University of Rajasthan
Jaipur

SYLLABUS

B.Sc. PART-I

2016
University of Rajasthan

SCHEME OF EXAMINATION
B.Sc. (Pass Course) Part-I

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

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

All the rest will be declared to have passed the examination, if they obtain a minimum pass mark in each subject viz. 36%. No division shall be awarded at the Part First and Part Second Examinations.

[Signature]
University of Rajasthan
JAIPUR-302 004

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## DISTRIBUTION OF MARKS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the Subject</th>
<th>No. of Papers</th>
<th>Duration</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Compulsory Subjects</td>
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<tr>
<td>1</td>
<td>General Hindi</td>
<td>One Paper</td>
<td>3 hrs.</td>
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<tr>
<td>2</td>
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<tr>
<td></td>
<td>(Communication Skills in English)</td>
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<tr>
<td>3</td>
<td>Environmental Studies Theory</td>
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<td>4</td>
<td>Elementary Computer Applications</td>
<td>Theory</td>
<td>6 hrs.</td>
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<td></td>
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<td>Elementary Hindi (in lieu of Gen. Hindi)</td>
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<td>Optional Subjects</td>
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<tr>
<td>1</td>
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<tr>
<td></td>
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<td>33</td>
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<td></td>
<td>Paper II</td>
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<td>33</td>
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<tr>
<td></td>
<td>Paper III</td>
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<td></td>
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<td>18</td>
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<td>2</td>
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<td></td>
<td>Inorganic</td>
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<td></td>
<td>Organic</td>
<td>3 hrs.</td>
<td>33</td>
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<td></td>
<td>Physical</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td>Paper II</td>
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<td>Paper III</td>
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<tr>
<td></td>
<td>Paper II</td>
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<td></td>
<td>Paper III</td>
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<td></td>
<td>Practical (One)</td>
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<td>Botany</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>Paper II</td>
<td>3 hrs.</td>
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<tr>
<td></td>
<td>Paper III</td>
<td>3 hrs.</td>
<td>34</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical (One)</td>
<td>5 hrs.</td>
<td>50</td>
<td>18</td>
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*Note: The values in parentheses represent the practical marks.*
<table>
<thead>
<tr>
<th>Subject</th>
<th>Paper I</th>
<th>Paper II</th>
<th>Practical (One)</th>
<th>Total Marks</th>
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<tr>
<td>6. Geology</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
<td>4 hrs.</td>
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<tr>
<td></td>
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<td>50</td>
<td>50</td>
<td>36</td>
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<td>7. Economics</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
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<tr>
<td></td>
<td>75</td>
<td></td>
<td>50</td>
<td>105</td>
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<td>8. Geography</td>
<td>3 hrs.</td>
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<td></td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>9. Statistics</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>100</td>
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<tr>
<td>10. Applied Statistics</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
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<td>50</td>
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<tr>
<td></td>
<td>50</td>
<td></td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>11. Psychology</td>
<td>3 hrs.</td>
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<td>3 hrs.</td>
<td>50</td>
</tr>
<tr>
<td>12. Electronics</td>
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<td></td>
<td>3 hrs.</td>
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</table>

**Additional Optional Subject**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Paper I</th>
<th>Paper II</th>
<th>Practical</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Textile &amp; Craft</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>2. Understanding Textile</td>
<td>2 hrs.</td>
<td>2 hrs.</td>
<td>6 hrs.</td>
<td>60</td>
</tr>
<tr>
<td>Business &amp; Accounting</td>
<td>60</td>
<td>60</td>
<td>80</td>
<td>100</td>
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<tr>
<td>Clothing &amp; Construction</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject</th>
<th>Paper I</th>
<th>Paper II</th>
<th>Practical</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Investigative Bio-</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
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<tr>
<td>Technology</td>
<td>50</td>
<td>50</td>
<td></td>
<td>100</td>
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<tr>
<td>4. Geology and Mining</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
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<tr>
<td>Science</td>
<td>50</td>
<td>50</td>
<td></td>
<td>100</td>
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</tbody>
</table>

**Add-on Subject**

1. Biotechnology
2. Industrial Microbiology
3. Computer Applications
पृष्ठक 100
समय 3 घंटे

नोट: 36 से कम अंक आने 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 पद्धति भाग। प्रत्येक भाग के लिए 25 अंक निर्धारित है।

क  दो व्याख्या पत्र से (प्रत्येक में विकल्प देना है)  5 x 2 = 10 अंक
ख  दो व्याख्या गद्य से (प्रत्येक में विकल्प देना है)  5 x 2 = 10 अंक
ग  आलोचनात्मक प्रश्न पत्र से (विकल्प देना है)  7⅔ x 2 = 15 अंक
घ  आलोचनात्मक प्रश्न गद्य से (विकल्प देना है)  7⅔ x 2 = 15 अंक

साहित्य खण्ड : गद्य-पद्य की निर्धारित रचनाएँ

पद्धति भाग – निर्धारित पद निर्धारित है –

1. कहानी : बड़े घर की हैदर (भ्रमचंद)
2. संसारपत्र : प्राणम (महत्त्वपूर्ण शास्त्री)
3. रेखााँच : बाईस वर्ष बाद (भानुसिद्धान चतुर्वेदी)
4. विवाह : शाने सबसे सुंदर घाय (पुणकार सुंदर)
5. निशां : गेंदे और गुलाब (सामुहिक के नृत्य)
6. निशां : सूरते गुलाब का मुगल (मिश्रमुकड़े)
7. निशां : मजदूरी और प्रेम (सरदार बुधसिंह)
8. निशां : राजस्थान की संस्कृतिक इतिहास (अमरसंबंध नाहर)
9. निशां : रात्रि का स्वरूप (वासुदेव शरण अग्रवाल)
10. यांत्रिक : निवास सुविदा हुआ गतगत (हरिशंकर परसाई)

1. कथा- 1. मन रे ! जागत रहिये भाई।
2. हमारे राम राम राम केसरी के सो, अलस रम लति लो।
3. काजों की जरुर खाने।
4. मन रे ! हरि महिष, यहि महिष हरि महिष भाई।
5. हे मन भजन की प्रेम

संसर्ग : कीवी श्यामवती–श्यामसूनदस्सा

2. सूचना 1. किसमत काहु परिवर्तित आवाज
2. सूचना तहुँ गोपालजी माता
3. इसकी भाई सूचना की समाप्त
3. तुलसीदास
   1. कव्वाल अंब अवज्ञ पाई
   2. अपलो नसानी अब न पहलीः
   3. मोह मुढ़ गया बुझता विभोगी
   4. ऐसी की उदार जग माही
   5. मज गोरीह अवज्ञ बीते

4. रहीम

5. पदमकर कविता
   1. कृपण में केलिंग में काफ़र में कुमार में
   2. और भूत कुंद में गुजरित मौर भीर
   3. जोतं बिनु कीह ऐसी भूती गुंड बीलेन के
   4. जिले जिले बारों ओर चौका पर लोहीं

6. मैथिलीशरण गुप्त

7. प्रसंस्करण: कामयानी, अढ़सर्ग - कहाँ आगम खुक न सस्तेह विजयिणी मानवता हो जाय।

8. पत्र: 1. प्रथम रंग संदे 1-13
   2. भाषा माता

9. निराला: 1. भाषी जनंजय करे
   2. नाच कर सचिव मानाएः
   3. दक्षर गगन पर करे करणा
   4. लिख न घन घराणे।

10. रामचर दीनदिन - रसिद्धी-दृष्टिसत्व सर्ग -अलाभक अला सर्गे रूपमा

सब है विचार जम आये हैं... क्या कर सकती दिनागर हैं।
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
3. COMPULSORY PAPER OF ENVIRONMENTAL STUDIES
(2015 - 2016)
Compulsory in I Year for all streams at undergraduate level

**Scheme of examination**

<table>
<thead>
<tr>
<th>Time 3 hrs</th>
<th>Min Marks</th>
<th>Max. Marks</th>
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</thead>
<tbody>
<tr>
<td></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 I: The Multidisciplinary nature of environmental studies**

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

Need for Environmental awareness, Environmental education in present day context.
Unit 2: Natural Resources and Challenges

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

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

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

d. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

e. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.

