B.SC. (HONS)
PART-I
2014

Prepared by   23/9

Checked by

23/9

1. सामान्य हिन्दी

पूर्णांक : 100   समय 3 घंटे   न्यूनतम उत्तीर्णांक : 36

नोट :– 36 से कम आने वाले छात्रों को उत्तीर्ण नहीं किया जाएगा। इस प्रश्न पत्र प्राप्त अंकों को श्रेणी निर्धारण हेतु नहीं जोड़ा जायेगा।

अंक विभाजन : प्रश्न पत्र में दो भाग होंगे 1. साहित्य खण्ड एवं 2. व्याकरण खण्ड साहित्य खण्ड में दो भाग होंगे – गद्य भाग एवं पद्य भाग। प्रत्येक भाग के लिए 26 अंक निर्धारित हैं। इस प्रकार साहित्य खण्ड कुल 52 अंकों का होगा जिसमें अंकों का विभाजन निम्न प्रकार होगा–

(क) गद्य भाग से दो व्याख्याएँ, प्रत्येक 6 अंक	= 12 अंक
(ख) गद्य भाग पर दो प्रश्न, प्रत्येक 7 अंक	= 14 अंक
(ग) पद्य भाग से दो व्याख्याएँ प्रत्येक 6 अंक	= 12 अंक
(घ) पद्य भाग पर दो प्रश्न, प्रत्येक 7 अंक	= 14 अंक

व्याकरण खण्ड कुल 48 अंकों का होगा जिसमें अंकों का विभाजन निम्न प्रकार होगा–

(i) निबन्ध	= 12 अंक
(ii) संक्षेपण	= 4 अंक
(iii) लोकोक्ति, मुहावरे	= 4 अंक
(iv) शुद्धीकरण	= 8 अंक
(शब्द शुद्धीकरण, 4 अंक)	
(वाक्य शुद्धीकरण, 4 अंक)	
(v) पारिभाषिक शब्द	= 4 अंक
(vi) पल्लवन	= 4 अंक
(vii) पत्र	= 4 अंक
(viii) शेष व्याकरण	= 8 अंक

1. साहित्य खण्ड : गद्य–पद्य की निर्धारित रचनाएँ।

(i) गद्य भाग :– निम्नांकित पाठ निर्धारित हैं–

1. एक दुराशा :– बाल मुकुन्द गुप्त : निबन्ध (व्यंग्य विनोद)

2. शिरीष के फूल :– हजारी प्रसाद द्विवेदी – ललित निबन्ध

3. हरी हरी दूब और लाचार क्रोध :– कु. ना. राय – ललित निबन्ध

4. सिस्तर का वास्ते :– महादेवी वर्मा – रेखाचित्र

5. महाराजपुर से ग्वारी घाट :– अमृतलाल बेगड़ – यात्रा वृत्तान्त

6. इंस्पेक्टर मातादीन चांद पर :– हरिशंकर परसाई – व्यंग्य

7. उजाले के मुसाहिब :– विजयदान देथा – कहानी

8. मैं और मैं :– कन्हैया लाल मिश्र प्रभाकर – निपोर्ताज

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9. ब्रह्माण्ड को टटोलता हुआ सुपर जीनियस :– दिनेश रावत – वैज्ञानिक निबन्ध

10. बलवान से भिड़न्त :– गांधी जी की आत्मकथा से।

(ii) पद्य भाग :– निम्नांकित कविताएँ निर्धारित हैं–

1. मैथिलीशरण गुप्त :– भूलोक का गौरव – अमल आभास में (भारत–भारती से)

2. सुमित्रानंदन पंत :– बापू तथा प्रथम रश्मि

3. सूर्यकान्त त्रिपाठी निराली :–जागों फिर एक बार तथा तोड़ती पत्थर

4. रामधारी सिंह दिनकर :– हिमालय के प्रति तथा बोधिसत्व

5. हरिवंश राय बच्चन :– पथ की पहचान तथा लहरों में निमंत्रण

6. केदारनाथ अग्रवाल :– जब जब मैंनें उसकों देखा तथा यह धरती उस किसान की

7. सुभद्रा कुमारी चौहान :– झाँसी की रानी तथा प्रमु तुम मेरे मन की जानों

8. भगवती प्रसाद मिश्र :– गीतफरोश तथा सतपुड़ा के घने जंगल

9. नागार्जुन :– कालिदान के प्रति तथा प्रेत का बयान

10. ताराप्रकाश जोशी :– आ रे आ बादल तथा प्राणों में यदि पाहुन होते।

2. व्याकरण खण्ड :– निबन्ध, संक्षेपण, पल्लवन, पारिभाषिक शब्दावली (मानविकी विज्ञान और वाणिज्य से सम्बन्धित) लोकोक्ति, महावरें, शुद्धीकरण, पत्र लेखन, प्रतिवेदन, उपसर्ग, प्रत्यय, पर्याय, विलोम, अनेकार्थी शब्द, समश्रुत और अनेक शब्दों के लिए एक शब्द।

GENERAL ENGLISH
ESSENTIAL LANGUAGE SKILLS

Max. Marks 100   Duration 3 hrs.   Min. 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 :

All questions will be compulsory. Questions will be set covering all the sections of the units with scope for internal choice.

Unit A : Phonetics and Vocabulary   (20 marks) (10 periods)

I	Transcription of Phonetic Symbols	(05)
II	Word Stress	(05)
III	Synonyms and Antonyms	(05)
IV	Word formation-Prefix, Suffix	(05)

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

I   Transformation of Sentences   (05)

1. Direct and Indirect Narration
2. Active and Passive Voice
3. Interchange of Degrees of Comparison

II. Modals (05)
III. Sequence of Tenses (05)
IV. Elements of a Clause (05)
    (as discussed in Quirk and Greenbaum)

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

Following texts to be compiled by Macmillan in the form of a book for the University of Rajasthan.

William Blake	The Little Black Boy
Sujata Bhatt	Voice of the Unwanted Girl
Lewis Carroll	A Mad Tea Party
Ruskin Bond	Night Train for Deoli
M.K. Gandhi	The Birth of Khadi
J.L. Nehru	A Tryst with Destiny
Martin L. King Jr.	I have a Dream
A.P.J. Abdul Kalam	Vision for 2020

The No. of questions must not exceed ten

In **Unit C : Comprehension**, there will be internal choice, one out of two passages. Five questions to be answered out of eight short answer question of 2 Marks each based one any one of the two passages from the prescribed text.

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

    I. Letters- Formal and Informal (10)
    II. CV's and Job Applications (10)
    III. Paragraph Writing (10)

Recommended Reading

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

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3. ENVIRONMENTAL STUDIES

Max. Marks 100   3 Hrs. Duration   Min. Pass Marks 36

Paper will have only 100 multiple choice question to be evaluated on O.M.R. sheet. These O.M.R. sheets will be evaluated by authorised computer firm of the Univercity.

Unit-I : The Multidisciplinary nature of environmental studies Definition, scope and importance   (2 hours)

● Need for public awareness.

Unit 2 : Natural· Resources

Renewable and non-renewable resources :

Natural resources and associated problems.

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

(b) Water resources : Use and over-utilization of surface and ground water. floods, drought, conflicts over water, dams-benefits and problems.

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

(d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, water logging, salinity, case studies.

(e) Energy resources : Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

(f) Land resources : Land as a resource, land degradation, man

indeed landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles. (12 hours)

Unit- 3 : Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :
  - (1) Forest ecosystem
  - (2) Grassland ecosystem
  - (3) Desert ecosystem
  - (4) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries) (8 hours)

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, esthetic and option values.
- Biodiversity at global, National and local level.
- India as a mega-diversity nation.
- Hot-spot of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (10 hours)

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Unit-5 Environmental Pollution

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.
- Disaster management : floods, earthquake, cyclone and land slides.
  (10 hours)

Unit 6 : Social Issues and the Environment

- 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 solutions.
- Climate change, global warming, acid rain, ozone layer depletion nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste product.
- Environmental Protection laws in India.
- Population growth, variation among nations.
- Population explosion-Family Welfare Programme.
- Environment and human health.   (8 hours)

References :
1. Agarwal K.C. 2001 Environmental Biology. Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Map in Publishing Pvt. Ltd. Ahmedabad-380013, India, Email : Mapinicenert, net (R)

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3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p

4. Clark R.S. Marine Pollution, Clanderson Press, Oxford (TB)

5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental & Encyclopedia, Jaico Publ. House, Mumbai, 1196p

6. De A.K. Environmental Chemistry, Wiley Eastern Ltd.

7. Down to Earth, Centre for Science and Environment (R)

8. Gleick, H.P. 1993, Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press, 473 p.

9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Mumbai (R)

10. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140 p.

11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.

12. Mckinney, M.L. & Schoeb, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639 p.

13. Mhaskar A.K. Matter Hazardous, Techno-Scinence Publication (TB)

14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)

15. Odum, E.P. 1971. Fundamental of Ecology, W.B. Saunders Co. USA 574 p.

16. Rao M.N. & Datta, A.K. 1987. Wastewater Treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.

17. Sharma B.K., 2001 Environmental Chemistry. Goel Publ. House, Meerut.

18. Survey of the Environment. The Hindu (M)

19. Townsend C., Harper, J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB).

20. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standard, Vol I and II, Enviro Media (R)

21. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution Techno-Science Publication (TB).

22. Wagner K.D. 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA 499 p.

(M) Magazine
(R) Reference
(TB) Textbook

4. ELEMENTARY COMPUTER APPLICATIONS

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

Question paper for Elementary Computer Applications, Compulsory Paper (common for B.A./B.Sc./B.Com. Part I) be so set that it has 120 multiple choice questions (bilingual) of $\frac{1}{2}$ mark each. The question paper will be of the duration of 2 hours. The examinees will have to give their answers on OMR Sheet only to be provied by the University whose evaluation will be done based on OMR Scanning technology by a competent computer firm duly approved by the University. Further the practical examination for this paper will be of 40 marks and its duration will be of two hours.

The workload for this paper will now be as follows :

Theory Paper : Four Periods/Three Hours per week.

Practical : Three Periods/Two Hours per week.

Unit-1 : Introduction to Computers and Related Terminology (Basic information only).

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

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

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

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

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

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

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

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

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

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

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

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

Practical   Max. Marks 40.

Workload : Four Period / Three hours per week.
Course : Practical Training of Course content of Unit 2,3 and 4
of Theory syllabus.
The Practical examination will be of two hour duration. It will
consist of four small exercises testing the working knowledge of
followings each carrying a weight as given below :

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

Condidectes are registerd to attempt any three exercises on of
above maintend four exercises.

