

**University of Rajasthan  
Jaipur**

**SYLLABUS**

**B.Sc. PART-I**

**2015**

~~SECRET~~

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%	

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

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## DISTRIBUTION OF MARKS

S. No.	Name of the Subject	No. of Papers	Duration	Max. Marks	Min. Pass Marks
1	2	3	4	5	6
<b>Compulsory Subjects</b>					
1.	General Hindi	One Paper	3 hrs.	100	36
2.	General English (Communication Skills in English)	One Paper	3 hrs.	100	36
3.	Environmental Studies Theory			100	36
4.	Elementary Computer Applications		Theory Practical	40 60	} 100 36
5.	Elementary Hindi (in lieu of Gen. Hindi)	One Paper	3 hrs.	100	
<b>Optional Subjects</b>					
1.	Physics	Paper I	3 hrs.	33	} 100 36
		Paper II	3 hrs.	33	
		Paper III	3 hrs.	34	
		Practical (One)	5 hrs.	50	18
2.	Chemistry	Inorganic	3 hrs.	33	} 100 36
		Organic	3 hrs.	33	
		Physical	3 hrs.	34	
		Practical (One)	4 hrs.	50	18
3.	Mathematics	Paper I	3 hrs.	50	} 132 48
		Paper II	3 hrs.	50	
		Paper III	2½ hrs.	32	
		Practical	2 hrs.	18	0.6
4.	Zoology	Paper I	3 hrs.	<del>30</del> 33	} 150 54
		Paper II	3 hrs.	<del>30</del> 33	
		Paper III	3 hrs.	<del>30</del> 34	
		Practical (One)	4 hrs.	50	18
5.	Botany	Paper I	3 hrs.	<del>30</del> 33	} 150 54
		Paper II	3 hrs.	<del>35</del> 34	
		Paper III	3 hrs.	<del>34</del> 35	
		Practical (One)	5 hrs.	50	18

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6. Geology	Paper I	3 hrs.	50	} 100	36
	Paper II	3 hrs.	50		
	Practical (One)	4 hrs.	50	18	
7. Economics	Paper I	3 hrs.	75	} 150	54
	Paper II	3 hrs.	75		
8. Geography	Paper I	3 hrs.	50	} 100	36
	Paper II	3 hrs.	50		
	Practical	5 hrs.	50	18	
9. Statistics	Paper I	3 hrs.	50	} 100	36
	Paper II	3 hrs.	50		
	Practical (One)	3 hrs.	50	18	
10. Applied Statistics	Paper I	3 hrs.	50	} 100	36
	Paper II	3 hrs.	50		
	Practical	3 hrs.	50	18	
11. Psychology	Paper I	3 hrs.	50	} 100	36
12. Electronics	Paper II	3 hrs.	50		
	Practical	3 hrs.	50	18	
<b>Additional Optional Subject</b>					
1. Textile & Craft	Paper I	3 hrs.	50	} 100	36
	Paper II	3 hrs.	50		
	Practical	3 hrs.	50	18	
2. Understanding Textile	Paper I	2 hrs. 60	50	22	18
	Theory				
Business & Accounting	Paper II	2 hrs. 60	50	22	18
	Theory				
Clothing Construction	Paper I	6 hrs. 80	50	28	18
	Practical				
3. Investigative Bio- Technology	Paper I	3 hrs.	50	} 100	36
	Paper II	3 hrs.	50		
	Practical	3 hrs.	50	18	
4. Geology and Mining	Paper I	3 hrs.	50	} 100	36
	Paper II	3 hrs.	50		
	Practical	3 hrs.	50	18	
5. Environ- mental Science	Paper I	3 hrs.	50	} 100	36
	Paper II	3 hrs.	50		
	Practical	3 hrs.	50	18	

**Add-on Subject**

1. Biotechnology
2. Industrial Microbiology

3. Computer Applications

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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 पद्य भाग। प्रत्येक भाग के लिए 25 अंक निर्धारित हैं।

		<b>50 अंक</b>
क	दो व्याख्या पद्य 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 पद्य से (विकल्प देना है)	7½ x 2 = 15 अंक
घ	आलोचनात्मक प्रश्न गद्य से (विकल्प देना है)	7½ x 2 = 15 अंक

**व्याकरण / व्यावहारिक हिन्दी खण्ड** **25 अंक**

i.	निबंध लेखन - शब्द सीमा 300 शब्द	8 अंक
ii.	कार्यालयी लेख - शासकीय-अर्द्धशासकीय पत्र, परिपत्र, अधिसूचना, कार्यालय ज्ञापन, विज्ञप्ति, कार्यालय आदेश।	4x2 = 8 अंक
iii.	संक्षेपण (विकल्प देना है)	5 अंक
iv.	पल्लवन (विकल्प देना है)	4 अंक
v.	शब्द निर्माण की प्रविधि - उपसर्ग, प्रत्यय, संधि, समास	5 अंक
vi.	वाक्य शुद्धि / शब्द शुद्धि	5 अंक
vii.	मुहावरे	5 अंक
viii.	पारिभाषिक शब्दावली	5 अंक
ix.	व्याकरणिक कोटियां - संज्ञा, सर्वनाम, विशेषण, क्रिया, क्रिया विशेषण	5 अंक

**साहित्य खण्ड : गद्य-पद्य की निर्धारित रचनाएँ**

**गद्य भाग - निम्नांकित पाठ निर्धारित हैं -**

1.	कहानी	:	बड़े घर की बेटी (प्रेमचंद)
2.	संस्मरण	:	प्रणाम (महादेवी वर्मा)
3.	रेखाचित्र	:	बाईस वर्ष बाद (बनारसीदास चतुर्वेदी)
4.	विज्ञान	:	शनि सबसे सुन्दर ग्रह (गुणाकर मुळे)
5.	निबंध	:	गेहूँ और गुलाब (रामवृक्ष बेनीपुरी)
6.	निबंध	:	सूखे चेहरों का भूगोल (मणिमधुकर)
7.	निबंध	:	मजदूरी और प्रेम (सरदार पूर्ण सिंह)
8.	निबंध	:	राजस्थान की सांस्कृतिक धरोहर (अगरचंद नाहटा)
9.	निबंध	:	राष्ट्र का स्वरूप (वासुदेव शरण अग्रवाल)
10.	व्यंग्य	:	ठिठुरता हुआ गणतंत्र (हरिशंकर परसाई)

**पद्य भाग -**

1.	कबीर-	1.	मन रे ! जागत रहिये भाई
		2.	हमारे राम रहीम करीमा केसौ, अलह राम सति सोई।
		3.	काजी कौन कतेब बखानै।
		4.	मन रे! हरि भजि, हरि भजि हरि भजि भाई।
		5.	है मन भजन कौ प्रवान
		संदर्भ :	कबीर ग्रंथावली-श्यामसुंदरदास
2.	सूरदास	1.	किलकत कान्ह घटुरुवनि आवत
		2.	मुरली तऊ गोपालहिं भावत
		3.	देखौ माई सुन्दरता कौ सागर

12/5/11

विभागाध्यक्ष  
हिन्दी विभाग  
जयपुर विश्वविद्यालय  
जयपुर

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4. जसोदा बार बार यौं भाखै
5. चित दै सुनौ स्याम प्रवीन

3. तुलसीदास

1. कबहुँक अंब अवसर पाई
2. अबलौं नसानी अब न नसैहौं
3. मोहि मूढ मन बहुत बियोगौ
4. ऐसौ को उदार जग मांही
5. मन पछितैहैं अवसर बीते

संदर्भ : विनय पत्रिका, गीता प्रेस गोरखपुर

4. रहीम

पद

1. छवि भावन मोहनलाल की
  2. कमल दल नैननि की उनमानि
- दोहा
1. प्रीतम छवि नैननि बसी
  2. बसि कुसंग चाहत कुसल
  3. रहिमन अंसुआ नैन ढरि
  4. रहिमन औछे नरन सौं बैर भलौ ना प्रीति
  5. रहिमन निज मन की बिथा
  6. काज परै कछु और है
  7. खैर खून खाँसी, खुसी बैर प्रीति मदपान
  8. दादुर मोर किसान मन लग्यो रहे घन माँहि
  9. पावस देखि रहीम मन कोइल साधै मौन
  10. रहिमन बिगरी आदि को बनै न खरचे दाम।

संदर्भ : रहीम ग्रन्थावली, विद्यानिवास मिश्र

5. पदमाकर

कवित्त

1. कूलन में केलिन में कछारन में कुंजन में
  2. और भाँति कुंजन में गुंजरित भौर भीर
  3. पात बिनु कीन्हे ऐसी भाँति गुन बेलिन के
  4. चितै चितै चारों ओर चौंकि चौंकि परै त्योंहीं
- सवैया
5. या अनुराग की लखौं जहँ.....
  6. फाग के भीर अभीरन में गहि गोविन्द लै गई भीतर गोरी।

6. मैथिलीशरण गुप्त

साकेत – अष्टमसर्ग से

कैकेयी का अनुताप

तदनन्तर बैठी सभा उटज के आगे .....

सौ बार धन्य वह एक लाल की माई।

7. प्रसाद : कामायनी, श्रद्धासर्ग – कहा आगन्तुक ने सस्नेह ..विजयिनी मानवता हो जाय।

8. पंत : 1. प्रथम रश्मि छन्द 1-13

2. भारत माता

9. निराला: 1. भारती जय विजय करे

2. बादल राग -1

3. दलित जन पर करो करुणा

4. फिर नभ घन घहराये।

10. रामधारी सिंह दिनकर –रश्मिरथी-तृतीय सर्ग –आरंभिक अंश

सच्चे शूरमा

सच है विपत्ति जब आती है ..... क्या कर सकती चिनगारी है।

# 2. GENERAL ENGLISH

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**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      |      |

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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**  
**(25 periods)**

**(30 marks)**

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

**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:**

1. Sasikumar, V., Dutta and Rajeevan, A Course in Listening and Speaking-I Foundation Books. 2005.
2. Sawhney, Panja and Verma eds. English At the Workplace, Macmillan 2003.
3. Singh, R.P. Professional Communication. OUP. 2004
4. Judith Leigh. CVs and Job Applications. OUP. 2004
5. Arthur Waldhorn and Arthur Zeiger, English Made Simple. Upa and Co.
6. Gunashekar ed. A Foundation English Course for Undergraduates. Book I, CIEFL, Hyderabad.
7. Quirk and Greenbaum: A University Grammar of English Longman, 1973

### 3. COMPULSORY PAPER OF ENVIRONMENTAL STUDIES

C ~~\_\_\_\_\_~~ \_\_\_\_\_ level \_\_\_\_\_

#### Scheme of examination

Time	Min Marks	Max. Marks
3 hrs	36	100

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

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

#### Note:

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

#### Unit.1: The Multidisciplinary nature of environmental studies

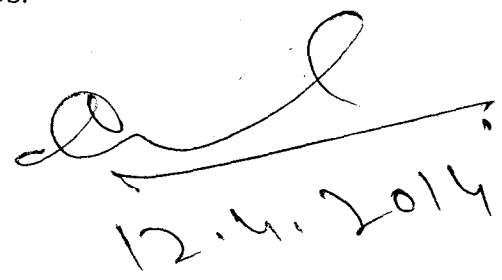
Definition, scope and importance- Relationship between Environmental Studies and other branches of science and social sciences.

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

#### Unit.2: Natural Resources and Challenges

- a. Natural resources and associated problems, Classification of resources: renewable resources, non renewable resources, classes of earth resources, resources regions: Definition and criteria, resource conservation.
- b. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- c. Water resources: Use and over-utilization of surface and groundwater, floods, drought conflicts over water, dams-benefits and problems.
- d. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

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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.

