University of Rajasthan
Jaipur

SYLLABUS

B.Sc. Part-I

Examination - 2019

CONTENTS

Scheme of Examination
SYLLABUS

Compulsory Subjects (Four)

Optional Subject :

Additional Optional Subjects

Vocational Subjects

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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 obatined 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.

बी.ए. प्रथम वर्ष – (कला, विज्ञान एवं वाणिज्य संकाय)
बी.ए./बी.एस.सी./बी.कॉम./
सामान्य हिन्दी
3 Hrs duration

पूर्णांक 100   न्यूनतम उत्तीर्णांक 36

नोट : 36 से कम अंक लाने पर छात्रों को उत्तीर्ण नहीं किया जायेगा। इस प्रश्न–पत्र में प्राप्त अंकों को श्रेणी निर्धारण हेतु नहीं जोड़ा जायेगा।

अंक विभाजन – प्रश्न पत्र में दो भाग होंगे – 1. साहित्य खण्ड एवं 2. व्याकरण खण्ड। साहित्य खण्ड में दो भाग होंगे – गद्य भाग एवं पद्य भाग। प्रत्येक खण्ड के लिए 50 अंक निर्धारित है।

50 अंक

क	दो 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

साहित्य खण्ड – 'क' :– गद्य–पद्य की निर्धारित रचनाएँ
गद्य भाग –

1. कहानी — प्रेमचन्द – बडे भाई साहब
   विजयदान देथा – सिकंदर और कौआ
2. संस्मरण — कन्हैंयालाल मिश्र 'प्रभाकर' – बयालिस के ज्वार की उन लहरों में
3. रेखाचित्र — रामवृक्ष बेनीपुरी– रजिया
4. विज्ञान — गुणाकर मुले – शनि सबसे सुन्दर ग्रह
5. निबंध — अगरचन्द नाहटा – राजस्थान की सांस्कृतिक धरोहर
6. व्यंग्य — शरद जोशी – जीप पर सवार इल्लियाँ
7. पर्यावरण — अनुपम मिश्र – आज भी खरे हैं तालाब

पद्य भाग :– (कबीर ग्रंथावली से सं. – श्यामसुंदर दास)

1. कबीर — साखी सं. – गुरूदेव को अंग – 7,12,26,30
   सुमरन को अंग – 10,17,24,26
   विरह को अंग – 2,6,10,18
2. सूरदास सूरसागर सार — सं. डॉ. धीरेन्द्र वर्मा
   — विनय भक्ति पद सं. – 21,33
   — गोकुल लीला पद सं – 55,58
   — वृंदावन लीला पद सं. – 10,28
   — उद्धव संदेश पद सं. – 77,79
3. तुलसीदास — विनय पत्रिका, गीताप्रेस, गोरखपुर पद सं. – 87,88,90,156,158
4. मीरां — पदावली सं. – नरोत्तम स्वामी पद सं. – 1,3,4,5,10
5. रहीम (दस दोहे) — रहीम ग्रंथावली संपादक विद्यानिवास मिश्र, गोविन्द रजनीश (दोहावली) 186,191,211,212,214,218,219,220,223,224
6. मैथिलीशरण गुप्त — मनुष्यता, हम राज्य लिए मरते हैं (गीत–साकेत के नवम सर्ग से)
7. सुमित्रानंदन पंत — नौका विहार
8. सूर्यकान्त त्रिपाठी निराला — वह तोड़ती पत्थर
9. सच्चिदानंद हीरानंद वात्स्यायन 'अज्ञेय' – हिरोशिमा
10. रामधारी सिंह दिनकर — विपथगा, सागर शेष है

४

खण्ड – 'ख'

व्याकरण / व्यावहारिक हिन्दी खण्ड   **50 अंक**

1. निबन्ध लेखन   शब्द सीमा 300 शब्द   8 अंक
2. कार्यालयी लेख   शासकीय – अर्द्धशासकीय पत्र, कार्यालय ज्ञापन, विज्ञप्ति एवं
                                 कार्यालय आदेश, अधिसूचना, पृष्ठांकन 4 x 2 =   8 अंक
3. संक्षेपण   4 अंक
4. पल्लवन   5 अंक
5. शब्द निर्माण प्रविधि   उपसर्ग, प्रत्यय, संधि, समास   5 अंक
6. शब्द शुद्धि एवं वाक्य शुद्धि   5 अंक
7. मुहावरे एवं लोकोक्ति   5 अंक
8. पारिभाषिक शब्दावली   5 अंक
9. शब्द के प्रकार   संज्ञा, सर्वनाम, विशेषण, क्रिया एवं क्रिया विशेषण   5 अंक

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2. GENERAL ENGLISH

Duration: 3 hrs.   **Max. Marks: 100**

                                        Minimum Pass Marks: 36

The syllabus aims at achieving the following objectives:

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

The Pattern of the Question Paper will be as follows:

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

    I Phonetic Symbols and Transcription of Words   (05)

    III Translation of 5 Simple sentences from Hindi to English   (05)

                       from English to Hindi   (05)

    IV Translation of 05 Words from Hindi to English $(2^{1/2})$

                    from English to Hindi $(2^{1/2})$

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

i Elements of a Sentence   (05)

II Transformation of Sentences   (05)

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(a) Direct and Indirect Narration

(b) Active and Passive Voice

II Modals   (05)

III Tense   (05)

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

(As discussed in Quirk and Greenbaum)

Unit C: Comprehension   **(25 marks)**

Following Essays and Stories in *Essential Language Skills* revised edition
compiled by Macmillan for University of Rajasthan General English B.
A. /B. Com./B. Sc.
Candidates will be required to answer 5 questions of two lines each to be
answered out of 10 questions. There would be two questions from the
prescribed text.   (10)

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

The candidates will be required to answer 5 questions from the given

unseen passage.   **(10)**

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

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

I Letters-Formal and Informal   (10)

II CV's Resume and Job Applications and Report   (10)

III Paragraph Writing   (10)

7.

Recommended Reading:

Sasikumar, V., Dutta and Rajeevan, A Course in Listening and Speaking-I Foundation Books. 2005.

Sawhney, Panja and Verma eds. English At the Workplace, Macmillan 2003.

Singh, R.P. Professional Communication. OUP. 2004

Judith Leigh. CVs and Job Applications. OUP. 2004

Arthur Waldhorn and Arthur Zeiger, English Made Simple. Upa and Co.

Gunashekar ed. A Foundation English Course for Undergraduates Book I, CIEFL, Hyderabad.

Quirk and Greenbaum: A University Grammar of English Longman, 1973

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3. COMPULSORY PAPER OF ENVIRONMENTAL STUDIES

Compulsory in I Year for all streams at undergraduate 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.

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

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

g. Land resources: Land as a resource, Land degradation man induced Landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.