5. प्रारम्भिक हिन्दी

(in lieu of Compulsory subject of General Hindi for foreign nationals and the students belonging to Non-Hindi speaking areas).

पूर्णांक : 100   समय 3 घण्टे   न्यूनतम उत्तीर्णांक : 36

अंकों का विभाजन

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

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 निबन्ध।

पाठ्य पुस्तकें

1. गद्य-संग्रह-*राष्ट्रीय गौरव के चिन्ह*-डॉ. हरिकृष्ण देवसरे
   प्रकाशक-नेशनल पब्लिशिंग हाउस, नई दिल्ली-2

व्याकरण एवं रचना

1. *आधुनिक हिन्दी व्याकरण तथा रचना*-लेखक-कृष्ण विक

प्रकाशक-नेशनल पब्लिशिंग हाउस, नई दिल्ली-2

2. *सुबोध व्याकरण एवं रचना*-सम्पादक-व्यथित हृदय-संशोधनकर्ता-डॉ. अम्बा प्रसाद सुमन। प्रकाशक-श्रीराम मेहरा एण्ड कम्पनी, आगरा।

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SUBJECTS (HONOURS SUBJECTS)

1. PHYSICS

Paper-I : Mechanics

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

Unit-I

Inertial and Non-Inertial Frames:

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

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

(iii) Transformation of displacement, velocity and acceleration between different frames rotating with respect to each other pseudo forces, centrifugal and coriolis forces, Motion relative to earth (in northern and southern hemispheres), variation with latitude, Effect of coriolis force on various bodies in motion on earth, Focault's pendulum.

Unit-II

Conservation laws : Conservative forces, Potential energy in gravitational and electrostatic field, Rectilinear motion under conservative forces, Discussion of potential energy curves and motion of a particle. Centre of mass. two particle system: Motion of the CM and motion of one particle relative to another. Reduced mass, Conservation of linear momentum, Collision of two particles in one and two dimensions (elastic and inelastic).

Slowing down of neutrons in a moderator. Motion of a system with varying mass. Angular momentum conservation and charged particle scattering by a nucleus. Mechanics of system of particles:

Motion of the centre of mass of a system of particles. Motion relative to C.M., Relationship for kinetic energy and angular

momentum of a system of particles in the lab frame and the CM frame. Conservation of energy, Equation of rotational motion of a system of particles, Conservation of angular momentum.

Unit-III

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

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

Unit-IV

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

Unit-V

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

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

Books Recommended :
1. Berkeley Physics Course Vol-I, Mechanics.
2. Fundamental University Physics Vol-I, Mechanics by Alonso and Finn.

Paper-II : Oscillations and Waves

Note : Five questions are to be set taking one from each unit (each question will have an internal choice). Student will attempt all

the five questions. 40% weightage will be given to problems and numericals.

Unit-I

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

Unit-II

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

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

Unit-III

Motion of two coupled simple harmonic oscillators, Differential equation for stiffness or capacitance coupled oscillators. Normal modes, Motion in mixed modes. Transient behaviour. Effect of coupling. Normal modes of vibration for CO_2 and H_2O molecules. Calculation of normal mode frequencies. Forces oscillations and resonance for two coupled oscillators, Electrically coupled circuits, frequency response, Reflected impedance effect of coupling (inductive case) and resistive load.

Unit-IV

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

Unit-V

Wave equation in one dimension and its solution for elastic waves in : Solid rod, Gas column, transverse waves on a string.

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Normal modes of a two dimensional system. Waves n two and three dimensions, Spherical waves.

Reflection and transmission of waves on a string at a boundary. Reflection and transmission of energy. Matching of impedances. Standing waves on a string of fixed length–Energy of a vibrating string, energy in each normal mode of a vibrating string. Standing Wave Ratio. Fourier series and Analysis of triangular sawtooth and square functions. Plane Electromagnetic waves, wave equation and its plane wave solution, energy and momentum, Radiation pressure, Radiation resistance of free space. EM wave in dispersive media (normal case). Spectrum of electromagnetic radiations.

Recommended Books :
1. Vibrations and Waves—A.P. French.
2. Physics of vibrations and waves—H.J. Pain.
3. Waves and Oscillation, Berkeley Physics Course Vol 3.

Paper-III : Electricity and Magnetism

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

Unit-I

Vector Fields : Partial derivative, Gradient of scaler field function, Line integral of a vector field, Divergence in Cartesian coordinate, Gauss divergence theorem, Physical meaning of divergence of a vector, concept of solid angle, Gauss law from inverse square law, Gauss law in differential form. The Laplacian operator, Poisson and Laplace equations. Curl of a vector function, Curl in Cartesian coordinates. Stoke's theorem. The physical meaning of curl of a vector. Vector identities using del operator.

Unit-II

The field of Moving Charges : Concept of Electrostatic field and potential due to discrete charges and continuous charge distribution, Potential energy of a system of charges, Application : Energy required to build a uniformly charged sphere, classical radius of an electron. The potential and field due to short dipole (in polar and three dimensional Cartesian coordinates), the torque and force on a dipole in an external field.

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Magnetic forces, measurement of charge in motion, invariance of charge. Electric field measured in different frames of reference, field of a point charge moving with constant velocity. Force on a moving charge. Interaction between moving charge and other moving charges.

Unit-III

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

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

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

Unit-IV

Electric Field in Matter : The Electrical moments of a system of discrete charges and continuous charge distribution, dipole and quadrupole moments of discrete charge distribution, simple examples, Atomic and molecular dipoles. Atomic polarizabiliity, Permanent dipole moments. Dielectrics Capacitor filled with a dielectric, The potential and field due to a polarized sphere, Dielectric sphere placed in uniform field, The field of a charge in dielectric medium and Gauss law, The connection between electric susceptibility and atomic polarizability, Polarization in changing fields, The bound-charge (polarization) current.

Unit-V

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

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

Books Recommended :

1. Berkeley Physics Course, Vol. 2, Electricity and Magnetism.
2. Feynman in Physics Vol.2
3. An Introduction to Electrodynamics by Griffiths
4. Fundamental University Physics, Vol.2, Fields Alonso & Finn.

Paper-IV : Thermal and Statistical Physics

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

Unit-I

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

Unit-II

Kinetic Theory : Derivation of Maxwell's law of distribution of velocities and its experimental verification. Most probable, average and RMS velocities, Diffusion, Equip partition Theorem, Classical theory of Specific heat capacity, specific heat of solid.

Transport Phenomenon : Mean free path, Distribution of free path, Coefficients of viscosity, thermal conductivity and diffusion. Brownian motion, Langevin's and Einstein's theories, Experimental determination of Avogadro number.

Unit-III

Production of low temperatures : Cooling by Adiabatic expansion, Coefficient of performance, Joule-Thomson effect, J-T coefficient, for ideal as well as Vander Waal's gases. Porous plug experiment Temperature of inversion, Regenerative cooling Air. Liquefiers. Adiabatic demagnetization of paramagnetic substances. Nuclear paramagnetism. Liquid He I and He II, Superfludity, Quest for absolute zero, Third law of thermodynamics and Nernst Heat Theorem.

Unit-IV

Classical Statistics : Validity of classical approximation, Phase space, Micro and Macro states, Thermodynamic probability, Entropy and probability, Monoatomic ideal gas Barometric equation, Specific heat of diatomic gas, Ortho and para hydrogen, Specific heat capacity of solids, Langevin's theory of Paramagnetism.

Unit-V

Quantum Statistics : Bose-Einstein and Fermi-Dirac distribution laws, Calculation of the thermodynamic functions of an ideal weak degenerate gas, Strong degeneration, Calculation of the thermodynamic functions of an ideal Bose gas, Derivation of Planck law, Flux of radiation energy, radiation pressure. Thermodynamic functions of an ideal Fermi electron gas, Free electron model for metals, Specific heat of metals, Richardson's equation of thermionic emission, Relativitstic Fermi gas, White dwarf stars, Chandrasekhar mass limit.

Reference Books :

1. Berkeley Series, Vol. V, Statistical Physics.
2. Reif–Thermodynamics and Statistical Physics.
3. Lokanathan and Khandelwal—Thermodynamics and Statistical Physics.
4. Sears–Thermodynamics, Kinetic Theory of Gases and Statistical Physics.
5. Kittle–Thermal Physics.

PRACTICAL

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

Students are expected to perform atlest 15 experiments in the academic session. The suggestive list of experiments is given below.

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The institution if necessary may introduce new experiments of the same standard and communicate the list to the Convener, Board of Studies.

Experiments on Linear Track :
1. Constant velocity motion.
2. Acceleted motion.
3. Harmonic motion.
4. Anharmonic motion.
5. Potential energy curves and energy conservation.
6. Elastic collisions and conservation laws.

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

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

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

Experiments with Electricity Board : ·
18. Study of R.C. circuit with D.C.
19. Study of source impedance.
20. Study of R.C. Circuit with AC nonsinusoidal.
21. Study of R.C. Circuit with AC sinusoidal.

Other Experiments :
22. Study of interference pattern by 1,2,3,4,5 .... slits.
23. Study of Fresnel's diffraction pattern. (a) Circular hole (b) Single slit.
24. Study of Franhofer diffraction.
25. Michelson's interfermeter.
26. Study of thermo e.m.f.
27. Change of B.P. of a liquid with pressure.
28. Rydberg constant from a given spectrum of hydrogen.

29. Experiment for displacement current.
30. Study of Radiation patters from dipole, quadruple.

2. CHEMISTRY (HONS.)

Scheme :

	Duration	Max. Marks	Min.Pass Marks
Paper-I : Inorganic	3 hrs.	75	
Paper-II : Organic	3 hrs.	75	
Paper-III : Physical	3 hrs.	75	120
Paper-IV : Analytical	3 hrs.	75	40
Practical	7 hrs.	100	

(Completed in one day)

Notes :

1. There shall be four theory papers for Part-I Examination. The duration of examination for each paper shall be three hours and the maximum marks shall be 75.

2. Each paper will contain ~~nine~~ Ten questions having two questions ~~form~~ From each unit. Candidates are required to attempt five questions in all selecting atleast one questions from each unit.

B.S.C. (Hons.) Pt-I

Paper-I : Inorganic Chemistry (4 hrs/week)

Unit-I

Ionic Bond

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

Solids

Metallic bind : Qualitative idea of free electron, valence bond and band theories, semiconducters and insulaters, conduction in ionic solids, electrical and magnetic properties of solids, introduction to superconducters and super-conductivity.

Unit-II

Covalent bond

General characteristics, Valence bond theory and its limitations. Directional characteristics of covalent bond, Resonance and

resonance energy, Hybridisation involving s,p and d-orbitals Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_2O, H_3O^+, SF_4, ClF_3, ICl_3, shapes of simple inorganic molecules and ions. Dipole moment, percentage ionic-character from dipole moment and electronegativity difference.