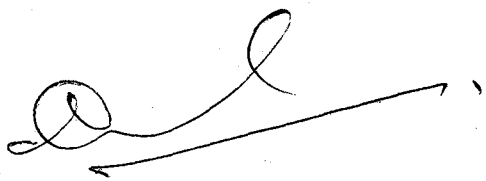
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

**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

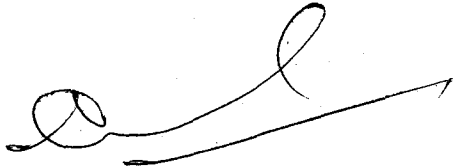
- Causes, effects and control measures of:
  - a) Air Pollution
  - b) Water Pollution
  - c) Soil Pollution
  - d) Marine Pollution
  - e) Noise Pollution
  - f) Thermal Pollution
  - g) Nuclear Hazards
- Solid waste management” Causes, effects and control measures of urban and industrial wastes
- Role 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:-**

1. Chauhan, Surendra Singh. 2001. Biodiversity, Biopiracy and Biopolitics: The Global Perspectives, Kalinga Publications, New Delhi.
2. Chauhan, Surendra Singh. 2004. Environmental Protection and Management: From Stockholm to Rio and After, Kalinga Publications, New Delhi.
3. Diwan A.P. and Arora D.K.1995. Human Ecology Anmol Publication Pvt.Ltd.,New Delhi.
4. Dubey, R.M.1992. Human Ecology and Environmental Education,Chaugh Publications,Allahabad.
5. Goudie,Andrew.The Human Impact.
6. Husain Maxia.1994 Human Geography,Rawat Publication,Jaipur.
7. Johnston, R.J.Ed.1986 Dictionary of Human geography,National Publication,New Delhi.
8. Malik,S.L.and Bhattacharya D.K.1986. Aspects of Human Ecology,Northern Book Center,New Delhi.
9. Mishra,R.P and Bhooshan,B.S.1979.Human Settlements in Asia.Public,Polices and programmes Haritage publisher,New Delhi.
- 10.Nathawat, G.S.1985. Human Ecology,An Indian perspective,Indian Human Ecology Council,Jaipur.
- 11.Russel, Bartrand, 1976.Impact of Science of society Unwin,Publisher,Indian. (paper back).
- 12.Sinha Rajiv, 1996.Gloobal Biodiversity Ina.,Shri publication,Jaipur.
- 13.Sinha Rajiv K., 1994. Development without Desertrction
- 14.Environmentalist,Jaipur. Sinha Rajiv K., 1996.Environmental Crises and Human at Risk,In A Shri Publication,Jaipur.
- 15.Smith, Dlanne, 1984.Urban Ecology,George Allen,London.
- 16.Swarnkar, R.C.1985.Indian Tribes.Printwell publisher,Jaipur.
- 17.Tivy,Joy and O'Hugegreg,1985.Human Impact on the Ecosystem Edinburgh George Allen Boyd.
- 18.United Nations Development Report, 1996.Human Development Report, 1996.Oxford University Press,Delhi.
- 19.Vannathony & Rogers Paul, 1974. Human Ecology and World Development,Flehum Press,New York.

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#### 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 provided by the University whose evaluation will be done based on OMR Scanning technology by a competent computer firm duly approved by the University. Further the practical examination for this paper will be of 40 marks and its duration will be of two hours.

The workload for this paper will now be as follows :

Theory Paper : Four Periods/Three Hours per week.

Practical : Three Periods/Two Hours per week.

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

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

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

**Unit-2 : Operating System**

(Working knowledge at Common Users Level Only)

1. Overview of important DOS commands. Windows 98 : Installation, Scandisk, Control Panel, Taskbar, Toolbars, Display, Settings (Background, Wallpaper, Screensaver, Desktop Themes). Files and Folder management, Window Explorer, Finding Files and Folders, Formatting Disks and Copying files, Printer Settings, Modem Installation, Mouse Installation, Adding and Removing Programs, Active Desktop Concepts, Winzip and its applications, Norton Antivirus and its use, Use of Calculator, Paintbrush, sinamp, MPEG Player and Windows Help.

**Unit-3 : Application Software**

(Working knowledge at Common Users Level only)

- (a) Word Processing, Software MS Word, Entering, Editing and Formatting Text, Document Formats, (Page Size and Orientation, Headers and Footers, Columns and Sections, Page layout), Spelling and Grammar Checkers, Thesaurus, Find the Replace, Cut and Paste, Tables and Formatting tables, Mail Merge, Styles and Templates.
- (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, Telnet, FTP, Chat, 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.

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**Practical**

Max. Marks **40.**

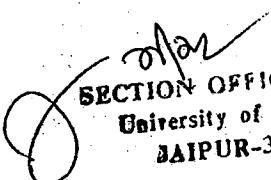
Workload : Four Period / Three hours per week.

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 on of above maintained four exercises.

  
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## प्रश्न पत्र 5: प्रारम्भिक हिन्दी

पूर्णांक : 100

अवधि : 3 घण्टे

### अंकों का विभाजन

- |                              |        |
|------------------------------|--------|
| 1. पुस्तकों पर आधारित प्रश्न | 50 अंक |
| 2. व्याकरण से संबंधित प्रश्न | 24 अंक |
| 3. रचना से संबंधित प्रश्न    | 26 अंक |
| (क) लोकोक्तियाँ मुहावरे      |        |
| (ख) पत्र लेखन अथवा निबंध     |        |

### पाठ्यक्रम

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

### पाठ्य पुस्तकें

1. गद्य-संग्रह-राष्ट्रीय गौरव के चिन्ह- डॉ. हरिकृष्ण देवसरे  
प्रकाशक-नेशनल पब्लिशिंग हाउस, नई दिल्ली

### व्याकरण एवं रचना

1. आधुनिक हिन्दी व्याकरण तथा रचना - लेखक कृष्ण विकल  
प्रकाशक-नेशनल पब्लिशिंग हाउस, नई दिल्ली
2. सुबोध व्याकरण एवं रचना-सम्पादक-व्यथित हृदय-संशोधनकर्ता-डॉ.अम्बा प्रसाद सुमन  
प्रकाशक - श्रीराम मेहरा एण्ड कम्पनी, आगरा

12/5/14  
विभागाध्यक्ष  
हिन्दी विभाग  
राजस्थान विश्वविद्यालय  
जयपुर

## PAPER I

### 1. PHYSICS

#### Scheme

Paper I	Exam. 3 Hours Duration	Min. Pass Marks <sup>12</sup>	Max. Marks. 33
Paper II	Exam. 3 Hours Duration	Min. Pass Marks <sup>10</sup>	Max. Marks. 33
Paper III	Exam. 3 Hours Duration	Min. Pass Marks <sup>12</sup>	Max. Marks. 34
Practical	Exam. 5 Hours Duration	Min. Pass Marks <sup>18</sup>	Max. Marks. 50

#### Paper – I (Mechanics)

**Work Load : Two hours lecture per week**

**Examination Duration : Three hours**

**Scheme of Examination:** All questions will carry equal marks and will be compulsory. Five questions shall be set. First question will be 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. Second to Fifth question will have two parts, namely (A) and (B). Part (A) of Second to Fifth question shall be compulsory and Part (B) of these questions will have internal choice.

#### Unit – I: 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  $\omega$ , Kinetic energy of rotation and idea of principal axes, Precessional 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 Oscillations**

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

### **Coupled Oscillations**

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

### **Reference Books:**

1. Mechanics : Berkeley Physics Course Vol- 1, Charles Kittel
2. Mechanics: H S Hans S P Puri, Tata McGraw-Hill
3. The Physics of Waves & Oscillations: N.K. Bajaj, Tata McGraw-Hill
4. Analytical Mechanics L.N. Hand, J.D. Finch. (Cambridge University Press).

### **Paper – II (Electromagnetism)**

**Work Load : Two hours lecture per week**

**Examination Duration : Three hours**

**Scheme of Examination:** All questions will carry equal marks and will be compulsory. Five questions shall be set. First question will be 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. Second to Fifth question will have two parts, namely (A) and (B). Part (A) of Second to Fifth question shall be compulsory and Part (B) of these questions will have internal choice.

### **Unit I: Scalar and Vector Fields**

Concept of Field, Scalar and Vector Fields, Gradient of scalar field, Physical significance and formalism of Gradient , Divergence and Curl of a vector field in

Cartesian co-ordinates system, 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 built a uniformly charged sphere, classical radius of electron, Electric field due to a short electric dipole, Interaction of electric dipole with external uniform and non uniform electric field, potential due to a uniformly charged spherical shell.

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

Electric potential and electric field due to a uniformly polarized sphere (i) out side 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) out side 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) out side (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:

1. Electricity & Magnetism ; A.S. Mahajan & Abbas A. Rangwala, Tata McGraw-Hill
2. Introduction to Electrodynamics ;, David J. Griffith, Prentice Hall
3. Berkley Physics Course , Vol. II
4. Fundamental University Physics Vol II : Fields and Waves ; M. Alonso and E.J. Finn; Addison-Wesley Publishing Company,

### Paper III

### OPTICS

**Work Load : Two hours lecture per week**

**Examination Duration : Three hours**

**Scheme of Examination:** All questions will carry equal marks and will be compulsory. Five questions shall be set. First question will be 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. Second to Fifth question will have two parts, namely (A) and (B). Part (A) of Second to Fifth question shall be compulsory and Part (B) of these questions will have internal choice.

### Unit – 1 Interference :

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

### Unit – 2 Diffraction:

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

### Unit – 3

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

(ii) **Laser**: Spontaneous and Stimulated emission Einstein's A&B coefficients, Energy density of radiation as a result of stimulated emission and absorption, population inversion, Methods of Optical pumping, Energy level schemes, He-Ne, Ruby, CO<sub>2</sub> lasers.

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

#### Unit – 4

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

#### Reference Books:

1. Optics by Brij Lal & Subramaniam, S. Chand.
2. Optics by D. P. Khandelwal.
3. Principles of optics by B. K. Mathur.
4. Introduction to Modern Optics by A. K. Ghatak.
5. An introduction to Modern Optics by G. R. Fowels.
6. Essentials of Lasers by Allen.

#### Practical

**Work Load : Four hours laboratory work per week**

**Examination Duration : Four hours**

**Minimum Experiments: Total sixteen taking eight from each section.**

The colleges are free to set new experiments of equivalent standard. This should be intimated and approved by the Convener, Board of Studies before the start of academic session. It is binding on the college to have experimental set up of at least sixteen experiments listed below (8 from each section). In case number of experiment performed by the student is less than sixteen, his marks shall be scaled down in final examination on pro rate basis. 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 semi-conductor junction diode and determine forward and reverse resistances.
7. To study the magnetic field along the axis of a current carrying circular coil. Plot the necessary graph and hence find radius of the circular coil.
8. To determine the specific resistance of a material and determine difference between two small resistance using Carey Fosters Bridge.
9. To convert a galvanometer into an ammeter of a given range
10. To convert a galvanometer into a voltmeter of a given range.

#### Section B

1. To study the random decay and determine the decay constant using the statistical board.
2. Using compound pendulum study the variation of time period with amplitude in large angle oscillations.
3. To study the damping using compound pendulum.
4. To study the excitation of normal modes and measure frequency splitting using two coupled oscillators.

5. To study the frequency of energy transfer as a function of coupling strength using coupled oscillators.
6. To study the viscous fluid damping of a compound pendulum and determining damping coefficient and Q of the oscillator.
7. To study the electromagnetic damping of a compound pendulum and to find the variation of damping coefficients with the assistance of a conducting lamina.
8. To find J by Callender and Barne's Method.
9. To determine Young's modulus by bending of beam.
10. To determine  $Y$ ,  $\sigma$  and  $\eta$  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

	Duration (hrs.)	Max. Marks	Min. Pass Marks
Paper I	3	33	
Paper-II	3	33	36
Paper-III	3	34	
Practical	5	50	18

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, Fajan's rule.  
**Metallic 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<sub>3</sub>, H<sub>3</sub>O<sup>+</sup>, SF<sub>4</sub>, ClF<sub>3</sub>, ICl<sub>2</sub>, H<sub>2</sub>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 of p-block elements:** Periodicity in properties of p-block elements with special reference to atomic and ionic radii, ionization energy, electron-affinity, electronegativity, diagonal relationship, catenation.  
**Some Important Compounds of p-block Elements:** Hydrides of boron, diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphuretanitride, basic properties of halogens, interhalogens and poly alides.

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.