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

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

Unit 3: Ecosystems, Concepts, Structure, Functions and Types

• Concept of an ecosystem
• Structure and function of an ecosystem
• Producers, consumers and decomposers
• Energy flow in the ecosystem
• Ecological succession
• Food chains, food webs and ecological pyramids
• Introduction, types characteristics features, structure and function of the following ecosystem:
  a. Forest ecosystem, Tropical Temperate and Alpine Ecosystem
  b. Grassland ecosystem and Their Types
  c. Desert ecosystem with emphasis on Thar Desert
  d. Aquatic ecosystems(ponds, streams, lakes, rivers, oceans, estuaries) and Wet Lands
Unit 4: Biodiversity and its conservation

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

Unit 5: Environmental Pollution and Control Measures

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

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

Unit 6: Social issues, Environment, Laws and Sustainability

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

Unit 7: Human Population and the Environment

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

5. Goudie, Andrew. The Human Impact.

12.4.2014
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 $\frac{1}{2}$ 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 providied 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.

(b) Software : Introduction to Programming, Languages, System
Software (Operating systems and Utilities), Application Software
(Word Processors, DBMS, Presentation Graphics, Browsers,
Personal Information Managers) Introduction to Multilingual Word-
processors.

(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, Serve, 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.
University of Rajasthan

Practical

Max. Marks 40

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 registered to attempt any three exercises out of above maintain four exercises.

SECTION OFFICER (N.C.V.1)
University of Rajasthan
JAIPUR-302 004

Asst. Registrar (Acad.)
University of Rajasthan
B.Sc. Part I

I. PHYSICS

Scheme

<table>
<thead>
<tr>
<th>Paper</th>
<th>Exam. 3 Hours Duration</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
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<tbody>
<tr>
<td>Paper I</td>
<td></td>
<td>12</td>
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</tr>
<tr>
<td>Paper II</td>
<td></td>
<td>12</td>
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</tr>
<tr>
<td>Paper III</td>
<td></td>
<td>12</td>
<td>34</td>
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<tr>
<td>Practical Exam. 4 Hours Duration</td>
<td>18</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

Paper - I (Mechanics)

Work Load: Two hours lecture per week

Examination Duration: Three hours

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

Unit - I

Physical Law and frame of Reference
(a) Inertial and non-inertial frames, Transformation of displacement, velocity, acceleration between different frames of reference involving translation. Galilean transformation and invariance of Newton's laws.
(b) Special theory of Relativity: Postulates of Special theory of relativity, Lorentz transformation, transformation of velocity and acceleration, Length contraction and time dilation with experimental verification
(c) Coriolis Force: Transformation of displacement, velocity and acceleration between rotating frame, Pseudo forces, Coriolis force, Motion relative to earth, Foucault's pendulum.

Unit - II

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

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

Conservative Forces
Introduction about conservative and non-conservative forces, Rectilinear motion under conservative forces, Discussion of potential energy curve and motion of a particle.
Unit - III

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

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

Unit - IV

Driven Harmonic Oscillation
Driven harmonic oscillator with damping, Frequency response, Phase relation, Quality factor, Resonance, Series and parallel of LCR circuit, Electromechanical system-Ballistic Galvanometer. Coupled Oscillations
Equation of motion of two coupled Simple Harmonic Oscillators, Normal modes, motion in mixed modes, Transient behaviour. Dynamics of a number of oscillators with neighbour interactions.

Reference Books:
1. Mechanics: Berkeley Physics Course Vol- I, Charles Kittel

Paper - II (Electromagnetism)

Work Load: Two hours lecture per week

Examination Duration: Three hours

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

Unit I

scalar and Vector Fields
Concept of Field, Scalar and Vector Fields, Gradient of scalar field, Physical significance and formalism of Gradient. Divergence and Curl of a vector field in Cartesian co-ordinates system, Problems based on Gradient, Divergence and curl operators.

Concept of Solid angle, Gauss divergence and Stoke’s theorem, Gauss law from inverse square law. Differential form of Gauss law.
Unit II

Field of stationary and moving charges

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

Poisson’s and Laplace equations in Cartesian co-ordinates and their applications to solve the problems of electrostatics.

Invariance of charge, Gaussian and SI units and their inter conversions, Electric field measured in moving frames, Electric field of a point charge moving with constant velocity.

Unit III

Electric field in matter

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

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

Unit IV

Magnetostatics and magnetic field in matter

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

Atomic magnet, Gyromagnetic ratio, Bohr-magneton, Larmor frequency, induced magnetic moment and dia-magnetism, spin magnetic moment, para and ferro magnetism, Intensity of Magnetization. Magnetic permeability and Susceptibility, free and bound current densities, Magnetic field due to a uniformly magnetized material and Non-uniformly magnetized material.

Reference Books:

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

Work Load: Two hours lecture per week

Examination Duration: Three hours

Scheme of Examination: First question will be of ten marks comprising of five parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit – 1

Interference:

Unit – 2

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

Unit – 3

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

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

(ii) Holography: Basic concepts of holography, Principle, Theory, Construction and reconstruction of image. Application of holography

Unit – 4

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

Reference Books:

1. Optics by Brij Lal & Subramaniam, S. Chand.
2. Optics by D. P. Khandelwal.

Practical

Work Load: Four hours laboratory work per week

Examination Duration: Four hours

Minimum Experiments: Total sixteen taking eight from each section.

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

Section A

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

9. To convert a galvanometer into a ammeter of a given range

10. To convert a galvanometer into a voltmeter of a given range.

Section B

1. To study the random decay and determine the decay constant using the statistical board.

2. Using compound pendulum study the variation of time period with amplitude in large angle oscillations.

3. To study the damping using compound pendulum.

4. To study the excitation of normal modes and measure frequency splitting using two coupled oscillators.

5. To study the frequency of energy transfer as a function of coupling strength using coupled oscillators.

6. To study the viscous fluid damping of a compound pendulum and determining damping coefficient and Q of the oscillator.

7. To study the electromagnetic damping of a compound pendulum and to find the variation of damping coefficients with the assistance of a conducting lamina.

8. To find J by Callender and Barne’s Method.

9. To determine Youngs modulus by bending of beam.

10. To determine Y, σ and η by Searle’s method.

11. To ensure Curie temperature of Monel alloy.

12. To determine modulus of rigidity of a wire using Maxwell’s needle.

13. Study of normal modes of a coupled pendulum system. Study of oscillations in mixed modes and find the period of energy exchange between the two oscillators.