Molecular Orbital Theory

Detailed description of linear combination of atomic orbital (LCAO), Homonuclear $(H_2$, He_2, B_2, C_2, N_2, O_2, $F_2)$ and heteronuclear diatomic molecules (CO, NO) and their ions, comparison of valence bond and molecular orbital theories, multicentre bonding in electron deficient molecules, bond strength and bond energy.

Unit-III

Weak Interactions

Hydrogen bond, theories of hydrogen bonding : Valence bond treatment, weak intermolecular forces of attraction, van der Waals forces.

Chemistry of Noble Gases

Position in the periodic table, discovery, Isolation, important compounds of noble gases with special references to xenon compounds : Synthesis, bonding and their stereochemistry.

s-Block Elements

Comparative study diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their functions in biosystems, an introduction to alkyls and aryls.

Unit-IV

p-Block Elements

Comparitive study of the p-block elements and group trends, electronic configuration, physical and chemical properties, atomic and ionic radii, ionisation potentials, electron affinity, electronegativity and oxidation states, oxidation state diagrams on the basis of redox potentials, inert pair effect, catenation.

Compounds of p-block Elements

Hydrides of boron, diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), silicones, oxygen fluorides, peracid s of sulphur, tetrasulphur tetranitride, basic properties of halogens, interhalogen compounds and polyhalides.

d-Block Elements

Chemistry of the elements of first transition series:
Electronic configuration and comparative study with respect to atomic and ionic radii, oxidation states and ionisation potentials. Redox potentials, oxidation state diagrams on the basis of redox potentials, binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry, metallic nature, magnetic properties, catalytic activity, colour and spectral properties of transition metal ions.

Chemistry of the elements of second and third transition series : Electronic configuration, general characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

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

Unit-I

Structure and Bonding : Bond energy, bond length, bond angle, Hybridization and bond properties, σ and π bond, Inductive effect, hyperconjugation, resonance, van der Waals interactions, inclusion compounds, clatherates, charge transfer complexes, hydrogen bonding.

Mechanism of Organic Reactions : Free radical and ionic reactions, homolytic and heterolytic bond breaking, Electrophiles and nucleophiles, Types of organic reactions, Energy considerations, transition state, Reactive intermediates-carbocations, carbonions, free radicals, carbenes, arynes and nitrenes. Assigning formal charge on intermediates and other ionic species. Methods of determination of reaction mechanism.

Alkanes : Nomenclature of branched and unbranched alkanes. Classification of carbon atoms in alkanes. Isomerism 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 reaction of alkanes. Mechanism of free-radical halogenation of alkanes : orientation, reactivity and selectivity.

Unit-II

Cycloalkanes : Nomenclature, methods of formation, chemical reactions. Baeyer's strain theory and its limitations. Ring strain in small rings (cyclo-propane and cyclo-buttane). Theory of strainless

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rings. The case of cyclopropane ring : banana bonds.

Alkenes : Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions. Markownikoffs rule, hydroboration-oxidation. Oxymercuration reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KNmO_4$, Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene.

Cycloalkenes : Methods of formation, conformations and chemical reactions.

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

Alkynes : Nomenclature, structure and bonding, Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal, ammonia reduction, oxidation and polymerization.

Unit-III

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 picture.

Aromaticity : the Huckel rule and its applications. Energy level of π-molecular orbitals (ethene, 1-3-butadiene, benzene)

Aromatic electrophilic substitution : General pattern of the mechanism, role of sigma and pi complexes, mechanism of nitration, halogenation, sulphonation, measuration and Friedel-Crafts reaction. Effect of substituent groups (inductive, mesomeric and hyperconjugative effect), activating and deactivating groups, Directive influence of groups, determination of orientation up to disubstituted derivatives, ortho/para matio, Birch Reduction.

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

Alkyl and Aryl Halides : Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution, reactions of alkyl halides S_N^2 and S_N^1 reactions with energy profile diagrams.

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

Relative reactivities of alkyl halides V/s allyl, vinyl and aryl halides. Preparation and properties of vinly, allyl and benzyl halides. Synthesis and used of DDT and BHC.

Unit-IV

Stereochemistry of Organic Compounds : Concept of isomerism. Types of isomeris.

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

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

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

Conformational isomerism : Conformational analysis of ethane and n-butane. Newman projection and Sawhorse formulae. Fischer and flying wedge formulae.

Difference between configuration and conformation.

Unit-IV

Electromagnetic Spectrum : Absorption Spectra

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

Infrared (IR) absorption spectroscopy—Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands,

measurement of IR spectrum, fingerprint region, characteristic absorptions of simple organic compounds, alkanes, alkenes, alkynes, alcohols, aldehydes, ketones, carboxylic acids and their derivatives.

Paper-III : Physical Chemistry
Unit-I

States of Matter   **(4 hrs/week)**

Ideal Gases : Concept of molar mass and molor volume. Determination of molar mass of a gas and volatile substance. The barometric distribution law. Maxwell distribution law of molecular velocities. The Maxwell Energy Distribution. The Maxwell Boltzman distribution law and its experimental verification.

Real Gases : Causes of deviations from ideal gas behaviour. Van der Waal's equation and its implications. Isotherms of van der Waal's gas. Critica phenomenon and critical constants. Reduced equation of state and the law of corresponding states.

Unit-II

Thermal expansion and compressibility, Heat of vaporization. Determination of vapour pressure and heat of vaporization. Disorder in liquid state and structure of liquid water. Intermolecular forces. Cohesion of liquids. Eyring Theory of liquids.

Crystalline and amorphous states. Isotropy and anisotropy, Elements of symmetry. Law of rational indices. Weiss and Miller indices and equation of plane in intercept form. Law of constancy of interfacial angeles. Unit cell and lattice Powder method of X-ray examination of crystals.

Unit-III

Rate, Initial rate, Specific rate, Rate constant and units. Method of determination of initial rate. Order, molecularity and stoichiometry of the reaction. Methods of determination of order of a reaction. Derivation of integrated rate equations-zero order, first order, second order and third order. Graphical applications of these equations for the determination of rate constant. Effect of temperature on the rate constant, Arrhenius equation, Energy of activation and its determination.

Complex reactions and their nature. How do these reactions differ from simple reactions? Derivation of rate equation for the

opposing reactions $(A+B \rightleftharpoons C)$; parallel reactions

$(A \overset{P_1}{\underset{P_3}{\longleftarrow}} P_2$ P's are products) and consecutive reactions
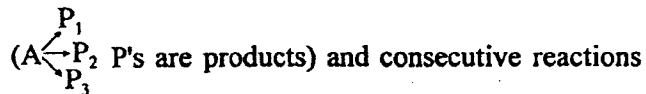
$(A \rightarrow B \rightarrow C)$ Characteristics of consecutive reactions.

Unit-IV

Thermodynamics :

Definition of thermodynamic terms. Concept of work and heat. Work of expansion and compression. Zeroeth law of thermodynamics. First law of thermodynamics, Exact and Inexact differential. First law of thermodynamics under isothermal and adiabatic conditions respectively. Enthalpy and changes at constant temperature and pressure. Concept of Cp and Cv and their thermodynamic relationship.

Application of First law of Thermodynamics. The heat of reaction and heat of formation. Hesse's Law. Heat of reaction at constant pressure and volume. Variation of heat of reaction with temperature. Bond enthalpies and Bond energies.

Unit-V

Solutions

Solutions of gases in liquids, Henry's law and its application to respiration. Solutions of solids in liquids and distribution law. Distribution law and extraction processes.

Osmosis, Osmotic Pressure, Determination of osmotic pressure. Lowering of vapour pressure. Relative lowering of vapour pressure and Rault's law. Depression in freezing point and elevation in boiling point. Vant's Hoff Factor and its implications.

Phase Equilibria

Explanation of terms phase, component and degrees of freedom. Phase rule and its thermodynamic derivation. Restricted phase rule. Analysis of (a) one component system such as sulfur and water (b) two component system such as lead-silver system.

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

Unit-I

Principle of Gravimetric analysis, precipitation methods, super saturation and ppt formation, the purity of the ppt, coprecipitation, postprecipitation, conditions of precipitation, precipitation from

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homogeneous solution, washing of the ppt. Ignition of the ppt, masking and demasking agents.

Unit-II

Solvent extraction : Principles and process of solvent extraction, the distribution law and the partition coefficient, liquid-liquid extraction, factors favouring solvent extraction, choice of solvent for solvent extraction, stripping, solid liquid extraction, organic reagents used in solvent extraction.

Organic reagents in quantitative inorganic analysis. Application of the following organic reagents-DMG, Cupferron, 8-hydroxyquinoline, cupron, salicylaldehyde, oxime, 1-nitroso-2-naphthol, 4-bromoandelic acid, nitron, tannic acid, arsonic acids, pyridine, anthranilic acid, pyrogallal, ethylendiamine.

Unit-III

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

Volumetric analysis-Principle and applications of Redox titrations, Iodometry and Iodimetry. Theory of complexation titrations. Methods of end point detection, EDTA as Titrant, types of EDTA titration of mixtures, selectivity masking and demasking agents, metal indicators.

Unit-IV

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

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

Polarimetry : Basic principle, instrumentation, experimental techniques, determination of (a) specific rotation of a substance (b) concentration of the substance & applications. An elementary idea of Refractometry, Interferometry-circular dichroism & optical rotatory dispersion.

Unit-V

Water pollutants and their analysis : Water analysis pollutants, Analysis of water for dissolved oxygen, B.O.D. and C.O.D. Biologic

treatment methods. Prevention of water pollution by treatment of industrial wastes with special reference to cement industry, fertilizer industries and dyeing industries.

Air pollution : General consideration types of air pollutants, unit of measurement sampling monitoring and analysis of CO and SO_2 in atmosphere effect of air pollutants on plants and human health method for pollution control, specially for pollution by automobiles.

Chemistry Practicals.

8 hours/12 periods per week (spread over four days)

Inorganic Chemistry Practicals

A. **Qualitative :** To analyse the given mixture containing six radicals (three acidic radicals and six basic radicals including Fluoride, borate, oxalate and Phosphate) and excluding insolubles).

B. **Quantitative :**

1. Volumetric exercises—involving :
   (i) Complexometric titrations (EDTA) : Estimation of Ca^{2+} & Mg^+
   (ii) Iodometric and Iodimetric titrations.
2. Determination of total hardness of water.
3. Determination of number of molecules of water of Crystallization in oxalic acid crystals.
4. Estimation of sodium carbonate and bicarbonate in mixed solution.
5. Estimation of sodium carbonate and sodium hydroxide in a mixed solution.
6. Estimation of Ferrous and Frric sulphates in a mixed solution.