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

**Unit-I**

**Mechanism of Organic Reactions:** Homolytic and heterolytic bond cleavage. Type of reagents, electrophiles and nucleophiles. Reactive intermediates - carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Types of organic reactions. Energy considerations. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

**Unit-II**

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

**Optical Isomerism:** Elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity. Properties of enantiomers, chiral and achiral molecules with two stereogenic centres. Diastereomers, threo and erythro isomers, meso compounds. Resolution of enantiomers. Inversion, retention and racemization (with examples).

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

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

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

**Unit-III**

**Alkanes and Cycloalkanes :** IUPAC nomenclature of branched and unbranched alkyl groups, classification of carbon atoms in alkanes. Methods of formation (with special reference of Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenations, orientation, reactivity and selectivity. Cycloalkanes - nomenclature, methods of formation, chemical reactions. Baeyer's strain theory and its limitations. Theory of strainless rings.

**Alkenes, Cycloalkenes, Dienes and Alkynes:** Methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides. Regioselectivity in alcohol dehydration - the Saytzeff rule, Hoffmann elimination. Physical properties and relative stabilities of alkenes. Chemical reactions of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions. Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with  $\text{KMnO}_4$ . Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes.

Classification and Nomenclature of isolated, conjugated and cumulated dienes. Structure of allenes and butadiene. Methods of formation, properties and chemical reactions - 1,2- and 1,4-additions, Diels-Alder reaction and polymerization reactions.

Structure and bonding in alkynes. Methods of formation. Chemical reactions - acidity of alkynes; mechanism of electrophilic and nucleophilic addition reactions; hydroboration-oxidation; metal-ammonia reduction, oxidation and polymerization.

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**Unit-IV**

**Arenes and Aromaticity:** Nomenclature of benzene derivatives: the aryl group, aromatic nucleus and side chain. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO diagram. Aromaticity: the Huckel rule, aromatic ions – three to eight membered rings.

**Aromatic electrophilic substitution:** General pattern of the mechanism, role of sigma and pi complexes. Mechanism of nitration, halogenation, sulphonation, mercuration, Friedel-Crafts reactions and chloromethylation. Energy profile diagrams. Activating and deactivating substituents. Directive influence - orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction.

**Unit-V**

**Alkyl and Aryl Halides:**

Methods of formation of alkyl halides, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides  $S_N2$  and  $S_N1$  reactions with energy profile diagrams.

Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl, 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  $k_x$ ,  $e^x$ ,  $x^n$ ,  $\sin x$  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 cholestric phases. Thermography and seven segment cell.

**UNIT- II**

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

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

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

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### UNIT- III

**Solid State:** Definition of space lattice, unit cell.

Laws of crystallography- (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals.

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.

Solids in liquids (sols): properties - kinetic, optical and electrical, stability of colloids. Protective action, Hardy-Schulze law, gold number.

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

Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier.

### UNIT V

**Chemical Kinetics:** Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction: concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions - zero order, first order, second order 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 based on equilibrium constant and thermodynamic aspects.

#### Suggested Books:

1. Principles of Physical Chemistry: B. R. Puri and L. R. Sharma.
2. A Text Book of Physical Chemistry: A. S. Negi and S. C. Anand.
3. Physical Chemistry: Ira N. Levine.
4. Physical Chemistry, Pt. I & II: C. M. Gupta, J. K. Saxena and M. C. Purohit.

### 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.

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**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, acetanilide from boiling water, naphthalene from ethanol etc.; Sublimation of naphthalene, camphor, etc.

**Qualitative Analysis**

Element Detection (N, S and halogens). Functional group determination (unsaturation, phenolic, alcoholic, carboxylic, carbonyl, ester, carbohydrate, amine, amide, nitro and hydrocarbon) in simple organic solids and liquids.

**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 H<sub>2</sub>SO<sub>4</sub> by studying the kinetics of hydrolysis of ethyl acetate.
- d) To study kinetically the reaction rate of decomposition of iodide by H<sub>2</sub>O<sub>2</sub>.

**(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/stalagmometer).
- 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

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Total 50

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**Books Suggested (Theory Course)**

1. Basic Inorganic Chemistry F.A. Cotton, G. Wilkinson and P.L. Caus, Wiley.
2. Concise Inorganic Chemistry, J.D. Lee, ELBS
3. Concepts of Models of Inorganic Chemistry B. Douglas, D. McDaniel and J. Alexander, John Wiley.
4. Inorganic Chemistry, D.E. Shriver P.W. Atkins and C.H. Langford, Oxford.
5. Inorganic Chemistry, W.W. Porterfield Addison Wesley.
6. Inorganic Chemistry, A.G. Sharpe, ELBS
7. Inorganic Chemistry, G.L. Miessler and D.A. Tarr, Prentice Hall.
8. Organic Chemistry, Morrison and Boyd, Prentice Hall.
9. Organic Chemistry, L.G. Wade Jr. Prentice Hall.
10. Fundamentals of Organic Chemistry, Solomons, John Wiley.
11. Organic Chemistry Vol. 1, 11, III S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International)
12. Organic Chemistry, F.A. Carey, McGraw Hill, Inc.
13. Introduction to Organic Chemistry. Streitwieser, Heathcock and Kosover. Macmillan.
14. Physical Chemistry, G.M. Barrow. International Student Edition, McGraw Hill.
15. Basic Programming with Application, V.K. Jain. Tata McGraw Hill.
16. Computers and Common Sense. R. Hunt and Shelly, Prentice Hall.
17. University General Chemistry, C.N.R. Rao, Macmillan.
18. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
19. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
20. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern Ltd.

**Books Suggested (Laboratory Courses)**

1. Vogel's Qualitative inorganic Analysis, revised, Svehla, Orient Longman.
2. Vogel's Textbook of Quantitative Inorganic Analysis (revised), J. Bassett, R.C. DeneOy, G.H. Jeffery and J. Mendham. ELBS.
3. Standard Methods of Chemical Analysis. W.W. Scott. The Technical Press.
4. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge.
5. Handbook of preparative Inorganic Chemistry. Vol I & II, Brauer, Academic Press.
6. Inorganic Synthesis, McGraw Hill.
7. Experimental Organic Vol I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
8. Laboratory manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
9. Vogel's Textbook of Practical Organic Chemistry, R.S. Furniss, Hannaford, V. Rogers, P.V.G. Smith and A.R. Tatchell, ELBS.
10. Experiments in General Chemistry, C.N.R. Rao and U.C. Agarwal, East-West Press.
11. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill
12. Advanced Practical Physical Chemistry, J.I.3. Yadav, Goel Publishing House.
13. Advanced Experimental Chemistry, Vol. 1-Physical, J.N. Gurtii and R. Kapoor, S. Chand & Co.
14. Selected Experiments in Physical Chemistry, N.G. Mukerjee. J.N. Ghjose & Sons.
15. Experiments in Physical Chemistry, J.C. Ghosh, Bharati Bhavan.

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### 3. MATHEMATICS

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

**Examination:**

	Min.Pass Marks		Max. Marks
Scheme:	Science – 54		150
	Arts – 72		200
		<b>Duration</b>	<b>Max.Marks</b>
Paper – I	Discrete Mathematics	3 hrs.	50 (Science) 66 (Arts)
Paper – II	Calculus	3 hrs.	50 (Science) 66 (Arts)
Paper – III	Three Dimensional Geometry and Optimization Theory	Theory : 2½ hrs.	32 (Science) 44 (Arts)
		Practical: 2 hrs.	18 (Science) 24 (Arts)

**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.

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**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.

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

Discrete numeric functions and Generating functions. Recurrence relations and Recursive Algorithms – Linear Recurrence relations with constant coefficients. Homogeneous solutions. Particular solution. Total solution. Solution by the method of generating functions.

**Unit 4:** Graphs – Basic terminology, Multigraphs, Weighted graphs, Paths and circuits, Shortest paths, Eulerian paths and Circuits. Travelling Salesman problem. Union, Join, Product and composition of graphs. Planar graphs and Geometric dual graphs.

**Unit 5:** Trees – Properties, Spanning tree, Binary and Rooted tree.

Digraphs – Simple digraph, Asymmetric digraphs, Symmetric digraphs and complete digraphs. Digraph and Binary relations. Matrix representation of graphs and digraphs.

**Paper- II: Calculus****Teaching : 3 Hours per Week****Duration of Examination : 3 Hours****Max. Marks: 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  $\sin x$ ,  $\cos x$ ,  $e^x$ ,  $\log_e(1+x)$ ,  $(1+x)^n$ .

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

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

**Unit 4:** 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.

**Unit 4:** The linear programming problem. Basic solution. Some basic properties and theorems on convex sets. Fundamental theorem of L.P.P. Theory of simplex method only. Duality. Fundamental theorem of duality, properties and elementary theorems on duality only.

**Practical:**

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

**Examination:****Duration: 2 Hours**

Scheme	Science	Arts
Max.Marks	18	24
Min.Pass Marks	06	08
<b>Distribution of Marks:</b>		
<b>Two Practicals one from each group</b>		
6 Marks each	= 12 Marks (08 Marks each)	16
Practical Record	= 03 Marks	04
Viva-voce	= 03 Marks	04
Total Marks	= 18 Marks	<u>24</u>

**Group A:** Modelling of industrial and engineering problems in to mathematical LPP and its dual and their solution by Simplex Method.

**Group B:** Modelling of industrial and engineering problems into

(i) Assignment Problems and (ii) Balanced and unbalanced Transportation Problems. and their solution

**Note:**

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

## 4 ZOOLOGY

**Scheme:**

Max. Marks : 100

Min. Pass Marks : 36

Paper-I	3 hrs. duration	33 Marks
Paper-II	3 hrs. duration	33 Marks
Paper-III	3 hrs. duration	34 Marks
Practical	4 hrs. duration	50 Marks

Note : 1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No.1 containing 9 (Paper-I & II)/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**

- (1) Zoogeographical distribution: principal zoogeographical regions of the World with special reference to their mammalian fauna.
- (2) Biodiversity of Fauna of India and World.
- (3) Adaptation to their modes of life and environment.
- (4) Conservation measures of biodiversity where required.
- (5) Continental drift.

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**Section-B**

**Diversity of Animals**

1. General principles of taxonomy; concepts of the five kingdom scheme.
2. Concept of Protozoa, Metazoa and levels of organization.
3. Taxonomy and basis of classification of Non-chordata and Chordata: symmetry, coelom, segmentation and embryogeny.
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*, *Labeo*, 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.
3. Variations, Isolation and Adaptations.
4. Paleontology: fossils, geological divisions of the earth's crust, imperfection of the geological record.
5. Study of extinct forms: Dinosaurs, Archeopteryx.

**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.

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- ii. RNA structure and type (mRNA, rRNA and tRNA) 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<sub>1</sub>, G<sub>2</sub> 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 synaptonemal 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

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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***

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

***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)

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**PRACTICAL-ZOOLOGY**

Min. Marks: 18

4 hrs./Week

Max. Marks: 50

**I. Microscopic Technique:**

1. Organization and working of optical microscopes: dissecting and compound microscope.
2. General methods of microscopical permanent preparations; narcotization; fixing and preservation; washing; staining; destaining; dehydration; clearing and mounting; general idea of composition, preparation and use of:
  - (i) Fixative: Formaline, Bouin's fluid.
  - (ii) Stain: Borax carmine, aceto-carmine, aceto-orcein, haematoxylin-eosin.
  - (iii) Common reagents: Normal saline, Ringer's solution, acid water, acid alcohol, and Mayer's albumin.
3. Collection and culture method:
  - (i) Collection of animals from their natural habitat during field trips, e.g., *Amoeba*, *Paramecium*, *Euglena*, *Planaria*, *Earthworm*, *Daphnia*, *Cyclops*, etc.
  - (ii) Culture of *Paramecium* in the laboratory and study of its structure, life-processes and behaviour in the living state.
4. Microscopic slides and specimens :

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

**Porifera:** *Leucosolenia*, *TS. Sycon*, Spicules, Spongin fibres, Gemmules.

**Coelenterata:** *Millepora*, *Physalia*, *Vellela*, *Aurelia*, *Alcyonium*, *Gorgonia*, *Penatula*, Sea anemone, Stone corals, *Obelia* colony and medusa.