14. To study variation of surface tension with temperature using Jaegger’s method.

15. To study the specific rotation of sugar solution by polarimeter
2. CHEMISTRY

Scheme:
Max Marks: 150

<table>
<thead>
<tr>
<th>Paper</th>
<th>Duration (hrs.)</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
</tr>
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<tbody>
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<td>Paper I</td>
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<tr>
<td>Paper-II</td>
<td>3</td>
<td>33</td>
<td>36</td>
</tr>
<tr>
<td>Paper-III</td>
<td>3</td>
<td>34</td>
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</tr>
<tr>
<td>Practical</td>
<td>5</td>
<td>50</td>
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</tr>
</tbody>
</table>

Note: Ten (10) questions are to be set taking two (02) questions from each unit. Candidates have to answer any five (05) questions selecting at least one (01) question from each unit.

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

Unit-I

Ionic Solids: Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajans's rule.
Metallide bond: Free electron, valence bond and band theories.

Unit-II

Covalent Bond: Valence bond theory and its limitations, directional and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH$_3$, H$_2$O, SF$_4$, CIF$_3$, ICl$_3$, H$_2$O.
Molecular Orbital Theory: Homonuclear and heteronuclear (CO and NO) diatomic molecules. Multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Unit-III

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

UNIT-IV

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

Some Important Compounds of p-block Elements: Hydrides of boron, diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

Unit-V

Chemistry of Noble Gases: Chemical properties of the noble gases, chemistry of Xenon, structure and bonding in Xenon compounds.

Weak Interactions: Hydrogen bonding, Van der Waals forces.
Unit-I

Unit-II
Stereochemistry of Organic Compounds: Concept of isomerism, Types of isomerism, Difference between configuration and conformation, Flying wedge and Fischer projection formulae.
Relative and absolute configuration, sequence rules, D / L and R / S systems of nomenclature.
Geometric Isomerism: Determination of configuration of geometric isomers - cis / trans and E / Z systems of nomenclature. Geometric isomerism in oximes and alicyclic compounds.
Conformational Isomerism: Newman projection and Sawhorse formulæ, Conformational analysis of ethane, n-butane and cyclohexane.

Unit-III
Unit IV


Aromaticity: the Hückel rule, aromatic ions – three to eight-membered rings.


Unit V

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

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

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

UNIT I

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

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

UNIT II

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

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

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

Solid State: Definition of space lattice, unit cell.
Basic concept of X-ray diffraction by crystals. Derivation of Bragg's equation. Determination of crystal structure of NaCl and CsCl (Laue's method and powder method.), band theory of solids.
Defects in solids

UNIT IV

Colloidal State: Definition of colloids, classification of colloids.
Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids.

UNIT V

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

Suggested Books:

B.Sc. Part-I

CH-104: Chemistry Practical (Pass course)
(4 hrs or 6 periods/week)

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

Qualitative Analysis

Physical Chemistry
One of the following experiments should be given in the examination
(i) Chemical Kinetics:
   a) To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
   b) To study the effect of acid strength on the hydrolysis of an ester.
   c) To compare the strengths of HCl and H2SO4 by studying the kinetics of hydrolysis of ethyl acetate.
   d) To study kinetically the reaction rate of decomposition of iodide by H2O2.
(ii) Viscosity and Surface Tension:
   a) To determine the viscosity/surface tension of a pure liquid (alcohol etc.) at room temperature (Using the Ostwald viscometer/stalogmometer).
   b) To determine the percentage composition of a given binary mixture (acetone and ethyl methyl ketone) by surface tension method.
   c) To determine the percentage composition of a given mixture (non-interacting systems) by viscosity method.
   d) To determine the viscosity of amyl alcohol in water at different concentration and calculate the excess viscosity of these solutions.

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

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

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

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

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

Total  50
Books Suggested (Theory Course)
2. Concise Inorganic Chemistry, J.D. Lee, ELBS
6. Inorganic Chemistry, A.G. Sharpe, ELBS

Books Suggested (Laboratory Courses)
1. Vogel's Qualitative Inorganic Analysis, revised, Svehla, Orient Longman.
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>Min. Pass Marks</th>
<th>Max. Marks</th>
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<tbody>
<tr>
<td>Science – 54</td>
<td>150</td>
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<td>Arts – 72</td>
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<table>
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<tr>
<th>Paper – I</th>
<th>Discrete Mathematics</th>
<th>Duration</th>
<th>Max. Marks</th>
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<table>
<thead>
<tr>
<th>Paper – II</th>
<th>Calculus</th>
<th>Duration</th>
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<table>
<thead>
<tr>
<th>Paper – III</th>
<th>Three Dimensional Geometry and Optimization Theory</th>
<th>Theory: 2½ hrs.</th>
<th>Max. Marks</th>
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<table>
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<tr>
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<td>24 (Arts)</td>
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</table>

Note:

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

2. Paper III is divided 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.

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

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

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

6. Each candidate has to pass in Theory and Practical examinations separately.
Paper – I: Discrete Mathematics
Teaching: 3 Hours per Week
Duration of Examination: 3 Hours
Max. Marks: 50 (Science)
66 (Arts)

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

Unit 1: 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.


Paper – II: Calculus
Teaching: 3 Hours per Week
Duration of Examination: 3 Hours
Max. Marks: 50 (Science)
66 (Arts)

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

Unit 1: 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 \( \sin x \), \( \cos x \), \( e^x \), \( \log_a(1+x) \), \( (1+x)^3 \).


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

Unit 5: Double integrals in Cartesian and Polar Coordinates; Change of order of integration. Triple integrals. Application of double and triple integrals in finding areas and volumes. Dirichlet’s integral.

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

Max. Marks: 32 (Science)
44 (Arts)

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

Unit 1: Sphere, Cone.

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

Unit 3: 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.

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

Examination:                      Duration: 2 Hours

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

Distribution of Marks:
- Two Practicals one from each group
  - 6 Marks each = 12 Marks (08 Marks each) = 16
  - Practical Record = 03 Marks = 04
  - Viva-voce = 03 Marks = 04
  - Total Marks = 18 Marks = 24

Group A: Modelling of industrial and engineering problems into 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.
### ZOOLOGY

<table>
<thead>
<tr>
<th>Scheme:</th>
<th>Max. Marks : 100</th>
<th>Min. Pass Marks : 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-I</td>
<td>3 hrs. duration</td>
<td>33 Marks</td>
</tr>
<tr>
<td>Paper-II</td>
<td>3 hrs. duration</td>
<td>33 Marks</td>
</tr>
<tr>
<td>Paper-III</td>
<td>3 hrs. duration</td>
<td>34 Marks</td>
</tr>
<tr>
<td>Practical</td>
<td>4 hrs. duration</td>
<td>50 Marks</td>
</tr>
</tbody>
</table>

**Note**: 1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No.1 containing 9 (Paper-I & II)/10 (Paper-III) very short answer (maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.

Second part of the question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part i.e. three from each unit/section, out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.

2. The candidate has to answer all questions in the main answerbook only.

### PAPER-I : Z-101

**DIVERSITY OF ANIMALS AND EVOLUTION**

**Note**: 1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No.1 containing 9 very short answer (maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.

Second part of the question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part i.e. three from each unit/section, out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.

2. The candidate has to answer all questions in the main answerbook only.

**Section -A**

**Diversity of animals**

2. Biodiversity of Fauna of India and World.
3. Adaptation to their modes of life and environment.
5. Continental drift.
Diversity of Animals

Section-B

1. General principles of taxonomy; concepts of the five kingdom scheme.
2. Concept of Protozoa, Metazoa and levels of organization.
4. Detailed classification of Non-chordata and Chordata, habits, habitat and external features only of the following prescribed types, viz, Amoeba, Paramecium, Euglena, Sycon, Obelia, Fasciola, Taenia, Nereis, Hirudinaria, Palaemon, Pila, Lameilidens and Asterias, Balanoglossus, Herdmania, Amphioxus, Petromyzon, Scoliodon, Laboe, any lung fish, Ichthyophis, Salamander, Frog, Hemidactylus, Naja, Python, Crocodile, Pigeon, Great Indian Bustard, Hare, Camel and Chinkara.

