
   Piping and facings

2. Basic Embroidery stitches:
   Chain, stem, running, lazy-dazy, satin, herring - bone, buttonhole, bullion, feather
   patch and appliqué work.

3. Make samples of following traditional embroideries:
Kashida, kantha, kasuti, phulkari, chamba rumal, chikankari, embroidery of Kutch.

4. Taking body measurements and knowledge of standard measurements from child to adults.

5. Design and prepare an article of embroidery/stitching sample.
Geology and Mining

Scheme:

Theory: Max Marks 100 Minimum Pass Marks 36

• Paper I: Physical Geology and Palaeontology 3 hrs duration Max Marks 50

• Paper II: Mineralogy and Structural Geology 3 hrs duration Max Marks 50

• Practical (one) 4 hrs duration Max Marks 50

Paper I: Physical Geology and Palaeontology

Section - A

Geology: its definition and scope, sub-disciplines and concept of Earth System Science

Earth: As a part of the Solar System, its origin, composition and structure, internal and external forces

Concept of Plate Tectonics and its application in understanding Earthquakes and volcanoes, Mid Oceanic Ridges and Sea Floor Spreading.

Mountain Building and Isostasy

Section - B

Weathering and Erosion: Geological work of natural agencies like running water (rivers), wind, glaciers, groundwater and oceans, and development of related landforms

Fossils: Conditions necessary for fossilization, mode of preservation, their significance in understanding the origin and evolution of life, Outline of Geological Time Scale

Microfossils: Definition and significance in geological studies, Skeletal morphology and geological distribution of Foraminifers.

Section - C

Skeletal morphology and geological distribution of the following groups: Foraminifers, Brachiopods, Molluscs, Trilobites and Echinoids.
Paper II: Mineralogy and Structural Geology

Section A

Crystal: crystalline, cryptocrystalline and amorphous states. Crystals faces, edges, solid angle and elements of crystal symmetry, unit cell, crystal notation and zones.


Section B

Classification of Silicate Minerals. Physical, optical and chemical properties of the following mineral groups: Feldspar, pyroxene, amphibole, mica and garnet.


Section C

Folds and Faults: Definition, geometry, geometric and genetic classification and recognition in the field.

Elementary ideas about Cleavages, fractures, joints, salt domes, inliers and outliers.

Practicals

Study of photographic features on topographical maps. Drawing of profiles and geological sections along given direction.

Identification, description and drawing of important fossils representing the following groups: Brachiopods, Molluscs, Trilobites, Echinoids.

Identification and description of common rock forming minerals on the basis of physical properties: Identification of quartz, feldspar, biotite, hornblende, muscovite, under microscope.

Geological field work and collection of specimens.
Environmental Science

Scheme:
Theory

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

Note:

1. Two types of Question papers for each theory paper will be applicable. Total duration of 3 hours for each paper. One question paper will comprise of the objective questions and the other will be of descriptive type question.

2. Descriptive type question paper (to be given during 1st 2 hours of examination) will have 9 questions, 3 from each section out of which a student is supposed to attempt 4 questions selecting at least 1 from each section. This portion of the paper will carry maximum 30 marks. Each descriptive question will be of 7.5 marks.

3. The objective question paper will be given after 2 hours of commencement of descriptive type paper and will have 35 questions of the objective type. This portion of the paper will carry 20 marks. The objective type questions will be of the following types:
   - Multiple choice type questions: 20 questions of ½ marks each.
   - Fill in the blanks/one word/true or false type questions: 10 questions of ½ mark each.
   - Very short answer type questions: 5 questions of 1 mark each.
Paper I: Fundamentals of Environmental Science

Section A

1. Ecosystem Concept, Ecosystem structures and function, Components of Ecosystem (Biotic and Abiotic Components).
3. Biogeochemical cycling (Nitrogen cycle, Phosphorous cycle, Carbon cycle, Oxygen cycle, Sulphur cycle, Water cycle etc.).
4. Concept of energy flow in Ecosystem, Production, Biomass and productivity.
5. Human Ecosystem, Agro- Ecosystem, Rural and Urban Ecosystem.