**Ctenophora :** Any ctenophore

**II. Anatomy**

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

**Cockroach :** External features, appendages (wing and leg), mouth parts alimentary canal, reproductive and nervous system and salivary gland.

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**III. Permanent Preparation and Study of the following :**

*Paramecium*, *Euglena*, Foraminiferous shells, Sponge spicules, spongin fibres, gemmule, *Hydra*, *Obelia* colony and medusa; Parapodium of *Nereis* and *Heteronereis*, Ovary, Nephridia, Nerve ring and setae of earthworm. Salivary glands and trachea of cockroach.

**IV. 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 *Chironomus* or *Drosophila* larva.
4. Study of cell permeability using mammalian R.B.C.

**V. Exercise 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, salivary gland chromosomes.

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

**V. Developmental Biology**

1. Study of development of frog/toad with the help of :
  - i. Preserved materials available: eggs, cleavage, blastula, gastrula, neurula, tail-bud, hatching, mature tadpole larvae, metamorphic stages, toadlet/froglet.
  - ii. Histological slides: cleavage, blastula, gastrula, neurula and tailbud stage.
2. Study of development of chick with the help of whole mounts
  - (i) 18 hrs, 21 hrs, 24 hrs, 33 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.

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

**Scheme of Practical Examination and Distribution of marks**

Time 4 : hrs.	Min Pass Marks: 28	Max. Marks: 50
	Regular	Ex. Students.
1. Dissection	7	9
2. Permanent Preparation	5	7
3. Exercise in Cell Biology and Genetics	4+4	4+4
4. Exercise in Developmental Biology	4	5
5. Identification and Comments on Spots (1 to 8)	16	16
6. Viva Voce	5	5
7. Class Record	5	=
<b>Total</b>	<b>50</b>	<b>50</b>

**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 :**

1. Genetics : Ahluwalia, K.B. Wiley Eastern Ltd. New Delhi.
2. Genetics : Altenberg, E. Oxford and IBH, New Delhi.
3. An Introduction to Embryology. Balinsky, B.I. : W.B. Saunders, Philadelphia.
4. Development Biology. Berrill, N.J. McGraw Hill book Company, New York.
5. Principles of Development. Lewis Wolpert, Oxford university Press, Oxford.

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*Syllabus : B.Sc. Part-I*

6. Cell Biology. De Robertis, E.D.P. : Nowinski, W. W. and Saez, F. A. W.B. Saunders, Philadelphia (Saunders International Student Edition Toppan Co. Ltd. Tokyo).
7. Cytology and Genetics. Dyansagar, C.R. Tata McGraw Hill Publ. Co. New Delhi.
8. Cell and Molecular Biology. Gerald karp, John Wiley & Sons, New York.
9. Principles of Genetics : Gardner, E.J. : Wiley Eastern, New Delhi.
10. Principles of Animal Developmental Biology : Goyal S.C. : Himalaya Publishing Co., Mumbai.
11. The Science of Genetics : Helter. W.M. and Yost. M. T. Prentice Hall, India, New Delhi.
12. Fundamentals of Comparative Embryology : Huettnner, A.F. Millan, New York.
13. Elements of Chordate Embryology Jain P.C. Visual Publication, Delhi.
14. Cell Biology and Genetics. Bhatia, A.B., Kohli, S. Jain, S. and Ramesh Book Depot. Jaipur.
15. Chordate Zoology. Jordan E.L. : S.Chand and Co. New Delhi.
16. Cell Biology. Rastogi S.C. : Tata McGraw Hill Publ. Co. New Delhi.
17. Invertebrate Diversity of Life : Rounds H.D. : Reinhold, New York (Indian reprinting : Affiliated East West Press, New Delhi.)
18. Principles of Taxonomy : Simpson, G.G. Oxford and IBH Publ. Co., New Delhi.
19. General Zoology : Storer, T.I. and Using, ex. K.L. : Tata McGraw Hill Publishing Co., New Delhi.
20. Chordate Embryology : Verma. P .S. Agrawal. V.K. and Tyagi, B.S., S. Chand and Co. New Delhi.
21. Cytology : Verma, P.S. and Agrawal V.K. : S.Chand and Co. New Delhi.
22. Genetics : Verma, P.S. and Agrawal V.K. : S.Chand and Co., New Delhi.
23. Genetics : Winchester, A.M. : Oxford and IBH Publ. New Delhi.
24. Development Biology, Veer Bala Rastogi and M.S. Jayaraj, Kedar Nath Ramnath, Meerut.
25. Cell and Molecular Biology. Sheeler P. and Bianchi, D.E., John Wiley and Sons, Inc, New York.

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26. Diversity of Animals and Evolution. Kotpal R.N. and Singh H.S.  
Rastogi Publication, Meexut.
27. An Inteoduction to Genetic Analysis, Griffith, A.J., Miller. J.H.,  
Suzuki, D.T., Lewontin, R.C. and Gelbrat W.M., W.H. Freeman  
and Company, New York.
28. Principles of Genetics. Basu, S.B. and Hossain, M., Books and  
Allied (P) Ltd., Kolkata.

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**5 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	4 hrs. duration

**Max Marks: 100**

**Max. Marks 33**

**Max. Marks 33**

**Max. Marks 34**

**Max. Marks 50**

**3 hours**

**4 hours**

Duration of examination of each theory paper-  
Duration of examination of practicals-

**Note:**

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 (short answer type) will have 20 questions covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

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Paper-I  
Cell Biology, Genetics and Plant Breeding  
(2 hrs /week)  
Unit-1

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

Unit-2

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

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

**Extra nuclear genome:** mitochondrial and Chloroplast genome, plasmids;

**Chromosomal aberrations:** Deletion, duplication, translocation, inversion, 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 coiling in snails, Kappa particles in *Paramecium*, Multiple allelism : ABO blood groups in men

Unit-4

**Plant Breeding :** Introduction and objectives of plant breeding; general methods of plant breeding- in self-pollinated, cross-pollinated and vegetatively propagated crop plants :Introduction and acclimatization, selections, hybridizations, hybrid vigour and inbreeding depression. Role of mutation and polyploidy in plant breeding. Famous Indian and international plant breeders and their contribution. National and International agricultural research institutes.

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

Suggested Laboratory Exercises:

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

Suggested Readings:

- Choudhary, H.K. (1989). Elementary Principles of Plant Breeding, Oxford and IBM Publishing Co., New Delhi.
- Gupta, P.K. (2009). Cytology, Genetics, Evolution. and Plant Breeding, Rastogi Publications, Meerut.
- Miglani, GS. (2000). Advanced Genetics, Narosa Publishing House, New Delhi.
- Russel, PI. (1998). Genetics. The Benejamins/Cummings Publishikng Co., Inc. U.S.A.
- Shukla, R.S. and Chandel, P.S. (2000). Cytogenetics, Evolution and Plant Breeding, S. Chand & Co. Ltd., New Delhi.
- Singh, R.B. (1999). Text Book of Plant Breeding, Kalyani Publishers, Ludhiana .
- Dnyansagar, VR. (1986). Cytology and Genetics, Tata McGraw-Hill Pub. Co. Ltd. New Delhi.
- Roy, SC. and De, KK. (1999). Cell Biology, New Central Book Agency (P) Ltd. Calcutta.
- Verma, PS. and Agarwal, VK. (2012). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Co. Ltd. New Delhi.

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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 biofilms.*

**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:

*Albugo* 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; *Agaricus*; *Alternaria* and early blight of potato.

**Suggested Laboratory Exercises:**

1. Study of bacteria using curd or any other suitable material, Gram's staining of bacteria.
2. Study of Mycoplasma, TMV, Poxvirus, bacteriophage (photographs/ 3-D models)
3. Study of symptoms of plant diseases—Downy mildew of Bajra, Green ear of bajra, Powdery mildew, mosaic of bhindi.

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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; *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:

- Alexopoulos, C.J. and Mims, C.W.: Introductory Mycology, John Wiley and Sons, New York, 2000
- Dube, H.C. :Fungi, Rastogi Publication, Meerut, 1989.
- Sarabhai, R.C. and Saxena, R.C.: A text book of Botany, Rastogi Publication, Meerut, 1990.
- Sharma, O.P.: Fungi, Today and Tomorrow Printers and Publishers, New Delhi, 2000.
- Vashihsta, B.R. Botany for Degree Students -Fungi, S. Chand & Co., New Delhi, 2001.
- Bilgrami, K.S. and Dube, H.C.: A text book of Modern Plant Pathology, Vikas Publications, New Delhi 2000.
- Biswas, S.B. and Biswas, A.: An Introduction to Viruses, Vikas Publications, New Delhi. 2000.
- Clifton, A.: Introduction of Bacteria, McGraw Hill Co. Ltd., New York, 1985.
- Madahar, C.L.: Introduction of Plants Virus, S. Chand and Co., New Delhi, 1978.
- Palzar M.J Jr. Chan, E.C.S. and Krieg, N.R. : Microbiology, McGraw Hill Edu.. Pvt. ltd., London 2001.
- Purohit, S.S.: Microbiology, Agro. Bot. Publication, Jodhpur 2002.
- Sharma, P. D.: Microbiology and Pathology, Rastogi Publication. Meerut, 2003.
- Singh, V. and Srivastava V. : Introduction of Bacteria, Vikas Publication, 1998.
- Cappuccino, J. and Sherman, N.: Microbiology: A Laboratory Manual (10<sup>th</sup>Ed.), Benjamin Cummings, 2013.
- Aneja, K.R.: Experiments in Microbiology, Plant Pathology and Biotechnology New Age International (P) Ltd., Publishers, New Delhi 2003.
- Mehrotra, R.S. and Aggarwal, Ashok: Plant pathology, Tata McGraw-Hill Education, 2003.

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

Unit-1

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

Unit-2

Type Studies

Cyanophyceae - *Oscillatoria*, *Nostoc*

Chlorophyceae - *Volvox*, *Chara*.

Xanthophyceae - *Vaucheria*.

Phaeophyceae - *Ectocarpus*.

Rhodophyceae - *Polysiphonia*.

Unit-3

General characters, Origin, and evolution of Bryophyta. Classification (Eichler); Habitat, Range of thallus structure, Reproduction (Vegetative and Sexual); Alternation of generations; Economic importance.


Type Studies: Hepaticopsida - *Riccia*, *Marchantia*

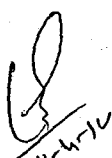
Unit-4

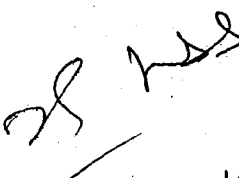
Type Studies: Anthocerotopsida - *Anthoceros*; Bryopsida - *Funaria*

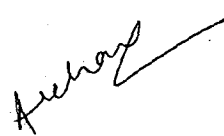
Lichens - General characters, habitat, Structure, reproduction and economic and Ecological importance of lichens.


**Suggested Laboratory Exercises**

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

  
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**Suggested Readings**

Bold, H.C. Alexopoulos, C.J. and Delevoryas, T.: Morphology of Plant and Fungi (4th Ed.) Harper & Foul Co., New Work, 1980.

Ghemawat, M.S., Kapoor, J.N. and Narayan, H.S.: A text book of Algae, Ramesh Book Depot, Jaipur, 1976.

Gilbart, M.Smith: Crypogamic Botany, Vol. I & II (2nd Ed.) Tata McGraw Hill. Publishing Co., Ltd., New Delhi, 1985.

Kumar, H.D.: Introductory Phycology, Affiliated East—West Press, Ltd. New York, 1988.

Puri, P.: Bryophytes, Atmaram & Sons. Delhi, Lucknow, 1985.

Sarabhai, R.C. and Saxena, R.C.: A text book of Botany. Vol I & II, Ratan Prakashan Mandir, Meerut, 1980.

Singh, V., Pande, P.C. and Jain, D.K.: A text book of Botany, Rastogi, & Co., Meerut, 2001.