Section-C

Evolution

1. History of evolutionary thoughts (Lamarckism and Darwinism).
2. Natural Selection, Genetic basis of evolution; Speciation.
4. Paleontology: fossils, geological divisions of the earth’s crust, imperfection of the geological record.
5. Study of extinct forms: Dinosaurs, Archepopteryx.

PAPER-II Z-102

CELL BIOLOGY AND GENETICS

Note: 1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No.1 containing 9 very short answer (maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.

Second part of the question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part i.e. three from each unit/section, out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
Syllabus: B.Sc. Part-I

2. The candidate has to answer all questions in the main answerbook only.

Section-A: Cell Biology

1. Introduction to cell: Morphology, size, shape and characteristics of Prokaryotic, Eukaryotic and Animal cells; basic idea of virus and cell-theory.


3. Cell membrane transport: Passive (diffusion and osmosis, facilitated, mediated) and active transport.

4. Cytoplasmic organelles:
   i. Structure and biogenesis of mitochondria; electron transport chain and generation of ATP molecules.
   ii. Structure and function of endoplasmic reticulum, ribosome (Prokaryotic and Eukaryotic) and Golgi complex.
   iii. Structure and function of lysosome, microbodies and centrioles.
   iv. Structure and functions of cilia, flagella, microvilli and cytoskeletal elements.

Section-B: Nuclear Organization

1. Nucleus:
   i. Structure and function of nuclear envelope, nuclear matrix and nucleolus.
   ii. Chromosomes: Morphology, chromonema, chromomeres, telomeres, primary and secondary constrictions, chromatids; prokaryotic chromosome.
   iii. Giant chromosome types: Polytene and Lambrush.
   iv. Chromosomal organization: Euchromatin, heterochromatin and folded fibre model and nucleosome concept.

2. Nucleic Acids:
   i. DNA structure, polymorphism (A, B and Z type) and replication (semi conservative mechanism), experiments of Messelson and Stahl; elementary idea about polymerases, topoisomerase, single strand binding protein, replication forks (both unidirectional and bidirectional), leading and lagging strands, RNA primers and Okazaki fragments; elementary idea about DNA repairs.
ii. RNA structure and type (mRNA, tRNA and rRNA) and transcription (brief idea about polymerase, exon and introns)
3. Genetic code and translation: triplet code, characteristics of triplet code; protein synthesis (translation)
4. Cell in Reproduction:
   i. Interphase nucleus and cell cycle: S, G-1, G-2 and M-phase.
   ii. Mitosis: Phases and process of mitosis, structure and function of spindle apparatus; anaphasic movement.
   iii. Meiosis: Phases and process of meiosis, synapses and synaptosomal complex, formation and fate of chiasmata and significance of the crossing over.

Section - C : Genetics
1. Mendelism: Brief history of genetics and mendel’s work; Mendelian laws, their significance and current status; chromosomal theory of inheritance.
2. Chromosomal mutations: Classification of chromosomal mutations, translocation, inversion, deletion and duplication. Variations in chromosome numbers; haploidy, diploidy, polyploidy, aneuploidy, euploidy and polysomy.
3. Linkage and crossing over, elementary idea of chromosome mapping.
4. Genetic interaction: Supplementary genes, complementary genes, duplicate genes, epistasis, inhibitory and polymorphic genes multiple gene inheritance; ABO blood groups and Rh factor and their significance.
5. Cytoplasmic inheritance.

PAPER-III : Z-103

GAMETE AND DEVELOPMENTAL BIOLOGY

Note : 1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No.1 containing 10 very short answer (maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.

Second part of the question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part i.e. three from each unit/section, out of
which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.

2. The candidate has to answer all questions in the main answerbook only.

Section-A

Developmental Biology-Scope and Early Events

1. Historical review and types and scope of embryology
2. Gametogenesis:
   i. Formation of egg and sperm.
   ii. Vitellogenesis
3. Fertilization: Activation of ovum, essence of activation: changes in the organization of the egg cytoplasm.
4. Parthenogenesis

Section-B

Developmental Biology-Pattern and Processes

2. Fate maps, morphogenetic cell movements, significance of gastrulation.
3. Embryonic induction; primary organizer, differentiation and competence;
4. Development of chick up to 96 hours stage.
5. Embryonic adaptations:
   i. Extra-embryonic membranes in chick, their development and functions.
   ii. Placentaition in Mammals: Definition, types, classification on the basis of morphology and histology, functions of placenta.

Section-C

Dimensions in Developmental Biology

1. Regeneration
2. Various types of stem cells and their applications
3. Cloning of animals:
   i. Nuclear transfer technique. ii. Embryo transfer technique
4. Teratology- (elementary idea).
5. Biology of aging (brief account)
University of Rajasthan
Practical – Zoology

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

I. Microscopic Techniques:


2. General methods of microscopic slide preparations; narcotization; fixing and preservation; washing; staining; destaining; dehydration; clearing and mounting; general idea of composition, preparation and use of:

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


   (iii) Common reagents: Normal saline, Ringer’s solution, Acid water, Acid alcohol, and Mayer’s albumin.

3. Collection and Culture Methods:

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

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

II. Study of Microscopic Slides and Museum Specimens:

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

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

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

   Ctenophora: Any Ctenophore.

III. Anatomy:

   Earthworm: External features, general viscera, alimentary canal, reproductive system and nervous system.
Cockroach: External features, appendages (wing and leg), mouth parts, alimentary canal, reproductive and nervous system.

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

V. 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 or cockroach testes.
3. Study of giant chromosomes in salivary glands of *Chironomous or Drosophila* larva.
4. Study of cell permeability using mammalian RBC.

VI. Exercises in Genetics:

A. Study of *Drosophila*:

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

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

VII. Developmental Biology:

1. Study of development of frog/toad with the help of:

   (i) Eggs, cleavage, blastula, gastrula, neurula, tail-bud, hatching, mature tadpole larvae, metamorphic stages, toadlet / froglet.

   (ii) Histological slides: Cleavage, blastula, gastrula, neurula and tail-bud stage.

2. Study of development of chick with the help of whole mounts

   (i) 18 hrs, 21 hrs, 24 hrs, 33 hrs, 48 hrs, 72 hrs and 96 hrs of incubation.

   (ii) Primitive streak stage in living embryo, if possible, after removal of the blastoderm from the egg.

   (iii) Study of the embryo at various stages of incubation *in vivo* by making a window in the egg-shell may also be demonstrated.

   (iv) Study of various foetal membranes in a 10-12 day old chick embryo.
University of Rajasthan  
B.Sc. Part - I  

Scheme of Practical Examination and Distribution of Marks  

Time: 4 Hrs.  
Min Pass Marks: 18  
Max. Marks: 50  

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

Notes:  
1. With reference to anatomy, study of museum specimens and developmental biology, candidates must be well versed in the study of various systems with the help of charts/models/CD-ROMs, multimedia computer based simulations including computer assisted learning (CAL) and other softwares.  
2. With reference to permanent preparations and microscopic slides, in case of non-availability, the exercise should be substituted with diagrams/photographs/models/charts, etc.  
3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.  
4. The candidates may be asked to write detailed methodology wherever necessary and separate marks may be allocated for the same.  
5. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.
University of Rajasthan

(iv) Study of various foetal membranes in a 10-12 day old chick embryo.