- Equitable use of resources for sustainable lifestyles.

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

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

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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 healt
- Case Studies

11.

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.

4. Elementary Computer Applications

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

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

Question paper for Elementary Computer Applications, (Compulsory paper-common for B.A. / B.Sc./ B.Com. Part-I) be so set that it has 120 multiple choice questions (Bilingual) of ½ marks each. The question paper will be of duration of 2 hours. The examinees will have to give their answers on OMR Sheet only to be provided by the University whose evaluation will be done based on OMR Scanning Technology. Further the practical examination for this paper will be of 40 marks and its duration will be of 2 hours.

Unit – I

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

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

Unit – II

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

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

Unit - III

Electronic Spreadsheet : Worksheet types of create and open a worksheet. Entering data text numbers and formula in a worksheet inserting and deleting cells, cell formatting, inserting rows and columns in a worksheet formatting worksheets. Using various formula and inbuilt function. Update worksheet using special tools like spell check and auto correct setup the page

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... margins of worksheets for printing. Format the data in the worksheet globally or selectively. creating charts. Enhance worksheets using charts. multiple worksheets-concepts

Unit - IV

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

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

Unit - V

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

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

Question Paper pattern for Main University Practical Examination   *Max Marks: 40*

Practical

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

The practical examination scheme should be as follows –

- Three Practical Exercise (including Attendance & Record performance)   30 marks
    - Operating system
    - MS Word
    - MS Excel
    - MS Power Point
    - Internet
- Viva-voce   10 marks

14.

5 बी.ए. प्रथम वर्ष : प्रारम्भिक हिन्दी

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 निकल
   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

15.

B.Sc. Part I (Pass Course)

I. PHYSICS

Scheme :   Max. Marks: 100

Min. Pass Marks: 36

Paper I	3 hrs. duration	Max. Marks: 33	Min. Pass marks 12
Paper II	3 hrs. duration	Max. Marks: 33	Min. Pass marks 12
Paper III	3 hrs. duration	Max. Marks: 34	Min. Pass marks 12
Practical	5 hrs. duration	Max. Marks: 50	Min. Pass marks 18

Paper-I : Mechanics & Oscillations

Work Load: 2 hrs. Lecture /week

Examination Duration: 3 Hrs.

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

Unit – I:

Physical Law and frame of Reference

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

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

(c) **Conservative Forces:** Introduction about conservative and non-conservative forces, Rectilinear motion under conservative forces, Discussion of potential energy curve and motion of a particle.

Unit – II:

Centre of Mass

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

Rigid body

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16.

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

Unit – III:
Motion under Central Forces
Introduction about Central Forces, Motion under central forces, Gravitational interaction, Inertia and gravitational mass, General solution under gravitational interaction, Keplers Laws, Discussion of trajectories, Cases of elliptical and circular orbits, 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 factor, Resonance, Series and parallel of LCR circuit, Electromechanical 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

Text books:

- Mechanics (SIE), Charles Kittel
- Introduction to Classical mechanics, TMH
- The Physics of Waves & Oscillations, Bajaj
- H. Goldstein, Classical mechanics.
- L.N. Hand, J.D. Finch. Analytical mechanics (Cambridge, 1998).
- L. Landau, E. Lifshitz, Mechanics.

Paper – II (Electromagnetism)

Work Load. 2 hrs. Lecture /week

Examination Duration: 3 Hrs.

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

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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 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,

Electric Field and Potential Energy

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

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

Electric field measured in moving frames, Electric field of a point charge moving with constant velocity.

Unit II: 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 III: Magnetostatics and Magnetic field in matter

Lorentz force, properties of magnetic field, Ampere's law, field due to a current carrying solid conducting cylinder (a) 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 mangnentic moment and dia-magnetism, spin magnetic moment, para and ferro-magnetism, Intensity of Magnetization, Magnetic permeability and Susceptibility, free and bound current dencities, Magnetic field due to a uniformly magnetized material and Non-unifomly magnetized material.

Unit IV: Maxwell's Equations and Electromagnetic waves

Displacement current, Maxwell's Equations, Electromagnetic waves, Electromagnetic waves in an Isotropic medium, Properties of electromagnetic waves, Energy density of Electromagnetic waves, Pointing vector, Radiation pressure of free space, Electromagnetic waves in Dispersive medium, Spectrum of Electromagnetic waves.

References :
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,

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: 2 hrs. Lecture /week

Examination Duration: 3 Hrs.

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

Unit – 1 Interference:
Concept of Spatial and Temporal Coherence, coherence length, coherence time, Definition and propagation of a wave front 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 λ 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 λ and refractive index μ 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 (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically Polarized light. Production of Plane polarized light: (i) by reflection (ii) by refraction (iii) by

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double refraction and (iv) by dichroism (Polaroid). Identification of polarized light. Huygen's theory of double refraction. Production of Circularly and Elliptically Polarized light. Quarter wave and half wave plates. Analysis of polarized light. Optical activity. Laws of optical Activity. Fresnel's explanation of optical activity. Experimental verification of Fresnel's theory. Specific rotation. Polarimeter. Types of Polarimeter: (i) Laurent's half shade polarimeter and (ii) Biquartz polarimeter.

Unit – 4: Quantum Optics & Photonics

(i) **Laser:** Spontaneous and stimulated emission, Einstein's A & B coefficients. Energy density of radiation as a result of stimulated emission and absorption, population inversion. Methods of optical pumping, energy level schemes, He-Ne, Ruby, CO_2 lasers.

(ii) **Holography:** Basic concepts of Holography, principle of holography. Theory. construction and reconstruction of image, application of holography.

(iii) **Fiber Optics:** Introduction of Optical Fiber, Necessity of Cladding, Optical fiber system, optical fiber cable, Total internal Reflection, Explanation of Propagation of light through an optical fiber.

Reference:

1. Optics by Brij Lal & Subramanium, 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.

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Practical

Work Load: Four hours laboratory work per week

Examination Duration: Four hours

Minimum Experiments: Total sixteen taking eight from each section.

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

Section A

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

Section B

1. To study the random decay and determine the decay constant using the statistical board.
2. Using compound pendulum study the variation of time period with amplitude in large angle oscillations.
3. To study the damping using compound pendulum.

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

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

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

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

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

9. To determine Young's modulus by bending of beam.

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

11. To ensure Curie temperature of Monel alloy.

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

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

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

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

2. CHEMISTRY

Scheme:
Max Marks: 150

	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 5 questions selecting at least one question from each unit.

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

Unit-I

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

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

Weak Interactions: Hydrogen bonding, vander Waals forces.

Unit-II

Covalent Bond: Valence bond theory and its limitations, directional and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+ SF_4, ClF_3, ICl_2, H_2O.