Organic Chemistry Practicals :

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

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7. Determination of m.p. and mixed m.p.

Physical Chemistry Practicals :

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

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Instructions to the Examiner

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Practical Examination   7 hrs. duration   100 Marks

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(Completed in one day)

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Exercises

1. **Qualitative :** To analyse the given mixture containing three basic and three acidic radicals including fluoride, borate, oxalate and phosphate. No insoluble will be given.   18
2. **Quantitative :** (One of the exercises mentioned in the syllabus) 12
3. Identification of functional group (2 compounds) and preparation of its suitable derivative, if feasible.   25
4. Physical Chemistry practical (perform one of the physical chemistry experiments mentioned in the syllabus   25
5. Viva   10
6. Record   10

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Total 100

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3. ZOOLOGY (HONS.)

Scheme :

Paper-I	: Animal Diversity-1	50 Marks
Paper-II	: Animal Diversity-2	50 Marks
Paper-III	: Cell Biology	50 Marks

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Paper-IV   : Molecular Biology   50 Marks
Paper-V   : Genetic & Biostatistic   50 Marks
Practicals   : 2 days (50 marks each)   100 Marks

Seminar, Posters, models visit reports etc will carry internal marking of 20 marks which will be added in the Practicals (Total=80+20 =100)

Note :

Paper-I : Animal Diversity-I

Max Marks : 50

Scheme of Examination

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

Section A

1. Principles of classification-Salient features and classification upto orders in non-chordates. Structural organization in different classes of non-chordates.
2. Protozoa-Type study (Paramecium) and study of locomotion. Osmoregulation, nutrition and reproduction in protozoa.
3. Origin of Metazoa-Metamerism and symmetry.

Section B

4. Porifera and Coelenterata-Type study (Leucosolenia and Obelia) canal system, corals and corals reefs, polymorphism in hydroxoa.

Section C

5. Ctenophora-affinities-Type stury (Pleurobrachia).
6. Platyhelminthes and Namatheliminthes.
   Type study : *Taenia solium* and Ascaris : reproduction and parasitic adaptations.

Section D

7. Economic Importance of
   7.1 Protozoa
   7.2 Corals and Coral reefs
   7.3 Helminthes

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Paper-II : Animal Diversity-2

Scheme of Examination   *Max. Marks : 50*

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

Salient features and classification upto orders and structural organization:

Section A

1. Annelida : Coelom and excretory system. Type study : Earthworm and Leech.
2. Mollusca : Torsion and distortion in Gastropod type study; Pila, Unio and Sepia.

Section B

3. Onychopora : Affinities and type study (Peripatus)
4. Arthropoda ; Crustacean larval forms.
   Vision in Arthropods, metamorphosis in insects, social life, mouth parts and economic importance of insects.

Section C

5. Comparative study of blood vascular, reproductive, respiratory and excretory system in Prawn, Cockroach, Scorpion, Trilobites.

Section D

6. Principles and Practices of
   (i) Sericulture (Including Ericulture)
   (ii) Lac culture
   (iii) Apiculture
7. Economic Importance of Arthropoda:
   Insects as part of human society and their management.
8. Economic Importance of Mollusca including an outline idea of Pearl culture.

Paper-III : Cell Biology

Scheme of Examination   Max.Marks : 50

1. There will be 5 Questions in each paper. All questions are compulsory and carry equal marks.

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2. Questions Number 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Questions should be evenly distributed covening entire syllabus.

3. Each paper is divided into four units/sections. There will be one question from each unit/section. The question number 2 to 5 will have internal choice.

Section A

1. Diversity of cell size and shape.
2. Cell theory.
3. Structure of prokaryotic and eukaryotic cells.
4. Cellular organelles-separation and characterization.
5. Cellular energy transactions-role of mitochondria and chloroplasts.
6. Cell junctions. Cell adhesion, and the extracellular matrix.

Section B

7. Membrane transport of small molecules and the ionic basis of membrane excitability.
8. Intracellular comparatments and protein sorting.
9. Vesicular traffic in the secretory and endocyticpathways (GERL System)

Section C

10. Cell signaling with reference to c-AMP and IP_3-DAG system.
11. Cytoskeleton.
12. Cell-division cycle.
13. The mechanics of cell division.

Section D

14. Tissues
    (i) Epithelial tissues : Structure function and type—(a) simple epithelia-squamous, cuboidal, colummar, ciliated, pseudostratified (b) compound-stratifed and transitional.
    (ii) Connective Tisseus ; Structure, function and types—(1) Connective tissue proper-areolar, adipose, white, fibrous, yellow elastic, reticular, mucous (b) Skeletalcartilage (hyaline, fibrous and calcified cartilage) and bones (dried, declacified and mammalian).
    (iii) Vascular tissuel; Structure, function and types-Blood (plasma and corpuscles) and lymph
    (iv) Nervous tissuel Structure, function and types-Myelinated

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and non-myelinated.

(v) Muscular : Structure, function and types-visceral/smooth, Skeletal/straiated and cardiac.

Paper-IV : Molecular Biology

Scheme of Examination **Max. Marks : 50**

1 There will be 5 Questions in each paper. All questions are compulsory and carry equal marks.

2. Question Number 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Questions should be evenly distributed covening entire syllabus.

3. Each paper is divided into four units/sections. There will be one question from each unit/section. The question number 2 to 5 will have internal choice.

Section A

1. Genes and chromosomes-nature of genetic material-central dogma.

2. Organization of DNA-Viral, bacterial and eukaryotic, palindromes, split genes.

Section B

3. DNA replication-General principles, enzymes and inhibitors.

4. DNA repair.

Section C

5. Transcription—basic details.

6. Protein biosynthesis—basic details.

7. Co-and post-translation modification, inhibitors.

Section D

8. Regulation of gene expression—general principles.

9. Gene transfer-general, concepts, genetic disorders, gene therapy.

Paper-V : Genetics & Biostatistics

Scheme of Examination **Max. Marks : 50**

1. There will be 5 Questions in each paper. All questions are compulsory and carry equal marks.

2. Question Number 1 will comprise 10 very short answer (maximum 25 words) type questions, each of 1 mark. Questions should be evenly distributed covening entire syllabus.

3. Each paper is divided into four units/sections. There will be one question from each unit/section. The question number 2 to 5 will have internal choice.

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Section A

1. Mendelian inheritance patterns and laws of heredity.
2. Co- and incomplete dominance.
3. Linkage and linkage maps.
4. Varieties of gene expressions—multiple alleles, lethal genes, pleiotropic genes, gene interactions, epistasis,

Section B

5. Transposons.
6. Sex-chromosome systems and sex-linkage.
7. Non-chromosomal inheritance.

Section C

8. Mutations and chromosomal alteration, meiotic consequences.
9. Human genetics—Chromosomal and single gene disorders; genetic counselling, somatic cell genetics.
10. Gene mapping and genome analysis.

Section D

Biostatistics

1. Introduction, scope and application of Biostatistics
2. Understanding the concepts of descriptive and inferential statistics.
3. Frequency distribution.
4. Graphical presentation of data.
5. Mean, mode, median and their significance.
6. Standard deviation and standard error and their significance.

Paper-VI : Biochemistry

Scheme of Examination　　　　　　　　　　**Max. Marks. 50**

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

Section A

1. Biochemistry : Meaning, history, scope and significance
2. Basic Chemical Concepts; bondsand functional groups.
3. Amino acids and peptides-Properties and structure.

4. Carbohydrates-classification, structures and clinical significance.
5. Lipids—classification, structure and clinical significance.
6. Vitamins—Discovery, structures and function.

Section B

7. Proteins—Classification, structural properties.
8. Nucleic acids and nucleotides—structural properties and functions.
9. Nature of enxymes, classification, Co-enzymes, Co-factors, Inhibition (competitive, uncompetitive and noncompetitive), Iso-enzymes, Factors contributing to catalytic efficiency.

Section C

10. Design and regulation of metabolism—selected examples from carbohydrate, lipid nucleotide and amino acid metabolism.

    10.1 Carbohydrates; Oxidation of glucose through glycolysis, Krebs cycle and oxidative phosphorylation; elementary knowledge of interconversion of glycogen and glucose in liver; role of insulin.

    10.2 Proteins; Essential and non-essential amino acids, transformation of amino acis, deamination, Transanination, decarboxylation, fate of ammonia syntheses of urea (ornithine cycle); fate of carbone skeleton.

Section D

    10.3 Lipids : Beta-oxidative pathways of fatty acids; brief account of biosynthesis of Triglycerides, Cholesterol and its metabolism.

    10.4 Catabolism and Biosynthesis of nucleic Acids.

    10.5 Mineral Metabolism; Iodine, Iron Calcium and Zinc

Practicals

Scheme of Practical Examination and Distribution of Marks:
Time : 10 Hrs. (Two days, 5 Hrs/day)
Min Pass : 36

	Regular
1. Dissection	10
2. Permanent Praparation	6
3. Exercise in cell Biology	8
4. Exercise in Genetics	8
5. Exercise in Biochemistry	8
6. Exercise in Biostatistics	6
7. Identification and Comments	24

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on spots (1 to 8)

8.	Viva-voce	10
9.	Class-Record	10
10.	Seminar/Project Report/Collection	<u>10</u>
	Total	<u>100</u>

Note :

1. With reference to dissection, the candidates must be well uersed with the techniques of flag lakelling and black paper insertion as the case may be for a clear illustration.
2. With reference to whole mounts and museum specimens in case of unavailability, the animal types should be substituted with diagrams, photographs, models etc.
3. Candidates will keep a record of all work-done in the practical examination.
4. It should be ensured that animals used in the practical exercises are not covered under the wildlife act 1972 and amendments made subsequently.

I.   Microscopic techniques:

1. Organization and working of optical microscopes : Dissecting & Compound microscopes.
2. General methods of microscopically permanent preparations: Narcotization; Fixing & Preservation; Washing; Staining & Destaining; Dehydration; Clearing & Decolourization; Mounting. General idea of composition, preparation & use of—
    (a) Fixatives : Formalin & Bouin's fluid
    (b) Stains : Borax carmine; Acetocarmine; Acetoorcein; Haematoxylin & Eosin.

II.   Colection & Culture Methods:

1. Collection of animals from their natural habital during field trip e.g. Amoeba; Paramecium; Euglena; Planaria; Earthworm; Daphnia; Cyclops etc.
2. Culture of Paramecium in the laboratory & study of it 'structure, life processes and behaviour collection & study of invertebrate parasites Rectal ciliates of fog.

III.   Museum Specimens:

1. Porifera : Leucosolenia; Euplectella; Spongilla.
2. Coelenterata : Millipora; Physalia; Vallela; Aurelia; Alcyonium; Gorgonia; Pennatula; Sea anemone; Stone coral; Obelia-Polyp

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& Medusa.

3. Ctenophora : Any one
4. Platyhelmintese : Taenia; Planaria; Fasciola
5. Ascheheliminthese : Ascaris
6. Annelida : Nereis; Heteronereis; Aphrodite; Chaetopterus; Arenicola; Glossiphonia; Pontobdella; Polygordius.
7. Onychophora : Peripatus
8. Arthropoda : Limulus, Spider; Scorpion; Centipede; Millipede; Lepas; Balanus; Squilla; Eupagarus; Crab; Mantis; Apis; Locust; Bomyx; Beetle.
9. Mollusca : Chiton; Aplysia; Cypraea; Mytillus; Pearl oyster; Dentalium; Loligo; Octopus; Nautilus.
10. Echinodermata : Pentaceros; Echinus; Ophiothrix; Cucumaria; Antidone.
11. Hemichordata : Balanoglossus

IV. Microscopic Slides:
1. Slides of all the tissues specified in the theory.
2. Protozoa : Euglena; Trypnosoma; Giardia; Entamoeba; Elphidium Foraminiferan shell; Monocystis; Plasmodium; Paramecium; Paramecium showing binary fission & conjugation; Opalina; Nyctotherus; Balantidium; Vorticella.
3. Porifera : L.S. & T.S. of Sycon; Sycon; Spongin fibres; Gemmules.
4. Playhelminthese : T.S. of Fasciola; Miracidium, Sporocyst, rediae, cercaria larvae of Fasciola; Taenia Scolex; T.S. of Taenia through mature proglottid; Cysticercus.
5. Annelida : T.S. body of Nereis
6. Arthropoda : Pediculus; Bedbug; Termite various types; Cyclops; Daphnia; Crustacean larvae.
7. Mollusca : V.S. Shell; T.S. Gill of Pila; Glochidium.

V. Anatomy:
1. **Earthworm :** External features; General viscera; Alimentary; Nervous system; Reproductive system.
2. **Cockroach :** External features; Appendages; Mouth parts; Alimentary canal; Nervous system; Reproductive system
3. **Prawn :** External features; Appendages; Alimentary canal; Nervous system.
4. **Pila :** External features; Pallial organs; Nervous system.

VI. Permanent preparation:
paramecium; Euglena; Rectal ciliates of Frog; Forminiferan shell; Sponge spicules; Spongin fibres; **Gemmule;** Hydra; Obelia colony; Parapodium of Nereis & Heteronereis; Ovary, Setae, Nerve ring & Nephridium of Earthworm; Salivary gland & Trachea of Cockroach; Hastate plate and Statocyst of Prawn; Gill lamella, Radula & T.S. ospharadium of Pila.

VII. Exercises in Cell Biology:
1. Squach preparation for the study of Mitosis in Onion root tip.
2. Squash preparation for the study of Meiosis in Grasshopper/ Cockroach testis.
3. Study of giant chromosomes in salivary gland of Chironomous/ Drosophila larva.

VIII. Exercises in Genetics:
1. Study of Drosophia : An idea about its culture & Life cycle.
2. Identification of male & female Drosophila.
3. Identification of wild and mutant Drosophila-Yellow & Ebony body; Normal & Vestigial wings; White & Red eyes etc.
4. Permanent preparation of sex comb of Drosophila
5. Identification of blood groups in Man (A, B, AB, O & Rh)

IX. Exercises in Biochemistry :
1. Detection of proteins, carbohydrates and lipids in animal tissues.
2. Identification of mono, di and polysaccharides in the given samples.
3. Demonstration of principles of paper chromatography.
4. Quantctative estimations of cholesterol, forotcin, glycogen and blood glucose.
5. Verification of Beer-Lambert's law.

X. Exercises in Biostatistics :
1. Exercises on mean, mode and media.
2. Construction of frequency table, pie chart, histogram and polygon.
3. Exercises on standard deviation and standard error.

Recommended Books:
1. Karp, G. : Cell and Molecule Biology, John Wiley and Sons, INC. Newyork.
2. Lddish, H. et. al., Molecular cell Biology, W.H. Freeman and Company, Newyork.
3. Sheeler, P. and Bianchi, D.E., Cell and Molecular Biology. John

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Wiley and Sons, INC, Newyork.

4. Snustad D.P., Simmons, M.J., Jenkins, J.B., Principles of Genetics, John Wiley and Sons, INC, Newyork.

5. Hor Ton, H.R., Moran, L.A., Scrimgeour, K.G. Perry, M.D., Rawn. J.D., Principles of Biochemistry, Rearson, Prentice Hall New Jersey.

6. Mckee T., Mekee, J.R., Biochemistry, McGraw Hill, New Dell.

7. Nslson, D.L., Cox, M.M., Lehninger Principles of Biochemistry Macmillan, worth Publishers, New york.

8. Voet, D., Voet, J.G., Biochemistry. John Wiley & Sons, Newyork.

9. Satayanarayana, V. Biochemistry, Books and Allied (p) Ltd. Kolkata.

10. Balinsky, B.I., An Introduction to Embryology. Affiliated East West Press Pvt. Ltd., New Delhi.

11. Wolpert, L., Principles of Developmental. Oxford University Press, Oxford.

12. Slack, J.M.W. Essential Developmental Biology, Black well Publishing company, Australia.

13. Cooper, G.M. The Cell : A molecular approach, ASM Press, Washington, DC.

14. Gardner, E.J. Simons, M.J., Snustad, D.P. Principles of Genetics John Wiley & Sons, Inc, New York.

15. Gilbert, S.F. Development Biology, Sinauer. Associates Inc. Massachusetts.

4. BOTANY

Scheme :

Max. Marks : 400   **Min. Pass Marks : 160**

Paper-I	: Diversity and Classification of Plant Kingdom	75 Marks
Paper-II	: Cell Biology and Basic Biochemistry	75 Marks
Paper-III	: Plant Physiology and Ecology	75 Marks
Paper-IV	: Development of Plants and their utilization	75 Marks
Practical		100 Marks

SCHEME OF EXAMINATION
Common for all papers

Max. Marks : 75   **Time : 3 hrs**

1.   Two types of question papers of three hours duration for the

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theory will be applicable. One question paper will comprise the Objective type of questions and the other will comprise of descriptive long answer type questions.

2. Descriptive type of question paper (to be given for the first two hours of the examination) will have 6 questions, out of which student is supposed to attempt any 3.This portion of the paper will carry maximum 45 marks.

3. The objective type question paper will be given after 2 hours of descriptive type paper and will have 30 questions of the objective type. This portion of the paper will carry 30 marks. The objective type of questions will be of the following types :

— Multiple choice type questions-20 of 1 mark each.

— Fill in the blanks/one word/true or false type questions 5 of 1 mark each.

— Very short answer type questions-5 of 1 mark each.

Paper-I
Diversity and Classification of Plant Kingdom
Unit-I

1. **Plant Kingdom :** Classification of kingdoms and the criteria (according to Mayr, the seven kingdoms of living organization); diversity in habitat, form, life span, nutrition and ecological status; origin, evolution and phylogeny of land plants.

2. **Algae :** General characters, classification and economic importance: Important features and life history of Cholorophyceae-*Volvox oedogonium; Xanthophyceae-Vaucheria, Phaeophyceae Ectocarpus; Chara; Rhodophyceae-Polysiphonia.*

3. **Fungi :** General characters, Classification and economic importance; Important features and life history of Mastigomycotina-*Psythium, Phytophthora; Zygomycotina, Mucor,* Ascomycotina-*Saccharomyces, Eurotium, Chaetomium, Peziza;* Basidiomycotina-*Puccinia. Agaricus; Deuteromycotina Cercospora, Collectotrichum;* General account of Lichens.

Unit-II

4. **Bryophytes :** Classification and comparative study of morphology, anatomy and reproduction; Broad interrelationships of Hepaticopsida, Anthocerotopsida, Bryopsida; Ecological and economic importance of bryophytes.

5. **Pteridophytes :** Salient feature of primary vascular plants;

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Classification, comparative study of morphology, anatomy, reproduction; Stelar Evolution : a general account of evolutionary significance of Psilopsida, Lycopsida, Sphenopsida and Pteropsida; Heterospory and seed habit.

Unit-III

6. **Gymnosperms :** Classification and salient features; Evolutionary significance of gymnosperms; comparative study of morphology, anatomy and reproduction of Cycadales, Coniferales and Gnetales.

7. **Angiosperms :** Unique features of angiosperms, their diversity; identification, nomenclature and classification; Comparison of systems of classification (Bentham & Hooker, Engler & Prantl); Primitive and advanced features; salient features of the International Code of Botanical Nomenclature; General account of morphology, anatomy, flower structure.

Suggested Readings

1. Bold, H.C., Alexopoulos, C.J. and Develorayas, T. 1980. Morphology of Plant and Fungi (4th Edition). Harper and Foul Co., New York.

2. Clifton, A. 1985, Introduction to the Bacteria. McGraw Hill Co., New York.

3. Dube, H.C. 1990 An Introduction to Fungi. Vikas Publishig Ltd. Delhi.

4. Gifford, E.M. and Foster, A.S. 1989. Morphology and Evolution of Vascular Plants. W.H. Freeman & Co., New York.

5. Gilbert, M.S. 1985 : Cryptogamic Botany, Vol. II (2nd Edition). Tata McGraw Hill Publishing Co.Ltd., New Delhi.

6. Kumar, H.D. 1988. Introductory to Plant Viruses. Chand & Co. Ltd. New Delhi.

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

8. Raven, P.H., Evert, R.F. and Eichhorn, S.E. 1999. Biology of Plants (5th edition), W.H. Freeman & Co., Worth Publ., New York, USA.

9. Sporne, K.R. 1991 : The Morphology of Gymnosperms. B.I. Publications Pvt. Bombay, Calcutta, Delhi.

10. Wilson, N.S. and Rthwell, G.W. 1993. Palaeobotany and the Evolution of Plants (2nd Edition). Cambridge University Press, UK.