Section B

1. Geographical and Geological aspects of forests, types and distribution of forest, structure and composition of forest, productivity of forest and biodiversity in forest.
2. Geographical and Geological aspects of Grassland Ecosystem, types and distribution of Grasslands, structures and compositions of Grasslands, productivity of Grasslands and biodiversity in Grasslands.
3. Geographical and Geological aspects of Desert Ecosystem, types and distribution of Desert Ecosystem at global level.
4. Aquatic Ecosystems; ponds, lakes and marine ecosystems.

Section C

1. Ecology of Rajasthan with respect to Indira Gandhi Canal.
2. Aravallis and Thar Desert Ecosystem.
3. Land forms in Rajasthan desert.
4. Adaptation in plants and animals of Rajasthan desert.
5. Types of vegetations and animals in Rajasthan Desert.
Suggested Readings:


Twickenham, Middlesex.
Paper II: Water Resources and Management.

Section A

1. Water Resources; precipitation, infiltration, evaporation, transpiration, runoff and Storm Water.
2. Hydrological cycles mechanism, significance.
3. Surface water resource availability at global, national and regional level.
4. Ground water Resources; Aquifers, ground water collection System, ground water hydrolics.
5. Ground water availability at global, national and regional level.
6. Rain water harvesting its necessity and various methods of collection system and its importance.
7. Water uses; Drinking water, use as cooling water in power plants, Irrigation recreational activities. Industrial use with respect to quantum of water use.

Section B

1. Water quality monitoring; Sampling, Methods of analysis, determination of organic matter, determination of inorganic substances, physical characteristics, Bacteriological measurements.

Section C

1. Secondary (Biological) Treatment; Activated Sludge Process, Trickling Filters, Sludge Treatment and Disposal.
2. Lagoons, Anaerobic digestion, Aerobic Digestion.
4. Recovery of material from process effluent.
5. Removal of Pesticide residues from water.
Suggested Readings:

Suggested Laboratory Exercises (practicals)
Frequency Determination
Density Determination
IVI Determination
Study of vegetation types in different forests.
Study of vegetation types in different landforms of Desert.
Study of animals types in different forests. (Knowledge about wildlife)
Study of animals types in different landforms of Desert. (Knowledge about wildlife)
Study of different types of adaptations in plants of Deserts.
Study of different types of adaptations in animals of Deserts.
Add-on Subjects

1. BIOTECHNOLOGY

Scheme:

Theory

Max. Marks : 100

Min. Pass Marks : 36

Paper I : Biochemistry & Microbiology (50 Marks)

Paper II : Cell Biology & Genetics (50 Marks)

Paper III : Biophysics, Bio-Maths & Computer Application (50 Marks)

Practical (75 Marks)

Paper-1 : Biotechnology and Microbiology

The first question in each paper shall be compulsory and it would be based on the entire syllabus. It will cover 20 percent marks. It will be of the objective type one word, short answers etc. which can be done in the same answer book.

Section-A

Nature of biological material. General properties: organic and inorganic compounds. Suitability of organic compounds for generation of structure, storage of energy and information. Hydrophilic and hydrophobic groups in biological molecules.

Classification of biomolecules based on their role in bioprocesses. Molecules involved in generation of mechanical stability—peptidoglycans: polysaccharides and membrane lipids. Analysis of carbohydrates, lipids, proteins and nucleic acid, biosensors and diagnostics.

Section-B

Molecules involved in information storage and retrieval—the nucleic acids.

Molecules executing mediator and catalytic functions—the proteins.


Perspectives of biological macromolecules.
Syllabus: B.Sc. Part-I

in nucleic acid and proteins. Helicity, bending, looping, pleats, salt bridges etc. and their determinants. The basis for intermolecular interaction e.g., enzyme-substrate and antigen—antibody recognition.

Section-C

Nature of biochemical reactions underlying biosynthesis and degradation. Role of enzymes in such reactions. Protein and non-protein enzymes. Kinetics of enzyme catalyzed reactions. In vitro activity of purified enzymes and their applications in industry. Various uses of enzymes—enzymes on food processing, medicine, diagnostics and production of new compounds. Enzymes as research tool—ELISA methods, modification of biological compounds with the help of enzymes

Development of microscopy (optical, TEM and SEM).

Pasteur's experiments disproving spontaneous generation.

The concept of sterilization. Methods of sterilization (Dry heat, wet heat, radiation, chemical and filtration etc.)

Section-D

Concept of microbial species and strains.

The various forms of microorganisms—PPLOS, cocci, bacilli and spilla.

Genetic homogeneity in clonal populations.

Spontaneous and induced variation arising in microbial population.

Gene transfer in microorganisms.


Prokaryotic and eukaryotic microbial cells.

Nutritional classification of microorganisms.

Microbes in extreme environments—the thermophiles and alkalophiles.

Pathogenic microorganisms. Defense mechanism against microorganisms.

Symbiosis and antibiotic among microbial populations.

N₂ fixing microbes in agriculture.
Microbial metabolism fermentation products. A survey of products from microorganisms.
Strains Improvement by enrichment, selection and recombinant DNA methods.
Production of heterologous protein in interest in microorganisms.

Paper II : Cell Biology & Genetics
The first question in each paper shall be compulsory and it would be based on the entire syllabus. It will cover 20 per cent marks. It will be of the objective type-one word, short answers etc. which can be done in the same answer book.

Section-A
Cell as a basic unit of living systems. The cell theory. Pre-cellular evolution : artificial creation of "cells". Broad classification of cell types : PPLOS, bacteria, eukaryotic microbes, plant- and animal cells. A detailed classification of cell types within an organism. Cell, tissue, organ and organism as different levels of organization of otherwise genetically similar cells. Ecological amplitude of cells in high, altitude, sediments, arctic, hot springs, and brackish and freshwater environments. Ultrastructure of the cell membrane.

Section-B
Structure and function of cell organelles : ultrastructure of cell membrane, cytosol, Golgibodies, endoplasmic reticulum (rough and smooth), ribosomes cytoskeletal structures (action, microtubules etc.) Mitochondria, chloroplasts, lysomes, peroxysomes, nucleus (nuclear membrane, nucleoplasm, nucleolus chromatin,). Cell division and cell cycle (include cell synchrony and its application). Cell-cell interaction.
Cell locomotion (amphibian, flagellar and ciliary). Muscle and nerve cells.
Cell senescence and depth. Cell differentiation of plants and animals.

Section-C
Mendelian laws of inheritance, gene interactions.
Syllabus: B.Sc. Part-I

Sex determination in plants and animals; sex-linkage; non-disjunction as a proof of chromosomal theory of inheritance. Linkage; mapping genes; interference; coincidence in pro- and eukaryotes. Chromosomes; chemical composition; structural organization of chromatids, centromeres, telomeres, chromatin, nucleosome organization; eu- and heterochromatin; special chromosomes (e.g. polytene and lampbrush, chromosomes); banding patterns in human chromosomes.

Structural and numerical aberrations involving chromosomes; evolution of wheat, cotton and rice;

Hereditary effects—Kleinfelter, Turner, Cri-du-Chat and Down syndromes.

Section—D

Mutations—spontaneous and induced; chemical and physical mutagens; induced mutations in plants, animals and microbes for economics benefit of man.

Basic-microbial genetics conjugation, transduction, transformations; isolation of auxotrophs, replica-plating techniques, analysis of mutations in biochemical pathways, one gene-one enzyme hypothesis.

Extra chromosomal inheritance, mitochondrial and chloroplast genetic systems.

Population genetics: Hardy-Weinberg equilibrium, gene and genotypic frequencies.

B.Sc. Part I

Paper-III Biophysics, Biomaths & Instrumentations and Computer Application

The first question in each paper shall be compulsory and it would be based on the entire syllabus. It will cover 20 per cent marks. It will be of the objective type one word, short answer etc which can be done in the same answer book.

Section—A

University of Rajasthan

Sis. Strategies of light reception in microbes, plants and animals.
Correction of vision faults. Electrical properties of biological compartments. Electricity as a potential signal

Section—B

The set theory properties of subsets, Linear and geometric functions, Limits of functions, derivatives of functions. The binomial theorem, Logarithm, Differentiation, Integration, Probability calculations, Biostatistics: Methods of sampling, confidence level, Measurements of central tendencies, Measurements of deviations.

Section—C

Computers: General introduction to computers, organization of computer digital and analogue computers: algorithm. Use of computers: Common languages of computer, word, excel, power point. Bioinformatics and use of computer in bioinformatics. Computers for online monitoring, computers in co-ordination of solute concentration, pH and temperature etc. of a fermenter in operation.

Section—D

General principles; buffers; electroanalytical methods: potentiometric and conductometric; photometry; chromatographic methods of separation: gel permeation, ion exchange, reverse phase and affinity chromatography, HPLC and FPLC: centrifugation; radiotracer technique: gel electrophoresis techniques: electro blotting and electrolution, capillary electrophoresis. API-electrosprary and MALDI-TOP mass spectrometry.

Practical-Based on Theory syllabus -Max marks 50
2. INDUSTRIAL MICROBIOLOGY

Scheme:

Max. Marks 100

Min. Pass Marks : 36

Paper I 3 hrs. duration

Marks : 50

Paper II 3 hrs duration

Marks : 50

Practical Min. Pass Marks : 18

Max. Marks : 50

Note: Each theory paper will contain nine questions, three questions form each section. Candidates are required to attempt five questions in all taking at least one question from each section.
Syllabus : B.Sc. Part-I

Paper-I : Fundamentals of Industrial Microbiology, Biostatistics, Tools and Techniques  

Section-A

1. General Introduction history and development of Industrial Microbiology Scope of Industrial Microbiology:
   - Introduction
   - Discovery of Microbial World
   - The experiments of Pasteur
   - The era of the discovery of antibiotic
   - The discovery of the anaerobic life
   - The Physiological significance of Fermentation

2. Classification isolation, characteristics and ultrastructure of microbes.
   - Bacteria
   - Algae
   - Fungi
   - Actinomycetes
   - Mycoplasma
   - Viruses
   - Procedure of isolation, preservation and identification of micro organisms
   - Methods of staining of different microbes.

3. Biological and Biochemical fundamentals.
   - Introduction
   - The microorganisms and biotechnology
   - Isolation methods for microorganisms
   - Culture preservation and stability
   - Preservation of microbes, serial subculture preservation by over laying culture with mineral oil lyophilisation of freeze drying.
   - Other methods for storage of fungi
   - Over production of microbial metabolizes
   - Preparation of inoculum
Section-B

4. Fundamental of Genetics
   - Introduction
   - Methods for the selection of mutants, direct selection methods for resistant mutants, penicillin selection, technique for mutant selection, conditional lethality and use in mutant section.
   - General account about the transfer of genetic information in prokaryotes.
   - Scope of genetic engineering.

5. Biostatistics
   - Basic idea of probability distribution patterns, normal binomial and poison distribution, sampling methods, means, mode and median, chi-square statistics. Analysis of variance, transformation.

6. Microscopy
   - Simple microscopy, phase contrast microscope, fluorescence and electron microscopy.

Section-C

7. Chromatography
   - Paper chromatography, thin layer chromatography, column chromatography, gas chromatography, affinity chromatography, gel filtration, Electrophoresis, moving boundary zone (paper gel etc.)

8. Instruments: basic principles and usage
   - pH meter Absorption and Emission spectrosopes. Principle and law of absorption and radiation use densitometry, fluorimetry, calorimetry spectrophotometry (Visible, UV infrared) manometry, polarography, Centrifugalization: principles and application.

9. Principle types of Fermentation
   - Introduction
Factors involved in fermenter design, difference between bio-chemical and chemical processes, classification of bio-chemical reactions, rate process, operational consideration, local conditions within a fermenter.

Fermenter configurations, the batch fermenter, continuous stirred tank fermenter the tubular fermenter, the fluidised bed fermenter, solid state fermenters.

Principal operating characteristics of fermenters.

Computer control of fermentation process.

Introduction

Computer hardware and software, Hardware Graphics, LOTus and DOS, Computer applications in fermentation.

Justification and planning.

Paper-II : Microbial Genetics,
Molecular Biology, Microbial Biochemistry.

Section-A

1. Nucleic Acids.
DNA as genetic material structure of DNA, RNA, DNA replication (conservative and semi-conservative replication, confirmational flexibility of DNA), replication of Eukaryotes. The genetic code, central dogma, reverse transcriptase, gene transcription, polymerases, transcription, production of DNA, tRNA, mRAN and rRNA, synthesis of RNA in eukaryotes and prokaryotes, catabolite effect operators and repression post transcriptional of RNA.


3. Mutation
Molecular mechanism of mutation forward and reverse muta-
tion, transition, transversion, chemical induced mutations, radiations and base analogies, induced mutations, mutation frequency applications of mutations, Mechanism of repair, of radiation induced damage, SOS repair, Post transcriptional repair.

Section-B

4. Genetic recombinant in bacteria.
Transformation, transduction and conjugation. Use of transformation, transduction and conjugative in genetic mapping, preparation of genetic maps.

5. Extra Chromosome genetic material.

6. Carbohydrates.
Classification of carbohydrates, optical property chemical properties of carbohydrates, chemical structure and property of starch, cellulose, gelcogen, synthesis of purines and pyrimidines.

7. Lipids
Saturated and unsaturated fatty acids, biosynthesis of fatty acids, distribution and function of lipids and microorganism. Degradation of lipids by alpha, beta and omega oxidation; lipid peroxidation.

Section-C

8. Enzymes
Classification, coenzyme, cofactor, thermodynamic explanation of enzyme, catalysis reaction orders derivation of Michaelis Menten equation, Transformation of Michaelis menten Kinetcis to Lineweaver Burke and Eadie Hoffstee polite Competitive, uncompetitive and non competitive inhibition kinetics of allosteric regulation of enzyme. Isozymes factors contributing to catalytic efficiency of enzymes (Mode of catalysis)

9. Amino Acids

10. **Oxidation and Reduction Reactions**:
Standard redox, potential law of thermodynamics, entropy, enthalpy and free energy of reaction; hydrolysis of energy rich intermediates and ATP. Respiratory electron transport and proton pump. Exudative phosphorylation (ATP synthesis), chemical coupling, configurational change and chemismotic, Central dogma of energy transduction role coupling factors and dissipation of proton pump.

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**Practical on Paper-I**

1. Preparation of media, autocolaving and sterilization of glassware, maintenance of culture room.
2. Isolation and minatenance of microbes of different groups.
   - (a) Bacteria, (b) Algae, (c) Bacteriophage, (d) Fungi.
5. Standard plate court.
6. Haemocytometer
7. Isolation of Phytoathogens
8. Biostatistics: manual and by computer
   - Problem of Chi-square test
   - Problem of mean, mode and median
9. Protein estimation by calorimeter.
10. Carbohydrate estimation by calorimeter.

1. Paper Chromatographic separation of amino acid and pigments by one way descending.
2. Paper Chromatographic separation by two dimensional Chromatograph.
3. Paper Chromatographic separation of carbohydrate.
15. Measurement of pH fruit juice.
17. Centrifugal separation of protein.
18. Absorption spectra of protein nucleic acid and pigments.

Practical On Paper-II

1. Isolation of antibiotic resistant bacteria.
2. Replica plate technique for isolation of mutants.
4. Demonstration of lysogeny in Escherichia coli.
5. Mutant isolation by gradient plate technique.
6. Location of site of mutation by using plasmid curing agent acrydine orange.
7. Isolation and purification of DNA.
8. Isolation and purification of RNA.
10. Demonstration of photorepair mechanism.
11. Extraction and identification of lipids by thin layer chromatography.
17. Separation of isozyme by polyacrylamide electrophoresis.

Reference Books:
2. Microbial Biochemistry by Meant.
3. Outlines of Biochemistry by Cohn and Stumpp.
12. Laboratory Techniques in Biology, by Swarop, Pathak, and Arora.
13. Fermentation Technology by Wildtaker.
3. COMPUTER APPLICATIONS

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<tr>
<th>Scheme</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
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<tr>
<td>Arts/Commerce</td>
<td>72 (Th. 47 Pr. 25)</td>
<td>200</td>
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<tr>
<td>Science</td>
<td>54 (Th. 36 Pr. 18)</td>
<td>150</td>
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<td>Paper-I 3 hours</td>
<td>Computer Fundamentals</td>
<td>Arts/Com. 65</td>
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<td>Paper-II 3 hours</td>
<td>Operating Systems</td>
<td>Arts/Com. 65</td>
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<td>Paper-III</td>
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<td>Arts/Com. 70</td>
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<td>Science 50</td>
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**Paper I : Computer Fundamentals and Introduction to IBM PC**

What is Computer? An introduction. Uses of computers in modern society e.g. weather forecasting, census, oil exploration, speech recognition, banking, publishing, accounting, research etc.

Information concepts and processing-hardware, software computer capabilities and limitations. Concept of files and directories.

Hardware features and use-CPU, I/O devices, Storage device, and media.
University of Rajasnan

Introduction to networking, multiprocessing, time sharing, multitasking and real time computing.

Variety of hardware systems and features. Various types of computers available in market. Micro, Mini and Main Supercomputers.

Evolution of personnel computers, Commodore, Atari, Apple, IBM, PC. Asic block diagram of computer. Difference between personal and main frames—Simple operating system, Easy to use, Less Memory, Dedicated, Normally single user.

Introduction to micro processors and associated computers. Timers, display controllers, DMA controllers.

Block diagram of IBM PC. Introduction to 8086 and 8088. Functional description of various modules and cards.

Boot process in IBM PC. System files. Self test.

Various types of displays & other peripherals used in IBM PCs.

Disk Operating System—Introduction, Batch files.

Configuration files. COM, EXE, SYS, BIN and TXT files. Introduction to programming in BASIC. Development of programs in Q BASIC. Use of graphics facilities using Basic.

Diagnostics for IBM PC. Use of Norton Utilities and other packages for undeleting files and other system maintenance jobs.

Advance version of IBM and compatibles.

Paper II: Operating Systems and Business Data Processing

Introduction to various categories of softwares. Operating system and its functions. Interaction of operating system with hardware and user programs.

Various components of operating system with reference to DOS. Single user operating system. Task loader. Memory management.

File management, Directory structure in DOS. Moving renaming, copying, deleting and undeleting files under DOS.

Practical

Visit to computer Lab. Introduction to various components of a computer. A simple documentation preparation and printing. Usage of printer and other components.

Physical inspection of IBM PC and internal procedure. Introduction
Syllabus: B.Sc. Part-1

Terminology (COM1 COM2, etc.) Writing batch files for various purposes. Modifying config-sys files. Creating RAM Disk. Diagnostics on IBM PC. Controlling PC hardware using BASIC programs.