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

Unit-III

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

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

UNIT-IV

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

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

Unit- V

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

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

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

Unit-I

Mechanism of Organic Reactions: Homolytic and heterolytic bond cleavage. Types 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, stereogeniccentre, 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, cyclohexane.

Unit-III

Alkanes and Cycloalkanes: IUPAC nomenclature of branched and unbranched alkyl group, 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 halogenation 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

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...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 $KMnO_4$. 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, Chemical reactions - 1,2- and 1,4-additions, Diels-Alder reaction and polymerization.

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.

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.

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.

Polyhalogen compounds: Chloroform, carbon tetrachloride.

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

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

UNIT-I

Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs and calculations of slopes, differentiation of functions like k_x, e^x, x^n, sinx 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.)

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; pseudo order, half-life and mean-life. Determination of the order of reactions - 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 spectrophotometry. Theories of chemical kinetics. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

Simple collision theory based on hard sphere model transition state theory (equilibrium hypothesis). Expression for the rate constant bases on equilibrium constant and thermodynamic aspects.

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

INORGANIC CHEMISTRY

Separation and identification of six radicals (3 cations and 3 anions) in the given inorganic mixture including special combinations.

ORGANIC CHEMISTRY

Laboratory Techniques

(a) Determination of melting point (naphthalene, benzoic acid, urea, etc.); boiling point (methanol, ethanol, cyclohexane, etc.); mixed melting point (urea-cinnamic acid, etc.).

(b) Crystallization of phthalic acid and benzoic acid from hot water, 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) 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_2SO_4 by studying the kinetics of hydrolysis of ethyl acetate.

(d) To study kinetically the reaction rate of decomposition of iodide by H_2O_2.

(ii) Viscosity, 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 by surface tension method (acetone & ethyl methyl ketone).

(c) To determine the percentage composition of a given mixture (non- interacting systems) by viscosity method.

(d) To determine the viscosity of amyl alcohol in water at different concentration and calculate the excess viscosity of these solutions.

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

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

Inorganic Chemistry

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

Organic Chemistry

Ex.2 Laboratory Techniques

Ex. 3 Qualitative Analysis
       Detection of element and detection of functional group   10

Physical Chemistry

Ex. 4 Perform one of the experiments mentioned in the syllabus.   12

Ex. 5 Viva-voce   5

Ex. 6 Record   5

_____Total_____   50

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Syllabus: B.Sc. Part-I (Pass Course)

Zoology

(2018-19)

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
Practicals	: 4 Hrs. duration	50 Marks

NOTE:

1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering the entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, *i.e.*, three from each unit /section out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

PAPER – I: Z-101

DIVERSITY OF ANIMALS

Section – A

Biosystematics and Taxonomy

1. General principles of taxonomy, concept of five kingdom scheme, international code of nomenclature, cladistics, molecular taxonomy.
2. Concept of Protozoa and Metazoa, and levels of organization.
3. Taxonomy and basis of classification of non-chordata and chordata: symmetry, coelom, segmentation and embryogeny.
4. Detailed classification of Non- chordata and Chordata (up to suborders with examples).

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Section – B

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

Note : * indicates wherever required

1. **Protozoa :** Amoeba, Entamoeba, Paramaecium, Euglena, Plasmodium, Trypanosoma and Leishmania.
2. **Porifera :** Sycon and Leucosolenia.
3. **Coelentrata:** Obelia and Aurelia.

Section – C

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

Note : * indicates wherever required

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

PAPER – II: Z-102
CELL BIOLOGY AND GENETICS

Section – A

Cell Biology

1. Introduction to cell: Morphology, size, shape, characteristics and structure of prokaryotic and eukaryotic animal cell; basic idea of virus and cell theory.
2. Cell membrane: Characteristics of cell membrane molecules, fluid-mosaic model of Singer and Nicholson, concept of unit membrane.
3. Cell membrane transport: Passive (diffusion and osmosis, facilitated, mediated and active transport.
4. Cytoplasmic organelles:

   (i) Structure and biogenesis of mitochondria; electron transport chain and generation of ATP molecules.
   (ii) Structure and functions of endoplasmic reticulum, ribosome (prokaryotic and eukaryotic) and Golgi complex.
   (iii) Structure and functions of lysosome, microbodies and centrioles.
   (iv) Structure and functions of cilia, flagella, microvilli and cytoskeletal elements.

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Section – B

1. **Nuclear Organization:**

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

2. **Nucleic Acids:**

   (i)   DNA structure, polymorphism (A, B and Z types) and replication (semi conservative mechanism) experiments of Messelson and Stahl: elementary idea about polymerases, topoisomerases, single strand binding proteins, replicating forks (both unidirectional and bidirectional), leading and lagging strands, RNA primers and Okazaki fragments; elementary idea about DNA repair.
   (ii) RNA structure and types (mRNA, rRNA and tRNA) and transcription.

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

4. **Cell in reproduction:**

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

Section – C

Genetics

1. Mendelism: Brief history of genetics and Mendel's work; Mendelian laws, their significance and current status, chromosomal theory of inheritance.
2. Chromosomal mutations: Classification, translocation, inversion, deletion and duplication; Variations in chromosome numbers; 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.
5. Multiple gene inheritance: ABO blood groups and Rh factor and their significance.
6. Cytoplasmic inheritance.
7. Sex determination in *Drosophila* and man, pedigree analysis.
8. Genetic disorders: Down's, Turner's and Klinefelter's syndromes, color blindness, Hemophilia, Phenylketonuria.
9. Concept of gene: Recon, muton and cistron.

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PAPER – III: Z-103
GAMETE AND DEVELOPMENTAL BIOLOGY

Section – A

Developmental Biology: Scope and Early Events

1. Historical review, types and scope of embryology.
2. Gametogenesis:

   (i) Formation of ova and sperm.
   (ii) Vitellogenesis.

3. Fertilization: Activation of ovum, essence of activation: Changes in the organization of the egg cytoplasm.
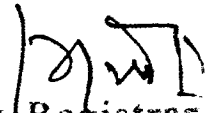4. Parthenogenesis.

Section – B

Developmental Biology: Pattern and Processes

1. Cleavage: Definition, planes and patterns of cleavage among non chordates and chordates, significance of cleavage, blastulation and morulation.
2. Fate maps, morphogenetic cell movements, significance of gastrulation.
3. Embryonic induction, primary organizer, differentiation and competence.
4. Development of chick up to 96 hours stage.
5. Embryonic adaptations:

   (i) Extra embryonic membranes in chick, their development and functions.
   (ii) Placentation in Mammals: Definition, types, classification on the basis of morphology and histology, functions of placenta.
   (iii) Paedogenesis and neoteny.

Section – C

Dimensions in Developmental Biology

1. Regeneration.
2. Various types of stem cells and their applications.
3. Cloning of animals:

   (i) Nuclear transfer technique.
   (ii) Embryo transfer technique.