Vashista, B.R.: Botany for Degree Students (Algae, Bryophytes) S. Chand & Co., New Delhi, 2002.

Handwritten signatures and initials:   
- Top left: A stylized signature with '11-12-14' written below it.   
- Top center: A signature that appears to be 'R'.   
- Middle left: The initials 'UP'.   
- Middle center: A signature that appears to be 'R.S.'.   
- Bottom center: A long, flowing signature that appears to be 'Arjun'.   
- Middle right: A signature that appears to be 'L'.

BOTANY PRACTICAL EXAMINATION B. Sc PART-I

SKELETON PAPER

M.M. 50

TIME: 4 Hours

S.No.	Practical	Regular	Ex NC
1(a)	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.	5	5.6
1(b)	Comment and solve the problem allotted to you along with suitable reasons.	4.5	5.8
2	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.	5	5.6
3	Make suitable preparation of the reproductive structure of material "C". Draw labelled diagrams, Identify giving reasons.	5	5.6
4	Make suitable stained preparation of material 'C' (vegetative/reproductive). Draw labelled diagrams. Identify giving reasons.	5	5.5
5	One Microbiology experiment for comments. Or Gram's staining.	4.5	5
6	Comment upon spots (1-6) (1-5)	12.10	12.15
7	Viva-Voce	5	5
8	Practical record	5	-
<b>TOTAL</b>		<b>50</b>	<b>50</b>

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# 6. GEOLOGY

**Scheme:  
Theory**

**Max. Marks 100**

**Min. Pass Marks: 36**

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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

1. Allen, P: 1997 : Earth Surface Processes. Blackwell Scientific.
2. Scott, W.B. : Introduction to Geology, Vol. 1., McMillan.
3. Holmes, A.: Physical Geology. Thomas Nelson & Sons, London.
4. Datta, A.K. : Physical Geology.

### 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 hexatetrahedral class; Tetragonal- Zircon type or ditetragonal bipyramidal class; Hexagonal- Beryl type or

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

### Section-B

Definition of mineral: rock forming, ore minerals and gemstones. Physical properties of minerals and their identification. Formation of minerals, elementary idea about experimental work on mineral stability, Isomorphism, polymorphism, pseudomorphism and solid solution.

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, Andalustite, 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.



**Syllabus : B.Sc. Part-I**

Orthorhombic system- Barite, Olivine, Staurolite, Sulphur.

Monoclinic system- Gypsum, Orthoclase, Augite, Hornblende, Epidote.

Triclinic system- Axinite, albite, Study of simple twinning in crystals.

Sp. Gr. determination by Minerals Walkers steel yard balance.

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, talc, chlorite, serpentine, kaoline, sphene, apatite, garnet, wollastonite and augite.

Study of petrological microscope and its parts inclusive of polarizer and their function, observation of Becke line and relative refractive index. Study of pleochroism in biotite, hornblende, tourmaline, hypersthene, andalusite and staurolite; study of twinkling in calcite.

**Books Recommended:**

1. Read, H.H. : Elements of Mineralogy, John Wiley & Co. London.
2. Mason, Berry : Mineralogy : Asian Publication.
3. Font, W.E. : Dana's Text book of Mineralogy. John Wiley and Sons, New York.
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.

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Elasticity, AR, MR, TR. Factors Affecting Price Elasticity of Demand. Substitute and Complementary Goods, Concept of Consumer's Surplus.

#### Section – B

Production Function: Law of Variable Proportions. Three Stages of Production Function. Iso- Quant and Iso-Cost, Optimum Factor Combination. Law of Returns and Returns to Scale. Theory of Cost-Short run and long-run Cost Curves. Different Market Structures: Perfect Competition: Determination of Price and Output in the Short and long run. Monopoly: Determination of Price and Output in the Short and long run. Discriminating Monopoly. Monopolistic Competition-Short and long run Equilibrium of the Firm. Excess Capacity.

#### Section – C

Marginal Productivity Theory of Distribution Factor Pricing under Perfect and Imperfect Competition in labour Market. Ricardian Theory of Rent. Modern Theory of Rent and Quasi-Rent. Classical Theory of Interest, liquidity Preference Theory of Interest. Risk and Uncertainty Theory of Profit.

#### Books Recommended:

1. Hal R. Varian: Intermediate Microeconomics WW Norton and Co. Fifth Edition.
2. D. Salvator: Micro Economics, Harper-Collins, 1991.
3. H. L. Ahuja: Advanced Economic Theory, S. Chand and Company, New Delhi.
4. एच. एल. आहूजा: उच्चतर आर्थिक सिद्धान्त, एस. चांद एण्ड कम्पनी, नई दिल्ली।
5. लक्ष्मीनारायण नाथूरामका: व्यक्ति अर्थशास्त्र, कॉलेज बुक हाउस, जयपुर।

#### Reference Books:

1. R. H. Leftwitch: Price System and Resource Allocation, Holt, Reinhart and Winston; 3rd Edition (Hindi & English). (Hindi & English).
2. Samuelson and Nordhaus: Economics, McGraw-Hill/Irwin; 19th edition.
3. J. P. Gould and C.E. Ferguson: Micro Economic Theory Revised by J.P. Gould and E.P. Lazer, All India Traveller Book Seller, Delhi.

Alpans

## Paper – II Indian Economy

### Section – A

Basic Characteristics of Indian Economy, Natural Resources: Land, Minerals, Water, Forests and Power Resource. Population: Size and Growth, Labour Force, Occupational Distribution, and Population Policy, Human Resource Development Indicators (i.e., literacy, Health, Nutrition etc.)

Agriculture: Role and Importance of Agriculture in the Indian Economy; Land Reforms, Irrigation and Irrigational Policy, Use of Fertilizers and Fertilizer Policy; Institutional Credit for Agriculture, Marketing of Agricultural Goods – Support Price and Public Distribution System.

### Section – B

Industry: Role, Strategy and Challenges, SMEs, Public and Private Sector Industries, Industrial Finance – Role of Financial Institutions and Commercial Banks; Industrial Policy – Pre and Post Reform Period, Recent Industrial Policy, New Economic Policy and Disinvestment of Public Sector Undertaking.

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

### Section – C

Planning in India: Objectives of Five Year Plans, Review of Economic Progress Under the Plans, A Comprehensive Study of the latest Five Year Plan.

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.
2. S. K. Mishra and V. K. Puri: Indian Economy, Himalaya Publishing House, New Delhi.
3. A. N. Agarwal: Indian Economy, Vikas Publishing Co., New Delhi.
4. Laxminarayan Nathuramka: Bhartiya Arthvyavastha, College Book House, Jaipur.
5. Government of India: Economic Survey (Hindi & English).
6. Government of India: Five Year Plan (Latest).

*Alpans*  
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Scheme of Examination

Faculty	Min. Pass Marks	Max. Marks
Arts/Social Science	72	200
Science	54	150
Paper I	Physical Geography	Arts 75 Science 50
Paper II	Geography of Rajasthan	Arts 75 Science 50
Practical	18	Arts 50 Science 50

Notes

- 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.
- There will be a common paper for Arts and Science.
- 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.
  - 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.
  - Part (b) will have 10 short answer questions carrying 10% marks of the maximum marks and candidates shall attempt any five items.
- Remaining 9 questions carrying equal marks will be set with three questions from each section of the syllabus.
- Candidate will attempt 5 questions in all including question No. 1 selecting at least one question from each section.
- Practical examination will be conducted by the board of examiners.
- The candidate will have to pass in theory and practical separately.
- The non-collegiate candidates will have to attend a practical training camp of 48 hours at a college affiliated to the University of Rajasthan, Jaipur notified by the University from time to time in which Geography subject is taught on payment of fee fixed by the University. The candidates appearing at examination from any examination centre located in Jaipur City will attend the practical camp at the University Post Graduate Department on payment of fee fixed by the University. The candidate will procure Certificate of successful completion of practical training camp from the College/Department of Geography and produce the same at the time of practical examinations.

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# SYLLABUS

## Paper I: Physical Geography

### Section A

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

### Section B

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

### Section C

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

### Recommended Readings:

- चौहान, वी.एस. व गौतम, ए. 2005, भौतिक भूगोल (जीवमण्डल सहित)। रस्तोगी पब्लिकेशन्स, मेरठ।  
दयाल, पी. 2012, भौतिक भूगोल। राजेश पब्लिकेशन्स, नई दिल्ली।  
गौतम, अल्का, 2012 : भौतिक भूगोल। रस्तोगी पब्लिकेशन, मेरठ।  
Husain, M. 2001, Fundamentals of Physical Geography. Rawat Publication, Jaipur  
Hess, D. 2012: Physical Geography : A Landscape Appreciation. PHI Learning Private Limited, New Delhi, Mcknight's Tevtt Edition.  
Khullar, D.R. 2012: Physical Geography. Kalyani Publishers, New Delhi  
सिंह, सविन्द्र, 2005 : भू-आकृति विज्ञान। तारा पब्लिकेशन, वाराणसी।  
सिंह, सविन्द्र, 2011: भौतिक भूगोल का स्वरूप। प्रयाग पुस्तक भवन, इलाहाबाद।  
शर्मा, एच.एस., शर्मा, एम. एल. एण्ड मिश्रा, आर.एन. 2008: भौतिक भूगोल। पंचशील प्रकाशन जयपुर।  
Sharma, R.C. and Vatal M. 1999: Oceanography for Geographers. Chaitanya Publishing House, Allahabad.  
Strahler, A.N. and Strahler, A.H. 1989: Elements of Physical Geography. John Wiley & Sons, New York.  
Tikka, R.N. 1999: Physical Geography. Kedar Nath Ram Nath & C., Meerut.

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## 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 bhil, meena and garasia.

Settlement pattern: types of settlements, building materials and house types in Rajasthan with examples, factors affecting settlement.

### Recommended Readings:

Bhalla, L.R. 1996-97: Geography of Rajasthan. Kuldeep Publications, Jaipur.

Gujar, R.K 1992: Geography of Indira Gandhi Canal. Rajasthan Hindi Granth Academy.

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

Mishra, V.C. 1967: Geography of Rajasthan. National book trust of India, New Delhi.

नाथुरामका, एल.एन., 2012.13: राजस्थान की अर्थव्यवस्था। कॉलेज बुक हाउस, जयपुर।

साईवाल, स्नेह 2012: राजस्थान का भूगोल। कॉलेज बुक हाउस, जयपुर।

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

Attar Singh. 1992: Flood Prone Areas of India. Aviskar Publishers Jaipur

Sharma H.S. and M.L. Sharma 2014: Geography of Rajasthan. Panchcil Puplicher, Jaipur.

सक्सेना, एच.एम., 2012: राजस्थान का भूगोल। राजस्थान हिन्दी ग्रन्थ अकादमी, जयपुर।

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## Practicals

### Scheme of Examination

Min. Pass Marks: 18

Max. Marks: 50

	Bifurcation of Marks	Time
Written test	24	3 hrs.
Field Survey and Viva voce	10+04	2 <sup>1</sup> / <sub>2</sub> hrs.
Record and Viva voce	08+04	

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:

चौहान, पी.आर. 2008: प्रयोगात्मक भूगोल। वसुन्धरा प्रकाशन, गोरखपुर।

Singh, L.R. 2006: Practical Geography. Prayag Pustak Publisher, Allahabad U.P.

Monkhouse, F. J. and Wilkinson, F.J. 1985: Maps and Diagrams. Methuen, London.

Singh, R.L. and Singh Rana P.B. 1991: Elements of Practical Geography. Kalyani Publishers, New Delhi.

Sarkar, A. K. 1997: Practical Geography: A Systematic Approach. Orient Longman, Kolkata.

शर्मा, जे.पी. 2011: प्रयोगात्मक भूगोल की रूपरेखा। रस्तोगी पब्लिकेशन, मेरठ।

Venkatrameiah, C. 1997: A Text Book of Surveying. University Press, Hyderabad.

