University of Rajasthan
Jaipur
SYLLABUS
B.Sc. (HONS)
PART-I
2016
सामान्य हिंदी

पृष्ठ 100

नोट: 36 से कम अंक अलग पर लिखने का निर्देश नहीं किया जा रहा है। इस प्रश्न-पत्र में प्राप्त अंकों को क्रमशः निर्धारित है और आंका जाएगा।

अक्षिक संकलन - प्रश्न पत्र में दो भाग होंगे - 1. साहित्य खण्ड एवं 2. व्याकरण खण्ड। साहित्य खण्ड में दो भाग होंगे- गद्य भाग एवं पद्य भाग। प्रश्न पत्र के लिए 25 अंक निर्धारित हैं।

क : दो व्याख्या पद से (प्रत्येक में विकल्प देना है) 5 x 2 = 10 अंक
ख : दो स्वरूप गद्य से (प्रत्येक में विकल्प देना है) 5 x 2 = 10 अंक
ग : आलोचनात्मक प्रश्न पद से (विकल्प देना है) 7½ x 2 = 15 अंक
घ : आलोचनात्मक प्रश्न गद्य से (विकल्प देना है) 7½ x 2 = 15 अंक

व्याकरण / व्याकरणिक हिंदी खण्ड

क्रम 1 : विकल्प लेखन - शब्द सीमा 300 शब्द
ii. कायम्यता लेखूँ - शास्त्री अद्वितीय पत्र, परिपत्र, अधिसूचना, कार्यालय ज्ञापन, वित्ति, कार्यालय आदेश
iii. संस्करण (विकल्प देना है) 5 अंक
iv. व्याख्या (विकल्प देना है) 4 अंक
v. शब्द निर्माण की प्रक्रिया - उपसर्ग, प्रत्यय, संधि, समास 5 अंक
vi. वाक्य शृंखला / शब्द शृंखला 5 अंक
vii. मूल रूप 5 अंक
viii. पारंपरिक शास्त्रानुसार 5 अंक
ix. व्याकरणिक कोडिंग - संधा, सर्वनाम, विशेषण, क्रिया, क्रिया विशेषण 5 अंक

साहित्य खण्ड : गद्य-पद की निर्धारित विचाराओं

गद्य भाग - निर्धारित पात्र निर्धारित हैं

1. कहानी : वड़े पर की बेटी (प्रतिवंड)
2. संरचना : प्रांगण (महादेवी वर्मा)
3. रेखाविचि : बाहर वर्ष बाद (भागवतीदास धूर्वदी)
4. विवाह : शास्त्री सबसे सुन्दर पह (दुलाल भानु)
5. निंदा : गेहूँ और गुलाब (रामचरण गुप्त)
6. निंदा : सुखे चेरी का मूल (विनोबा बोध बोध)
7. निंदा : मजदूरी और प्रेम (सचिन और निती)
8. निंदा : राजस्थान की सांस्कृतिक धरोहर (अमरसंग नानदी)
9. निंदा : शहीद का स्मृति (वासुदेव बरवाल)
10. अंक : हिंदुस्तान एवं गणतंत्र (हरिशंकर परसाई)

पद्य भाग -

1. कविता- 1. मन रे। जागत सहिये भाई
2. हमारे राम रहिम करीम भातो, अलाल राम सति सोइ।
3. बुधी जी की रणभूमि न रहे मैं
4. गुरु के हाथ में है ब्रह्मण, हाथ में है श्री का भाई।
5. है मन भावन की प्राण
6. सांस्कृतिक : कविता रामचरण- नानदी

2. सूत्रदास 1. किंद्रिय कानून घटुक्तियाँ प्राप्त अनुमान
2. सूत्रदास 1. किंद्रिय कानून घटुक्तियाँ प्राप्त अनुमान
3. देखे भाई सुन्दरता की सारां
3. तुलसीदास
   1. कविहरूकं अंक अवसर पाई
   2. अवलोक नसनी अब न नसली
   3. मोहि गूढ़ मन बहुत वियोगी
   4. ऐसी की उदार जग माही
   5. मन पँकियों अवसर बीते
   संदर्भ : विनय परिक्रेमा, गीता प्रेस गोरखपुर