Scheme of Practical Examination and Distribution of marks

<table>
<thead>
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<tbody>
<tr>
<td>Regular</td>
<td>Ex. Students</td>
<td></td>
</tr>
<tr>
<td>1. Dissection</td>
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<td>9</td>
</tr>
<tr>
<td>2. Permanent Preparation</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>3. Exercise in Cell Biology and Genetics</td>
<td>4+4</td>
<td>4+4</td>
</tr>
<tr>
<td>4. Exercise in Developmental Biology</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Identification and Comments on Spots (1 to 8)</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>6. Viva Voce</td>
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<td>5</td>
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<tr>
<td>7. Class Record</td>
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<tr>
<td>Total</td>
<td>50</td>
<td>50</td>
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</tbody>
</table>

Notes
1. With reference to dissection, candidates must be well versed with the technique of flag labeling and black paper insertion as the case may be for a clear illustration.
2. With reference to whole mounts and museum specimens in case of unavailability of certain animal types, diagrams, photographs, models etc. should be substituted, study will include classification (upto classes) with diagnostic characters and comments.
3. Candidates will keep a record of all work done in the practical class and it will be submitted for inspection at the time of the practical examination.
4. Mounting material as per the syllabus or available from collection and culture methods.
5. The detailed methodology may be asked to write wherever necessary and separate marks may be allocated for it.

Recommended Books:
BOTANY
B. Sc. Part I (Pass Course Syllabus)

Scheme
Min. Pass Marks: 36
Paper I 3 hrs. duration
Paper II 3 hrs. duration
Paper III 3 hrs. duration
Practical Min. Marks: 18 4 hrs., duration

Max. Marks: 100
Max. Marks 33
Max. Marks 33
Max. Marks 34
Max. Marks 50
3 hours
4 hours

Note:

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only.

2. Q.No. 1 will have 18 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.

3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have Internal choice.
Cell organelles and Nuclear material: Ultrastructures and functions of different cell organelles (cell wall, plasma membrane, nucleus, mitochondria, chloroplast, ribosome, peroxisomes, Lysosome, Golgi bodies and Endoplasmic Reticulum). Chromatin structure & Chromosome organization: eukaryotic and prokaryotic. Chromosome morphology; specialized types of chromosomes (Sex chromosomes, lambrush Chromosome, Polytenic chromosome); transposons.

Unit-2


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

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

Unit-3

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

Cytoplasmic inheritance: maternal influence, shell colouring in snails, Kappa particles in Pinctada maxima, Multiple allelism: ABO blood groups in men.

Unit-4

Suggested Laboratory Exercises:

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

- Emasculation, bagging & tagging techniques
- Cross pollination techniques

Suggested Readings:

Paper II
Microbiology, Mycology and Plant Pathology
(2 hrs /week)

Unit-1

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

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

Mycoplasma: occurrence, morphology, reproduction and importance.

Unit-2

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

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

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

Unit-3

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

A. Bogo and white rust; Sclerospora and Downy mildew/Green ear disease of Bajra; Aspergillus;

Claviceps and Ergot; Peziza.

Unit-4

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

Puccinia and Black rust of wheat; Ustilago and loose smut of wheat and covered smut of barley;

Agoricus; Alternaria and early blight of potato.

Suggested Laboratory Exercises:

1. Study of bacteria using curd or any other suitable material, Gram’s staining of bacteria.
2. Study of Mycoplasma. TMV, Poxvirus. bacteriophage (photographs/ 3-D models)
4. Study of specimen, permanent slides and by making suitable temporary slides: *Albugo*- white rust; *Sclerospora*- downy mildew, green ear; *Aspergillus*; *Claviceps*- ergot; *Ustilago*- loose smut of wheat, covered smut of barley. *Puccinia*- Black rust of wheat; *Agaricus*; *Peziza* and *Alternaria*- early blight of potato.

5. Media preparation: potato dextrose agar, Nutrient agar

6. Culture techniques of fungi and bacteria.

Suggested Books:


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

Unit-1

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

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

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

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


### Botany Practical Examination B. Sc Part-I

**Skeleton Paper**

**M.M. 50**

**Time: 4 Hours**

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

**Total** | 50 | 50 |
6. GEOLOGY

Scheme:
Theory
Max. Marks 100

Min. Pass Marks: 36
Syllabus: B.Sc. Part-I

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

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

Paper I: Physical Geology

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

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

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

Books Recommended

Paper II Crystallography and Mineralogy

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

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

Section-B


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

Section-C

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

Physical and optical properties of following minerals: Olivine, Epidote, Beryl, Apatite, Cordierite, Tourmaline, Staurolite, Topaz, Zircon, Sphene, Chlorite. Serpentine, Andalusite, Kyanite, Sillimanite, Talc Kaolin, Fluorite, Magnetite and Rutile.

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

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

Crystallography and mineralogy:
Crystallography: Determination of symmetry in crystal models and measurement of interfacial angles with contact goniometer.
Drawing of crystals of cubic system by Clinographic Projection.
The study of the symmetry, forms and combination of forms in crystals given below.
Cubic system- Galena, Fluorite Magnetite and Garnet, Pyrite Tetrahedrite..
Tetragonal system- Zircon, Rutile, Cassiterite, Hexagonal system- Beryl, Calcite, Tourmaline and Quartz.
Orthorhombic system- Barite, Olivine, Staurolite, Sulphur.
Monoclinic system- Gypsum, Orthoclase, Augite, Hornblende, Epidote.
Triclinic system- Axinite, albite, Study of simple twinning in crystals.
Study of Hardness: Lustre, Fracture, Cleavage and streak of minerals.
Study of the Physical properties and diagnostic features of the following minerals:
opal, hematite, magnetite, halite, calcite, fluorite, tourmaline, magnetite, orthoclase, microcline, plagioclase, hypersthene, augite, Tourmaline, tremolite, hornblende, asbestos, beryl, nepheline, sodalite, garnet, olivine, zircon, topaz, sillimanite, kyanite, quartz and its varieties, chalcedony, flint and jasper; epidote, staurolite, muscovite, biotite, natrolite, t alc, chlorite, serpentine, kaolinite, sphene, apatite, garnet, wollastonite and augite.
Study of petrological microscope and its parts inclusive of polarizer and their function, observation of Becke line and relative refractive index. Study of pleochroism in biotite, hornblende, tourmaline, hypersthene, andalusite and staurolite; study of twinkling in calcite.
Books Recommended:
4. Sharma, N.L. : Determinative Table, ISM, Dhanbad.
Field Training : Geological Field work for at least 7 days duration and report thereon. The field work would be carried out locally including collection of specimens.
Scheme: Min. Pass Marks Max. Marks
Arts 72 200
Science 54 150

Paper – I 3 hours duration Micro Economic Theory Arts 100 Science 75
Paper – II 3 hours duration Indian Economy Arts 100 Science 75

Note: There will be two papers of Economics. Each paper shall consist of three parts. Part A shall contain question No 1 consisting of very short type X (Ten) questions. The candidate is required to answer each question in 20 words. Part B shall contain question No 2 consisting of V (five) questions. The candidate is required to answer each question in 100 words. Part C shall contain three essay type questions (one from each section) with internal choice.
A candidate will be required to attempt five questions in all. All questions of Part A and Part B are compulsory while rest 3 questions are to be attempted from parts C selecting one question from each section. All questions carry equal marks. Each question will carry 20 marks for Arts students and 15 marks for Science students.