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## 9. STATISTICS

Scheme:	Duration	Max Marks		Min. Pass Marks	
		Sc.	Arts	Sc.	Arts
Paper- I	3 hrs.	50	65	18	24
Paper-II	3 hrs.	50	65	18	24
Practical	3 hrs.	50	70	18	25
	Total	150	200	54	72

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 I. Important concepts of Probability:** Random experiment: Trial, Events and their types. Definitions of probability. Sample point and sample space. Axiomatic Approach of Probability and its properties. Addition and Multiplication theorems of probability. Conditional Probability. Bayes Theorem and its Applications (Simple Problems Only). 18 hours

**Unit II. Random Variable:** Definition with illustrations, Types of Random Variables. Probability Mass Function, Probability Density Function. Distribution Function and its properties. Joint Probability Distribution, Marginal and Conditional Probability Distributions and density functions (Continuous and Discrete Cases). Chebychev's Inequality and its applications. 18 hours

**Unit III. Mathematical Expectation:** Expectation of a random Variable and its simple properties. Addition and Multiplication Theorems of Expectation. Conditional Expectation. Definition of Variance and Covariance and properties. Raw and Central Moments, Moment Generating Function and their properties. 18 hours

**Unit IV. Univariate Discrete Distributions and their properties:** Bernoulli Distribution, Binomial Distribution, Poisson Distribution, Geometric Distribution. Idea of Hyper-geometric and Negative Binomial Distribution. 18 hours

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**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**

1. Bhatt, B. R. Srivenkatramana, T and Rao Madhava K.S. (1997) : Statistics : A Beginner's Text, Vol. II, New Age International (P) Ltd., New Delhi.
2. Goon A.N., Gupta M.K., Das Gupta B. (1991) : Fundamentals of Statistics, Vol. I & II, World Press, Calcutta.
3. Kapoor V.K. & Gupta S.C. : Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.
4. Mood A.M., Graybill F.A. and Boes D.C. (1974) : Introduction to the Theory of Statistic, McGraw Hill.

**Additional References**

1. Hoel P.F. (1971) : Introduction to Mathematical Statistics, Asia Publishing House.
2. David, S (1996) : Elementary Probability, Oxford Press.
3. Cooke, Cramer and Clarke : Basic Statistical Computing, Chapman and Hall.
4. Meyer P.L (1970) : Introductory Probability and Statistical Applications. Addison Wesley

**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 cummulative. Graphical preentation 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). **18 hours**

**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. **18 hours**

**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. **18 hours**

**Unit V. Finite Differences :** Operators  $E, \Delta, \nabla$ , their relationship and properties, factorial notation. Difference table and fundamental theorem of finite differences. Estimation of one and two missing terms. meaning of interpolation and extrapolation. Newton's forward and backward formulae for equal intervals, Lagrange's Formula and numerical problems. **18 hours**

### References

1. Bhatt B.R. Srivenkatramanna T and Rao Madhava K.S. (1997) : Statistics : A Beginner's Text, Vol. II, New Age International (P) Ltd., New Delhi.
2. Croxton F.E., Cowden D.J. and Kelin S (1973) : Applied General Statistics, Prentice Hall of India, New Delhi.
3. Goon A.M., Gupta M.K., Das Gupta B. (1991) : Fundamentals of Statistics, Vol. I & II, World Press, Calcutta.
4. Kapoor V.K. & Gupta S.C. : Fundamentals of Mathematical Statistics, Sultan Chand and Sons, N. Delhi.
5. Gupta S.P. : Statistical Methods, Sultan Chand and Sons, N. Delhi.
6. Elhance D.N. : Fundamentals of Statistics

7. Nagar K.N. : Sankhyaki Ke Mool Tatva (Hindi), Minakshi Prakashan Mandir, Merrut.
8. Johnson R.A. : Miller and Freund's Probability and Statistics for Engineers. PHI.
9. Saxena H.C. : Finite Differences and Numerical Analysis. S. Chand & Co.

#### **Additional References**

1. Anderson T.W. and Sclove S.L. (1978) : An Introduction to the Statistical Analysis of Data. Houghton Mifflin Co.
2. Mood A.M. Graybill F.A. and Boes D.C. (1974) : Introduction to the Theory of Statistics, McGraw Hill.
3. Spiegel M.R. (1967) : Theory & Problems of Statistics, Schaum's Publishing Series.

#### **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.
3. Computation for marginal and Conditional 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.
9. Computation of Spearman's rank correlation.
10. Construction of Difference table.
11. Interpolation Problems based on Newton and Langrange's Formulae.

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**10. APPLIED STATISTICS**

Scheme:	Duration	Max Marks		Min. Pass Marks	
		Sc.	Arts	Sc.	Arts
Paper- I	3 hrs.	50	65	18	24
Paper-II	3 hrs.	50	65	18	24
Paper-III (Practical)	3 hrs.	50	70	18	25
Total		150	200	54	72

**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 I:** Functional relationship between two variables, Polynomials, exponential logarithmic & Binomial functions and their expansions. Infinitesimal quantity. Idea of permutation and combination. Notion of limits. Rules for finding limits. Continuity, Differential Coefficient and its physical interpretation as a rate measure. Standard results for differential coefficients of  $x^n$ ,  $e^x$ ,  $\log x$  etc. (without proof). Rules for differentiation of sum, difference, product and quotient and function of a function (without proof). 18 hours

**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

**Unit III. Important Concepts of Probability:** Random Experiment, Trial, Events and their types. Classical and Statistical definitions of Probability. Sample point and sample space. Axiomatic Approach to Probability and its properties. Addition and Multiplication theorems of probability. Conditional Probability. Baye's Theorem and its Applications (Simple Problems only). Chebychev's Inequality and its applications. 18 hours

**Unit IV. Random Variable:** Probability Mass Function, Probability Density Function. Distribution Functions, Joint Probability Distribution, Marginal and Conditional Probability distribution (Continuous and Discrete case). 18 hours

**Unit V. Mathematical Expectation :** Expectation of a random Variable and its properties. Addition and Multiplication Theorems of Expectation. Conditional Expectation. Definition of Variance and Covariance, Moments, Skewness and Kurtosis. Moment Generating Functions and their simple properties. Definitions of Binomial Distribution, Poisson Distribution, Normal Distribution, Gamma Distribution, Beta Distribution & their mean, Variance & mfg. **18 hours**

### References

1. Bhatt B.R. Srivenkatramanna T and Rao Madhava K.S. (1997) : Statistics : A Beginner's Text, Vol. II, New Age International (P) Ltd.
2. Goon A.M., Gupta M.K., Das Gupta B. (1991) : Fundamentals of Statistics, Vol. I & II, World Press, Kolkata.
3. Kapoor V.K. & Gupta S.C. : Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.
4. Mood A.M. Graybill F.A. Boes D.C. (1974) : Introduction to the theory of statistics, McGraw Hill.

### Additional References :

1. Hoel P.G. (1971). : An Introduction to Mathematical Statistics, Asia Publishing House.
2. David S. (1996) Elementary Probability., Oxford Press.
3. Cooke, Cramer and Clarke : Basic Statistical Computing, Chapman and Hall.
4. Meyer P.L. (1970) : Introductory Probability and Statistical Applications. Addison Wesley.

### 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)

## II. PSYCHOLOGY

### SCHEME OF EXAMINATION :

Faculty	Max. Marks	Min. Passing Marks
Arts	200	72 (Th.54 Pr.18)
Science	150	54 (Th.36 Pr.18)

Paper	Nomenclature	Duration	Max. Marks	
			Arts	Science
I	Basic Psychological Processes	3 Hrs.	75	50
II	Social Psychology	3 Hrs.	75	50
III	Practicals	3 Hrs.	50	50

### 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			
Section	No. of Questions	Marks	Total
A	10	1.5	15
B	5 (Out of 7)	03	15
C	3 (with internal choice)	15	45
Total Marks			75

SCIENCE			
Section	No. of Questions	Marks	Total
A	10	01	10
B	5 (Out of 7)	02	10
C	3 (with internal choice)	10	30
Total Marks			50

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.
2. Biological Basis of Behaviour: The Nervous System-Structure and Functions of Neuron. Structure and Functions of Central Nervous System and Peripheral Nervous System
3. Sensation and Perception: Sensation- Meaning, Sensory Receptors, Sensory Thresholds, Habituation and Sensory Adaptation. Perception- Meaning, Constancies- Size, Shape and Brightness, Gestalt Principles, Factors Influencing Perception.

**Section-B**

4. Learning : Definition and Theories- Classical Conditioning, Operant Conditioning, Cognitive Learning, Observational Learning.
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.
6. Motivation and Emotion : Motivation - Meaning and Approaches- Instinct, Drive-reduction, Arousal, Incentive and Humanistic. Emotion- Elements: Physiology, Expression and Subjective Experience; Theories- Cannon-Bard, James-Lange, Schachter-Singer, Opponent-Process.

**Section-C**

7. Cognition : Thinking- Mental Imagery and Concepts; Problem Solving- Trial and Error, Algorithms, Heuristics, Insight; Barriers to Problem Solving.
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:**

- Baron. R.A. (2003). Psychology. Allyn and Bacon. New Delhi Prentice Hall India.
- Gerrig, R.J. and Zimbardo, P.G. (2005). Psychology and Life. New Delhi. Pearson Education.
- Ciccarelli, S.K. and Meyer, G.E. (2006). Psychology. New Delhi, Pearson Education.
- सिंह. अरुणकुमार (2002). आधुनिक सामान्य मनोविज्ञान. नई दिल्ली, मोतीलाल बनारसीदास।



**Paper-II****Social Psychology****Section-A**

1. Introduction : Meaning, Nature, Scope and Goals of Social Psychology. Methods of Social Psychology; Experimental and Non-Experimental Methods.
2. Social Perception and Person Perception: Social Perception- Meaning and Nature; Perceptual Defense, Perceptual Accentuation and Subliminal Perception. Person Perception: Meaning and Nature, Role of Non-verbal Cues; Perceivers' Characteristics and Role of Ongoing Interaction.
3. Attitudes: Nature, Functions, Formation, Change and Measurement.

**Section-B**

4. Prejudice and Discrimination: Nature and Origin; Reduction of Prejudice and Discrimination.
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**

7. Communication: Meaning, Nature and Types : Verbal and Non-verbal; Barriers in Communication.
8. Pro-Social Behaviour: Personal, Situational and Socio-Cultural Determinants. Explaining Pro-Social Behaviour: Empathy, Altruism Hypothesis, Negative-State Relief Model, Emphatic-Joy Hypothesis and Genetic-Determinism Model.
9. Aggression and Social Problems: Aggression- Theories, Determinants, Prevention and Control; Social Problems –Meaning and Nature; Types of Social Problems - Poverty, Deprivation, Population Explosion, Economic Development; Solutions to Social Problems.

**Books Recommended:**

- Baron, R.A. and Byrne.D. (1998): Social Psychology, New Delhi, Prentice Hall.
- Myers, David G (1994): Exploring Social Psychology, New York; McGraw Hill
- अरुण कुमार सिंह (2002) : समाज मनोविज्ञान की रूपरेखा' मोतीलाल बनारसीदास, दिल्ली।

**Paper-III****Practicals**

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

## 12. ELECTRONICS

**Scheme :**

**Min.Pass Marks : 36**

**Max.Marks : 100**

**Part-I**

**3 hrs. duration**

**Max.Marks : 33**

**Part-II**

**3 hrs. duration**

**Max.Marks : 33**

**Part-III**

**3 hrs. duration**

**Max.Marks : 34**

**Practical**

**Min. Pass Marks : 18**

**5 hrs. duration**

**Max.Marks : 50**

### **Paper-I-Circuit Analysis**

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

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JAMPUR-302 004

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.

Measurement of high resistance by leakage method. Behaviour of series and parallel L-C-R Circuit with D.C. and A.C. sources. Phasor diagrams and concept of  $j$  operator.

### Unit-III

Network definitions. Constant voltage and constant current sources. Kirchhoff's law's and applications. Mesh and node circuit analysis.

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  $\alpha$ ,  $\beta$  and  $\gamma$  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 photo diodes, simple applications of photodiodes, photo voltaic effect, solar cell LED, photo-multiplier tubes.

**Reference Books :**

1. Hand book of electronics by Gupta and Kumar.
2. Applied electronics by G.K. Mithal.
3. Engineering electronics by Ryder.