4. राहीम
   पद
   1. छि स्वाधे मोहनलाल की
   2. कळं दया सैतते की उनमानि
   प्रोहा
   1. प्रीतम छि तेिनि कसी
   2. क्षित कुसंग चाहत कुसल
   3. रहििन असुचा नैन ढ़रि
   4. रहििन ऊँझे नरन सी बैर मली न ग़ृति
   5. रहििन निज मन की हिमा
   6. काज परे कछू और हे
   7. खेंड भूं खेंड़ी, खेंड़ी बैर गृति मदमान
   8. ददुर मोह विशाश मन लयो रहे घन माहि
   9. पायस देखि रहीम मन कोहल सबी मैन
   10. रहििन विसरी आदि को बने न खरचे दाम।
   संदर्भ : राहीम प्रस्तावित, विद्यानिवास मिश्र

5. पदमाकर
   कविता
   1. कृतन में सैलिन में कफ़रन में कुज़न में
   2. और माहि कुज़न में गुलाबिस बैर बीर
   3. पला बिनु कीड़े ऐसी माहि गूढ़ सैलिन के
   4. चिते चिते चारो और चींकि चींकि परे त्योहारी
   सब़ैया
   5. या अनुसार की लखी जहाी...........
   6. फाग के बीर अभीन में गाहि गोविन्द ले गई भीतर गोरी

6. मैथिलीशरण गुप्ता
   साकेत – अद्भुतसर्ग से
   कृष्णेयो का सातार
   तत्वतत्त्व वैदी समा उदज के आगे ???????
   सी बार धन्य वह एक लाल की माई।

7. प्रसाद : कामायिनी, अद्भुतसर्ग – कहा आगमिक ने सरलेह...विज्ञायिनी मानवता हो जाय।
8. पंच : 1. प्रथम राहिम छःद 1–13
   2. भारत माला
9. निर्देशात्मक: 1. भारती जय विजय करे
   2. बादल राग –1
   3. दिलख जन पर कहे क्रुः
   4. किर जन घन घड़ये।
10. रामधर्म सिंह दिनरक – रामधर्मी-तुलीय सर्ग – आसिक अंश
    सब तुर्पु तेिया
    सब है विनायि जब आती है .... क्या कर संतति विन्यास गरे।
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 Transcription of Phonetic Symbols (05)
II Word Stress (05)
III Translation of 5 sentences from Hindi to English (05)
IV Translation of 10 Words from Hindi to English (05)

Unit B: Grammar and Usage (20 marks)
(10 periods)

I Transformation of Sentences (05)
   a. Direct and Indirect Narration
   b. Active and Passive Voice
c. Interchange of Degrees of Comparison

II Modals (05)
III Sequence of Tenses (05)
IV Punctuation of a Short-Passage with 10 Punctuation Marks (05)

Unit C: Comprehension (30 marks)
(25 periods)

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.

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

Five questions to be answered out of eight questions Two marks each based on 6 units of the prescribed texts

Five questions of 3 marks each to be answered from the given passage: 15 marks
1 Vocabulary question from the given passage (at least 10 words): 5 Marks
Unit D: Compositional Skills (30 marks)
(15 periods)
   I Letters-Formal and Informal (10)
   II CVs and Job Applications (10)
   III Paragraph Writing (10)

Recommended Reading:

4. Judith Leigh. CVs and Job Applications. OUP. 2004

Compulsory in I Year for all streams at undergraduate level

**Scheme of examination**

<table>
<thead>
<tr>
<th>Time</th>
<th>Min Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<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-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
4. ELEMENTARY COMPUTER APPLICATIONS

Theory : Max. Marks 60
Practical : Max. Marks 40
Workload : Four Periods/Three hours per week

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 1/4 mark each. The question paper will be of the 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 by a competent computer firm duly approved by the University. Further the practical examination for this paper will be of 40 marks and its duration will be of two hours.

The workload for this paper will now be as follows:
Theory Paper : Four Periods/Three Hours per week.
Practical : Three Periods/Two Hours per week.

Unit-I : Introduction to Computers and Related Terminology
(Basic information only).

(a) Hardware : CPU (Motherboard, Microprocessor, The Intel Pentium III, AMD and Cyrix), MMX Technology, System Clock Address Bus, Data Bus (PCI and EISA) Cache Memory, Processing Speed, Expansion Slots (Video Controller, Sound Cards, SCSI, Network Card), Memory-(Unit, RAM, ROM, EDO-RAM, SD RAM), Input and Output Devices(Keyboard, The Standard keyboard Layout), Mouse, Printers (Dot matrix, Ink-Jet, Laser-Jet), Microphone, Speakers, Modem, Scanner, Density, Formatting, Boot Record, FAT, Folder Directory), Hard Disk Drive, CD ROM Drive (CD ROM Speeds). CD-R Drive, DVD Rom Drive, Tape Drive.


(c) Communications and Connectivity : Data Communication systems, Data Transmission (Serial, Parallel, Bandwidth, Protocols), E-mail, FAX, Voice and Video messaging, Video Conferencing. Online Services, user connection (types), Net-
Syllabus: B.Sc. Part-I

'working of Computers (Node, Client, Server, LAN, WAN), Using the network, The Internet and the Web.

Unit-2: Operating System
(Working knowledge at Common Users Level Only)


Unit-3: Application Software
(Working knowledge at Common Users Level only)


(b) Spreadsheet Program-MS Excel
Entering data, Labels, Values, Dates, Formulas, Cell references, Formats, Functions, Templates, Charts and Maps, Analyzing data in a spreadsheet.

(c) DBMS-Microsoft Access
Database, Entering data into the database. Creating Database tables, editing data. Viewing Records, Sorting records. Querying a database, generating reports.

Unit-4: The Internet and Online Resources
(Working knowledge at Common Users Level Only)

1. How the Internet work, Introduction to TCP/IP, IP and DNS address. Features of the Internet (E-mail, News, Telent, FTP, Chart, Channel, WWW, Online Services Bulletin Board Services), Connecting to a PC to the Internet (Setting Dial up and Internet connection Wizard), Overviews of Internet Explorer 5 and features therein, use of search engines, surfing, creating and Use of E-mail, Awareness about e-commerce and its advantages.
Practical

Workload: Four Period / Three hours per week.
Course: Practical Training of Course content of Unit 2, 3 and 4 of Theory syllabus.

The Practical examination will be of two hour duration. It will consist of four small exercises testing the working knowledge of followings each carrying a weight as given below:

1) Course content in Unit 2 of Theory Max. Marks 10
2) Course content in Unit 3 (a) of Theory Max. Marks 10
3) Course content in Unit 3 (b) of Theory Max. Marks 10
4) Course content in Unit 3 (c) of Theory Max. Marks 10
5) Viva-Voce Examination Max. Marks 10

Candidates are required to attempt any three exercises on of above maintain four exercises.
দেখা যায় যে সময় থেকে আমি তা অনুভব করি।

প্রথম অংশ:

দেখা যায় যে সময় থেকে আমি তা অনুভব করি।

দ্বিতীয় অংশ:

দেখা যায় যে সময় থেকে আমি তা অনুভব করি।

তৃতীয় অংশ:

দেখা যায় যে সময় থেকে আমি তা অনুভব করি।

চতুর্থ অংশ:

দেখা যায় যে সময় থেকে আমি তা অনুভব করি।

নভম্বর ১৪, ২০১২

লেবি দিগন্তের লেখা উপলক্ষে

লেবি দিগন্তের লেখা উপলক্ষে

লেবি দিগন্তের লেখা উপলক্ষে

লেবি দিগন্তের লেখা উপলক্ষে
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, Macro 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, centrifugal 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, Foucault'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 Law.

**Unit-IV**

Relativistic Kinetic Theory: 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**

(i) Rigid Body Dynamics: Equation of motion of a rotating body, Inertial coefficients, Moment of inertia of a disc, cylinder, spherical shell, sphere, and rods of rectangular and circular cross section, Case of J not parallel to ω kinetic energy of rotation and principal axes, Precessional motion of spinning top, Gyroscope, spin precession in constant magnetic field.

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

**Books Recommended:**


**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 system, 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

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. Force 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 monoatomic 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:
1. Vibrations and Waves—A.P. French
2. Physics of vibrations and waves—H.J. Pain

Paper-III: Electricity and Magnetism

Note: Five questions are to be set taking one from each unit (each question will have an internal choice). Students will attempt all 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. Ampere's circuital law with applications. Ampere'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.


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 moving 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
solenoid of finite length, Mutual inductance, mutual inductance between two coils, self-inductance of a straight conductor. Energy stored in an inductor and in the magnetic field. Displacement current, Modified Ampere's law, Maxwell's equations in differential and integral form. Maxwell's equations in material media, Boundary conditions for electric and magnetic fields at vacuum-dielectric and vacuum-metal boundaries.

Books Recommended:
1. Berkeley Physics Course, Vol. 2; Electricity and Magnetism.
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, system 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 enthalpy, 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, Vapor 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

Transport Phenomenon: 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.
Syllabus : B.Sc. (Hons.) Pl-I • 23

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.
B.Sc. (Hons.) Pt.-I

CHEMISTRY

Scheme

Max Marks: 400

<table>
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<th>Duration (hrs)</th>
<th>Max. Marks</th>
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<tr>
<td>Practical</td>
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</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 any 5 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, Franel 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 $\text{NH}_3$, $\text{H}_2\text{O}$, $\text{H}_3\text{O}^+$, $\text{SF}_4$, $\text{ClF}_3$, $\text{ICl}_3$, 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 (H$_2$, He$_2$, B$_2$, C$_2$, N$_2$, O$_2$, F$_2$) 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.
Unit-III

Weak Interactions:
Hydrogen bond, theories of hydrogen bonding, Valence bond treatment, weak intermolecular forces of attraction, Vander 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, fullerences, 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 interaction, 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, carbonium, free radicals, carbenes, arynes and nitrenes. Methods of determination of reaction mechanism.

Unit-II


Alkenes: Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and \( \text{C}_2 \) hydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes, mechanisms involved in hydrogenation, electrophilic and free radical additions. Markownikoff’s rule, hydroboration-oxidation, oxymercuration-demercuration, epoxidation, ozonolysis, hydration, hydroxylation and oxidation with \( \text{KMnO}_4 \) polymerization of alkenes. Substitution at the allylic and vinylc positions of alkenes. Industrial applications of ethylene and propene.

Cycloalkenes: Methods of formation, conformations and chemical reactions.

Diens: 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 Hückel rule and its applications. Energy level, molecular orbital diagram (ethylene, 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 \( \text{Sn}2 \) and \( \text{Sn}1 \) reactions with energy profile diagrams.

Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and elimination-addition mechanisms of nucleophilic aromatic substitution reactions.

Relative reactivities of alkyl halides V/s allyl vinyl and aryl halides. Preparation and properties of vinyl, 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, resoluion 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.

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 its 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 react..ns.

Unit IV
Thermodynamics:

Unit V
Solutions:
Phase Equilibria:
Explanation of terms phase, component and degrees of freedom. Phase rule and its 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.

Suggested Books:

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, copercipitation, postprecipitation, conditions of precipitation, precipitation fromhomogeneous solution, washing of the precipitate. Ignition of the precipitate, masking and demasking agents.
Unit-II
Solvent extraction: Principle 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-bromoanisole, acid, nitron, tannic acid, arsonic acids, pyridine, anthranilic acid, pyrogallol and ethylen diamine.

Unit-III
Completion of gravimetric results, compilation of results, reliability of results-accuracy and precision, cleaning and calibration of glassware, standard deviation, T, Q and F tests, correction, significant figures, errors in analysis.

Volumetric analysis: Principle and applications of redox titrations, iodometry and potentiometry. Theory of complexation titrations. Methods of end point detection, EDTA as Titrant types of EDTA titration of mixtures, metal indicators.

Unit-IV
Distillation methods of organic solvents, steam, fractional, vacuum and molecular distillations, monomers and monostates. Analysis of oils and fats, saponification value, iodine value, RM value, acid value.

Quantitative estimation of following functional groups-alcoholic phenolic, carboxylic acids and unsaturated groups (olefinic and 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 and 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.

Asst. Registrar (Acad-I)
University of Rajasthan
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.
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, sulphonlic acids and halogen derivatives.
2. Purification of solid substance by recrystallization.
3. Separation of two miscible liquids by fractional distillation.
4. Preparation of acetanilide 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 pK, of an acid by Handerson equation.
4. Determine the relative viscosity of a liquid by using viscometer.
5. Determine the relative surface tension of a liquid by using stalgmometer.
6. Determine the heat of neutralization of an acid and base.
7. Determine the molecular complexity of benzoic acid in benzene by Distribution Law.
8. Determine the heat of reaction and verify Hess's law.

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(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.
Ex. 2 Quantitative: One of the exercises mentioned in the syllabus.

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

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

Total 100
University of Rajasthan

3.

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

(2015-16)

Scheme:

Paper I : Animal Diversity-1 Max. Marks-50
Paper II : Animal Diversity-2 Max. Marks-50
Paper III : Biochemistry Max. Marks-50
Paper IV : Cell Biology Max. Marks-50
Paper V : Molecular Biology Max. Marks-50
Paper VI : Genetics and Biostatistics Max. Marks-50
Practicals : 2 Days (8 hrs.) Max. Marks-100

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)

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.

Section-A

1. Principles of classification: Salient features and classification up to orders in non-chordate (Protozoa to Aschelminthes).

Section-B

4. Porifera: Type study– Sycor; Types of canal system.
5. Coelenterata: Type study – Obelia and Aurelia; Polymorphism in Hydrozoa.

Section –C

6. Ctenophora: Type study: Beroe; Affinities.
7. Platyhelminthes: Type study: Fasciola hepatica and Taenia solium; Parasitic adaptations.
8. Aschelminthes: Type study – Ascaris lumbricoides; Parasitic adaptations.
Section -D

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

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

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.

Section – A

1. Principles of classification, Salient features and classification up to orders (Annelida to Hemichordates).
2. Annelida: Type study- Leech and Nories ; 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 Apis).
5. Mollusca: Type study - Pila and Unio; Torsion and distortion in Gastropods.

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**

**Scheme of Examination:**

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<thead>
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<th>Max. Marks: 50</th>
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<tr>
<td>1. There will be 5 Questions in each paper. All questions will be compulsory and carry equal marks.</td>
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<tr>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
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**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:
    7.1 Carbohydrates: Oxidation of glucose through glycolysis, Kreb’s cycle and oxidative phosphorylation, glycogenesis, glycogenolysis and gluconeogenesis.
    7.2 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**

7.3 Lipids: β-oxidative pathway of fatty acids, brief account of biosynthesis of triglycerides, cholesterol and its metabolism.
7.4 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

Scheme of Examination:  

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.

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

1. Structure of Prokaryotic and Eukaryotic cells; Diversity of cell size and shape.
3. Structure and function of organelles: Golgi complex, endoplasmic reticulum, ribosomes, (prokaryotes and eukaryotes), lysosomes, peroxisomes and mitochondria.

Section-C

5. Chromosome structure: Morphology, chromatema, chromomeres, primary and secondary constrictions and telomeres.
7. Cell junctions: Tight junctions, Desmosomes (belt and spot) and Gap junctions.
8. Transport: Osmosis, diffusion (facilitated and mediated), active transport ($Na^+$/K$^+$ ATPase pump, Ca$^{2+}$ ATPase pump) and ionic basis of membrane excitation.

Section-D

9. Cell-cell signaling: Endocrine, paracrine and autocrine signaling; second messenger cAMP and IP$_3$ DAG system.
11. Eukaryotic cell cycle: Mitotic and meiotic cell division and their significance.
Paper-V Molecular Biology

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.

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

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.

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.
10. Eugenics, Euthenics and Euphenics.

Section – C

11. Introduction, scope and application of biostatistics.
12. Understanding the concept of descriptive and inferential statistics.
13. Frequency distribution.

Section - D

14. Diagrammatic and graphical presentation of data (bar diagrams, histograms, frequency polygons & Pie charts).
15. Measures of central tendency: Mean, median and mode (direct, short-cut & step-deviation methods) and their merits & demerits.
University of Rajasthan  
Syllabus: B.Sc. Zoology (Hons.) Part-I

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<th>Min. Marks 40</th>
<th>8 hrs./week</th>
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Practicals

Scheme of practical examination and distribution of marks

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

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1st day

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<td>3. Exercise in Biochemistry</td>
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<td>4. Identification and Comments on spots (1 to 6)</td>
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<td>5. Viva voce</td>
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<td>6. Class Record</td>
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2nd day

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<td>7</td>
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<tr>
<td>2. Exercise in Genetics</td>
<td>7</td>
</tr>
<tr>
<td>3. Exercise in Biostatistics</td>
<td>6</td>
</tr>
<tr>
<td>4. Identification and Comments on spots (1 to 5)</td>
<td>15</td>
</tr>
<tr>
<td>5. Viva voce</td>
<td>5</td>
</tr>
<tr>
<td>6. Class Record</td>
<td>5</td>
</tr>
<tr>
<td>7. Seminar/Project Report/Collection</td>
<td>5</td>
</tr>
</tbody>
</table>

Note:

1. With reference to anatomy, the candidate must be well versed with the techniques of flag labeling and black paper insertion as the case may be for a clear illustration. Study of the various systems may be carried out with the help of charts/models/CD-ROM’s/high resolution picture/video’s of lives anatomy and web-site dedicated to alternative of animal anatomy providing free wares.

2. With reference to whole mounts and museum specimens in case of unavailability, the animal types should be substituted with diagrams/photographs/models etc.
3. Students will keep records of all 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.

I. Microscopic techniques

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

1. Protozoa: Euglena, Trypanosoma, Entamoeba, Leishmania, Giardia, Elphidium, Foraminiferous shell, Monocystis, Plasmodium, Paramecium,
Paramecium (Binary fission & conjugation), Opatina, Nyctotherus, Balantidium and Vorticella.
5. Annelida: T. S. of body of Nereis and Heteronereis-parapodium.

V. Anatomy: Study of the following with charts / models / CD-ROM's, high resolution picture, video's of lives anatomy, web-site dedicated to alternative of animal anatomy providing free wares etc.
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

Paramecium, Euglena, Foraminiferan 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).
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.

Recommended Books:

7. De Robertis EDP and De Robertis Jr EMF: Cell and Molecular Biology. 8th edition Lippincot Williams & Wilkins 2006.
14. Lal SS: Practical Zoology Invertebrate. 11th revised edition Rastogi
B.Sc. Botany Honours

B.Sc. Part I 2015-16

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

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

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 Ethnobotany 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.
B.Sc. Part-I
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 *Paramaecium*; 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*.
• 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.
• Emasculaton 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-Paucheria 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 Nucule
- 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, Tetrasiophyty.

Fungi

External Morphology and Permanent slides of-
• Chaetomium- Sexual reproduction-Ascospores
• Peziza- Sexual Reproduction-Apothecia V.S.
• Puccinia- Wheat leaf: Uredospore and Teleutospore
• Agarius- 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
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 partioning.

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 N₂ to ammonia, 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, abscisic 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 respirometer.
• Growth Measurement-Measurement of growth using auxanometer.
• 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**


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 following Hydrophytes:-
  - Hydrophytes – Hydrilla stem, Typha leaf and Nymphaea/Eichhornia petiole.
  - Xerophytes – Calotropis, Capparis, and Cassurina stem and Nerium leaf.

SUGGESTED BOOKS

MATHEMATICS


Teaching: 3 Hours per Week per Theory paper.
2 Hours per Week per Batch for Practical
(20 candidates in each batch)

Examination:

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Science – 160</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.Pass Marks</td>
<td></td>
<td>400</td>
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</table>

<table>
<thead>
<tr>
<th>Paper – I</th>
<th>Discrete Mathematics</th>
<th>Duration</th>
<th>Max. Marks</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>3 hrs.</td>
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<table>
<thead>
<tr>
<th>Paper – II</th>
<th>Calculus</th>
<th>Duration</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3 hrs.</td>
<td>100</td>
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</table>

| Paper – III    | Three Dimensional Geometry and Optimization Theory | Theory: 2½ hrs. | 68 |
|                |                                                    | Practical: 2 hrs. | 32 |

<table>
<thead>
<tr>
<th>Paper – IV:</th>
<th>Number Theory</th>
<th>Duration</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3 hrs.</td>
<td>100</td>
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</table>

Note:

1. Papers I, II and IV are divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All question carry equal marks.

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

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

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

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

6. 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: 100

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 and Propositions – 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: Algebraic structures – Groups, Rings, Integral domains, Fields (Definitions, simple examples and elementary properties only).
Boolean Algebras- Lattices and Algebraic structure, Duality, Distributive and Complemented Lattices. Boolean Lattices, Boolean functions and expressions.

Unit 3: Logic and Propositional Calculus.


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.

Paper - II: Calculus
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours
Max. Marks: 100

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


Unit 4: Rectification, Areas, Volumes and Surfaces of solids of revolution.


Paper-III: Three-Dimensional Geometry and Optimization Theory
Teaching : 3 Hours per Week
Duration of Examination : 2½ Hours
Max. Marks: 68

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

Unit 1: Sphere, Cone.

Unit 2: Central Conicoids – Ellipsoid, Hyperboloid of one and two sheets, Tangent lines and tangent planes, Director sphere, Normals.

Unit 3: System of generating lines and Generating lines of hyperboloid of one sheet and its properties. Reduction of a general equation of second degree in three-dimensions to standard forms.


Practical:
Teaching: 2 Hours per Week per Batch
(20 Candidates in each Batch)

Examination:
Duration: 2 Hours

<table>
<thead>
<tr>
<th>Scheme</th>
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<tbody>
<tr>
<td>Max.Marks</td>
<td>32</td>
</tr>
<tr>
<td>Min.Pass Marks</td>
<td>13</td>
</tr>
</tbody>
</table>

Distribution of Marks:
Two Practicals one from each group
10 Marks each = 20 Marks
Practical Record = 06 Marks
Viva-voce = 06 Marks
Total Marks = 32 Marks

Group A: Modelling of industrial and engineering problems in to mathematical LPP and its dual and their solution by Simplex Method.
Group B: Modelling of industrial and engineering problems into (i) Assignment Problems and (ii) Balanced and unbalanced Transportation Problems. and their solution

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: 100

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. I.c.m., Prime, Infinitude of primes, Fundamental theorem of Arithmetic. Fibonacci sequence.

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

Unit 3: Number theoretic functions, τ and σ-functions, the Möbius 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).


Assist. Registrar (Acad-I)
University of Rajasthan
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>
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<tbody>
<tr>
<td>Paper-I</td>
<td>Advanced General Psychology</td>
<td>3 Hrs.</td>
<td>75</td>
<td></td>
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<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>Section</th>
<th>No. of Questions</th>
<th>Marks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>B</td>
<td>5 (Out of 7)</td>
<td>03</td>
<td>15</td>
</tr>
<tr>
<td>C</td>
<td>3 (with internal choice)</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>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 सामाजिक मनोविज्ञान. नई दिल्ली, मोटीलाल बनारसीदास

Paper-II:

Social Psychology

Section-A


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)
### B.A./B.Sc. (Hons.) Geography Part-I Examination 2015 and onwards

**Scheme of Examination**

<table>
<thead>
<tr>
<th>Paper</th>
<th>Duration</th>
<th>Subject</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>3 hour</td>
<td>Physical Geography</td>
<td>80</td>
</tr>
<tr>
<td>II</td>
<td>3 hour</td>
<td>Human Geography</td>
<td>80</td>
</tr>
<tr>
<td>III</td>
<td>3 hour</td>
<td>Economic Geography</td>
<td>80</td>
</tr>
<tr>
<td>IV</td>
<td>3 hour</td>
<td>Geography of Rajasthan</td>
<td>80</td>
</tr>
<tr>
<td>Practical</td>
<td></td>
<td></td>
<td></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 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: epirogenic 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.
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 Thordthwaite, 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, savannas and temperate grasslands.

Recommended Readings:

- बौद्धान, दि. एस. व गौतम, र. 2005, भौतिक भूगोल (जीवमण्डल सहित). स्लोगी पश्चिमी, मेरठ।
- बलर, पी. 2012, भौतिक भूगोल. राजेंद्र पश्चिमी, नई दिल्ली।
- गौतम, अक्षय, 2012: भौतिक भूगोल. स्लोगी पश्चिमी, मेरठ।
- शिख, सहिन, 2005. मूल-आचरण विज्ञान. ताता पश्चिमी, गोरखपुर।
- शिख, सहिन, 2011: भौतिक भूगोल का रूपन. प्रायम गुरुकृत विभा, इलाहाबाद।
- शर्मा, रेक. एस., शर्मा, एम. एल. एंड मिश्रा, आर.एन. 2008: भौतिक भूगोल. पंजाबी प्रकाशन जयपुर।

Paper II: Human Geography

Section A

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:

Gupta, Dr. 2014: मानव पूर्व गोल | पंचशील प्रकाशन, जयपुर।
Habib, E. 2006: संसाधन पूर्व गोल | वसुधारा प्रकाशन, गोरखपुर।
Koirip, C.K. 2012: मानव पूर्व गोल | रस्तोगी पुस्तकांक, नेपाल।
Seth, S. 2008: मानव पूर्व गोल | वसुधारा प्रकाशन, जयपुर।
Sharma, R. 2013: जनसंख्या पूर्व गोल | रैलु पुस्तकांक, जयपुर।
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 food stuffs.

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 Ruhr 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:

Ghosh, Pratap. 2010: आर्थिक भूगोल। रस्तों नी प्रकाशन, मेरठ।
Ghosh, Prem. 2006: संसार भूगोल। विश्वविद्यालय प्रकाशन, गोरखपुर।
Jain, G. 2014: आर्थिक भूगोल। पंचसिल प्रकाशन, जयपुर।

Signature: [Signature]

Asst. Registrar (Acad.-I),
University of Rajasthan
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, zinc 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


नायबुरामका, एल.एन., 2012: संस्थान की अर्थव्यवस्था। कॉलेज बुक हाउस, जयपुर।

काइलाल, भेंडे 2012: संस्थान का मूर्गील। कॉलेज बुक हाउस, जयपुर।

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


सक्सेना, एच.एम., 2012: राजस्थान का मूर्गील। राजस्थान हिन्दी ग्राम अकादमी, जयपुर।

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Practicals

Scheme of examination

<table>
<thead>
<tr>
<th>Min. Pass Marks: 32</th>
<th>Bifurcation of Marks</th>
<th>Max. Marks: 80</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written test</td>
<td>40</td>
<td></td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Field survey and viva voce</td>
<td>15+5</td>
<td></td>
<td>2½ hrs.</td>
</tr>
<tr>
<td>Record and viva voce</td>
<td>15+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Marks</td>
<td>80</td>
<td></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:

शम्भू. जे.पी. 2012: प्रायोगिक भूगोल। रस्तोगी प्रकाशन, मेंढ़