4. Teratogenesis (Genetic and Induced).
5. Biology of aging.
6. Cell death.

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B.Sc. Part - I

Scheme of Practical Examination and Distribution of Marks
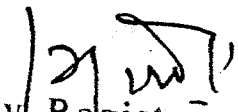
Time: 4 Hrs.   **Min Pass Marks: 18**   **Max. Marks: 50**

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

Notes:

1. Anatomy: Study of systems of the prescribed types with the help of dissection.

2. With reference to microscopic slides, in case of non-availability, the exercise should be **substituted with diagrams / photographs.**

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

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

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

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

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Syllabus: B.Sc. Part-I (2018-2019)
Practical – Zoology

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

I. Microscopic Techniques:

1. Organization and working of Optical Microscope: Dissecting and compound microscopes.

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

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

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

   (ii) Stains: Aceto-carmine, Aceto-orcein, Haematoxylin, Eosin.

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

4. Collection and Culture Methods:

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

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

II. Study of Microscopic Slides and Museum Specimens:

Protozoa	:	*Amoeba, Euglena, Trypanosoma, Giardia, Entamoeba, Elphidium (Polystomella),Foraminiferous* shells, *Monocystis, Plasmodium, Paramecium, leishmania, Paramecium* showing binary fission and conjugation, *Opalina, Nyctotherus, Balantidium, Vorticella.*
Porifera	:	*Leucosolenia, Euplectella, Spongilla,* T. S. Sycon, Spicules, Spongin fibers, Gemmules
Coelenterata	:	*Millepora, Physalia, Velella, Aurelia, Alcyonium, Gorgonia, Pennatula,* Sea anemone, Stone corals, *Obelia* colony and medusa.
Ctennophora	:	Any Ctenophore
Platyhelminthes	:	*Taenia, Planaria,* Fasciola (WM), T. S. body of *Fasciola,* Miracidium, Sporocyst, Redia and Cercaria Larvae of *Fasciola,* Scolex, T. S. mature proglottid of Taenia, gravid proglottid, Cysticercus larva.
Aschelminthes	:	*Ascaris, Wuchereria, Dracunculus*
Annelida	:	Neries, Heteroneries, Arenicola, Aphrodite, Chaetopterus, Tubifix, Glossiphonia, Pontobdella, Polygordius

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III. Anatomy:

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

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

IV. Study of the Following Through Permanent Slide Preparation: *Paramecium, Euglena,* Foraminiferous shells, Sponge spicules, *Spongin* fibres, Gemmule, *Hydra, Obelia* colony and Medusa; Parapodium of Nereis and Heteronereis; Earthworm-ovary, testes, septal nephridia and brain ring; Leech-ovary, testes sac and salivary glands.

V. Exercises in Cell Biology:

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

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

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

4. Study of cell permeability using mammalian RBC's.

VI. Exercises in Genetics:

A. Study of *Drosophila*:

1. Life cycle and an idea about its culture

2. Identification of male and female

3. Identification of wild and mutants (yellow body, ebony, vestigial wing and white eye)

4. Study of permanent prepared slides: Sex comb and salivary gland chromosomes.

B. Numerical problems based on monohybrid and dihybrid cross.

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

VII. Developmental Biology:

1. Study of development of frog/toad with the help of Charts/Slides/Models.

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

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

2. Study of development of chick with the help of whole mounts/ Charts/Slides/Models

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

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

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

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

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3. Cell Biology and Genetics	4+4	6+6
4. Developmental Biology	6	5
5. Identification and comments on Spots (1 to 8)	16	16
6. Viva Voce	5	5
7. Class Record	5	-
	50	50

Notes:

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

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

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

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

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

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

Recommended Books:

1. Balinsky B. I. and Fabain BC: Introduction to Embryology, CENGAGE Learning 2012.
2. Barrington EJW: The Biology of Hemichordata and Protochordata. Oliver & Boyd, London 1965.
3. Berril N. J: Development Biology, Tata McGraw Hill. 1971.
4. Colbert EH: Evolution of the Vertebrates. 2nd edition John Wiley & Sons, New York 1969
5. Colbert EH, Morales M, Minkoff EC, Colberts: Evolution of the Vertebrates: A History of the Backboned Animals Through Time. 5th edition Wiley Liss 2001.
6. Costanzo LS: Physiology. 4th edition Saunders Inc.2009.
7. Davenport R.: An Outline of Animal Development. Addison-Wesley Longman Inc. 1979.

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

9.   Gasque: CD Manual of Laboratory, Experiences Cell Biology Mc Graw-Hill Professional publishing 1989.

10.   Gilbert SF and Singer SR: Development Biology. Sinauer Associates;9th edition.2010.

11.   Lodish H, Berk A, Kaiser CA, Krieger M, Scott MP, Bretscher A, Ploegh H, Matsudaira P. Molecular Cell Biology. 6th edition W.II Freeman and Company, New York, 2008.

12.   Lodish H, Berk A, Kaiser CA, Krieger M, Bertscher A, Ploegh H, Amon A, Scott M P: Molecular Cell Biology. 7th edition Mac Millian High Education (International edition) England, 2013.

13.   Lodish H, Berk A, Matsudaira P, Kaiser CA, Krieger M, Scott MP, Zipursky SL, Darnell J: Molecular Cell Biology. 5th edition W H Freeman and Company, New York, 2004.

14.   Lodish H, Berk A, Zipursky SL, Matsudaira P, Baltimore D, Darnell J: Molecular Cell Biology. 4th edition WH Freeman & Company, New York, 2000.

15.   Morgan DD: The Cell Cycle: Principles of Control. Sinauer /Panima Books, 2007.

16.   Petsko GA and Ringe D: Protein Structure and Function. Sinauer/Panima Books, 2004.

17.   Rao KV: Development Biology: A Modern Synthesis. Oxford and IBH Publishing. 1994.

18.   Rastogi VB: Animal Distribution, Evolution and Development Biology. Kedar Nath Ram Nath Educatioal Publishers.

19.   Singh SP and Tomar BS: Cell Biology. 10th edition Rastogi Publications, Meerut, New Delhi, 2014

20.   Snustad DP and Simmons MJ: Principles of Genetics. 4th edition John Wiley & Sons, Inc., 2005.

21.   Verma PS. A Manual of Practical Zoology: Invertebrates. S. Chand & Co. Ltd. New Delhi. 1971.

22.   Verma PS and Agarwal VK: Chordate Embrylogy: Development Biology. S. Chand & Company Ltd. 2012.

23.   Verma PS and Agarwal VK: Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. 14th edition, S. Chand 2004.

24.   Winchester AM: An Introduction to Genetics. Barners & Noble, Canada 2002.

25.   Winchester AM: Genetics: A Survey of Principles of Heredity. Oxford & IBH Publishing Co., 1967.

26.   Winchester AM: Human Genetics. Ohio Charles E. Merrill Publishing Co., 1971.

4. BOTANY

Scheme

Min. Pass Marks: 36

Paper I	3 hrs. Duration	Max Marks: 100
Paper II	3 hrs. Duration	Max. Marks 33
Paper III	3 hrs. Duration	Max. Marks 33
Practical Min. Marks: 18	4 hrs, duration	Max. Marks 34
		Max. Marks 50

Duration of examination of each theory paper-   3 hours

Duration of examination of practical's-   4 hours

Note:

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

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

3. Each paper is divided into four units. There will be one question from each unit. These Q. No. 2 to 5 will have internal choice.