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Suggested Laboratory Exercises

1. Study of prokaryotic organisms; bacteria (Bacillus, Coccus, Streptococcus,Spirillum), Bacterial staining (Gram's staining), Blue green algae-Anabaena.
2. Study of eukaryotic organisms.
3. Alage : Volvox, Chara, Oedogonium, Ectocarpus. Polysiphonia.
4. Fungi : Rhizopus, Yeast, Aspergillus, Penicillium, Chaetomium, Peziza. Agaricus.
5. Study of morphology, anatomy and reproductive structure in Riccia, Marchantia, Anthoderos, Funaria.
6. Study of morphology, anatomy and reproductive structures in Rhynia, Lycopodium, Selaginella, Equisetum, Marsilea, Pteris, Lepidodendron, Lepidocarpon.
7. Study of morphology, anatomy and reproductive structures in Cycas, Pinus, Gnetum or Ephedra.
8. A study of representative members of the following angiosperm families : Ranunculaceae or Brassicaceae, Euphoribiaceae, Fabaceae (Papilionoideae, Caeselpiniodeae, Mimosoideae). Apiaceae, Acanthaceae/Labiatae, Asteraceae, Liliaceae, Poaceae Apocyanaceae.

Course II. Cell Biology and Basic Biochemistry
Unit-I

Cellular Chemistry : Covalent and noncovalent interactions; hydrogen bond; electrostatic interactions: hydrophobic interactions; Van der Walls forces and their significance; Structure; properties and biological significance of water, pH and its significance; pH scale; Henderson-Haselbach equation; isoelectric point; buffers (inorganic and organic) and their importance; ATP the energy currency; phospohrylation/dephosphorylation of proteins.

Emergy flow and enzymology : Laws of thermodynamics; concept of free energy; energy transfer and redox potential; classification and nomenclature of enzymes; enzymes as biocatalysis; physico-chemical properties of enzymes; cofactors and coenxymes; isozymes; kinetics of enzyme action; significance of Km; regulation of enzyme activity; factors affecting enzyme activity, e.g. temperature, pH; allosteric modification and feedback regulation.

Unit-II

The Cell : Historical backgound; cell theory; kingdom-wise cell

size and cell structure; viroids and prions; comparative account of prokaryotic and eukaryotic cell; characteristics of archaebacteria and mycoplasma.

Cell division and its regulation : Mitosis and melosis-historical perspective and significance; various stages of cell division progression; cytokinesis; role of centromere, kinetochore and spindle apparatus; animal and plant cell cycl; mechanisms of cell cycle control; appoptosis. Nucleus and ribosomes; Ultrastructure; nuclear envelope and nuclear pore complex; nuclear matrix and nucleoplasm; DNA and histones; nucleosome and higher level of organization; centromere and telomeres; ribosome structure (prokaryotic, eukaryotic cell organelle ribosomes) and their functional significance.

Mitochondrion and chloroplast : Origin of organelles; organelles structure and biogenesis; organelle membrances and organization of macromolecular complxes; variation in size, shape and nubmer; types of plastids' organelle-nuclear interations; organelle genome organization.

Unit-III

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

Cell wall and cell membrance : Origin, ultrastructure, chemical constituents and functions of cell wall; models of cell membrane organization; role of various membrane proteins, lipids and carbohydrates; role of ion channels and pumps in cellular transport and signalling.

Techniques in cell biology : Principles of light and electronmicroscopy; phase contrast and fluorescence microsopy; TEM and SEM; cell fractionation procedures; principles of various chromatography techniques-paper chromatography, TLC, GLC and HPLC autoradiography and its applications.

Suggested Readings

1. Alberts, B., Bray, D. Lewis, J., Raff, M., Roberts, K. and Watson, J.D. 1999. Molecular Biology of Cell. Garland Publishing Co., Inc., New York, USA.
2. Avers. C.J. 1986. Molecular Cell Biology, Addision-Wesely Publishing Co., Inc., New York, USA.
3. Avers, C.J. 1986 Molecular Cell Biology. Addison-Wesley

Publishing Co., Massachusetts, USA.

4. Campbell, M.K. 1999. Biochemistry (3rd Edition). Saunders College Publishing, Philadelphia. USA.

5. Gupta, P.K. 1999. A Text-book of Cell and Molecular Biology, Rastogi Publications. Meerut, India.

6. Kleinsmith, L.J. and Kish. V.M. 1995. Principles of Cell and Molecular Biology (2nd Edition). Harper Collins College Publishers, New York, USA. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. Worth Publishers, New York, USA.

7. Lodish, H.; Berk, A.; Zipursky, S.L.; Mastudaira, P.; Baltimore, D. and Darnell, J. 2000. Molecular cell (Fourth edition) W.H. Freeman & Co., New York, USA.

8. Rawn, D.J. 1989. Biochemistry Neil Patterson Publisher, North Carolina, USA

9. Stryer, L., 1995. Biochemistry. W.H. Freeman and Co., New York, USA.

10. Wolfe, S.L. 1993. Molecular and Cellular Biology, Wadsworth Publishing Co., California. USA.

11. Zubay, G. 1993. Biochemistry (3rd Edition) WCB Publishers, Iowa, USA.

Suggested laboratory Exercises

1. Study of cell structure from onion leaf peels; demonstration of staining and mounting methods.

2. Comparative study of cell structure in onion cells, Hydrilla and Spirogyra. Study of cyclosis in Tradescantia staminal hairs.

3. Study of plastids to examine pigement distribution in plants (e.g. Cassia, Lycopersicon, Capsium).

4. Examinations of electron micrographs of eukaryotic cells with special reference to organelles.

5. Preparation of phosphate buffer measurement of pH of different plant juices.

6. Use of dialysis to separate small molecules fromlarger molecules.

7. Enzymology : activity of catalase, invertase, amylase and urease, and effect of pH and temperature on enzyme activity.

8. Study of various stages of mitosis and meiosis using appropriate plant material (e.g. root tips and flower buds of onion).

Suppested Readings (for laboratory exercises)

1. Dryer, R.L. and Lata, G.F. 1989. Experimental Biochemistry. Oxford University Press, New York.
2. Gunning, B.E.S. and Steer, M.V. 1996. Plant Cell Biology : Structure and Function. Jones and Bartiett Publishers,Boston, Massachusetts.
3. Harris, N. and Oparka, K.J. 1994, Plant Cell Biology. A Practical Approach. IRL Press, at Oxford University Press, Oxford, U.K.
4. Ninfa, A.J. and Ballou,D.I.P. 1998. Fundamental Laboratory Approaches for Biochemistry and Biotechnology, Fitzgerals Science Press, Inc., Maryland. USA.
5. Wilson K. and Goulding. K.H. (Eds.) 1986. A Biologists Guide to Principles and Techniques of Practical Biochemistry Edward Arnold, London. UK.

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Paper-III. Plant Physiology and Ecology

Unit-I

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PLANT PHYSIOLOGY

Plant-water relations : Water transport processes; diffusion and osmosis; water potenital and chemical potential; absorption of water transport through tracheids and xylem; transpiration and its significance; factors affecting transpiration; mechanism of stomatal movement.

Mineral nutrition : Criteria of essentiality of elements; macro- and micronutrients; role of essential elements; mineral deficiency symptoms and plant disorders; nutrient uptake and transport mechanism; role of cell membrance, ion pumps and carriers.

Photosynthesis : Historical background and significance; structure of photosynthetic apparatus; phtosynthetic pigments; accessory reactions; electron transport pathways in chloroplast membranes; photophosphorylation; Calvin cyle; C_4 carbon cycle; crassulacean acid metabolism; synthesis of starch and sucrose; photorespiration.

Transport of organic substances : Transport of photosynthates; Sourcesink relationship; the mechanism of translocation in the phloem; assimilate partitioning.

Resipration : Glycolysis; TCA cycle and its regulation; electron transport in mitochondria; oxidative phosphorylation, pentose, phosphate pathway, cyanide-resistant respiration.

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Nitrogen metabolism : Biological nitrogen fixation, reduction of N_2 to ammonia, nif genes; regulation of nitrate reductase and nitrogenase; nitrate and ammonium assimilation.

Unit-II

Growth and development : General asspects-definitions, phases of growth; kinetics of growth; physiology of seed dormancy and seed germination; concept of photoperiodism; physiology of flowering; the florigen concept and role of hormones; vernalization; senescence and fruit ripening, importance of respiratory climateric; discovery, physiological role and mechanism of action of the phytohormones-auxins, cytokinins, gibberellins, abscisic acid, Signal transduction basic concept; plant movements-tropic and nastic Biological clock.

ECOLOGY

Introductin : Holocenonotic nature of environment; limiting factors; ecological amplitude; triggering factors (soil, water, atmosphere).

Ecological adaptations : Concept, ecads, ecotypes and significance of photosynthetic pathways.

Population : Concepts; density and pattern; idealized plant life history; population growth; carrying capacity; population regulation : r and k selection; population interactions.

Unit-III

Community : Community characteristics and their measurement; species diversity (alpha, beta, and gamma); niche.

Ecosystem : Concept, components and organization; energy flow, ecological efficiencies; cycling of C, N and P Characterization structure of ecosystem; the biotic and abiotic components, their inter-relationship the processes within ecosystem; the trophic organization; autotrophy, heterotrophy, parasitism, detritus, decomposition.

Ecological succession : Mechanism and types; nature of climax; food chains and food webs; ecological pyramids.

Flow of energy and materials : Flow of energy and materials within ecosystem; models of energy flow; ecosystem productivity; biogeochemical cycels; major types of ecosystems. Plant indicators and their role in environmental monitroing.

Phytogeograph : General principles, vegetation of India.

Suggested Readings

Plant Physiology

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1. Glaston, A.W. 1989. Life Processes in Plants, Scientific American Hall, Library, Springer-Verlage, New York, USA.
2. Hooykass, P.J.J., M.A. and Libbenga, K.R. (eds) 1999. Biochemistry and Molecular Biology of Pant Hormones. Elsevier, Amsterdam, The Natherlands.
3. Hopkings. G.C. 1995. Introduction to Plant Physiology John Wiley & Sons. Inc., York, USA.
4. Moore, T.C. 1989 Biochemistry and Physiology of Plant Hormones (2nd edition). Springer-Verlag. New York, USA.
5. Salisbury, F.B. and Ross, C.W. 1922 Plant Physiology (4th edition). Wadsworth Publishing Co., California, USA.
6. Taiz, and Zeiger, E. 1998. Plant Physiology (2nd edition). Sinauer Associates, Inc., Publishers, Massachusetts, USA.

Ecology

1. Odum, E.P., 1983, Basic Ecology, Saunders, Philadelphia.
2. Barbour, M.G., Burk, J.H., and Pitts, W.D. 1987. Terrestrial Plant Ecology.
3. Benjamin/Cummings Publication Co., California.
4. Kormondy, E.J. 1996. Concepts of Ecology, Prentice-Hall of India Pvt. Ltd., New Delhi.
5. Mackenzie, A. et al. 1999. Instant Notes in Ecology. Viva Books Pvt. Ltd., New Delhi

Suggested Laboratory Exercises

Plant Physiology

1. To study the permeability of plasma membrane using different concentations or organic solvents.
2. To study the effect of temperature on permeability of plasma membrane.
3. To extract enxymes and study their activity, e.g. amylase, lipase, phosphatase, catalase, peroxidase.
4. Effect of the following factors on enzyme activity : pH, temperature, enzyme and substrate concentration.
5. Comparative study of rate of respiration of various plant parts.
6. To extract and separate chloroplast pigments by solvent method and demonstrate fluorescence in chloroplast extracts.
7. To determine the osmotic potential of vaccular sap by plasmolytic method.
8. Bioassay of plant hormones—auxina, ethylene, GA, ABA and

cytokinin.

9. To dtermine stomatal index, stomatal frequency and percentage of leaf area open through stomata. Also, to study the effect of ABA on stomatal closure.

.10. Role of light in germination of photoblastic seeds, e.g. Lactuca sativa, Arabidopsis.

Suggested Reading (for laboratory exercises)

1. Copeland, R.A. 1996. Enzymes : A practical introduction to Structure, Mechanism, and Data Analysis. VCH Publishers, New York.

2. Dryer, R.L., and Lata G.F. 1989 Experimental Biochemistry. Oxford University Press, New York.

3. Moore. T.C. 1974, Research Experience in Plant physiology. A Laboratory Manual Springer-Verlag, Berlin.

4. Wilson, K. and Goulding, K.H. (Eds.) 1986. A Biologists Guide to principles and Techniques of Practical Biochemistry. Edward Arnold, London, UK.

Ecology :

1. To dtermine the working and use of instruments for the measurement of temperature (soil, air, water), rainfall, relative humidity, soil moisture, wind velocity and direction light, intensity.

2. To study selected soil properties by spot test; texture; pH, carbonate, nitrate, base deficiency and reductivity.

3. To study ecological adaptations (morphological and anatomical) in plants (hydrophytes, xerophytes, epiphytes).

4. To determine minimum area of sampling unit (quadrant) for the study of grassland community.

5. To estimate Importance Value Index for grassland species.

6. To study leaf from spectrum of a woodland.

7. To prepare maps of India with respect to (i) major climatic zones (ii) forest types, and (iii) biogeographical regions and to comment on it.

Suggested Reading (for laboratory exercises)

1. Smit. R.L. 1996, Ecology and Field Biology, Haper Collins, New York, P.W. and Chapman, S.B. 1986. Methods in Plant Ecology, Blackwell Scientific Publications.

2. Misra, R. 1968. & cology work book, oxford & IBH, New Delhi.

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Paper IV. : Development of Plants and their Utilization
Unit-I

Organization of the higher plant body : Shoot and root systems : variation in habit and longivity; environment influences.

Meristems and development : Shoot apical meristem, root apical meristem, lateral meristems and their functions.

Range of form and structure of stem, leaf and root; their tissues and functions.

Secondary body of the plant : Vascular cambium; secondary xylem (basic structure of wood); secondary pholem and periderm.

Role of wild plants in ecosystem functioning; A general account.

Unit-II

Domestication of plants: Primary and secondary centers of diversity; plant introduction.

A general account of plants : Primary and secondary centers of diversityl plant introduction. A general account of wheat, rice, maize, sorghum, bajra, potato and sugarcane.

Legumes; Chickpea (Bengal gram), red gram (arhar) and fodder legumes general account.

Vegetable oil sources : Mustard, groundnut, soybean and coconut a brief account.

Unit-III

Plant fibers : Cotton, jute and choir.

Timber and firewood species : A general account of use of properties of any ten plants of your region.

Medical plants : A brief account of ten important plant drugs and their chief constituents used in indigenous and allpathic system of medicine.

Natural rubber (Hevea brasiliensis), essential oil, insecticides and dyes-a concise account.

Ornamental plants Familiarity with seasonals and perennials grown in your locality.

Suggested Readings

1. Carlquist, S. 1988. Comparative Wood Anatomy; Systematic, Ecological and Evolutionary Aspects of Dicotyledonous Wood. Springer-Verlag, Berlin.

2. Cutter, E.G. 1969 Part I. Cells and Tissue. Edward Arnold, London.

3. Cutter E.G. 1971. Plant Anatomy : Experiment and Interpretation. Part II. Organs. Edward Arnold, London.
4. Esau, K. 1977. Anatomy of Seed Plants, 2nd edition, John Wiley and Sons, New York.
5. Fahn, A. 1974 : Plant Anatomy, 2nd edition, Pergamon press. Oxford.
6. Fuller, K.W. and Gallon, J.R. 1985. Plant Products and New Technology. Clerendon Press, Oxford, New York.
7. Lyndon, R.F. 1990. Plant Development; The Cellular Basis. Unwin Hyman, London.
8. Mauseth, J.D. 1988. Plant Anatomy. The Benjamin/Cumins Publishing Company Inc., Menlo Park, California, USA.
9. Nair, M.N.B. 1998. Wood Anatomy and Major Uses of Wood. Faculty of Forestry. University Putra Malaysia, 43400 Serdang, Selangor D.E. Malaysia.
10. Reghvan. V. 2000. Developmental Biology of Flowering Plants, Springer Verlag. New York.
11. Raven, P.H. Evert R.F. and Eichhoron, S.E. 1999. Biology of Plants. 5th edition W.H. Freeman and Co., Worth Publishers, New York.
12. Sambamurthy. A.V.S.S. and Subramanyam, N.S. 1989. A Textbook of Economic Botany. Wiley Eastern Ltd., New Delhi.
13. Sharma O.P. 1996. Hill's Economic Botany. Tata McGraw Hill Publishing Company Ltd., New Delhi.
14. Simpson, B.B. and Conner-Ogorzaly, M. 1986 Economic Botany-Plants in Our World McGraw Hill, New York.
15. Steeves, T.A. and Sussex, I.M. 1989, Patterns in Plant Development 2nd edition. Cambridge University Press, Cambridge.
16. Tippo. O. and Stern, W.L. 1977. Humanistic Macmillan India. Ltd. New Delhi.

Suggested Laboratory Exercises

1. Study of organization in a flowering plant. Role of shoot and root apical meristem (using whole mounts of shot tips of Hydrilla vertical sections Coleus or Bryophyllum, whole mount of root tip of Pistia, or vertical sections of root tip of onion, maize, aerial roots of Ficus bengalensis or Tinspora cordifolia.)
2. Study in the field of a large variety of herbaceous and perennials,

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both monocotyedonous an dicotyledonous; aquatic, mesophitic, xeromporphic plants, succulents, climbers, twiners, parasites, and tress with varied canopyarchitecture. Field diary to be prepared.

3. Morphology and anatomy of stems, roots, and leaves using stained hand sections or permanent slides (tapioca, carrot, radish, onion, garlic, turnip, potato, etc.)

4. Study of vascular cambium in stem and root. Secondary growth. Examples of cambial variants and resultant secondary structures.

5. Preparation of world maps to show Vavilov's centres of origin of cultivated plants and Zhukovsky's concept of mega centres.

6. Preparation of maps showing the centers of primary diversity of importnat economic plants that orginated in India and the regions of cultivation of plants introduced from the New World, Africa, Europe, Central Asia, Australia, Malaysia, China.

7. Study of vegetative and reproductive morphology and anatomy of wheat, rice, maize, sorghum, bajra, potato and sugarcane. Also study of starch grains in these plants (except in surgarcane). Epidermal structure of sugarcane, stem and leaves. Tests for surose.

8. Study of vegetative and floral morphology, pod development in chickpea and red gram. Familarization with four fodder legumes (such as berseem, lucerne, methi, Clitoria, guar, cowpea etc.)

9. Study of structure of oil storing tissues in sectioned seed of mustard, groundnut and soybean, coconut endosperm, using mircochemical tests.

10. Study of vegetative, floral and fruit morphology of cotton, Ontogeny of cotton fibre in young ovules and tracing the development of cotton fibre. Microscopic structure of cotton fibre. Preparation of absorbent cotton by alkali treatment. Staining of cotton with and without mordanting. Study of stem of jute showing orgin and development of jute fibre. T.S. coir to show that coir is a fibrovascular bundle.

11. Study of wood anatomy of ring-porous, diffuse, porous woods using hand sectins or prepared slides. Understanding of wood anatomy using. T.S., T.L.S. and R.L.S. in five timber yielding species (teak, Dalberiga, Albizzia, Gmelina, Eucalyputus, Cedrus of Pinus, Acacia, Shorea, Temnialia, Mangifera, Azadirachta, or

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any other depending on the location of the institution). Preparation of a list of 10 fire wood species in your region and their properties).

12. Study of 10 whole plants (live or from herbarium specimens) used as resources of drugs; (Poppy, Rauvolfia, Adhatoda, Embilica officinalis, Terminalla bellirica, T. Chebula, Glycyrrhiza, Phyllanthus amarus (P. fraternus), garlic, Andrographis paniculata, Catharanthus rosesus, Atropa belladonna, Digitalis purpurea, Aloe barbadense, or any other important plants of your area).

13. Study of laticiferous system in the stem of Haeva brasiliensis, familiarization with whole plants (fresh of herbarium specimens of Cymbopogon sp., Eucalyptus, Jasmium, Geranium, Pandanus sp., Rosa, Vetiveria zizaniodes, Santalum ablum (or any other local sources of essential oil).

14. Study of the neem plant, Artemisia annua, Chrysanthemum cinerarifolium (pyrethrum) from live specimens.

15. Souces of dyes: Curcuma longa (turmeric), Bixa orellana (annato), Crocus sativus, Butea monosperma (palash), Indigofera (indigo), Lawsonia inermis (mehnidi). Extraction of pigments.

16. Preparation of a list of trees and shrub used as ornamentals alongwith their popular and scientific names. Seasons of flowering and brief description. Calendar of seasonals grown as bed plants, potted plants house plants, flowers used for worship or ornamentation. This may be illustrated and presented as a term paper at the time of examination section. Candidates are required to attempt five questions in all selecting atleast one question from each section.

5. GEOLOGY

Scheme :

Four Papers	Duration	Max. Marks	Min. Pass Marks
Paper-I	3 hours	75	
Paper-II	3 hours	75	
Paper-III	3 hours	75	120
Paper-IV	3 hours	75	
Practical		100	40

Note : Each paper will contain nine questions having three questions in each section. Candidates are required to attempt five

questions in all selecting atlest one questions from section.

Paper-I : General Geology

Section-A

Geology—its definition, scope, subdivisions, applications & relationship with other Sciences. Solar system & its members, relations of Earth with other members. Earth-Shape, size, origin-review of the different Theories, internal Structure and composition. Age of the earth, different methods of determining the age with special reference to radioactive methods. Nature and constitution of the Earth's crust and its movements.

Weathering, Geological work of river, wind, glacier, sea and groundwater.

Section-B

Earthquakes—Causes, classification, effects, earthquake waves, Seismograph, and relationship with volcanism and crystal deformation, Seismic belts.

Significacne of the earthquakes waves in the study of the interior of Eath. Volcanoes—Cause, Types, Products, effects and distributioin. Mountains-kinds, origin and distribution.

Section-C

Origin & distribution of contienets and oceans, Isostasy, Continental drift, Island Arcs, Geosynelines, coralreefs. Elementrayr ideas of Plate techtonics, Seafloor spreading.

Paper-II : Structural Geology

Section-A

Definition, scope, relationship with other branches of Geology. Dip and strike and their determination with Clinometer and Brunten Compass Sedimentary structures and their significance, criterion for recognition of top and bottom sequence. Unconformity : Definition, classification, geological significance and recognition in the field. Joints—Classification and economic significance.

Section-B

Description, geometric and genetic classification of folds and faults. Effects of folds and faults on outcrop pattern and their economic importance. Mechanics of folding and faulting. Criterion of their recognition in the field.

Thrust, Nappe, Windo Klippe, overlap and offlap, outlier and inlier.

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Section-C

Elementary ideas of cleavages and LInear structures, Study of geological maps and sections. Plotting of linear structures on Stereonet and their significance, salt Domes.

Paper-III : Crystallography and Mineralogy

Section-A

Symmetry elements, parameter and Index system of Weiss and Miller, Classification of Crystal systems. Crystal Zones, Twining. The use of contact goniometer.

Study of the holohedral classes of various system and hemihedral classes of the cubic and Hexagonal systems.

Section-B

Stereographic and gonomonic projections. Elementary ideas about the derivation of crystal classes and internal structure of crystals. Elements of crystal chemistry; Isomorphism, polymorphism, ionic radii, classification of Silicates.

Section-C

Physical properties of mineral—Determination of RI and birerfringence. Uniaxial and biaxial mineral, Double refraction. Quarts, wedge, retardation and accessory plates. Concept of uniaxial and biaxial indicatrix.

Uniaxial and biaxial interference figures. Optic sign and pleochroic scheme. Study of the Chemical composition, important physical and optical properties and paragenesis of the following groups; Quartz, Feldspars, Felspathoids, Amphiboles, pyroxenes, Micas, Alumino silicates, Garnet, olivine and carbonates.

Paper-IV : Palaeontology

Section-A

Definition and Subdivisions. Fossil Collection and preparation, condition necessary for preservation. Mode of preservation of fossils. Imperfection of palaeontological records and evolution indicators. Broad Classification of animal kingdom.

Section-B

Morphology and Geological distribution of the following groups :
1. Foraminifera
2. Graptoloidea
3. Trilobita
4. Anthozoa

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5. Echinoidea

Section-C

Morphology, Geological distribution and recent classification of the following groups :

1. Brachipoda
2. Mollusca
   (a) Gasteropoda
   (b) Vivalvia (Lamellibranchia)
   (c) Cephalopoda—
      (i) Nautiloidea
      (ii) Ammonoidea
      (iii) Coleoidea (Dibranchia)

Elementary ideas of Gondwana flora and study of Morphology of following plant fossil. Glossopteris, Gangamopteris, Vertebraria and Ptilophyllum.

Practicals

Study of following crystal Model in hand specimen. Garnet, Fluorite Diamond, Halites, Zircon, cassiterite, Vasuarite, appophyllite, illmenite. Olivine, sulphur, Stanealite, Barjito Topaz, Gypsum, Orthoclase, Hornblend, Autige, Epidote Albite, Barite Beryl, Calcite, Quartz.

Study of the following minerals under microscope. Quartz Orthoclase, Microcline, Plagioclase, Muscovite, Biotite, Olivine, Hornblend, Augite, Hypersthene Actionlite, tremolite, Epidote, Garnet, Staurolite, Tourmaline, Chlorite, Calcite, Kyanite, Sillimanite Nephelene. Study of the Physical properties and diagnostic features of the following minerals—quartz, Chalcedony, plagioclase, Biotite, Chlorite, Hornblende, Augite, Hypersthene. Muscovite, Invertebrate fossils and plant fossils—Nummulites, Alcolina, Assilina, Monograptus, Diplograputs Calymene, Paradoxides, Trimiceleous, Phacops Olenus. Zapherents, Calceota, Favosites, Cidaris, Stigmatophygus, Micraster Hemiaster, Schizatr. Terebratula, Phynchonella, Productives, Spirifer, Athyris, Atrypa, Lingula, Turitella, Physa, Natica, Conus, Murex, Cyprea, Trochus, Turbo, Venus, Unio, Trigonia, Pholadomya, Area, Inoceramus Lopha, Hippurites. Nautilus, Goniatites, Ceratites, Perisphinetes macrocephailites, Acanthoceras, Baculites, Belemnites Glossopteirs, Gangamopteris. glossopteris, Gangamopteris. Vertebrasia, Ptilophyllum.

GEOLOGY PRACTICALS

Scheme

Max. Marks : 100   **Min. Pass Marks : 40**

Identifications and Morphological description of important invertebrate fossils and their stratigraphic horizon with special reference to India. Clinographic projection of the crystals of the cubic systems, Identification of Crystal models corresponding to the syllabus of the theory paper. Study of simple twins. Stereographic projection of the crystals, Determination of the axialration.

Identification in hand specimen and description of important rock forming minerals under microscope. Identification of length fast, length slow characters of minerals, determination of optic sing. Interpretation of geological maps. Completion of outcrop pattern, thickness of the strata, true and apparent dip. Stricke of the fault. Solution of true and apparent dip by the Stereographic projection. Solution of simple structural problem by stereographic projection.

Field work : Field work of atleast 10 days duration in the State of Rajasthan, covering the various disciplines of theory papers and report thereon.

6. MATHEMATICS

B.A./B.Sc. (Hons) Part-I

Teaching : 3 Hours Per Week Per Theory Paper

2 Hours per Week per Batch for Practical

(20 candidates in each batch)

Examination

Min. Pass Marks

Scheme : Science : 160

		Duration	Max. Marks 400	Min. Pass Marks
Paper-I	Discrete Mathematics	3 hrs.	100	40
Paper-II	Calculus	3 hrs.	100	40
Paper-III	Three-Dimensional Geometry and Optimization	Theory : 2½ hrs.	68	27
		Practical: 2 hrs.	32	13
Paper-IV	Theory of Numbers and Lattices	3 hrs.	100	40

Note.

1. Paper I, II & IV will be divided into Five Units. Two questions will be set from each Unit. Candidates are required to attempt Five questions in all taking One question from each Unit. All question carry equal marks.

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

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

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

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

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

Paper-I : Discrete Mathematics

Teaching : 3 Hours Per Week

Duration of Examination : 3 Hours   Max. Marks : 100

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

Unit 1 Sets and Propositions—Cardinality, Principal of inclusion and exclusion. Mathematical induction.

Relations and Functions—Binary relations, Equivalence relations and Partitions, Partial ordered relations and Lattices. Chains and Antichains, Pigeon Hole principle.

Unit 2   Algebraic structures—Groups, Rings, Integral domains. Fields (Definitions, simple examples and elementary properties only.)

Boolean Algebras—Lattices and Algebraic structure, Duality, Distributive and Complemented Lattices. Boolean Lattices, Boolean functions and expressions.

Unit 3   Computability and Formal languages—Ordered sets, Languages, Phrase, Structure, Grammars, Types of Grammars and Languages. Finite State Machine—Equivalent machines, Finite State Machines as language recognizers.

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

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

Unit 5   Trees—Properties, Spanning tree, Binary and Rooted tree. Digraphs—Simple digraph, Asymmetric digraphs, Symmetric digraphs and complete digraphs. Digraph and Binary relations, Matrix representation of graphs and digraphs.

Paper-II : Calculus

Teaching : 3 Hours per week
Duration of Examination : 3 Hours   **Max. Marks : 100**

Note :   This paper divided into Five Units. Two questions will be set from each Unit. Candidates are required to attempt Five questions in all taking One questions 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. (Derivation of tests is not required). Alternating series. Absolute convergence. Taylor's theorem. Maclaurin's theorem. Power series expansion of a function. Power series expansion of $\sin x$, $\cos x$, e^x, $\log_e (1+x)$, $(1+x)^n$.

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

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

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

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

Paper-III : Three-Dimensional Geometry and Optimization
Theory

Teaching : 3 Hours per week

Duration of Examination : 2½ Hours   **Max. Marks : 68**

Note : (i)   This paper divided into Four Units. Two Questions will be set from each Unit. Candidates are required to attempt Four questions in all taking One question from each Unit. All questions carry equal marks.

(ii)   Non-Programmable Scientific Calculators are allowed.

Unit 1   Sphere, Cone and Cylinder

Unit 2   Central Conicoids—Ellipsoid, Hyperboloid of on and two sheets, Condition of tangency for a plane, Director sphere, Normals. 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 3   The linear programming problem. Problem Formulation L.P.P. in matix notation. Graphical solution of linear programming problems. Basic solution. Some basic properties of convex sets. Theorems based on convex sets., Fundamental theorem of L.P.P. Application of the Simplex method for solution of a L.P.P. to simple problems.

Unit 4   Duality, Fundamental theorem of duality, Properties and Simple problems of duality, Assignment problems, Transportation problems.

PRACTICAL

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

Examination : Duration : 2 Hours

Scheme

Min. Marks : 32   Min. Marks : 13

Distribution of Marks :

Two Practicals one fro each group

10 Marks each	=	20 Marks
Practical Record	=	06 Marks
Viva-Voce	=	06 Marks
Total Marks	=	32 Marks

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

Group B : Modelling of industrial and engineering problems into (i) Assignment Problems and (ii) balanced and unbalanced Transportation Problems and their solution.

Note :

1. Problems will be solved by using Scientific Calculators.
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.

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Paper-IV : Number Theory

Teaching : 3 Hours per Week
Duration of Examination : 3 Hours   **Max. Marks : 100**

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

Unit 1   Divisibility—Division Algorithm, g.c.d. the Euclidean algorithm. 1. c.m., Prime, Infinitude of primes, Fundamental theorem of Arithmetic. Fibonacci sequence.

Unit 2   Congruence—Linear conguruence, Fermat, Little and Wilson's theorems. Chinese remainder theorem. Fermat's last theorem, Euler's factorization, Mersenne's factorization.

Unit 3   Number theoretic functions, π and σ-funcions, the Mobius function, Greatest integer function, