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*Dy. Registrar (Academic)*  
*University of Rajasthan*  
*JAIPUR*
SCHEME OF EXAMINATION
B.Sc. (Honours) Part-I
(10+2+3 Pattern)

For a pass at each examination, a candidate shall be required to obtain a minimum of 36% marks in each subsidiary subject and 40% marks in the Honours subjects, passing separately in the practicals, wherever prescribed.

Successful candidates will be classified as under:

- First Division 60% of the aggregate marks prescribed both in Honours and subsidiary subject of Part I, Part II, and Part III Examinations taken together.
- Second Division 50% of the aggregate marks prescribed both in Honours and subsidiary subject of Part I, Part II, and Part III Examinations taken together.

All the rest shall be declared to have failed the examination if they obtain a minimum of 40% marks in the aggregate.

No division shall be awarded at the Honours Part I.

The number of papers and practicals, wherever prescribed the duration of examination, maximum and minimum pass marks shall be shown in the relevant schedule.

A candidate shall be required to offer the Honours subject and one subsidiary subject out of the following subjects to the condition that the same were offered by him as optional subjects at the First Year T.D.C. Examinations of the University, or an examination recognised by the Universities equivalent thereto:

Honours Subjects:
1. Physics
2. Chemistry
3. Zoology
4. Botany
5. Mathematics
6. Psychology
7. Geography

N.B.: Candidates shall be required to offer Four papers and practical (wherever prescribed) of the Honours subject offered by him.

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पूर्णक 100

नोट : 36 से कम अंक लाने पर छात्रों को उत्तीर्ण 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. व्याकरण खण्ड। साहित्य खण्ड में दो भाग होंगे  गद्य भाग एवं पद्य भाग। प्रत्येक खण्ड के लिए 50 अंक निर्धारित है।

50 अंक

क  दो ग्राम थे (प्रत्येक में विकल्प देना है) 5 x 2 = 10 अंक

ख  दो ग्राम थे (प्रत्येक में विकल्प देना है) 5 x 2 = 10 अंक

ग  आलोचनात्मक प्रश्न पत्र से (विकल्प देना है) 7 1/2 x 2 = 15 अंक

घ  आलोचनात्मक प्रश्न पत्र से (विकल्प देना है) 7 1/2 x 2 = 15 अंक

साहित्य खण्ड -- 'क' -- गद्य-पद्य की निर्धारित रचनाएँ

गद्य भाग -- (कबीर ग्रंथावली से सं. -- स्त्रांसुंदर दास)

1. कबीर  -- साखि सं. -- गुरुदेव को अंग  -- 7,12,26,30
--- सुमन को अंग  -- 10,17,24,26
--- विरह को अंग  -- 2,6,10,18

2. सूरदास सूरसागर सार  -- सं. दों. धीरेन्द्र वर्मा
--- विनय भक्ति पद सं.  -- 21,33
--- गोकुल लीला पद सं.  -- 55,58
--- वृंदावन लीला पद सं.  -- 10,28
--- उन्द्रत वंदनेश पद सं.  -- 77,79

3. तुलसीदास  -- विनय पात्र, गीताग्रेस, गोरखपुर पद सं.  -- 87,88,90,156,158

4. मीरा  -- पदावली सं. -- नरेश्वर स्वामी पद सं. -- 1,3,4,5,10

5. रजीम  -- रजीम ग्रंथावली संपादक विश्वास मिश्र, गोविन्द रजनीश
(द्वसे दोहे)

6. मैक्लीडार्स गुप्त  -- मनुष्यता, हम राज्य लिए मरते हैं (गीत-साकेत के नवन सर्व से)

7. सूफियननदन पंडी  -- नौका दीवार

8. सूफीका त्रिपाठी निराला  -- वह तोड़की पत्थर

9. भक्तिवाणिय वाल्मिक हरियान  -- हिम्रोशिया

10. साधारण सिंह दिनकर  -- सिपाहा, समर शोष है

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| खण्ड — ‘ख’ |  | 50 अंक |
| व्याकरण/व्यावहारिक हिन्दी खण्ड |  |  |
| 1. निबन्ध लेखन | — | शब्द सीमा 300 शब्द | 8 अंक |
| 2. कार्यालयी लेख | — | शासकीय — अर्थशासकीय पत्र, कार्यालय झापन, विज्ञविति एवं कार्यालय आदेश, अविसूचना, पृष्ठांकन 4 x 2 | 8 अंक |
| 3. संक्षेपण | — | 4 अंक |
| 4. पत्रवाण | — | 5 अंक |
| 5. शब्द निर्माण प्रविधि | — | उपसर्ग, प्रत्यय, संधि, समास | 5 अंक |
| 6. शब्द शुद्धि एवं वाक्य शुद्धि | — | 5 अंक |
| 7. मुहावरे एवं लोकोक्ति | — | 5 अंक |
| 8. पारिमाणिक शब्दावली | — | 5 अंक |
| 9. शब्द के प्रकार | — | संज्ञा, सर्वनाम, विशेषण, क्रिया एवं क्रिया विशेषण | 5 अंक |
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
III Tense
IV Punctuation of a Short Passage with 10 Punctuation Marks

(As discussed in Quirk and Greenbaum)

Unit C: Comprehension

Following Essays and Stories in Essential Language Skills revised edition compiled by Macmillan for University of Rajasthan General English B. A./B. Com./B. Sc.
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.

Sujata Bhatt Voice of the Unwanted Girl
Ruskin Bond Night Train for Deoli
M.K. Gandhi The Birth of Khadi
J.L. Nehru A Tryst with Destiny
A.P.J. Abdul Kalam Vision for 2020

The candidates will be required to answer 5 questions from the given unseen passage.
One vocabulary question of 10 words from the given passage.

Unit D: Compositional Skills

(15 periods)
I Letters-Formal and Informal
II CV’s Resume and Job Applications and Report
III Paragraph Writing

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University of Rajasthan)
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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<th>Time</th>
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<td>3 hrs</td>
<td>36</td>
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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.

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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-sport 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.
Elementary Computer Applications

Work load: Teaching 2 hours per week
Practical 2 hours per week

Max Marks: 100 (Main University Exam: Theory -60 Marks, Practical- 40 Marks )

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

Main University Examination : Question pattern for Theory Paper

Max Marks: 60

Part – I (very short answer) consists 10 questions of one marks each with two questions from each unit. Maximum limit for each question is up to 20 words.

Part – II (short answer) consists 5 questions of two marks each with one question from each unit. Maximum limit for each question is up to 40 words.

Part – III (Long answer) consists 5 questions of eight marks each with one question from each unit with internal choice. Maximum limit for each question is up to 400 words.

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, multiprocessing, distributed and timeshared operating systems. Introduction to Unix, Linux, Windows, Windows NT. Programming languages – Low level and high level languages, generation of languages, 3 GL and 4 GL languages. Graphic User Interfaces.

Unit – II

Word Processing Tool - Introduction, Creating, Saving, Copy, Move and Delete, Checking Spelling and Grammar. Page Layout, interface, toolbars, ruler, menus, keyboard shortcut, editing, Text Formatting, insert headers and footers. Bullets and Numbering, Find and Replace etc., Insert Table and Picture, Macro, Mail Merge.

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 basics. Create, save 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 formulae and inline functions. Update worksheets 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


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
5. बी.ए. प्रथम वर्ष : प्रारंभिक हिंदी

पूर्णांक : 100
अवधि : 3 घंटे

अंकों का विभाजन
1. पुस्तकों पर आधारित प्रश्न
2. व्याकरण से संबंधित प्रश्न
3. रचना से संबंधित प्रश्न
   (क) लोकोक्तियों मुहावरे
   (ख) पत्र लेखन अध्ययन निक्षेप

पाठ्यक्रम
1. गद्य संग्रह
2. व्याकरण : शब्द विचार, वाक्य विन्यास, वाक्य खण्ड, पद क्रम का ज्ञान तथा इनमें होने वाली सामान्य त्रुटियों का ज्ञान।
3. (क) मुहावरों एवं लोकोक्तियों का प्रयोग, वाक्यों में रिक्त स्थानों की पूर्ति, समान दिखाने वाले शब्दों का अर्थ भेद अथवा वाक्यों में प्रयोग
   (ख) पत्र लेखन अध्ययन निक्षेप

पाठ्य पुस्तकें
1. गद्य—संग्रह—राष्ट्रीय गौरव के बिन्ह—डॉ. हरिकुश देवसरे
   प्रकाशक—नेशनल पब्लिशिंग हाउस, नई दिल्ली

व्याकरण एवं रचना
1. आधुनिक हिंदी व्याकरण तथा रचना— लेखक: कृष्ण चिकल
   प्रकाशक—नेशनल पब्लिशिंग हाउस, नई दिल्ली
2. सुबोध व्याकरण एवं रचना—समापदक—व्याख्या हृदय—संशोधनकर्ता—डॉ. अभ्या प्रसाद सुमन
   प्रकाशक—श्रीराम मेहरा एण्ड कम्पनी, आगरा

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SUBJECTS (HONOURS SUBJECTS)
1. PHYSICS

Paper-I : Mechanics

Note : Five questions are to be set taking one from each unit (each question will have an internal choice). Student will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-I
Inertial and Non-Inertial Frames:
(i) Inertial and non-inertial frames of reference, examples. Transformation of displacement, velocity and acceleration between different frames of reference involving translation. Invariance of Newton's Laws and energy conservation in a collision process.

(ii) Postulates of special theory of relativity, Lorentz transformations of velocity and acceleration; time dilation and length contraction. Lorentz transformations as rotation in space-time, world line and Minkowski space, time-like and space-like vectors, Macros causality, Light cone and past, present and future.

(iii) Transformation of displacement, velocity and acceleration between different frames rotating with respect to each other pseudo forces, centripetal and coriolis forces. Motion relative to earth (in northern and southern hemispheres), variation with latitude. Effect of coriolis force on various bodies in motion on earth, F
cau
t's pendulum

Unit-II
Conservation laws : Conservative forces, Potential energy in gravitational and electrostatic field, Rectilinear motion under conservative forces, Discussion of potential energy curves and motion of a particle. Centre of mass, two particle system: Motion of the CM and motion of one particle relative to another. Reduced mass, Conservation of linear momentum, 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 conservation and charged particle scattering by a nucleus. Mechanics of system of particles: Motion of the centre of mass of a system of particles. Motion relative to C.M., Relationship for kinetic energy and angular
momentum of a system of particles in the lab frame and the CM frame. Conservation of energy, Equation of rotational motion of a system of particles, Conservation of angular momentum.

Unit-III

Gravitation and Motion under Central forces: Law of gravitation, Gravitational and inertial mass, Gravitational potential energy and gravitational field, Principle of superposition, Gravitational field due to a large plate: Spherical shell and sphere.

General motion under central forces—general solution and discussion of trajectories, Rutherford scattering case of elliptical and circular orbits. Kepler's Laws.

Unit-IV

Relativistic Kinematics: Four vectors, Transformation of energy and momentum, Transformation between Lab and the CM frames, Transformation of four frequency vector, longitudinal and transverse Doppler effect. Four momentum conservation, Elastic and inelastic collision of particles of two particles, Kinematics of decay products of an unstable particle, reaction threshold energy, Pair production, Compton effect.

Unit-V


(ii) Elastic Properties of Matter: Elasticity, Young's modulus, Bulk modulus, Modulus of Rigidity, Poisson's ratio and derivation of relations between various classic constants, Bending of a beam, Torsion of a cylinder, Experimental determination of elastic constants by static and dynamical methods.

Books Recommended:
2. Fundamental University Physics Vol-I, Mechanics by Alorsio and Finn.

Paper-II: Oscillations and Waves

Note: Five questions are to be set taking one from each unit (each question will have an internal choice). Student will attempt all.
the five questions. 40% weightage will be given to problems and numericals.

**Unit-I**

Free oscillations of systems with one degree of freedom, oscillations in an arbitrary potential well, Simple harmonic motion, solution using complex exponentials, Examples of mechanical and electrical systems, Energy of the oscillator, Power-Dissipation and damping of the oscillator under viscous and solid friction. Superposition of (i) two and (ii) N-linear undamped harmonic oscillations, beats, Combination of two oscillations at right angles, Anharmonic Oscillators—pendulum as an example.

**Unit-II**

Undamped Oscillator with harmonic force, forced oscillations with damping, Effect of varying the resistive term, Transient phenomenon, power absorbed by a driven oscillator, Frequency response, phase relations, quality factor, Resonance: Electrical Oscillations, Series and parallel LCR circuit.

Electromechanical System—ballistic galvanometer, effect of damping, Optical Thermal expansion of a crystal, Non-linear effects in electrical devices, Non-linear effects in Acoustic Waves.

**Unit-III**

Motion of two coupled simple harmonic oscillators, Differential equation for stiffness or capacitance coupled oscillators, Normal modes, Motion in mixed modes, Transient behaviour, Effect of coupling, Normal modes of vibration for CO2 and H2O molecules, Calculation of normal mode frequencies, Forced oscillations and resonance for two coupled oscillators, Electrically coupled circuits, frequency response, Reflected impedance, effect of coupling (inductive case) and resistive load.

**Unit-IV**

Many coupled Oscillators: N-coupled oscillators, Normal modes and their properties, Longitudinal Oscillators, Equation of motion for one dimensional monatomic and diatomic lattices, acoustic and optical modes, dispersion relations, concept of group and phase velocities. Electrical transmission line, propagation velocity, losses, characteristic impedance, standing waves, effect of termination.

**Unit-V**

Wave equation in one dimension and its solution for elastic waves in: Solid rod, Gas column, transverse waves on a string.
Normal modes of a two dimensional system. Waves in two and three dimensions, Spherical waves.


Recommended Books:
3. Waves and Oscillations, Berkeley Physics Course—Vol 3.

Paper-III: Electricity and Magnetism

Note: Five questions are to be set, taking one from each unit (each question will have an internal choice). Student will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-I


Unit-II

The field of Moving Charges: Concept of Electrostatic field and potential due to discrete charges and continuous charge distribution. Potential energy of a system of charges. Application: Energy required to build a uniformly charged sphere, classical radius of an electron. The potential and field due to short dipole in polar and three dimensional Cartesian coordinates, the torque and force on a dipole in an external field.
Magnetic forces, measurement of charge in motion, invariance of charge. Electric field measured in different frames of reference, field of a point charge moving with constant velocity, force on a moving charge. Interaction between moving charge and other moving charges.

**Unit-III**

The magnetic field in free space and matter: The definition of magnetic field, properties of the magnetic field. Ampère's circuital law with applications. Ampère's law in differential form. Vector potential. Poisson's equation for vector potential. Vector potential and evaluation of B for (i) a current in an infinite solenoid (ii) outside a current carrying long straight wire (iii) Inside a long straight wire carrying uniform current. Field of any current carrying wire; and deduction of Biot-Savart law.

Transformation relations for different components of electric and magnetic fields between two inertial frames.

The field of a current loop. The force on a magnetic dipole in an external field. Electric currents in atoms—Bohr magneton, Orbital gyromagnetic ratio. Electron spin and magnetic moment. Magnetic susceptibility. The magnetic field caused by magnetized matter. Magnetization current, free currents and the field II.

**Unit-IV**


**Unit-V**

Electromagnetic Induction and Maxwell's Equation: Faraday's law of electromagnetic induction, a conducting rod moving through a uniform magnetic field, a loop move through a non-uniform magnetic field, a loop with the field source moving. Betatron. Differential form of Faraday's law. Inductance, self-inductance of a

Books Recommended:
2. Feynman Physics Vol. 2.
3. An Introduction to Electrodynamics by Griffiths.

Paper-IV: Thermal and Statistical Physics

Note: Five questions are to be set taking one from each unit (each question will have an internal choice). Student will attempt all the five questions. 40% Weightage will be given to problems and numericals.

Unit-I
Thermal and adiabatic interactions: Thermal interaction, Zeroth law of thermodynamics, systems in thermal contact with a heat reservoir (canonical distribution), Energy fluctuations, Entropy of a system in a heat bath, Helmholtz free energy, Adiabatic interaction and entropy, General interaction and first law of thermodynamics, Infinitesimal general interaction, Gibbs free energy, Phase transitions, Triple point, First and second order phase transition, Clausius-Clapeyron equation, Vapour pressure curve, transformation of disorder into order, Heat engine and efficiency of engine, Carnot's cycle, Thermodynamic scale, as an absolute scale, Maxwell relations and their applications.

Unit-II
Kinetic Theory: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Most probable, average and RMS velocities, Diffusion, Equipartition Theorem, Classical theory of Specific heat capacity, Specific heat of solid, Transport Phenomena: Mean free path, Distribution of free path, Coefficients of viscosity, thermal conductivity and diffusion, Brownian motion, Langevin's and Einstein's theories, Experimental determination of Avogadro number.
Unit-III


Unit-IV


Unit-V


Reference Books:
2. Reif—Thermodynamics and Statistical Physics.
3. Lokanathan and Khandelwal—Thermodynamics and Statistical Physics.

PRACTICAL

Max. Marks 100 Duration: 2 Practicals in two days Min. Pass (5 hrs. duration each day) Marks 40

Students are expected to perform at least 15 experiments in the academic session. The suggestive list of experiments is given below.
The institution if necessary may introduce new experiments of the same standard and communicate the list to the Convener, Board of Studies.

Experiments on Linear Track:
1. Constant velocity motion.
2. Accelerated motion.
3. Harmonic motion.
4. Anharmonic motion.
5. Potential energy curves and energy conservation.

Experiments with simple oscillator:
7. Inelastic collisions.
8. Variation of time period with amplitude.
9. Composition of two perpendicular S.H.Ms.
10. Frequency response.
11. Damping and ‘O’ value.
12. Phase curves.

Experiments with coupled oscillator:
13. Excitation of normal modes and frequency measurement.
14. Period of energy transfer as a function of coupling strength.

Experiments with Torsional wave apparatus:
15. Velocity of wave propagation.
16. Excitation of normal modes both ends open, one end open.
17. Impedance matching.

Experiments with Electricity Board:
18. Study of R.C. circuit with D.C.
19. Study of source impedance.

Other Experiments:
22. Study of interference pattern by 1,2,3,4,5... slits.
23. Study of Fresnel’s diffraction pattern. (a) Circular hole (b) Single slit.
24. Study of Fraunhofer diffraction.
25. Michelson’s interferometer.
26. Study of thermo e.m.f.
27. Change of B.P. of a liquid with pressure.
28. Rydberg constant from a given spectrum of hydrogen.
29. Experiment for displacement current.
30. Study of Radiation patterns from dipole, quadruple.
2. CHEMISTRY

CHEMISTRY

Scheme

<table>
<thead>
<tr>
<th>Paper</th>
<th>Duration (hrs)</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
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<tbody>
<tr>
<td>Paper I</td>
<td>3</td>
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<tr>
<td>Paper-II</td>
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<tr>
<td>Paper-III</td>
<td>3</td>
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<tr>
<td>Paper-IV</td>
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</tr>
<tr>
<td>Practical</td>
<td>7</td>
<td>100</td>
<td>40</td>
</tr>
</tbody>
</table>

*(Complete in One day)*

Notes:
1. There shall be four theory papers for Part-I Examination. The duration of examination for each paper shall be three hours and the maximum marks shall be 75.
2. Each paper will contain ten (10) questions having two (02) questions from each unit. Candidates are required to attempt five questions in all selecting at least one question from each unit.

**Paper-I: Inorganic Chemistry**

*(4 hrs/week)*

Unit-I

**Ionic Bond:**
General characteristics, types of ions, size effects, radius ratio and coordination number, Madelung-constant, Born-Haber cycle, Applications of lattice energy, polarizing power, polarizability, Fajan's rules, hydration energy, solubility of ionic-compounds, defects in structures, Frankel and Schottky defects, Non-stoichiometric compounds.

**Solids:**
Metallic bond: Qualitative idea of free electron, valence bond and band theories, semiconductors and insulators, conduction in ionic solids, electrical and magnetic properties of solids, introduction to superconductors and super-conductivity.

Unit-II

**Covalent bond:** General characteristics, Valence bond theory and its limitations. Directional characteristics of covalent bond, Resonance and resonance energy, Hybridisation involving s, p and d-orbitals.

**Valence Shell Electron Pair Repulsion (VSEPR) Theory** to NH₃, H₂O, H₃O⁺, SF₄, CIF₃, IC₃, shapes of simple inorganic molecules and ions. Dipole moment, percentage ionic-character from dipole moment and electronegativity difference.

**Molecular Orbital Theory:** Detailed description of linear combination of atomic orbital (LCAO), Homonuclear (H₂, He₂, B₂, C₂, N₂, O₂, F₂) and heteronuclear diatomic molecules (CO, NO) and their ions, comparison of valence bond and molecular orbital theories, multicentre bonding in electron deficient molecules, bond strength and bond energy.

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Unit-III
Weak Interactions:
Hydrogen bond, theories of hydrogen bonding: Valence bond treatment, weak intermolecular forces of attraction, van der Waals forces.
Chemistry of Noble Gases:
Position in the periodic table, discovery, Isolation, important compounds of noble gases with special references to xenon compounds: Synthesis, bonding and their stereochemistry.
S-Block elements:
Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their functions in biosystems, an introduction to alkyls and aryls.

Unit-IV
p-Block elements:
Comparative study of the p-block elements and group trends, electronic configuration, physical and chemical properties, diagonal relationship, atomic and ionic radii, ionization potentials, electron affinity, electronegativity and oxidation states, oxidation state diagrams on the basis of redox potentials, inert pair effect, catenation.
Compounds of p-block elements:
Hydrides of boron, diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), silicones, oxygen fluorides, peracids of sulphur, tetrasulphurtetranitride, basic properties of halogens, interhalogen compounds and polyhalides.

Unit-V
d-Block elements:
Chemistry of the elements of first transition series: Electronic configuration and comparative study with respect to atomic and ionic radii, oxidation states and ionization potentials. Redox potentials, oxidation state diagrams on the basis of redox potentials, binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry, metallic nature, magnetic properties, catalytic activity, colour and spectral properties of transition metal ions.
Chemistry of the elements of second and third transition series: Electronic configuration, general characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

Paper-II: Organic Chemistry
(4 hrs/week)

Unit-I
Structure and Bonding: Hybridization, Inductive effect, hyperconjugation, resonance, van der Waals interactions, inclusion compounds, clathrates, charge transfer complexes, hydrogen bonding.
Mechanism of Organic Reactions: Free radical and ionic reactions, homolytic and heterolytic bond breaking, electrophiles and nucleophiles, types of organic reactions, energy considerations, transition state, reactive intermediates-carbocations, carbonions, free radicals, carbenes, arynes and nitrenes. Methods of determination of reaction mechanism.

Unit-II


Cycloalkenes: Methods of formation, conformations and chemical reactions.

Diienes: Nomenclature and classification, isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reaction-1,2 and 1,4 additions. Diels-Alder reaction.


Unit-III

Aromaticity: The Huckel rule and its applications. Energy level, molecular orbital diagram (ethane, 1-3-butadiene, benzene). Aromatic electrophilic substitution: General pattern of the mechanism, role of sigma and pi-complexes, mechanism of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Effect of substituent groups (inductive, mesomeric and hyperconjugative effect), activating and deactivating groups, directive influence of groups, determination of orientation up to disubstituted derivatives, ortho/para ratio, Birch Reduction.

Method of formation and chemical reactions of benzene, alkyl benzenes and biphenyl.

Alkyl and Aryl Halides: Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution, reactions of alkyl halides S_N2 and S_N1 reactions with energy profile diagrams.

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 halides V/s allyl vinyl and aryl halides. Preparation and properties of vinly, allyl and benzyl halides. Synthesis and uses of DDT and BHC.

Unit-IV
Optical Isomerism: Elements of symmetry, molecular chirality, enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization, Asymmetric synthesis.

Relative and absolute configuration, sequence rule, D & L and R & S systems of nomenclature.

Geometric isomerism: Determination of configuration of geometrical isomers, E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.


Difference between configuration and conformation.

Unit V

Electromagnetic Spectrum: Absorption Spectra

Ultraviolet (UV) absorption spectroscopy: Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. Absorption bands of simple molecules like alkenes, Conjugated dienes, carbonyl compounds, enones, acids and aromatic compounds.

Infrared (IR) absorption spectroscopy: Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of simple organic compounds, alkanes, alkenes, alkynes, alcohols, aldehydes, ketones, carboxylic acids and their derivatives.

Paper-III Physical Chemistry
(4 Hrs. /Week)

Unit I

States of matter:


Unit II

Liquid State:

Unit III

Chemical Kinetics:
Rate, Initial rate, specific rate, rate constant and units. Method of determination of initial rate. Order, molecularity and stoichiometry of reaction. Methods of determination of order of reaction. Derivation of integrated rate equations- Zero order, first order, second order and third order. Graphical applications of these equations for the determinations of rate constant. Effect of temperature on rate constant, arrhenius equation, energy of activation and it’s determination. Complex reactions and their nature. How do these reactions differ from simple reactions? Derivation of rate equation for the opposing reactions (A+B→C); Parallel reactions (P’s are products) and consecutive reactions (A→B→C) characteristics of consecutive reactions.

Unit IV

Thermodynamics:

Unit V

Solutions:

Phase Equilibria:
Explanation of terms phase, component and degrees of freedom. Phase rule and it’s thermodynamic derivation. Restricted phase rule. Analysis of (a) One component system such as sulfur and water (b) two component system such as lead-silver system.

Paper-IV: Analytical Chemistry
(4 hrs/week)

Unit-I

Principle of Gravimetric analysis, precipitation methods, super saturation and precipitate formation, the purity of the precipitate, coprecipitation, post precipitation, conditions of precipitation, precipitation from homogeneous solution, washing of the precipitate. Ignition of the precipitate, masking and demasking agents.

Unit-II

Solvent extraction : Principles and process of solvent extraction, the distribution law and the partition coefficient, liquid-liquid extraction, factors favouring solvent extraction, choice of solvent for solvent extraction, stripping, solid liquid extraction, organic reagents used in solvent
extraction.
Organic reagents in quantitative inorganic analysis. Application of the following organic reagents: DMG, Cupferron, 8-hydroxyquinoline, cupron, salicylaldehyde, oxime, 1-nitroso-2-naphthol, 4-bromoandroic acid, nitron, tannic acid, arsenic acids, pyridine, anthranilic acid, pyrogallol, ethylenediamine.

Unit-III
Completion of gravimetric results, compilation of results, reliability of results-accuracy and precision, cleaning and calibration of glassware, standard derivation, t, Q and F tests, correction, significant figures, errors in analysis.
Volumetric analysis: Principle and applications of Redox titrations, iodometry and iodimetry. Theory of complexation titrations. Methods of end point detection, EDTA as Titrant, types of EDTA titration of mixtures, selectivity masking and demasking agents, metal indicators.

Unit-IV
Distillation methods of organic solvents, steam, fractional, vacuum and molecular distillations, monometers and monostates. Analysis of oils and fats, saponification value, iodine value, RM value, acid value.
Quantitative estimation of following functional group: alcoholic phenolic, carboxylic acids and unsaturated groups (olefinic & acetylenic).
Polarimetry: Basic principle, instrumentation, experimental techniques, determination of (a) specific rotation of a substance (b) concentration of the substance & applications. An elementary idea of Refractometry, Interferometry-circular dichroism & optical rotatory dispersion.

Unit-V
Air pollution: General consideration types of air pollutants, unit of measurement sampling monitoring and analysis of CO and SO₂ in atmosphere effect of air pollutants on plants and human health method for pollution control, especially for pollution by automobiles.

B.Sc. (Hons.) Part-I Chemistry Practicals
(8 hrs or 12 periods / week) (Spread over four days)

INORGANIC CHEMISTRY
A. Qualitative: To analyze the given mixture containing six radicals (three acidic and three basic) including interfering acid radicals - fluoride, borate, oxalate, phosphate and excluding insolubles.
B. Quantitative:
1. Volumetric exercises—Involving
   (i) Complexometric titrations (EDTA): Estimation of Ca²⁺ & Mg²⁺
   (ii) Iodometric and Iodimetric titrations.
2. Determination of total hardness of water.
3. Determination of number of molecules of water of Crystallization in oxalic acid crystals.
4. Estimation of sodium carbonate and bicarbonate in mixed solution.

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5. Estimation of sodium carbonate and sodium hydroxide in a mixed solution.

ORGANIC CHEMISTRY
1. Identification of functional groups in organic compounds and preparation of suitable derivative: unsaturation, alcoholic (−OH), phenolic (=C−OH), aldehydic, ketonic, carboxylic, ester, carbohydrate, nitro, amido, amino, sulphonic acids and halogen derivatives.
2. Purification of solid substance by recrystallization.
3. Separation of two miscible liquids by fractional distillation.
4. Preparation of acetaldehyde from aniline.
5. Preparation of an azo-dye.

PHYSICAL CHEMISTRY
1. To study the solubility curve of salts such as potassium nitrate, etc.
2. To study the solubility curve of phenol in water and hence study the effect of separate addition of substances such as naphthalene, potassium chloride and acetic acid.
3. Determination of pH of different buffer solutions and evaluate the $P_K_a$ of an acid by Henderson equation.
4. Determine the relative viscosity of a liquid by using viscometer.
5. Determine the relative surface tension of a liquid by using stalganometer.
6. Determine the heat of neutralization of an acid by alkali.
7. Determine the molecular complexity of benzoic acid in benzene by Distribution Law.
8. Determine the heat of reaction and verify Hess's law.

(Instructions to the Examiner)
B.Sc.(HONS.) Pt-I CHEMISTRY PRACTICAL EXAMINATION

Max. Marks: 100 Duration of Exam: 7 hrs. (Complete in One day)

Inorganic Chemistry
Ex. 1 Qualitative: To analyze the given mixture containing six radicals (three acidic and three basic) including interfering acid radicals - fluoride, borate, oxalate and phosphate.
No insolubles will be given. 18
Ex. 2 Quantitative: One of the exercises mentioned in the syllabus. 12

Organic Chemistry
Ex. 3 Identification of functional group of the given two compounds and preparation of their suitable derivative, if feasible. 25

Physical Chemistry
Ex. 4 Perform one of the physical chemistry experiments given in the syllabus. 25
Ex. 5 Viva-voce 10
Ex. 6 Record 10

100

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3. Zoology

B.Sc. Zoology (Hons.) Part-I
(2017-18)

Scheme:

<table>
<thead>
<tr>
<th>Paper</th>
<th>Course</th>
<th>Max. Marks</th>
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<tbody>
<tr>
<td>I</td>
<td>Animal Diversity-1</td>
<td>50</td>
</tr>
<tr>
<td>II</td>
<td>Animal Diversity-2</td>
<td>50</td>
</tr>
<tr>
<td>III</td>
<td>Biochemistry</td>
<td>50</td>
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<tr>
<td>IV</td>
<td>Cell Biology</td>
<td>50</td>
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<tr>
<td>V</td>
<td>Molecular Biology</td>
<td>50</td>
</tr>
<tr>
<td>VI</td>
<td>Genetics and Biostatistics</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Practical Days (8 hrs.)</td>
<td>100</td>
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</tbody>
</table>

Scheme of Examination: Max. Marks: 50

1. There will be 5 Questions in each paper. All questions will be compulsory and carry equal marks.
2. Question number 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Questions should be evenly distributed covering entire syllabus.
3. Each paper is divided into four units/sections. There will be one question from each unit/section. The question number 2 to 5 will have internal choice.

Seminars, posters, models, educational tour report, practical record etc. will carry internal marking which will be added in the practicals

Paper-I: Animal Diversity –I (Non-chordates)

Section - A

1. Principles of classification: Salient features and classification up to orders in non-chordates (Protozoa to Aschelminthes).
2. Protozoa: Type study—Entamoeba, Paramecium, Plasmodium, Trypanosoma and Leishmania.

Section - B

4. Porifera:
   (i) Type study—Sycon; Types and evolution of canal system.
   (ii) Development of Sycon
5. Coelenterata:
   (i) Type study—Obelia and Aurelia; Polymorphism in Hydrozoa.
   (ii) Metagenesis.

Section - C

6. Ctenophora: Type study: Beroe; Affinities of Ctenophora

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7. Platyhelminthes: Type study: *Fasciola hepatica* and *Taenia solium*; Parasitic adaptations.
8. Aschelminthes: Type study – *Ascaris*; Parasitic adaptations.

Section – D

10. Economic importance of Porifera, Corals, Coral reefs (types, formation and distribution with reference to India, and their conservation), Polymorphism in siphonophores.

Paper-II: Animal Diversity-II (Non-chordates)

Section – A

1. Salient features and classification up to orders (Annelida to Hemichordates).
2. Annelida: Type study - *Pheretima, Leech* and *Nereis*; Metamerism in Annelida.
3. Onychopora: Type study – *Peripatus*; Affinities.

Section - B

4. Arthropoda: Type study – *Prawn*; Crustacean larval forms; Mouth parts and vision in Arthropods; Social insects (*Termite and honey bee*).
5. Mollusca: Type study - *Pila and Unio*; Torsion and distortion in Gastropods, Molluscan larvae

Section – C

6. Echinoderms: Type study – *Asterias*; Larval forms of Echinodermata; Affinities of Echinodermata.

Section - D

8. Applied aspects of -
   (i) Vermiculture.
   (ii) Sericulture and Ericulture.
   (iii) Lac culture.
   (iv) Apiculture.
9. Economic importance of Arthropods; Metamorphosis in insects; Integrated pest management.
10. Economic importance of Mollusca; Pearl culture.

Paper-III: Biochemistry

Section - A

1. Basic chemical concepts, bonds and functional groups.
2. Carbohydrates: Classification, structure and clinical significance.
3. Lipids: Classification, structure and clinical significance.
4. Vitamins: Types (water and fat soluble), structure, function and clinical significance.

Section - B

5. Proteins: Classification and structural properties.

Section - C

7. Regulation of metabolism:
   (i) Carbohydrates: Oxidation of glucose through glycolysis, Kreb’s cycle and oxidative phosphorylation, glycogenesis, glycogenolysis and gluconeogenesis.
   (ii) Proteins: Essential and non essential amino acids, transformation of amino acids, deamination, transamination, decarboxylation, fate of ammonia, synthesis of urea (Ornithine cycle), fate of carbon skeleton.

Section - D

(iii) Lipids: β-oxidative pathway of fatty acids, brief account of biosynthesis of triglycerides, cholesterol and its metabolism.
(iv) Inborn errors of metabolism [Galactosemia, Glycogen storage disease (type I-VI), Hurler syndrome, Phenylketonuria, Alkaptonuria, Maple syrup urine disease, Lysosomal storage disease (Fabry disease, Gauchers disease, Nieman Picks disease, Lesch-Nyhan syndrome)].

Paper-IV  Cell Biology

Section - A

1. Microscopy: General principle of compound microscope, fluorescent and electron microscope.
2. Principles and uses of instruments: pH meter, colorimeter, spectrophotometer and centrifuge.
3. Separation of cellular organelles through centrifugation and their characterization.

Section - B

4. Structure of prokaryotic and eukaryotic cells; Diversity of cell size and shape.
Section - C

8. Chromosome structure: Morphology, chromonema, chromomeres, primary and secondary constrictions and telomeres.
10. Cell junctions: Tight junctions, desmosomes (belt and spot) and gap junctions.
11. Transport: Osmosis, diffusion (facilitated and mediated), active transport (Na⁺/K⁺ ATPase pump, Ca²⁺ ATPase pump) and ionic basis of membrane excitation.

Section - D

12. Cell-cell signaling: Endocrine, paracrine and autocrine signaling; second messenger cAMP and IP₃ DAG system.

Paper-V: Molecular Biology

Section - A

1. Chromosome remodeling: Nucleosome concept, solenoid and scaffold formation; heterochromatin and euchromatin.
2. RNA: Structure and types (mRNA, rRNA and tRNA).
3. Replication mechanism in prokaryotes.
4. Transcription in prokaryotes.
5. Translation in E. coli.

Section - B

7. DNA replication: Semiconservative replication and replication mechanism in eukaryotes.
8. Genetic code.

Section - C

10. Translation and post- translational modifications in eukaryotes.
11. Gene expression: Operon concept; lac operon

Section - D

13. Transposons: LTR, reverse transcription of retroviral genomic- RNA to DNA.
14. Gene transfer (Conjugation, transformation and transduction) and gene therapy.
Paper-VI: Genetics and Biostatistics

Section - A

1. Mendelian inheritance; Deviation from Mendelian inheritance.
2. Chromosomal theory of inheritance.
3. Multiple alleles, gene interaction, epistasis, lethality and pleiotropic genes.
4. Linkage, crossing over and linkage maps.
5. Sex chromosome system and sex linkage.

Section - B

7. Sex determination and dosage compensation in Drosophila and mammals.
8. Mutation: Types and molecular basis; Variation in chromosomal number.

Section – C

11. Eugenics, euthenics and euphenics.

Section – D

12. Introduction, scope and application of biostatistics.
13. Understanding the concept of descriptive and inferential statistics.
14. Frequency distribution.
15. Diagrammatic and graphical presentation of data (bar diagrams, histograms, frequency polygons & Pie charts).
17. Standard deviation and standard error and their merits & demerits.
I. Microscopic techniques

1. Organization and working of optical microscopes: (Dissecting and compound microscopes).
2. General methods of microscopic permanent preparations: Narcotization; fixing and preservation, washing, staining and destaining, dehydration, clearing and decolourization & mounting.
3. General idea of composition, preparation and use of:
   (a) Fixatives: Formalin and Bouin's fluid.
   (b) Stains: Borax carmine, Aceto-carmine, Aceto-orcein, Haematoxylin & Eosin.

II. Collection and culture methods

1. Collection and culture of Euglena, Daphnia, Cyclops etc.
2. Culture of Paramecium in the laboratory and study of its structure, life processes and behavior.

III. Museum specimen

1. Porifera: Sycon, Leucosolenia, Euplectella and Spongilla.
7. Onychophora: Peripatus.
IV. Microscopic slides

3. Coelenterata: *Obelia, Hydra and Obelia medusa*.

1. V. Anatomy: Study of the following with Dissection.
   1. *Pheretima*: External features, general viscera, alimentary canal, nervous system and reproductive system.
   2. *Periplanata*: External features, appendages, mouth parts, alimentary canal, nervous system and reproductive system.

VI. Permanent Preparation

*Amoeba, Paramecium, Euglena, Foraminifera shells, Sponge spicules, Sponge fibres, Gemmules, Hydra, Obelia colony, Parapodium of Nereis and Heteronereis, salivary gland, mouth parts and trachea of Periplanata, whole mount of mosquito larva.*

VII. Exercises in Biochemistry

1. Detection of carbohydrates, proteins and lipids in the given sample.
2. Identification of mono-, di- and polysaccharide in the given sample.
3. Quantitative estimation: Standard curve of total cholesterol, total protein and glycogen.

VIII. Exercises in Cell Biology

1. Squash preparation for the study of mitosis in onion root tip.
2. Squash preparation for the study of meiosis in Grasshopper/Periplanata testes.
4. Study of mitochondria using vital stain (Janus Green B).
5. Permanent slides of mitosis and meiosis (all stages).
IX. Exercises in Genetics

2. Identification of male & female *Drosophila*.
3. Identification of wild and mutant (Yellow body, Ebony body, Vestigial wings, White eyes etc.) *Drosophila*.
4. Permanent preparation of W.M. of *Drosophila*.
5. Permanent preparation of sex comb of *Drosophila*.
6. Study of Barr body from buccal smear.

X. Exercises in Biostatistics

1. Construction of frequency tables, bar diagrams, histograms, frequency polygons and Pie charts.
2. Exercises on Mean, median and mode (Direct, short-cut and step deviation methods).
3. Exercises on standard deviation and standard error.

B.Sc. Zoology (Hons.) Part-I

Scheme of practical examination and distribution of marks

8 Hrs. (2 days, 4hrs/day)

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<th>Min marks: 20</th>
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<tr>
<td>1. Anatomy</td>
<td>08</td>
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<tr>
<td>2. Permanent preparation</td>
<td>04</td>
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<tr>
<td>3. Exercise in Biochemistry</td>
<td>07</td>
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<tr>
<td>4. Identification and Comments on spots (1 to 8)</td>
<td>16</td>
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<tr>
<td>5. <em>Viva voce</em></td>
<td>05</td>
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<tr>
<td>6. Class Record</td>
<td>05</td>
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<tr>
<td>7. Seminar /Project Report/</td>
<td>05</td>
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</tbody>
</table>
Min marks: 20                               Max marks: 50

II£d day

1. Exercise in Cell Biology          07
2. Exercise in Genetics             06
3. Exercise in Biostatistics        06
4. Identification and Comments on spots (1 to 8)  16
5. Viva voce                         05
6. Class Record                      05
7. Seminar/Project Report/Collection 05

Note:

1. With reference to anatomy, and prescribed types, candidates must be well versed in the study of various systems with the help of charts/models/CD ROMs / multimedia computer based simulations including computer assisted learning (CAL) and other softwares.
2. With reference to whole mounts and museum specimens in case of the animal types may be substituted with diagrams/photographs/models etc.
3. Students will keep record of all the work done in the practical records.
4. It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.
5. The details methodology may be asked to be written where ever is necessary.

Recommended Books:

7. De Robertis EDP and De Robertis Jr EMF: Cell and Molecular Biology. 8th edition Lippincot Williams & Wilkins, 2006.
4. **BOTANY**

**B.Sc. Part I**

Maximum Marks: 400

- Paper-I Cytology, Genetics and Plant Breeding 75 marks
- Paper-II Algae, Fungi and Bryophyta 75 marks
- Paper-III Plant Physiology and Biochemistry 75 marks
- Paper-IV Ecology and environmental science 75 marks
- Practical (6 hrs.) 100 marks

**Min. Pass Marks: 160**

**B.Sc. Part II**

Maximum Marks: 400

- Paper-I Molecular biology 75 marks
- Paper-II Pteridophyta, Gymnosperm and Paleobotany 75 marks
- Paper-III Morphology and Anatomy of angiosperms 75 marks
- Paper-IV Microbiology and plant pathology 75 marks
- Practical (6 hrs.) 100 marks

**Min. Pass Marks: 160**

**B.Sc. Part III**

Maximum Marks: 400

- Paper-I Plant Biotechnology 75 marks
- Paper-II Systematics of angiosperms 75 marks
- Paper-III Plant utilization and Ethanobotany 75 marks
- Paper-IV Embryology of angiosperms and Seed science 75 marks
- Practical (6 hrs.) 100 marks

**Min. Pass Marks: 160**
Scheme of Examination (Common for all theory papers)

Each theory paper shall have two parts A & B. Part A will be compulsory having 30 very short answer type questions (with a limit of 20 words) of one mark each with a total of 30 marks.

Part B of question paper shall be divided into three units. There will be one question from each unit. Question number 2-4 will have internal choice. Each question will carry 15 marks with a total of 45 marks.
Paper I- Cytology, Genetics and Plant Breeding

UNIT-I

The Cell: Introduction to modern tools and techniques of cell biology (Light and Electron microscopy); History; cell theory; cell size and cell structure of Prokaryotic and Eukaryotic cells.

Cell wall and cell membrane: Origin, ultra structure, chemical constituents and functions of cell wall; models of cell membrane organization; cellular transport and signaling.

Mitochondria and chloroplast: Origin of organelles; organelles structure and biogenesis; organelle membranes and organization of macromolecular complexes; variation in size, shape and number; types of plastids organelle-nuclear interactions; organelle genome organization.

Structure/function of other sub-cellular structures: Golgi complex; endoplasmic reticulum; ribosome; lysosomes ; microbodies-peroxisomes and glyoxysomes; cytoskeleton.

UNIT-II

Nuclear organization: ultra-structure; nuclear envelope and nuclear pore complex; nuclear matrix and nucleoplasm; DNA and histones; nucleosome and higher level of organization

Cell division and its regulation: Mitosis and meiosis-historical perspective and significance; various stages of cell division progression; cytokinesis; role of centromere, kinetochore and spindle apparatus; animal and plant cell cycle; mechanisms of cell cycle regulation; apoptosis.

Chromosomal Alterations: Origin, types and effects of duplications, deletions, inversions and translocations; meiosis in structural heterozygotes.Origin, types and
effects of auto and allopolyploidy; origin and meiosis in nullisomics, monosomics and trisomics.

**Genetic alterations**: Spontaneous and induced mutations; mutagens—types and mode of action; transitions, transversions and frame-shift mutations.

**UNIT-III**

**Mendelism**: Mendel’s experiment and principles of inheritance, back cross and test cross, gene interaction and modified dihybrid ratios – complementary, supplementary, duplicate and epistatic factors.

**Multiple allelism**: multiple alleles in *Drosophila* (eye colour) man (blood group).

**Linkage and sex determination**: coupling and repulsion phases; two and three point test crosses, linkage map; mechanism of sex determination; sex linked, sex limited and sex influenced characters.

**Maternal influence on inheritance**: shell coiling in snails and Kappa particles in *Paramecium*; cytoplasmic inheritance in yeast (mitochondria) and *Mirabilis jalapa* (plasmid).

**Plant breeding**: Introduction, objectives of plant breeding. Types of plant reproduction: vegetative, sexual and apomixes, their effect on generating and fixing genotypic variation; Green revolution.

**Methods of plant improvement**: Pureline and mass selection; hybridisation in self and cross pollinated crops; introduction and acclimitisation; hybrid vigour and inbreeding depression.

**Suggested laboratory exercises:**

**Cytology**

- Study of prokaryotic cells of various organisms.
- Bacteria, (*Bacillus, Coccus, Streptococcus, Spirillum*).
- Study of eukaryotic cells of various organisms.
- Comparative study of cell structure in onion cells, *Hydrilla* and *Spirogyra*. 

[Signature]

**Dy. Registrar**

**University of Rajasthan**
Study of cyclosis in *Tradescantia* staminal hairs.
- Bacterial staining (Gram's staining).
- Study of plastids (Cassia, Lycopersicum, Capsicum).
- Mitosis - all stages - onion root tip.
- Meiosis - permanent slides.

**Genetics and Plant Breeding**

- Study of sex chromosomes.
- Preparation of chromosome maps - Gene mapping with a Three-Point Cross.
- Exercise based on Mendal's Laws.
- Exercise on gene Interaction and modified hybrid ratios.
- Emasculation and hybridisation.

**Suggested Readings:**

Paper II Algae, Fungi and Bryophyta

UNIT-I

Algae: History, occurrence and distribution, general characters, thallus organization and evolutionary tendencies, ultrastructure of algal cell, classification and economic importance; important features and life history of Chlorophyceae-Volvox and Chara, Xanthophyceae-Vaucheria and Oedogonium, Pheophyceae-Ectocarpus and Rhodophyceae- Polysiphonia.

UNIT-II

Fungi: History, occurrence and distribution, general characters, ultrastructure of fungal cell, classification and economic importance, nutrition, reproduction, important features and life history of Mastigomycotina-Psythium, Phytophthora; Zygomycotina-Mucor; Ascomycotina-Saccharomyces, Eurotium, Chaetomium, Peziza; Basidiomycotina-Puccinia, Agaricus; Deuteromycotina-Cercospora, Colletotrichum. General account of Lichens.

UNIT-III


Suggested laboratory exercises:

Algae

External Morphology and Permanent slides of-
- Volvox: Volvox colony, daughter colony, Antheridia, Zygote.
- Chara: Sexual organs, Globule and Nucle.
- Oedogonium: Thallus structure, Sexual Stage, Antheridia and Oogonia.
• *Vaucheria* - Thallus structure, Sexual Stage, Antheridia and Oogonia
• *Ectocarpus* - Thallus structure, Unilocular and Pleurilocular sporangia
• *Polysiphonia* - Thallus structure, Cystocarp, Tetrasporophyte.

**Fungi**

External Morphology and Permanent slides of-
• *Chaetomium* - Sexual reproduction-Ascospores
• *Peziza* - Sexual Reproduction - Apothecia V.S.
• *Puccinia* - Wheat leaf: Uredospore and Teleutospore
• *Agaricus* - Pileus (V.S.)
• *Colletotrichum* - Thallus

**Bryophyta**

Study of Specimens and external morphology of the following-
• *Riccia* - Thallus structure
• *Marchantia* - Thallus structure, Gemma cup, male and female gametophyte
• *Anthoceros* - Thallus structure, sporophyte
• *Funaria* - Thallus structure, sporophyte

**SUGGESTED BOOKS**


**Paper-III Plant Physiology and Biochemistry**

**UNIT-I**

Plant-water relations: Water transport processes; diffusion and osmosis; water potential and chemical potential, absorption of water transport through tracheids and

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xylem; transpiration and its significance factors affecting transpiration; exchange of gases, role of stomata, mechanism of stomatal movement; antitranspirants, guttation.

**Mineral nutrition**: criteria of essentiality of element; macro and micronutrient; role of essential elements; mineral deficiency symptoms and plants disorders; nutrients uptake and transport mechanism; role of cell membranes, ions-pumps and carriers; ion antagonism and toxicity.

**Transportation of organic substances**: transport of photosynthetic; source sink relationship the mechanism of translocation in the phloem assimilate partitioning.

**UNIT-II**

**Photosynthesis**: Structure of photosynthetic apparatus; photosynthetic pigments; electron transport pathways in chloroplast membranes; photophosphorylation; Calvin cycle; C4 carbon cycle; Crassulacean acid metabolism; photorespiration.

**Respiration**: Glycolysis; TCA cycle and its regulation; electron transport in mitochondria; oxidative phosphorylation, pentose phosphate pathway.

**Nitrogen metabolism**: Biological nitrogen fixation; reduction of \( \text{N}_2 \) to ammonia, \( \text{nif} \) genes; regulation of nitrate reductase and nitrogenase; nitrate and ammonium assimilation.

**UNIT-III**

**Growth and development**: Phases of growth; Seed dormancy and seed germination; concept of photoperiodism; physiology of flowering; the florigen concept and role of hormones; vernalistaion; Senescence and fruit ripening; importance of respiratory climacteric; discovery, physiological role and mechanism of action of the phytohormones- auxins, cytokinin, gibberellins, abscissic acid, Signal transduction basic concept; plant movement-tropic and nastic; Biological clock.

**Secondary metabolites**: Introduction of secondary metabolites (alkaloids, flavonoids and steroids) and their importance.

**Suggested laboratory exercises:**

**Physiology and Biochemistry**

- **Root Pressure**: To demonstrate root pressure.
- **Transpiration**: To demonstrate rate of transpiration by use of potometers.
- **Photosynthesis**: Photosynthesis by inverted funnel method, Moll's experiment.
- **Respiration**: To demonstrate anaerobic and aerobic respiration.
- Respiration-R.Q. by Ganong's respiromater.
- Plasmolysis- To determine the osmotic potential of vacuolar sap by plasmolytic method.
- Osmosis-Demonstration of phenomenon of osmosis by use of potato osmometer.
- Permeability-To study the effect of temperature of permeability of plasma membrane.
- Chloroplast Pigments- To separate chloroplast pigments by solvent method.
- Chloroplast Pigments -To separate chloroplast pigments using paper chromatography.
- Separation of Amino acids-To separate amino acids in a mixture by paper chromatography.
- Enzymes-To demonstrate the enzyme activity - Catalase, Peroxidase and Amylase and effect of pH and temperature on enzyme activity.
- Histochemical Test- Cellulose; Lignin; Starch; Fat; Protein and; Tannin

SUGGESTED BOOKS


Paper IV Ecology and Environmental Science

UNIT-I

Plants and Environment: Atmosphere (stratosphere, troposphere, mesosphere and thermosphere): Adaptations (Morphological, anatomical and physiological) Hydrophytes, Xerophytes and Halophytes. Light (global radiation, photosynthetically active radiation: Zonation in water body: littoral, limnetic and profundal zones;

**Ecosystems** - Concept, Structure and Function of Ecosystem; Energy flow models and principles; trophic levels; Food chains and Food webs; Productivity; Ecological Pyramids; Ecological efficiency; Biogeochemical Cycles - C, N and P; Ecosystem Diversity – Aquatic (freshwater) and Terrestrial (Forests).

**UNIT-II**

**Population ecology**: Characteristic (Density, Dispersion, Natality, Mortality, Survivorship curves, Age Structure); Diversity and pattern; Population growth, Carrying capacity; Population regulation: - r and k selection.

**Communities**: Concept of ecological niche, Ecological amplitude, Ecotone and Edge effect; Succession types, Climax concept, Species diversity (α, β).

**Phytogeography**: Phytogeography of India, Vegetation of Rajasthan.

**UNIT III**

**Natural resource management**: Renewable and non-renewable resource, management and conservation; Endangered conventional and non-conventional energy sources; Conservation of Biodiversity. Hot Spots, IUCN categories of threatened species.

**Impact of human activities**: - Pollution of Air, Water, and soil and their prevention and control Environmental Protection Act (EPA) and Global Warming Environment Impact Assessment (EIA)
Suggested laboratory exercises

- Determination of pH of various soil and water samples by pH meter and pH paper.
- Analysis of chlorides and dissolved oxygen in water samples (titration method).
- Determination of bulk density and soil porosity and water holding capacity in soil samples.
- Determination of organic matter in soil samples by Walkley and Black method.
- Determination of species area curve by minimal quadrat size to study the herbaceous vegetation.
- Quantitative analysis of herbaceous vegetation for frequency, density and abundance.
- Estimation of biomass of aerial and belowground part of herbaceous plants (fresh and dry weight).
- Study the adaptation of the following Hydrophytes :-
  - Xerophytes – Calotropis, Capparis, and Cassurina stem and Nerium leaf.

SUGGESTED BOOKS

5. **MATHEMATICS**

Teaching: 3 Hours per Week per Theory paper.
2 Hours per Week for Practical Paper

<table>
<thead>
<tr>
<th>Examination:</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheme:</td>
<td>Science – 160</td>
<td>400</td>
</tr>
<tr>
<td>Paper – I</td>
<td>Discrete Mathematics</td>
<td>Duration 3 hrs.</td>
</tr>
<tr>
<td>Paper – II</td>
<td>Calculus</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Paper – III</td>
<td>Conic Section and Three Dimensional Geometry</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Paper – IV:</td>
<td>Number Theory</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Practical:</td>
<td>Optimization Techniques</td>
<td>2 hrs.</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 not more than 100 (Hundred) candidates.

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

Max. Marks: 85

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: 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 Algebras- Lattices and Algebraic structure, Duality, Distributive and Complemented Lattices. Boolean Lattices, Boolean functions and expressions. Fundamental theorem of arithmetic, divisibility in Z, Congruencies, Chinese Remainder Theorem, Euler's \( \phi \)-function, primitive roots.

Unit 3: Logic and Propositional Calculus, Propositions, Simple and compound Propositions, Basic Logical operations, Truth tables, Tautologies and contradictions, Propositional Functions, quantifiers.


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: 85

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 required). Alternating series. Absolute convergence. Taylor's theorem. Maclaurin's theorem. Power series expansion of a function. Power series expansion of \( \sin x \), \( \cos x \), \( e^x \), \( \log(1+x) \), \( (1+x)^n \).


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

Reference Books:


Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR
Paper-III: Conic Section and Three dimensional Geometry
Teaching: 3 Hours per Week
Duration of Examination: 3 Hours
Max. Marks: 85

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 system of generating lines 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 per Batch

Examination:
Scheme
Max.Marks
Min.Pass Marks
Distribution of Marks:
Two Practicals one from each group
20 Marks each = 40 Marks
Practical Record = 10 Marks
Viva-voce = 10 Marks
Total Marks = 60 Marks

Duration: 2 Hours
60
20

Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR
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.

Paper IV: Number Theory
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours

Max. Marks: 85

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: Divisibility – Division Algorithm, g.c.d. the Euclidean algorithm, l.c.m., Prime, Infinitude of primes, Fundamental theorem of Arithmetic, Fibonacci sequence.

Unit 2: Congruence – Linear congruence, Fermat, Little and Wilson’s theorems. Fermat’s last theorem, Euler’s factorization, Mersenne’s factorization.

Unit 3: Number theoretic functions, \( \tau \) and \( \sigma \)-functions, the Mobius function, Greatest integer function, Euler phi function and the properties of Phi function. Application to Cryptography.

Unit 4: Diophantine equations – \( ax + by = c \), \( ax - by + cz = d \), \( x^2 + y^2 = z^2 \), \( x^4 + y^4 = z^4 \). General Integers solution of the equation \( x^2 + y^2 + z^2 = w^2 \) \( (x,y,z,w = 1) \).


Reference Books:
6. **PSYCHOLOGY**

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

**SCHEME OF EXAMINATION:**

<table>
<thead>
<tr>
<th>Papers</th>
<th>Nomenclature</th>
<th>Duration</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-I</td>
<td>Advanced General Psychology</td>
<td>3 Hrs.</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Paper-II</td>
<td>Social Psychology</td>
<td>3 Hrs.</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Paper-III</td>
<td>Developmental Psychology</td>
<td>3 Hrs.</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Paper-IV</td>
<td>Statistical Foundations in Psychology</td>
<td>3 Hrs.</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Practicals</td>
<td></td>
<td>3 Hrs.</td>
<td>100</td>
<td>40</td>
</tr>
</tbody>
</table>

**NOTE :-**

1. There will be four theory Papers in Psychology in B.A. Honour Part-I. It would be common for Arts and Science. Each paper will be of 3 hours. It would comprise 3 Sections A, B and C and would cover the entire course content of the paper.

   **Section-A** will contain 10 questions of 20 words consisting of 1.5 marks each. Thus, Part-A will be of 15 marks.

   **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. Thus, Part-B will be of 15 marks.

   **Section-C** will contain 3 long questions each with internal choice. Each question will be of 15 marks. Thus, Part-C will be of 45 marks.

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

<table>
<thead>
<tr>
<th>B.A. Honours(Psychology) Part-I</th>
<th>Section</th>
<th>No. of Questions</th>
<th>Marks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>10</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>5 (Out of 7)</td>
<td>03</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>3 (with internal choice)</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total Marks 75</td>
</tr>
</tbody>
</table>

2. Use of simple calculator will be allowed for statistical portions of all papers.
PAPER-I:

ADVANCED GENERAL PSYCHOLOGY

Section-A

1. Introduction to Psychology: Definition, Goals, History, Recent Trends and Methods.

2. Perception: Definition and Determinants; Gestalt view of Perception, Types of Illusion and Depth Perception.


Section-B


5. Memory: Meaning and Models - Level of Processing, Information Processing and Parallel Distributed Processing; STM and LTM, Forgetting Curve and Causes of Forgetting.


Section-C

7. Thinking and Problem Solving : Basic Elements of Thought: Mental Imagery; Concepts, Reasoning and Decision Making; Problem Solving: Trial and Error, Algorithms, Heuristics, Insight; Barriers to Problem Solving; Methods of Problem Solving.


Books Recommended:

- Morgan, King & Robinson (1986). - Introduction to Psychology.
- Atkinson - Introduction to Psychology
- सिंह. अरुणकुमार (2002). आधुनिक सामान्य मनोविज्ञान. नई दिल्ली, मोतीलाल वनारसीदास

Paper-II:

Social Psychology

Section-A


Section-B

4. Social Attitude: Development and Functions; Attitude Change and Measurement of Attitude.

5. Groups and Organizations: Basic Characteristics of Group Structure; Norms and Ideology, Performance in Group and Individual Situation; Cooperation and Conflict, Decision Making in Groups.

6. Leadership: Origin and Attributes of leadership; Functions, Type and Theories of leadership.

Section-C


Books Recommended:


Paper-III:

Developmental Psychology

Section-A


2. Theories of Human Development: Psychoanalytic, Learning and Cognitive Developmental Theories.

3. Prenatal Period and Infancy: Characteristics and Periods of Prenatal Development; Hazards during Prenatal Period; Characteristics of Infancy; Adjustment to Postnatal Life.

Section-B

4. Early and Late Childhood: Characteristics and Developmental Tasks; Personality Development in Early and Late Childhood.

5. Adolescence: Characteristics of Adolescence, Social Changes during Adolescence; Adolescent Interests; Sex Interests and Sex Behaviour; Personality Changes during Adolescence.

6. Adulthood: Characteristics and Developmental Tasks; Vocational and Marital Adjustment; Adjustment to Parenthood.

Section-C

7. Old Age: Mental Abilities and Interests in Old Age; Changes in Motor Abilities; Adjustment to Physical Changes; Adjustment to Retirement and Changes in Family Life.


Books Recommended:


Paper-IV:

Statistical Foundations in Psychology

Section-A

1. Introduction: Nature and Scope of Statistics and Psychological Data; Application of Statistics in Psychology; Nature and Levels of measurement- Categorical and Continuous Variables.


3. Measurement of Central Tendency: Purpose and Types; Characteristics and Computation of Mean, Median and Mode.
Section-B

4. Measures of Variability: Concept and Uses; Characteristics and Computation of Range, Quartile Deviation, Average Deviation and Standard Deviation.

5. Correlation: Concept and Types- Pearson’s Product Moment Correlation (for Ungrouped Data by Assumed Mean and Actual Mean); Spearman’s Rank Order Correlation.

6. Hypothesis Testing and Inferences Making: Population and Sample, Types of Sampling, Standard error of Mean, ‘t’ test (Independent group), Interpretation of ‘t’ values, levels of Significance.

Section-C


8. ANOVA: Purpose and Assumptions of ANOVA. One way and Two way ANOVA


Books Recommended:


Practicals:

1. Human Maze Learning
2. Serial Position Effect (Non-sense syllables)
3. Bilateral Transfer of Training
4. Retroactive Inhibition
5. Figure Ground Reversal
6. Concept Formation
7. Measurement of Attitude
8. Assessment of Emotional Maturity
9. Assessment of Social Maturity
10. Youth Problem Inventory
11. Normal Probability Curve
12. Measurement of Intelligence (Bhatia Battery)
7. **GEOGRAPHY**

**Scheme of Examination**

Min. Pass Marks 160 (40%)  
Max. Marks 400

- Paper -I 3 hour duration  
  Physical Geography  
  Max. Marks 80

- Paper -II 3 hour duration  
  Human Geography  
  Max. Marks 80

- Paper -III 3 hour duration  
  Economic Geography  
  Max. Marks 80

- Paper -IV 3 hour duration  
  Geography of Rajasthan  
  Max. Marks 80

- Practical

**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 3 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.

**SYLLABUS**

**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 Thorthwaite, 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:

चौहान, च.एस. द गोतम, ए. 2005, भौतिक भूगोल (जीवमण्डल सहित)। रस्तोंगी पत्रिकाकेश्वर, मेरठ।
दयाल, श्री. 2012, भौतिक भूगोल। राजेश पत्रिकाकेश्वर, नई दिल्ली।
गोतम, अल्कांक, 2012 : भौतिक भूगोल। रस्तोंगी पत्रिकाकेश्वर, मेरठ।
सिंह, सविन्द्र, 2005 : मूर्तिकृति विज्ञान। तरा पत्रिकाकेश्वर, चानपुरासी।
सिंह, सविन्द्र, 2011: भौतिक भूगोल का स्वरूप। प्रयाग पुर्तक मंचन, इलाहाबाद।
शर्मा, एच.एस., शर्मा, एम. एल. एण्ड निगम, अरु.एन. 2008: भौतिक भूगोल। पंचसील प्रकाशन प्रयागपुर।

Paper II: Human Geography

Section A

Introduction of human geography: meaning, definition, nature, scope and importance, branches of human geography and its relation with other social sciences, principles of human geography, essential elements of human geography: Brunhes and Huntington, approaches to human geography: environmental determinism, possibilism, stop and go determinism,
contribution of various scholars: Fredrick Ratzel, Miss Ellen Sample, Vidal de la Blache, Huntington.

Section B


Section C

Building materials and house types, types and patterns of rural & urban settlement, internal structure of cities, transport foci and centers of specialized services, principal human occupations and principal agglomerations, their ecological and distributional aspects, trends of urbanization movement of mankind: definition, types, causes and effects in past and present times.

Recommended Readings:


Paper III: Economic Geography

Section A

Meaning and scope of economic geography, study of the geographical factors affecting production, consumption and distribution of principal raw materials and foodstuffs.

Section B

Man's utilization of natural resources and conservation, agricultural types and agricultural region of the world, irrigation systems, important minerals and their distribution iron, copper, aluminium and uranium, coal and petroleum.

Section C

Industrial region of the world, major manufacturing industries and their localisation iron and steel, textile and chemical, study of economic regions — Damodar Valley, Hooghly and Kanpur region, world trade and transport, trade and trade routes — Sea, Air and Pipe lines.
(Questions will be on the basis of world regions and not on countries.)

Recommended Readings:

गौतम, अलका. 2010: आर्थिक भूगोल। रस्तोगी प्रकाशन, मेरठ।
हारून, एम. 2006: संसाधन भूगोल। वसुंधरा प्रकाशन, गोरखपुर।
जाट, बी.सी. 2014: आर्थिक भूगोल। पञ्चवील प्रकाशन, जयपुर।
Paper IV: 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, zino and copper smelting.

Transport & trade, development of tourism, desert development programme, tribal areas development programme, Aravali 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:

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

नाथुमालक, एच.एम., 2012.13: राजस्थान की अर्थव्यवस्था। कॉलेज बुक हाउस, जयपुर।
साईलाल, सन्तान 2012: राजस्थान का भूगोल। कॉलेज बुक हाउस, जयपुर।
Sing, R.L. 1971 (ed.): India A Regional Geography NGSI. Varanasi.
सस्तेना, एच.एम., 2012 राजस्थान का भूगोल। राजस्थान हिन्दी ग्रंथ अकादमी, जयपुर।
Practicals

Scheme of examination

Min. Pass Marks: 32
Max. Marks: 80

<table>
<thead>
<tr>
<th>Written test</th>
<th>Bifurcation of Marks</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field survey and viva voce</td>
<td>40</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Record and viva voce</td>
<td>15+5</td>
<td>2½ hrs.</td>
</tr>
<tr>
<td>Total Marks</td>
<td>80</td>
<td></td>
</tr>
</tbody>
</table>

N.B. 1. There shall be 6 questions in written test 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 hrs per week for practicals.

SYLLABUS

Section A


Section B

Enlargement and reduction of maps, use of pantograph, representation of temperature, pressure and rainfall data, use of line and bar graphs, isotherms, isobars and isohytes, construction and significance of climograph, hythergraph and climatograph.

Section C

Study and interpretation of weather maps of India (particularly July and January)

Prismatic Compass survey: equipments, methods of measurement of bearings, correction of bearings, record of survey closing error and its corrections.

Recommended Readings:


Recommended Readings:

Sharma, J. P. 2012: प्रायोगिक भूगोल। रस्तोगी पत्रिकेशन्स, मेरठ।