**Paper-III Digital Computer Electronics**

**Note :** The paper will be divided into five units. Two question 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 alphanumeric displays (ASCII code).

**Unit-II**

**Logic Gates & Boolean Algebra**—Meaning of gate, OR, AND, NOT, NOR, NAND Gates and their truth table. Diode and TTL Logic, Laws of Boolean Algebra, DeMorgan's theorem, simplification of boolean expressions—sum of product method. Algebraic simplification. Exclusive or gate.

**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, Schmitt 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 Semi conductor 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 subtractor.
3. Verification of superposition theorem.
4. Verification of Norton's theorem.

(a)

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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.

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# ADDITIONAL OPTIONAL SUBJECTS

## 1. TEXTILE CRAFT

Scheme :	Duration	Max. Marks		Min. Pass.Marks	
		Arts/Com.	Sc.	Arts/Com.	Sc.
(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. Warp and Weft, Difference between warp and weft
2. Handloom, Parts of Handloom
3. Warp path on Handloom
4. Motion of Handloom(primary & secondary)
5. Elementary Weaves(Basic weaves): Plain, Twill, Satin & Sateen

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, plated & 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

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## 2. GARMENT PRODUCTION & EXPORT MANAGEMENT

B.A./BCom. Part	Paper no.	Nomenclature of the paper	Teaching hrs. per week	Max. marks	Min. pass marks	Duration examination (hrs.)
Theory	1	Understanding textile	3	60	22	3
	2	Business and <del>Industries</del> <i>accounting</i>	3	60	22	3
<i>and Garment</i> Practical	1	Clothing construction-1	6	80	28	4

### B.Sc. Part—I

Theory	1	Understanding textile	3	50	18	3
	2	Business and <del>Industries</del> <i>accounting</i>	3	50	18	3
<i>Garment Industries</i> Practical	1	Clothing construction-1	6	50	18	4

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B.COM./B.A./B.SC. PART - I ← EXAM 2015

**PAPER- I : UNDERSTANDING TEXTILE**

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

**HRS. 3**

**B.SC. M.M. 50**

**SECTION A: Textile Technology**

1. General properties of : Natural Fibers – cotton , wool , silk,  
Regenerated -Rayon , Acetate  
Synthetic Fibers – Nylon , Acrylic
2. Fibers to yarn : The basic processes involved in making  
Yarns including Blending , carding ,  
combing, mechanical and chemical spinning
3. Fabric construction : Weaving: plain ,Twill, & satin weave
4. Fabric Finishes : Elementary knowledge of calendaring ,  
mercerization and tentering

**SECTION B :Traditional Textile**

5. Knowledge of hand woven fabrics : Dacca muslin ,jamdani , chanderi,brocade  
baluchari, kashmiri shawls ,doria ,  
kanjivaram
6. Dyed Fabrics : Bandhej , ikat ,patola.
7. Printed Fabric : kalamkari , madhubani
8. Traditional embroideries of india :
  - (a).kashida of Kashmir
  - (b)kasuti of karnatka
  - (c)Manipuri
  - (d)chamba rumal

Convenor:  
1. (Rishi Gupta)  
Members: 2. Jeta (Dr. Gagan B. Khanna)  
3. (78) 212 mra (Rashmi Gupta)

- (e)kantha of bengal
- (f)Phulkari of Punjab
- (g)Chikankari of lucknow

**SECTION - C**

**SELECTION CRITERIA**

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

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

**References :**

- 1. corbman, textiles fibre to fabric
- 2. Phyllis g. tortora , understanding textile.
- 3. Naik , traditional embroidaries of india.
- 4. Bhatnager, paul, traditional Indian costumes and textiles.
- 5. Dhantyagi sushila ,fundamentals of textile and their care.
- 6. Brindra singh ,vastra vigyan avam paridhan.
- 7. Joseph marjoy L ,introductory textile science CBS college publishing.
- 8. Joseph marjoy L ,essentials of textiles .

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

**PAPER-II**

**BUSINESS AND GARMENT INDUSTRIES**

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

HRS.-3

B.SC.-M.M. 50

Convener.

1. zyn -AI (Ritu Gupta)

Members:

1. Jati (Dr Gagan K. Khanna)

2. Jati (Rashmi Gupta)

**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 bookeeping.

**SECTION - B**

**MERCHANDISING THEORY**

- 5. Introduction to fashion merchandising: merchandising planning, scheduling, buying and evaluation
- 6. Visual merchandising.
- 7. Careers in Apparel industries.

**SECTION -C**

**GARMENT INDUSTRY**

- 8. Project planning for garment production unit.
- 9. Production and storage space, laundry area of garment industry.
- 10. Site selection for unit .
- 11. Budgeting for garment production unit.

Referances :

Convener :

1. *[Handwritten Name]* (Ritu Gupta)

Members :

1. *[Handwritten Name]* (Dr Gagan B. Khanna)

2. *[Handwritten Name]* (Rashmi Gupta)

- 1.kaplan S. Robert, Anthen A. ,Alkinson management accounting.
- 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

HRS. 4

B.SC.---M.M. 50

**1.Decorative samples :**

- Lacè 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 Embroidary stitches :**

Chain,stem, running, lazy-dazy, satin,herring- bone,buttonhole ,bullion ,feather patch and appliqué work.

**3.Make samples of following traditional embroidaries :**

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 2. ... ..

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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 EXAM 2015~~

**THEORY PAPER-I**

**Fashion and Apparel Design**

**B.A./B.COM. MM- 30**

**HRS-3**

**B.SC. MM- 50**

**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. Eight head 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 .

Convenor:  
1. *[Signature]* (Ritu Gupta)

Members:  
1. *[Signature]* (Dr Jagan B. Kaunso)  
2. *[Signature]* (Rashmi Gupta)



## 4: Geology and Mining (2012-2013 E.)

Scheme:

Theory: Max Marks 100 Minimum Pass Marks 36

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

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

Practical (one) 4 hrs duration Max Marks 50

### Paper I: Physical Geology and Palaeontology

#### Section - A

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

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

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

Mountain Building and Isostasy.

#### Section - B

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

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

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

#### Section - C

Skeletal morphology and geological distribution of the following groups

~~Brachiopods~~ Brachiopods, Molluscs, Trilobites and Echinoids.

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Brachiopods, Molluscs, Trilobites and Echinoids

## Paper II: Mineralogy and Structural Geology

### Section A

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

Mineral: Definition, rock forming minerals and ore minerals. Physical properties of Minerals: Concept of Isomorphism, Polymorphism, Pseudomorphism and Solid Solution

Optical Mineralogy: Construction and use of petrological microscope, Double refraction, Pleochroism, Extinction angle, Interference colours.

### Section B

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

Deformation: Elastic, plastic and brittle deformation. Attitude of planar and linear structures, dip, strike, pitch and plunge. Concept and use of clinometer; compass. Unconformity and its types, criteria for determination of top and bottom of sequences.

### Section C

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

Elementary ideas about Cleavage, dislocations, 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, plagioclase, microcline, orthoclase, biotite, hornblende, muscovite, etc. under microscope.

Geological field work and collection of samples.

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## 5 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 1<sup>st</sup> 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  $\frac{1}{2}$  marks each.
  - Fill in the blanks/one word/true or false type questions: 10 questions of  $\frac{1}{2}$  mark each.
  - Very short answer type questions: 5 questions of 1 mark each

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**Paper I: Fundamentals of Environmental Science**

## Section A

1. Ecosystem Concept, Ecosystem structures and function, Components of Ecosystem ( Biotic and Abiotic Components).
2. Pyramids of Energy, Biomass and number.
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

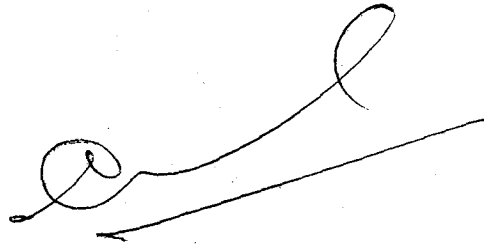
1. Ecology of Rajasthan with respect to Indira Gandhi Canal.
2. Aravallis and Thar Desert Ecosystem.
3. Land forms in Rajasthan desert.
4. Adaptation in plants and animals of Rajasthan desert.
5. Types of vegetations and animals in Rajasthan Desert.
6. Mineral wealth of Rajasthan.

**Suggested Readings:**

- ❖ Allaby, M, 1986 Ecology Facts. Bridge House London, Kd.
- ❖ Beez, A.V. Knamitter, G.W. and Smith, J.C. 1987. the Environmental Science and Technology Education. Pergmon Press, Oxford.
- ❖ Betaking, D.B. and Killer E.A.F. 1982. Environmental Studies. Charles E. Merrill Publishing Co. London.
- ❖ Cassedy, E.S. and Grossman, P.Z. 1990. introduction to Energy. Cambridge University Press, New York.
- ❖ Chauhan S.S.2001.Biodiversity,Biopiracy and Biopolitics:The Global Perspective. Kalinga Publications.New Delhi.
- ❖ Chauhan S.S.2004 Environmental Protection and Management: From Stockholm to Rio and After. Kalinga Publications.New Delhi.
- ❖ Colinvanx, P. 1986, Ecology. Jolm Wiley and Sans. New York.
- ❖ Cunnigham, W.P. and Cunnigham M.A. 2003. Principles of Environmental Science. Tata Mc Graw-Hill Publishing Company Ltd. New Delhi.
- ❖ Dicastri, F. Baker, FWG and Hadley M. 1984, Ecology in Practice, Tycooly International Publishing Ltd. Dublin.
- ❖ DiCastri, F. Banker, FWG and Had buy. M. 1984. Ecology in Practice, Tycooly International Publishing Ltd. Dublin.
- ❖ Krebs. C.J. 1985 Ecology. Harper and Row Publishers, New York.
- ❖ Majupuria T.C. 1986. Wildlife Wealth of India. Teq Press service, Bangkok.
- ❖ Odmn, E.P. 1933, Basic Ecology, Harper and Row Publishers, New York.
- ❖ Prakash I. 1988. Desert Ecology, Scientific Publishers.
- ❖ Rana, S.V.S. 2005. Essentials of Ecology and Environmental Science. Prentice Hall of India, Pvt. Ltd. New Delhi.
- ❖ Santra, S.C. 2001. Environmental Science. New Central Book Agency Pvt. Ltd. Calcutta.
- ❖ Shadri, B. 1986, India Wildlife and Wildlife Resources, Sterling Publishers Pvt. Ltd. New Delhi.

A handwritten signature in black ink, followed by the number 85 enclosed in a hand-drawn circle.

- ❖ Smith, R.L. Elements of Ecology, Harper and Row Publishers, New York.
- ❖ Tegue, D.D. 1985, A manual of Wildlife Conservation, Natraj Publishers, Dehradun.
- ❖ Tietenberg, T. 1968. Environmental and National Resources Economics, Scott, Foresmsn, London.
- ❖ Twickenham, Middlesex.



**Paper II: Water Resources and Management.**

Section A

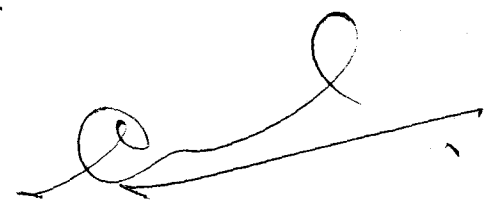
- 1. Water Resources; precipitation, infiltration, evaporation, transpiration, runoff and Storm Water.
- 2. Hydrological cycles mechanism, significance.
- 3. Surface water resource availability at global, national and regional level.
- 4. Ground water Resources; Aquifers, ground water collection System,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

Section B

- 1. Water quality monitoring; Sampling, Methods of analysis, determination of organic matter, determination of inorganic substances, physical characteristics, Bacteriological measurements.
- 2. Water processing; Mixing and flocculation, Sedimentation, Filtration, Turbidity removal, Taste and Odour removal, Organic Chemicals removal, Iron and Manganese removal, Water Stabilization, Chlorination, Disinfection, Removal of dissolved salts.

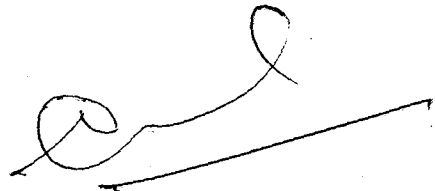
Section C

- 1. Secondary (Biological) Treatment; Activated Sludge Process, Trickling Filters, Sludge Treatment and Disposal.
- 2. Lagoons, Anaerobic digestion, Aerobic Digestion.
- 3. Advance Waste water treatment, Removal of Suspended Solids, Nitrogen Removal, Advanced Biological System.
- 4. Recovery of material from process effluent.
- 5. Removal of Pesticide residues from water.



## Suggested Readings:

- ❖ Alvares, C. and Billorey, R. 1988. Damming the Narmada, Natraj Publishers, Dehradun.
- ❖ Arden, T.V. 1968. Water Purification by Ion Exchange. Butterworths, London, U.K.
- ❖ Botkin, K. 2000. Environmental Science. John Wiley and Sons. New York.
- ❖ Bourne, P.G. 1984. Waste and Sanitation. Academic Press. Inc. New York.
- ❖ Engler, E.D. Kormelink, J.R. Smith, B.F., Smith, R.J. 1986. Environmental Science. W.C. Brown Publishers. Iowa, U.S.A.
- ❖ Gupta, C.P. 1989. Appropriate methodologies for development & management of ground of ground water resources in developing countries. IBH Publishing Co. Pvt. Ltd. New Delhi.
- ❖ Hammer, M.J. and Hammer, M.J. Jr, 2001. Water and Waste water Technology. Prentice-Hall of India, (P) Ltd. New Delhi.
- ❖ Kumar, P. 1988. Ground water and well drilling. CBS Publishers and Distributors, New Delhi.
- ❖ Nazaroff, W.W. and Cohen, L.A. Environmental Engineering Science. John Wiley and Sons. New York.
- ❖ Pillai, K.M. 1987. Water Management and Planning. Himalaya Publishing, New Delhi.
- ❖ Schroeder, E.D. 1977. Water and Waste water treatment. Mc Graw-Hill, New York.
- ❖ Sincero, G.A. and Sincero, A.P. 1999. Environmental Engineering - A Design Approach. Prentice-Hall of India, (P) Ltd. New Delhi.
- ❖ Sinha, U.K. 1986. Ganga: Pollution and Health Hazards, Alka Enterprises, New Delhi.
- ❖ Chauhan S.S.2001. Biodiversity, Biopiracy and Biopolitics: The Global Perspective. Kalinga Publications. New Delhi.
- ❖ Chauhan S.S.2004 Environmental Protection and Management: From Stockholm to Rio and After. Kalinga Publications. New Delhi.





Suggested Laboratory Exercises (Practicals)

Frequency Determination

Density Determination.

IVI Determination

Study of vegetation types in different forests.

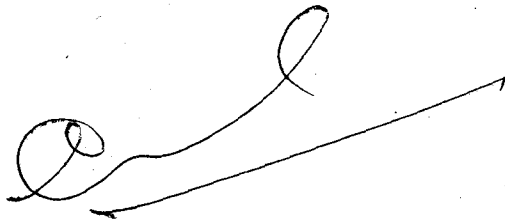
Study of vegetation types in different landforms of Desert.

Study of animals types in different forests. (Knowledge about wildlife)

Study of animals types in different landforms of Desert. (Knowledge about wildlife)

Study of different types of adaptations in plants of Deserts.

Study of different types of adaptations in animals of Deserts.



## Add-on Subjects

### 1. BIOTECHNOLOGY

**Scheme:**

**Theory**

**Max. Marks : 100**

**Min. Pass Marks : 36**

Paper I : Biochemistry & Microbiology (50 Marks)

Paper II : Cell Biology & Genetics (50 Marks)

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

Practical (75 Marks)

**Paper-1 : Biotechnology and Microbiology**

The first question in each paper shall be compulsory and it would be based on the entire syllabus. It will cover 20 per cent marks. It will be of the <sup>maximum 25 words</sup> 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.

The sign molecules. Biochemical composition of cell Protein, Lipids, Carbohydrates, Nuclear acids and metabolic pool. Nature of genetic material. DNA, replication

Perspectives of biological macromolecules : The repeating units

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 sprilla.

Genetic homogeneity in clonal populations.

Spontaneous and induced variation arising in microbial population.

Gene transfer in microorganisms.

Nature of the microbial cell surface. Gram positive and gram negative bacteria. Kinds of flagella. Stereotypes.

Prokaryotic and eukaryotic microbial cells.

Nutritional classification of microorganisms.

Microbes in extreme environments—the thermophiles and alkalophiles.

Pathogenic microorganisms. Defense mechanism against microorganisms.

Symbiosis and antibiosis among microbial populations.

N<sub>2</sub> 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 : PPLLOS, 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 fresh-water environments. Ultrastructure of the cell membrane.

#### ***Section-B***

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

Cell locomotion (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—Klinefelter, Turner, Cri-duChat and Down syndromes.

#### **Section—D**

Mutations—spontaneous and induced; chemical and physical mutagens; induced mutations in plants, animals and microbes for economic 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**

Energetics of living body sources of heat limits to temperature. Heat dissipation and conservation. Lambert—Beer law. Spectrophotometry and colorimetry Primary events in photosynthe-

sis. Strategies of light reception in microbes, plants and animals.

Correction of vision faults. Electrical properties of biological compartments. Electricity as a potential signal

**Section—B**

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

**Section—C**

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

**Section—D**

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

FPLC : centrifugation; radiotracer technique: gel electrophoresis techniques : electro blotting and electroelution. capillary electrophoresis. API-electrosprary and MALDI-TOP mass spectrometry.

**Practical-Based on Theory syllabus -Max marks 50**

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## 2. INDUSTRIAL MICROBIOLOGY

Scheme :

Max. Marks 100

Paper I

Paper II

Practical

3 hrs. duration

3 hrs duration

Min. Pass Marks : 18

Min. Pass Marks : 36

Marks : 50

Marks : 50

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 atleast one question from each section.

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

**Section-A**

- 1. General Introduction history and development of Industrial Microbiology Scope of Industrial Microbiology :**
  - Introduction
  - Discovery of Microbial World
  - The experiments of Pasteur
  - The era of the discovery of antibiotic
  - The discovery of the anaerobic life
  - The Physiological significance of Fermentation.
- 2. Classification isolation, characteristics and ultrastructure of microbes.**
  - Bacteria
  - Algae
  - Fungi
  - Actinomycetes
  - Mycoplasma
  - Viruses
  - Procedure of isolation, preservation and identification of micro organisms
  - Methods of staining of different microbes.
- 3. Biological and Biochemical fundamentals.**
  - Introduction
  - The microorganisms and biotechnology
  - Isolation methods for microorganisms
  - Culture preservation and stability
  - Preservation of microbes, serial subculture preservation by over laying culture with mineral oil lyophilisation of freeze drying.
  - Other methods for storage of fungi
  - Over production of microbial metabolizes
  - Preparation of inoculum



**Section-B**

**4. Fundamental of Genetics**

- Introduction.
- Methods for the selection of mutants, direct selection methods for resistant mutants, penicillin selection, technique for mutant selection, conditional lethality and use in mutant selection.
- 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 poisson 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 spectroscopes. 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

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

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

**Section-A**

**1. Nucleic Acids.**

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

**2. Molecular Biology of Protein Synthesis.**

Translation and protein synthesis in eukaryotes and prokaryotes, tRNA synthetase activation of amino acid. Inhibitors of protein synthesis. Gene expression catabolite repression regulation of gene expression, peron concept, cAMP. Catabolite Activator Protein (CAP) Positive and negative control and gene expression in prokaryotes lac operon. Brittori Davidson model of gene regulation in eukaryotes.

**3. Mutation**

Molecular mechanism of mutation forward and reverses 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 its 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, glycogen, synthesis of purines and pyrimidines.

#### **7. Lipids**

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

### **Section-C**

#### **8. Enzymes**

Classification, coenzyme, cofactor, thermodynamic explanation of enzyme, catalysis reaction orders derivation of Michaelis Menten equation, Transformation of Michaelis menten 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**

Structure of amino acids, classification of essential amino acids based on polarity. Henderson and Hasselbalch equation for ionization of amino acids and Zwitterion, property. Synthesis of peptides, properties of proteins (acid base, property and solubility). Amino acid sequencing of proteins—primary secondary and tertiary structures, probes for protein conformation.

**10. Oxidation and Reduction Reactions :**

Standard redox, potential law of thermodynamics, entropy, enthalpy and free energy of reaction, hydrolysis of energy rich intermediates and ATP. Respiratory electron transport and proton pump. Oxidative phosphorylation (ATP synthesis), chemical coupling, conformational change and chemiosmotic, Central dogma of energy transduction role coupling factors and dissipation of proton pump.

**Practical on Paper-I**

1. Preparation of media, autoclaving and sterilization of glass-ware, maintenance of culture room.
2. Isolation and maintenance of microbes of different groups.  
(a) Bacteria, (b) Algae, (c) Bacteriophage, (d) Fungi.
3. Single spore drawing.
4. Camera lucida drawing.
5. Standard plate count.
6. Haemocytometer
7. Isolation of Phyto pathogens
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 Chromatograph.
13. Paper Chromatographic separation of carbohydrate.

14. Paper Chromatographic separation of organic acid.
15. Measurement of pH fruit juice.
16. Electrophoretic separation of protein.
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.
3. Measurement of mutation frequency in bacteria.
4. Demonstration of lysogeny in *Escherichia coli*.
5. Mutant isolation by gradient plate technique.
6. Location of site of mutation by using plasmid curing agent acrydine orange.
7. Isolation and purification of DNA.
8. Isolation and purification of RNA.
9. Effect of UV light on mutation frequency in bacteria.
10. Demonstration of photorepair mechanism.
11. Extraction and identification of lipids by thin layer chromatography.
12. Estimation of glycogen in a bacterial cell.
13. Estimation of alkaline phosphates activity.
14. Derivation of Michaelis-Menten constant  $V_{max}$  of alkaline phosphate.
15. Measurement of competitive inhibition of ammonium uptake using structural analogy methyl I spectra.
16. Change in protein conformation due to pH, Heat, ionic concentration by observing UV spectra.
17. Separation of isozyme by polyacrylamide electrophoresis.
18. Measurement of relative enzyme activity of cellulose.
19. Measurement of cellulose by reducing sugar assay test.

### **Reference Books :**

1. Principles of Biochemistry by Lehninger.
2. Microbial Biochemistry by Moat.
3. Outlines of Biochemistry by Cohn and Stumph.

**Syllabus : B.Sc. Part-I**

4. Microbiology : Fundamentals and Application by R.A. Atlas, macmilan.
5. Microbiology : Fundamentals by A.H. Patel, Macmillan India.
6. Industrial Microbiology by Power and Daginawala, Himalaya Publishing House, Mumbai.
7. General Microbiology by Power and Daginawala, Himalaya Publishing House, Mumbai.
8. Statistics by D.N. Elhance.
9. Statistics by Mishra and Mishra.
10. General Microbiology by R.Y. Stainer.
11. Tools and techniques in biology, by Welson and Gouldin.
12. Laboratory Techniques in Biology by Swaroop, Pathak and Arora.
13. Fermentation Technology by Wihttaker.
14. Principles of Genetics by E.J. Garnder.

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### 3. COMPUTER APPLICATIONS

Scheme :		Min. Pass Marks	Max. Marks
Arts/Commerce		72 (Th. 47 Pr. 25)	200
Science		54 (Th. 36 Pr. 18)	150
Paper-I	3 hours duration	Computer Fundamentals and introduction to IBM PC	Arts/Com. 65 Science 50
Paper-II	3 hours duration	Operating Systems and Business Data Processing	Arts/Com. 65 Science 50
Paper-III		Practical	Arts/Com. 70 Science 50

#### 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 and media

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 personal computers, Commodore, Atari, Apple, IBM, PC. Basic 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-1**

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.



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