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

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

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

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 Lycopersicom, 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

Paper II

Microbiology, Mycology and Plant Pathology

(2 hrs /week)

Unit-1

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

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

Mycoplasma: occurrence, morphology, reproduction and importance.

Unit-2

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

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

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

Unit-3

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

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, Pox virus, 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, *Puccinia*- Black rust of wheat; *Agaricus*; *Peziza* and *Alternaria*- early blight of potato *y.* Visit a local Botanical Garden /Field /Study of Plant in Farmers field /Agricultural Stations.

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[th]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.

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 Bryophtya. 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. Alexopoulous. 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.

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
1(b)	Comment and solve the problem on Genetics allotted to you along with reasons.	5	5
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
3	Make suitable preparation of the reproductive structure of material "C" (Fungi). Draw labelled diagrams. Identify giving reasons.	5	5
4	Make suitable stained preparation of material "D" (Bryophyta (vegetative/ reproductive). Draw labelled diagrams. Identify giving reasons	5	5
5	One Microbiology experiment for comments. Or Gram's staining.	5	5
6	Comment upon spots (1-5)	10	
7	Viva-Voce	5	
8	Practical record	5	-
	TOTAL	50	50

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5. 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 3 hrs. duration — Max. Marks 50
and Mineralogy

Practical (One) 4 hrs. duration — Max. Marks 50

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

Paper- I : Physical Geology

Section-A

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

Section- B

Elements of continental drift, sea floor spreading, plate tectoncs, 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.
1. Datta, A.K. : Physical Geology.

Paper II Crystallography and Mineralogy

Section-A

Definition of mineral and crystal-crystaline, cryptocrystalline ind 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 ype or ditetragonal bipyramidal class; Hexagonal-Beryll type or

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Hexagonal 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, Flourite Magnetite and Garnet, Pyrite etrahedrite.

Tetragonal system- Zircon, Rutile, Cassiterite. Hexagonal system- Beryl, Calcite, Tourmaline and Quartz.

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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, hypersethene, augite, Tourmaline, tremolite, hornblende, asbestos, beryl, nepheline, sodalite, garnet, olivine, zircon, topaz, sillimanite, kyanite, quartz and its varieties, chalcedony, flint and jaspar; 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.
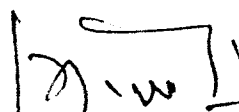
6. MATHEMATICS

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

Examination:

Scheme:	Min.Pass Marks		Max. Marks
	Science – 54		150
	Arts – 72		200

		Duration	Max.Marks
Paper – I	Discrete Mathematics	3 hrs.	40 (Science)
			53 (Arts)
Paper – II	Calculus	3 hrs.	40 (Science)
			53 (Arts)
Paper – III	Analytic Geometry and Optimization Theory	3 hrs.	40 (Science)
			54 (Arts)
Practical	Optimization Techniques	2 hrs.	30 (Science)
			40 (Arts)

Note:

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

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

3. An Internal/external examiner can conduct Practical Examination of not more than **100 (Hundred)** Candidates.(20 candidates in each batch)

4. Each candidate has to pass in Theory and Practical examinations separately.

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Paper – 1: Discrete Mathematics
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours

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

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

Unit 1 : Sets, Cardinality, Principal of inclusion and exclusion, Mathematical induction. Relations and Functions- Binary relations, Equivalence relations and Partitions, Partial ordered relations and Lattices, Chains and Antichains, Pigeon Hole principle.

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

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

Unit 4: Graphs – Basic terminology, Multigraphs, Weighted graphs. Paths and circuits, Shortest paths, Introduction to Eulerian and Hamiltonian Graphs. 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.

Reference Books:

1. V.K.Balakrishnan, Introductory Discrete Mathematics, Prentice-Hall, 1996.
2. N. Deo, Graph Theory with Applications to Computer Science, Prentice-Hall of India.
3. S. Wiitala, Discrete Mathematics: A Unified Approach, McGraw-Hill Book Co.
4. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 1995.
5. Ian Anderson, A First course in Combinatorial Mathematics, Springer, 1989.
6. C.L. Liu, Elements of Discrete Mathematics, (Second Edition). McGraw Hill, International Edition, 1986.
7. Kenneth H. Roson, Discrete Mathematics and Its Applications, Tata Mc-Graw Hills, New Delhi, 2003.

Paper- II: Calculus
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours

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

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

Unit 1: Series – Infinite series and Convergent series. Tests for convergence of a series – Comparison test, D'Alembert's ratio test, Cauchy's n-th root test, Raabe's test, De-Morgan-Bertrand's test, Cauchy's condensation test, Gauss's test, (Derivation of tests is not required). Alternating series. Absolute convergence. Taylor's theorem. Maclaurin's theorem. Power series expansion of a function. Power series expansion of sinx, cosx, 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.
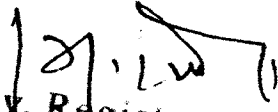
Unit 3: Envelopes and evolutes, Maxima and Minima of functions of two variables. Lagrange's method of undetermined multipliers. Asymptotes. Multiple points. Curve tracing of standard curves (Cartesian and Polar curves).

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

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

Reference Books:

1. Chandrika Prasad and Gorakh Prasad, A Text Book on Differential Calculus, Pothishala Pvt. Ltd., Allahabad, 1992.
2. Chandrika Prasad and Gorakh Prasad, A Text Book on Integral Calculus, Pothishala Pvt. Ltd., Allahabad, 1992.
3. Shanti Narayan and P.K. Mittal, Differential Calculus, S. Chand & Co., N. D., 2013.
4. Shanti Narayan and P.K. Mittal, Integral Calculus, S. Chand & Co., N. D., 2013
5. H.S.Dhami, Differential Calculus, Age Int. Ltd., New Delhi, 2012.
6. M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
7. H. Anton, I. Bivens and S. Davis, Calculus (7th Edition), John Wiley and sons (Asia), Pt Ltd., Singapore, 2002.
8. G.B. Thomas, R. L. Finney, M. D. Weir, Calculus and Analytic Geometry, Pearson Education Ltd, 2003.

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Paper-III: Analytic Geometry and Optimization Theory
Teaching: 3 Hours per Week
Duration of Examination: 3 Hours   **Max. Marks: 40 (Science)**
                                                         54 (Arts)
Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

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

Unit 2: Sphere, Cone.
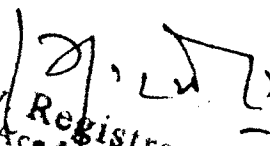
Unit 3: Cylinder, Central Conicoids – Ellipsoid, Hyperboloid of one and two sheets. tangent lines and tangent planes. Direct sphere. Normals.

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

Unit 5: 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.

Reference Books:

1. S.L. Loney, The Elements of Coordinate Geometry, Macmillan and co London, 1895.
2. R.J.T. Bell, Elementary Treatise on Co-ordinate geometry of three dimensions, Macmillan India Ltd., 1994.
3. N.Saran and R.S.Gupta, Analytical geometry of Three Dimenssions, Pothishala Pvt. Ltd., Allahabad, 1992.
4. P.K. Jain and Khalil Ahmed, A Text Book of Analytical geometry of Three Dimenssions, Wiley-Eastern Ltd., 2000.
5. G. Hadley, Linear Programming, Narosa Publishing House, New Delhi, 2002.
6. Hamdy A. Taha, Operations Research, An Introduction (9th edition), Prentice-Hall, 2010.

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Practical: Optimization Techniques
Teaching: 2 Hours per Week

Examination:
Scheme
Max.Marks
Min.Pass Marks
Distribution of Marks:
Two Practicals one from each group

			Duration: 2 Hours	
			Science	Arts
Max.Marks			30	40
Min.Pass Marks			10	13
10 Marks each	=	20 Marks	(13 Marks each)	26
Practical Record	=	05 Marks		07
Viva-voce	=	05 Marks		07
Total Marks	=	30 Marks		40

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

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

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

ECONOMICS

Scheme	Min. Pass Marks	Max. Marks
Arts	72	200
Science	54	150
Paper - I 3 hours duration — Micro Economic Theory		Arts 100
		Science 75
Paper - II 3 hours duration — Indian Economy		Arts 100
		Science 75

Note: There will be two papers of Economics. Each paper shall consist of three parts. Part A shall contain question No 1 consisting of very short type X (Ten) questions. The candidate is required to answer each question in 20 words. Part B shall contain question No 2 consisting of V (five) questions. The candidate is required to answer each question in 100 words. Part C shall contain three essay type questions (one from each section) with internal choice.

A candidate will be required to attempt five questions in all. All questions of Part A and Part B are compulsory while rest 3 questions are to be attempted from parts C selecting one question from each section. All questions carry equal marks. Each question will carry 20 marks for Arts students and 15 marks for Science students.

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PAPER I-MICRO ECONOMIC THEORY

Section -A

Nature and scope of Economics. Methodology: Micro and Macro Economi Static and Dynamic analysis. Positive and Normative Economics.

Theory of Consumer Behavior: Utility Analysis. Indifference Curve Analy Consumer's Equilibrium. Price, Substitution and Income Effects, Normal, Infe and Giffen Goods. Law of Demand and the Demand Curve. Elasticity of Dema Price, Income and Cross Elasticity, Arc and Point Elasticity, Relationship betw Elasticity, AR, MR and TR. Factors affecting Price Elasticity of Dema Substitute and Complementary Goods, Consumer's Surplus.

Section -B

Production Function: Law of Variable Proportions, Three Stages of Producti Function, Law of Returns to Scale. Iso-quant and Iso-Cost. Optimum Fac Combination, Theory of Cost: Short-run and Long-Run Cost Curves. Mar Structures: Determination of Price And Output in the Short and Long Run und Perfect Competition, Monopoly, Discriminating Monopoly, Monopolis Competition. Excess Capacity.

Section-C

Theory of Distribution, Marginal Productivity Theory, Factor Pricing Un Perfect and Imperfect Competition in Labor Market, Ricardian Theory of Re Modern Theory of Rent and Quasi-rent. Theory of Interest: Classical and Liquid Preference, Theory of Profit, Risk and Uncertainty.

Books Recommended:

1. Lipsey and Crystal : Economics 13ed, Oxford University Press.
2. Karl E. Case, Ray C. Fair and Sharon Oster, Principles of Economics Edition, Pearson Education Inc.
3. Hal R. Varian: Intermediate Microeconomics WW Norton and Co. Fi Edition.
4. D. Salvatore: Micro Economics, Harper Collins, 1991.
5. H.L Ahuja: Advanced Economic Theory, S. Chandand Company, Ne Delhi. (English &Hindi).
6. लक्ष्मीनारायण नाथूरामकाव्यष्टिअर्थशास्त्र, रमेशबुकडिपो, जयपुर।

Reference Books

1. R.H. Leftwitch: Price System and Resource Allocation, Holt, Reinhart and Winston: 3rd Edition.
2. Samuelson and Nordhaus: Economics, McGraw Hill Irwin:Latest Edition.
3. J.P Gould and C.E Ferguson: Micro Economic Theory Revised By

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Paper – II Indian Economy

B.sic Features and Present Position of Indian Economy, Natural Resource
Population : DemographicFeatures and Major trends. Concept of Populat
Dividend. Population Policy, Human Resource Development.National Income
India: trends and composition. Agriculture: Role and Importance of Agriculture
the Indian Economy', Land Reforms, Growth of Modern Inputs: Irrigation, HY
Fertilizers.Institutional Credit, Microfinance, Marketing of Agricultural Goo
Support Price.Concept of Crop Insurance, Food Security.

Section-B

Industry: Role, Strategy and Challenges, Growth of MSMEs, Public and Priv
Sector Industries. Industrial Finance, Industrial Policy of 1991. New Pol
Initiatives for Industrial Development. New Economic Policy and Disinvestme
Foreign direct investment. Services Sector in India: IT, Education and Health.
Foreign Trade: Size, Composition and Direction: Recent Trends, Foreign Tra
Policy.

Section-C

Planning in India: Objectives and Achievements, NITI Aayog, Natior
Development Agenda, Problems Of Poverty; Unemployment, Inflati
AndRegional Inequalities; Rural Development programmesand Policy: Secto
Reforms in Infrastructure after 1991.

Books Recommended:

1. RudraDattand K.P.M Sundaram: Indian Economy (Hindi & English).
   Chand, New Delhi.
2. S.K. Mishra and V.K. Pure: Indian Economy, Himalaya Publishing Hous
   New Delhi.
3. A.N. Agarwal: Indian Economy, Vikas Publishing Co., New Delhi.
4. LaxminaryanNathuramka: BhartiyaArthvvyavastha, Ramesh Book Dep
   Jaipur.
5. Uma Kapila, Indian Economy Since Independence , Academic Foundation
6. Government of India; Economic Survey (Hindi & English.)

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8. Geography

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

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

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

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

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

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

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

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

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

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

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

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

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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:

नेहान, वी.एस. व गौतम, ए. 2005, भौतिक भूगोल (जीवमण्डल सहित)। रस्तोगी पब्लिकेशन्स, मेरठ।

यास, पी. 2012, भौतिक भूगोल। राजेश पब्लिकेशन्स, नई दिल्ली।

गौतम, अलका 2012 : भौतिक भूगोल। रस्तोगी पब्लिकेशन, मेरठ।

lusain, M. 2001, Fundamentals of Physical Geography. Rawat Publication, Jaipur

'ess, D 2012: Physical Geography : A Landscape Appreciation. PHI Learning Private imited, New Delhi. Mcknight's Tevu Edition.

nullar, D R 2012: Physical Geography. Kalyani Publishers, New Delhi

ह. सविन्द्र. 2005 भू-आकृति विज्ञान। तारा पब्लिकेशन, वाराणसी।

इ. संविन्द्र. 2011 भौतिक भूगोल का स्वरूप। प्रयाग पुस्तक भवन, इलाहाबाद।

.. एन.एस. शर्मा, एम एल एण्ड मिश्रा, आर.एन 2008 भौतिक भूगोल। पंचशील प्रकाशन जयपुर।

arma, R.C and Vatal M. 1999 Oceanography for Geographers. Chaitanya Publishing use, Allahabad

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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:

Jhalla, C.R. 1996-97: Geography of Rajasthan. Kuldeep Publications, Jaipur

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

Jodha, 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.

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

ईवाल, नेह 2012: राजस्थान का भूगोल। कॉलेज बुक हाउस, जयपुर।

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

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

Sharma H.S. and M.L. Sharma 2014: Geography of Rajasthan. Panchsheel Publisher Jaipur.

मीना, पूनम, 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	2½ 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:

जन, 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

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 proper- Bernoulli Distribution, Binomial Distribution, Poisson Distribu- Geometric Distribution. Idea of Hyper-geometric and Negative nial Distribution.

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

tion 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, Δ, ∇, 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

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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 Miffin 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.

10. APPLIED STATISTICS

Scheme:

	Duration	Max Marks Sc.	Arts	Min. Pass Marks 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 logrithmic & 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 cases).   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 Distibution & their mean, Variance & mfg.

<div align="right">18 hours</div>

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. 1 & 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)

11. 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

Dy. Registrar

For each option 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

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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।

Dy. Registrar

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

Part-I	3 hrs. duration	Max.Marks : 100
Part-II	3 hrs. duration	Max.Marks : 33
Part-III	3 hrs. duration	Max.Marks : 33
Practical	3 hrs. duration	Max.Marks : 34

Min. Pass Marks : 18   5 hrs. duration

Paper-I-Circuit Analysis

Max.Marks : 50

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

The candidates are required to attempt one question from each unit.

Max. Marks : 33

Time : 3 hrs.

Unit-I

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

Transient growth and decay of current in L-R circuit and time constant. Measurement of induetance 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. Phaser diagrams and concept of j operator.

Unit-III

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

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

Unit-IV

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

Unit-V

Concept of filters, Low, high, band pass and band elimination ilters. M derived filters. L and π configuration of filters. Cascading filter. short circuit and open circuit impedances. Design circuit ation of filters

Fourier analysis of periodic wave. Analysis of square, triangular wave forms. Analysis of output wave forms of half and full wave rectifiers. Experimental determination of the Fourier components of a square wave.

Reference :

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

Paper-II Semiconducting and Opoto electronic devices

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

Max. Marks: 33

Time : 3 hrs.

Unit-I

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

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

Varactor diode, tunnel diode and their characteristics, photo

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 arithmatic addition, subtraction, multiplication and division. Meaning of bit, nibble, byte, BCD code, Excess three code, other four bit codes, five bit code, gray code alfa numeric displays (ASCII code).

Unit-II

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, Schimett trigger.

Unit-IV

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

Unit-V

SSI & MSI integrated circuits, magnetic core, Magnetic core logic, Magnetic memory, Addressing Semi conductor memories, bi polar, 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 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

To study the RS flip-flop circuit and verify its truth table.
To study the half adder and substractor.
Verification of superposition theorem.
Verification of Norton's theorem.

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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.

1. TEXTILE-CRAFT

Scheme:

			DURATION	MAX.MARK	MIN.MARK
(i)	**Theory:**	One paper	3Hrs	50	22
(ii)	**Practical:**	One	3Hrs	50	28
(iii)	**Submission:**	Two		50	22

Syllabus (Theory): Introduction to Textile Craft

UNIT-I

1. Introduction to Textiles

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

3. Classification of fibres

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

5. Yarn manufacture by Takli and Charkha

UNIT-II

1. Warp and Weft, Difference between warp and weft

2. Handloom, Parts of Handloom

3. Warp path on Handloom

4. Motion of Handloom(primary & secondary)

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

UNIT-III

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

2. Dyes and Pigments (colourless dyes)

3. Classification of Dyes

4. Dyeing of cotton fabric by Tie and Dye process

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

Syllabus (Practical):

Samples preparation

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

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

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

(iv) Hand painting

(v) Stencil Preparation and Painting

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Submission:

Develop any two products

(i)   Dupatta / scarf/table cover using tie and dye

(ii)   Cushion cover or table mats using hand painting or stencil painting

Examination Scheme:

Major Problem: 50 Marks

Tie and dye/ stencil printing / hand painting on a product

Minor Problem: 30 Marks

Preparation of any weave or colour scheme

Reference books:

Dantyagi, S. (2012) Fundamental of Textiles, Orient Blackswan private limited.

Gohl, E. P. G. & Vilensky, L.D. (2005) Textile Science, CBS publishers & distributors PVT.Ltd. New Delhi

Taggart, W. (1920) Cotton Spinning, London; New York: Macmillen. London

Bannergee, N.N. (1986) Weaving Technology, 9th edition, Textile book house

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 ~~Industries~~ ~~accounting~~ and Garment	3	60	22	3
Practical	1	Clothing construction-1	6	80	28	4

B.Sc. Part—I

	Paper no.	Nomenclature of the paper	Teaching hrs. per week	Max. marks	Min.pass marks	Duration examination (hrs.)
Theory	1	Understanding textile	3	50	18	3
	2	Business and ~~accounting~~ Garment Industry	3	50	18	3
Practical	1	Clothing construction-1	6	50	18	4

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B.COM./B.A./B.SC. PART –I

PAPER- I : UNDERSTANDING TEXTLE

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

B.SC. M.M. 50   HRS. 3

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

Traditional embroidaries of india :

).kashida of Kashmir

)kasuti of karnatka

)Manipuri

chamba rumal

(e)kantha of bengal

(f)Phulkari of Punjab

(g)Chikankari of lucknow

SECTION - C

SELECTION CRITERIA

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

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

References :

1. corbman, textiles fibre to fabric

2. Phyllis g. tortora , understanding textile.

3. Naik , traditional 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

B.SC. M.M. 50

HRS.-3

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SECTION A

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

2. The important factors to be considerd 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, laundary area of garment industry.

10.Site seletion for unit

11 Budgeting for garment production unit.

Referances .

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

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

HRS. 4

1.Decorative samples :

Lace edging - (machine)

Gathers -(machine),darts

Pleats- knife ,box, inverted box

Frills- one side ,two sided

Tucks –pin,cross ,shell

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 apliqué work.

3.Make samples of following traditional embroidaries

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.

3 Geology and Mining

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
from Brachiopods, Molluses, Trilobites and Echinoids.

By R

...hepods, 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, ... ry, geometric and genetic classification and recognition in the field

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

Practicals

Study of physiographic features ... geographical 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 prop... classification ... plagioclase, microcline orthoclase biotite, hornblende, muscovite under microscope.

Geolo... ...mple.

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4. Environmental Science

Max Marks: 100

Min. Marks: 36

Paper 1   3 hours duration   Max Marks: 50

Paper 2   3 hours duration   Max Marks: 50

Practical   4 hours duration   Min. Marks: 18   Max Marks: 50

Note:

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

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

3. The objective question paper will be given after 2 hours of commencement of descriptive type paper and will have 35 questions of the objective type. This portion of the paper will carry 20 marks. The objective type questions will be of the following types:

   - Multiple choice type questions: 20 questions of ½ marks each.
   - Fill in the blanks/one word/true or false type questions:10 questions of ½ mark each.
   - Very short answer type questions: 5 questions of 1 mark each

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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

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Suggested Readings:

- Dalaby, 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. Merril 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 1. 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.

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

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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.

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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.

❖ Gopta, 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

Paper II : Cell Biology & Genetics (50 Marks)

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

Practical (50 Marks)

(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 objective type one word, short answers etc. which can be done in the same answer book.

Section-A

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

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

Section-B

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

Molecules execcuting mediator and catalytic functions—the proteins.

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

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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 sell 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 thermopiles and lkalophiles.
Pathogenic microorganisms Defense mechanism against microorganisms
Symbiosis and antibiosis among microbial populations.
N fixing microbes in agriculture.

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Microbial metabolism fermentation products. A survey of products from microorganisms.

Strains improvement by enrichment, selection and recombinant DNA methods.

Production of heterologous protein in interest in microorganisms.

Paper II : Cell Biology & Genetics

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

Section-A

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

Section-B

Structure and function of cell organelles : ultrastructure of cell embrane, cytosol, Golgibodies, endoplasmic reticulum (rough and nooth), ribosomes cytosketal structures (action, microtubles etc.) itochondria, chloroplasts, lysomes, peroxysomes, nucleus (nuclear embrane, nucleoplasm, nucleolus chromatin,). Cell division and ll cycle (include cell synchrony and its application). Cell-cell in-action.

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

Cell senescence and depth. Cell differentiation of plants and nals

Section C

Mendelian laws of inheritance, gene interaction,

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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; chemcial 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 at aberrations involving chromosomes; evolution of wheat, cotton and rice;

Hereditary effects—Kleinefelter, Turner, Cri-duChat and Down syndromes.

Section—D

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

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

Extra chromosomal inheritance, mitochondrial and chloroplast genetic systems.

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

B.Sc. Part I
Paper-III Biophysics, Biomaths & Instrumentations and Computer Application

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

Section - A

Energetics of living body sources of heat limits to temperature heat dissipation and conservation Lambert Bear law pectrophotometry 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

		Min. Pass Marks : 36
Paper I	3 hrs. duration	
Paper II	3 hrs duration	Marks : 50
Practical		Marks : 50
	Min. Pass Marks : 18	Max. Marks : 50

Note : Each theory paper will contain nine questions, three questions form each section. Candidates are required to attempt five questions in all taking 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

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Section-B

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

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

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

Section-C

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

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

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 fludidised bed fermenter, solid state fermenters.

— Principal operating characteristics of fermenters.

— Computer control of fermentation process.

— Introduction

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

— Justification and planning.

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

1. **Nucleic Acids.**

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

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 reverse muta-

transition, transversion, chemical induced mutations, radiations and base analogies, induced mutations, mutation frequency applications of mutations, Mechanism of repair, of radiation induced damage, SOS repair, Post transcriptional repair.

Section-B

4. **Genetic recombinant in bacteria.**

   Transformation, transduction and conjugation. Use of transformation, transduction and conjugative in genetic mapping, preparation of genetic maps.

5. **Extra Chromosome genetic material.**

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

6. **Carbohydrates.**

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

7. **Lipids**

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

Section-C

8. **Enzymes**

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

9. Amino Acids

Structure of amino acids, classification of essential aminto acids based on polarity. Hendersen and Hesselbalch equation for ionization of amino acids and Z winter ioni, property. Synthesis of peptizes, properties of proteins (acids 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, potentional law of thermodynamics, entropy, enthalpy and free energy of reaction; hydrolysis of energy rich intermediates and ATP. Respiratory electron transport and proton pump. Exudative phosphorylation (ATP synthesis), chemical coupling, confirmational change and chemismotic, Central dogma of energy transduction role coupling factors and dissipation of proton pump.

Practical on Paper-I

1. Preparation of media, autoculaving and sterilization of glassware, maintenance of culture room.
2. Isolation and minatenance of microbes of different groups.
   (a) Bacteria, (b) Algae, (c) Bacteriophage, (d) Fungi.
3. Single spore drawing.
4. Camera lucida drawing.
5. Standard plate court.
5. Haemocytometer
'. Isolation of Phytoathogens
. Biostatistics : manual and by computer
Problem of Chi-square test
Problem of mean, mode and median
Protein estimation by calorimeter.
Carbohydrate estimation by calorimeter.
Paper Chromatographic separation of amino acid and pigments by one way descending.
Paper Chromatographic separation by two dimensional Cromatograph
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 Excherichia coli.
5. Mutant isolation by gradient plate technique.
6. Location of site of mutation by using plasmid curing agent acrydine orange.
7. Isolation and purification of DNA.
8. Isolation and purification of RNA.
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 Vmax 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.

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

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

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

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

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

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

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

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

Disk Operating System—Introduction, Batch files.

Configuration files. COM, EXE, SYS, BIN and TXT files. Introduction to programming in BASIC. Development of programs in Q BASIC. Use of graphics facilitities 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 opearting 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 omputer. A simple documentation preparation and printing. Usage f printer and other components

Physical inspection of IBM PC and internal of ***Introduction*

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...enclature (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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