Paper I- Micro Economic Theory

Section – A

Section – B


Section – C


Books Recommended:

4. एच. एल. आलूजा: उच्चतर आर्थिक सिद्धांत, एस. चौंद एण्ड कम्पनी, नई दिल्ली।
5. लक्ष्मीनारायण नाथसुगन्तक: व्यवसाय अर्थशास्त्र, कॉलेज बुक हाउस, जम्मू।

Reference Books:

Paper – II Indian Economy

Section – A


Section – B


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

Section – C


Problems of Poverty; Unemployment, Inflation and Regional Inequalities; Rural Development Programmes and Policy; Sectoral Reforms in Infrastructure after 1991.

Books and References:

1. Rudra Datt and K.P.M. Sundaram: Indian Economy (Hindi & English), S. Chand, New Delhi.
Scheme of Examination

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

Notes

1. Students are permitted to use the stencils, simple calculator and log tables wherever needed in both theory and practical examinations. Each theory paper will have a teaching of 4 hours per week.

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

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

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

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

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

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

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

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

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

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

पाठ्यपत्र, शी.एस. व गौतम, ए. । 2005, भौतिक भूगोल (रीवांगण्डल सहित)। सत्योत्तम प्रकाशन, नेवड।
दयाल, थी. 2012, भौतिक भूगोल। सत्योत्तम प्रकाशन, नेवड।
गौतम, अलका, 2012 : भौतिक भूगोल। सत्योत्तम प्रकाशन, नेवड।


सिंह, सवित्रा, 2005 : सूर्य-आकृति विज्ञान। सत्योत्तम प्रकाशन, उपनगर।
सिंह, सवित्रा, 2011: भौतिक भूगोल का स्वरूप। प्रयाग पुस्तक भवन, उपनगर।
शर्मा, एच.एस., शर्मा, एच. एल. एच. गिरिता, आर.एन. 2008: भौतिक भूगोल। सत्योत्तम प्रकाशन, उपनगर।


Paper II: Geography of Rajasthan

Section A

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

Section B

Mineral resources: distribution and production; Power and energy resources: distribution and production (hydro-electricity, coal, petroleum, solar energy and bio-energy) irrigation sources, irrigation intensity, crop wise irrigation, quality of irrigation water problems, irrigation projects: detailed study of Indira Gandhi canal project, Chambal valley project, Mahi Bajaj Sagar projects on physical and socio-economic aspects; agriculture: development under five year plans, problems of agriculture development, general land use, live-stock and dairy development, minerals.
Industries: textile, sugar, cement, marble and granite, fertilizer, zinc and copper smelting.
Transport & trade, development of tourism, desert development programme, tribal areas development programme, 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 bhill, 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. Sahitya Bhawan Publication, Hospital Road, Agra
नाथुरामका, एल.एन. 2012.13: राजस्थान की अर्थव्यवस्था। कॉलेज बुक हाउस, जयपुर।
साईवल, नेह 2012: राजस्थान का मूर्तियों। कॉलेज बुक हाउस, जयपुर।
Sing, R.L. 1971 (ed.): India A Regional Geography NGSI.Varanasi.
सक्सेना, एच.एम., 2012: राजस्थान का मूर्तियों। राजस्थान हिन्दी प्रस्तुत अकादमी, जयपुर।
Practicals
Scheme of Examination

Min. Pass Marks: 18
Max. Marks: 50

<table>
<thead>
<tr>
<th>Written test</th>
<th>Bifurcation of Marks</th>
<th>Time</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>24</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Field Survey and Viva voce</td>
<td>10+04</td>
<td>2½ hrs.</td>
</tr>
<tr>
<td>Record and Viva voce</td>
<td>08+04</td>
<td></td>
</tr>
</tbody>
</table>

N.B. 1. There shall be 6 questions in written paper selecting at least two questions from each section. Candidates are required to attempt 3 questions selecting 1 question from each section. All question carry equal marks. Each practical batch of 30 students will be allotted a teaching of 4 hours per week for practicals.

SYLLABUS

Section A

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

Section B

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

Section C

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

Recommended Readings:

चीहान, शै.अर. 2008: प्रयोगात्मक भूगोल। वसुलत्रा प्रकाशन, घोरखुपुर।
Singh, L.R. 2006: Practical Geography. Prayag Pustak Publisher, Allahabad U.P.
शर्म, जे.पी. 2011: प्रयोगात्मक भूगोल की शर्मा। स्तीमी पवित्रसंकलन, गरेल।
9. STATISTICS

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Duration</th>
<th>Max Marks</th>
<th>Min. Pass Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-I</td>
<td>3 hrs.</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>Paper-II</td>
<td>3 hrs.</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>Practical</td>
<td>3 hrs.</td>
<td>70</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>150</td>
<td>54</td>
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</table>

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

Paper-I Probability Theory


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

References

Additional References

Paper II : Descriptive Statistics

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

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

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

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

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

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


Additional References

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

<table>
<thead>
<tr>
<th>Scheme:</th>
<th>Duration</th>
<th>Max Marks</th>
<th>Min. Pass Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-I</td>
<td>3 hrs.</td>
<td>50 Sc.</td>
<td>18 Sc. 24 Arts</td>
</tr>
<tr>
<td>Paper-II</td>
<td>3 hrs.</td>
<td>50 Sc.</td>
<td>18 Sc. 24 Arts</td>
</tr>
<tr>
<td>Paper-III (Practical)</td>
<td>3 hrs.</td>
<td>50 Sc. 70 Arts</td>
<td>18 Sc. 25 Arts</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>150 Sc. 200 Arts</td>
<td>54 Sc. 72 Arts</td>
</tr>
</tbody>
</table>

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

Paper I: Probability Theory


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


References

Additional References:

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

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

SCHEME OF EXAMINATION:

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

NOTE:-

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

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

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

Section-C will contain 3 long questions each with internal choice. Each question will be of 15 marks for Arts students and 10 marks for Science students. Thus, Part-C will be of 45 marks for Arts students and 30 marks for Science students.
For clarification the distribution of marks is tabulated as below:

### ARTS

<table>
<thead>
<tr>
<th>Section</th>
<th>No. of Questions</th>
<th>Marks</th>
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</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>0.3</td>
<td>15</td>
</tr>
<tr>
<td>C</td>
<td>3 (with internal choice)</td>
<td>1.5</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
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<td><strong>75</strong></td>
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### SCIENCE

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<tr>
<td>A</td>
<td>10</td>
<td>0.1</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>5 (Out of 7)</td>
<td>0.2</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>3 (with internal choice)</td>
<td>1.0</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td></td>
<td></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

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

**Paper-I**

**Basic Psychological Processes**

**Section-A**

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


Section-B


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


Section-C


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

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

Books Recommended:


- सिंह, अरुणकुमार (2002). आधुनिक सामाजिक मनोविज्ञान. ताई दिल्ली, मोतीलाल बनारसीदास।
Section-A


Section-B


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

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

Section-C


Books Recommended:

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

Paper-III

Practicals

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

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

Part-I 3 hrs. duration Max. Marks: 33
Part-II 3 hrs. duration Max. Marks: 33
Part-III 3 hrs. duration Max. Marks: 33

Practical
Min. Pass Marks: 18 5 hrs. duration Max. Marks: 50

Paper-I-Circuit Analysis

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

Unit-I

Difference between linear and non-linear devices. Resistance and inductance their types and behaviour with D.C. and A.C. sources, colour codes.
Transient growth and decay of current in L-R circuit and time constant. Measurement of inductance by Rayleigh's method.

Unit-II

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

Unit-III

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

Unit-IV

* Superposition theorem, Reciprocity theorem. Thevenin theorem, Maximum power transfer theorem, coupled circuits, mutually inductively coupled circuit, reflected impedance \( Q \), impedance \( Q \) matching.

Unit-V

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

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

Paper-II Semiconducting and Opoto electronic devices

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

Max. Marks: 33 Time: 3 hrs.

Unit-I
Metal, insulators and semiconductors, intrinsic semiconductors, mobility and conductivity, extrinsic semiconductor (N-type and P-type), Physical concepts of carrier concentration, carrier life time, diffusion, continuity equation and hall effect.

Dipolar space charge region and potential barrier, voltage and current equation, forward and reverse bias characteristics, DC and AC resistance.

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

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

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

Unit-V
Variactor diode, tunnel diode and their characteristics, photo
conductivity cell, P-N photodiodes, PIN photodiodes, avalanche photodiodes, simple applications of photodiodes, photo voltaic effect, solar cell LED, photo-multiplier tubes.

**Reference Books:**
3. Engineering electronics by Ryder.

**Paper-III Digital Computer Electronics**

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

Max. Marks : 34  
Time : 3 hrs.

**Unit-I**

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

**Unit-II**


**Unit-III**

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

**Unit-IV**

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

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

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

Experiments for Practical work

Note: A candidate has to perform at least sixteen experiments in all taking eight experiments from each section 'A' and 'B'. In practical examination, the candidate will be required to perform two experiments one from section 'A' and other from section 'B'.

The distribution of marks will be as follows:

Time duration: 5.00 hrs.

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

Section-A

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

Section-B

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

Scheme: Duration    Max. Marks    Min. Pass. Marks

(i) Theory: One Paper 3 hrs.  60   50   22   18
(ii) Practical 5 hrs.  80   50   28   18
(iii) Submission  60   50   22   18
               200  150  72   54

Syllabus (Theory):

Part-A
1. Introduction to Textiles
2. Definition of fibre, Properties of fibre
3. Classification of fibre
4. Natural fibres
5. Yarn manufacture by Takli and Charkha

Part-B
1. Wärp and Weft, Difference between warp and weft
2. Handloom, Parts of Handloom
3. Warp path on Handloom
4. Motion of Handloom (primary & secondary)
5. Elementary Weaves (Basic weaves): Plain, Twill, Satin & Sateen
Part-C

1. Concept of colours, colour scheme, Achromatic & Monochromatic colour
2. Dyes and Pigments (colourless dyes)
3. Classification of Dyes
4. Fabric finishes- Introduction and Importance
5. Dyeing process of Tie and Dye

Syllabus (Practical):

Samples preparation

(i) Tie and Dye (Ball shape, platted & folded, leharia and bandhej)
(ii) Elementary weaves (plain, twill, satin and sateen) on graph paper
(iii) Primary colour, secondary colour, colour scheme, achromatic & monochromatic colour
(iv) Hand painting
(v) Stencil cutting on paper
2. GARMENT PRODUCTION & EXPORT MANAGEMENT

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Teaching hrs. per week</th>
<th>Max. marks</th>
<th>Min. pass marks</th>
<th>Duration (hrs.)</th>
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<tr>
<td>Theory</td>
<td>1</td>
<td>3</td>
<td>60</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>2 Business and Industry</td>
<td>3</td>
<td>60</td>
<td>22</td>
</tr>
<tr>
<td>Practical</td>
<td>1 Clothing construction</td>
<td>6</td>
<td>80</td>
<td>28</td>
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</table>

**B.Sc. Part—I**

<table>
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<th>Part no.</th>
<th>Teaching hrs. per week</th>
<th>Max. marks</th>
<th>Min. pass marks</th>
<th>Duration (hrs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory</td>
<td>1 Understanding textile</td>
<td>3</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>2 Business and accounting</td>
<td>3</td>
<td>50</td>
<td>18</td>
</tr>
<tr>
<td>Practical</td>
<td>1 Clothing construction</td>
<td>6</td>
<td>50</td>
<td>18</td>
</tr>
</tbody>
</table>
B.COM./B.A./B.SC. PART - I

PAPER- 1 : UNDERSTANDING TEXTILE

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

HRS. 3

B.SC. M.M. 50

SECTION A: Textile Technology

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

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

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

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

SECTION B: Traditional Textile

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


7. Printed Fabric : kalamkari, madhubani

8. Traditional embroideries of India :
   (a) kashida of Kashmir
   (b) kasuti of karnataka
   (c) Manipuri
   (d) chamba rumal

Convenor:

[Signatures]
(e) kantha of Bengal

(f) Phulkari of Punjab

(g) Chikankari of Lucknow

SECTION - C

SELECTION CRITERIA

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

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

References:

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

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

PAPER-II

BUSINESS AND GARMENT INDUSTRIES

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

B.SC. - M.M. 50

Convenor:

[Signature]

Members:

[Signature]
SECTION A

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

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

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

4. Objectives, importance and utility of bookkeeping.

SECTION B

MERCHANDISING THEORY

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


7. Careers in Apparel industries.

SECTION C

GARMENT INDUSTRY

8. Project planning for garment production unit.

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

10. Site selection for unit.


References:

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Signatures:

Convenor:

Members:

Handwritten text:

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

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

PRACTICAL –I

BASICS OF SEAMS AND EMBROIDERIES

B.A./B.COM.—M.M.  80
B.SC.—M.M.  50

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

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

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

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

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

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

THEORY PAPER-I

Fashion and Apparel Design

B.A./B.COM. MM- 30
B.SC. MM- 50

HRS-3

SECTION -A

TRADITIONAL COSTUMES

1. Study of traditional costumes of various regions of India.
2. History of costumes of Indian civilization.
3. Brief knowledge of world costumes: French, German, Greek, European.

SECTION -B

TECHNIQUES IN PATTERN MAKING

4. Eighthead theory- principles and advantages.
5. Pattern making techniques – drafting, draping, flat pattern.
6. Colour and colour schemes, psychological effects of colour on clothes.
7. Fitting – principles of fitting, factors to be considered while fitting, common fitting problems, remedying fitting defects of bodice, sleeves, and skirts.

SECTION -C

DESIGN

8. Classification of design – structural and decorative
9. Elements and principles of design.
I: Geology and Mining

Scheme:

Theory: Max Marks 100
Minimum Pass Marks 36

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

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

Practical (one) 4 hrs duration Max Marks 50

Paper I: Physical Geology and Palaeontology

Section - A

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

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

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

Mountain Building and Isostasy

Section - B

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

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

Microfossils: definition and significance in geological studies. Skeletal morphology and geological distribution of Foraminifera.

Section - C

Skeletal morphology and geological distribution of the following groups:
Brachiopoda, Mollusca, Trilobita, and Echinodermata.
Paper II: Mineralogy and Structural Geology

Section A

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


Section B

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


Section C

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

Elementary idea about Cleavage, fractures, joints, salt domes, inliers and outliers.

Practicals

Study of physiographic features in topographical maps. Drawing of profiles and geological sections along given direction.

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

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

Geological field work and collecting of samples.

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University of Rajasthan
JAIPUR-202 013

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Syllabus B.Sc. Pt I  
Environmental Science

Scheme:
Theory

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

Note:

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

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

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

79
Paper I: Fundamentals of Environmental Science

Section A

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

Section B

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

Section C

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


81
Paper II: Water Resources and Management.

Section A

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

Section B

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

Section C
Secondary (Biological) Treatment; Activated Sludge Process, Trickling Filters, Sludge Treatment and Disposal.

2. Lagoons, Anaerobic digestion, Aerobic Digestion.


4. Recovery of material from process effluent.

5. Removal of Pesticide residues from water.

Suggested Readings:

Suggested Laboratory Exercises (Practicals)

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

1. BIOTECHNOLOGY

Scheme:
Theory
Max. Marks : 100

<table>
<thead>
<tr>
<th>Paper</th>
<th>Subject</th>
<th>Min. Pass Marks</th>
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<tbody>
<tr>
<td>I</td>
<td>Biochemistry &amp; Microbiology</td>
<td>(50 Marks)</td>
</tr>
<tr>
<td>II</td>
<td>Cell Biology &amp; Genetics</td>
<td>(50 Marks)</td>
</tr>
<tr>
<td>III</td>
<td>Bophysics, Bio-Maths &amp; Computer Application</td>
<td>(50 Marks)</td>
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Practical (75 Marks)

Paper-1 : Biotechnology and Microbiology

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

Section-A

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

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

Section-B

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

Molecules executing mediator and catalytic functions—the proteins.


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

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

Section-C

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

Development of microscopy (optical, TEM and SEM).
Pasteur's experiments disproving spontaneous generation.
The concept of sterilization. Methods of sterilization (Dry heat, wet heat, radiation, chemical and filtration etc.)

Section-D

Concept of microbial species and strains.
The various forms of microorganisms—PPLOS, cocci, bacilli and spirilla.
Genetic homogeneity in clonal populations.
Spontaneous and induced variation arising in microbial population.
Gene transfer in microorganisms.
Prokaryotic and eukaryotic microbial cells.
Nutritional classification of microorganisms.
Microbes in extreme environments—the thermophiles and alkalophiles.
Pathogenic microorganisms. Defense mechanism against microorganism.s
Symbiosis and antibiotic among microbial populations.
N₂ fixing microbes in agriculture.
Microbial metabolism fermentation products. A survey of products from microorganisms.

Strains Improvement by enrichment, selection and recombinant DNA methods.

Production of heterologous protein in interest in microorganisms.

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

**Section-A**

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

**Section-B**

Structure and function of cell organelles : ultrastructure of cell membrane, cytosol, Golgi bodies, endoplasmic reticulum (rough and smooth), ribosomes cytoskeletal structures (action, microtubules etc.). Mitochondria, chloroplasts, lysomes, peroxysomes, nucleus (nuclear membrane, nucleoplasm, nucleolus, chromatin,). Cell division and cell cycle (include cell synchrony and its application). Cell-cell interaction.

Cell locomotion (ambeoid, flagellar and ciliary). Muscle and nerve cells.

Cell senescence and depth. Cell differentiation of plants and animals.

**Section-C**

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

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

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

Section—D

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

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

Extra chromosomal inheritance, mitochondrial and chloroplast genetic systems.

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

B.Sc. Part I

Paper-III Biophysics, Biomaths & Instrumentations and Computer Application

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

Section—A

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

Section—B

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

Section—C

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

Section—D

General principles; buffers; electroanalytical methods: potentiometric and conductometric; photometry; chromatographic methods of separation: gel permeation, ion exchange, reverse phase and affinity chromatography, HPLC-and

FPLC: centrifugation; radiotracer technique: gel electrophoresis technjaues : electro blotting and electrolution. capillary electrophoresis. API-electrospary and MALDI-TOP mass spectrometry.

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

Scheme :

Max. Marks 100 Min. Pass Marks : 36

Paper I 3 hrs. duration Marks : 50
Paper II 3 hrs duration Marks : 50
Practical Min. Pass Marks : 18 Max. Marks : 50

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

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

Section-A

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

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

3. Biological and Biochemical fundamentals.
   — Introduction
   — The microorganisms and biotechnology
   — Isolation methods for microorganisms
   — Culture preservation and stability
   — Preservation of microbes, serial subculture preservation by over laying culture with mineral oil lyophilisation of freeze drying.
   — Other methods for storage of fungi
   — Over production of microbial metabolizes
   — Preparation of incomlum
4. Fundamental of Genetics
   — Introduction.
   — Methods for the selection of mutants, direct selection methods for resistant mutants, penicillin selection, technique for mutant selection, conditional lethality and use in mutant section.
   — General account about the transfer of genetic information in prokaryotes.
   — Scope of genetic engineering.

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

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

Section-C

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

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

9. Principle types of Fermentation
   — Introduction
Syllabus: B.Sc. Part-I

- Factors involved in fermenter design, difference between bio-chemical and chemical processes, classification of biochemical reactions, rate process, operational consideration, local conditions within a fermenter.
- Fermenter configurations, the batch fermenter, continuous stirred tank fermenter the tubular fermenter, the fluidised bed fermenter, solid state fermenters.
- Principal operating characteristics of fermenters.
- Computer control of fermentation process.
- Introduction
- Computer hardware and software, Hardware Graphics, LOTus and DOS, Computer applications in fermentation.
- Justification and planning.

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

Section-A

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


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

Section-B

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

5. Extra Chromosome genetic material.
   Plasmids, cosmids, transposons insertion sequence. Overlapping genes, silent genes, exon and intron evolutionary significance of silent gene, ribonucleo protein. Genetic recombination and it prospects, basics of recombinant RNA, recombinant DNA technology.

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

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

Section-C

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

9. Amino Acids

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

**Practical on Paper-I**

1. Preparation of media, autocolaving and sterilization of glassware, maintenance of culture room.
2. Isolation and minatenance of microbes of different groups.
   (a) Bacteria, (b) Algae, (c) Bacteriophage, (d) Fungi.
5. Standard plate court.
6. Haemocytometer
7. Isolation of Phytoathogens
8. Biostatistics : manual and by computer
   Problem of Chi-square test
   Problem of mean, mode and median
9. Protein estimation by calorimeter.
10. Carbohydrate estimation by calorimeter.
11. Paper Chromatographic separation of amino acid and pigments by one way descending.
12. Paper Chromatographic separation by two dimensional Cromatograph.
13. Paper Chromatographic separation of carbohydrate.
University of Rajasthan

Paper Chromatographic separation of organic acid.
15. Measurement of pH fruit juice.
17. Centrifugal separation of protein.
18. Absorption spectra of protein nucleic acid and pigments.

Practical On Paper-II

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

Reference Books:

3. Outlines of Biochemistry by Cohn and Stumph.
12. Laboratory Techniques in Biology by Swaroop, Pathak and Arora.
13. Fermentation Technology by Wihttaker.
3. COMPUTER APPLICATIONS

<table>
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<tr>
<th>Scheme</th>
<th>Min. Pass Marks</th>
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<td>Arts/Commerce</td>
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<td>Science</td>
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**Paper I : Computer Fundamentals and Introduction to IBM PC**

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

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

Hardware features and use-CPU, I/O devices, Storage devices
Introduction to networking, multiprocessing, time sharing, multitasking and real time computing.

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

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

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

Block diagram of IBM PC. Introduction to 8086 and 8088.

Functional description of various modules and cards.

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

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

Disk Operating System—Introduction, Batch files.

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

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

Advance version of IBM and compatibles.

**Paper II : Operating Systems and Business Data Processing**

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

Various components of operating system with reference to DOS.

Single user operating system. Task loader. Memory management.

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

**Practical**

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

Physical inspection of IBM PC and internal cards. Introduction
Syllabus: B.Sc. Part-I

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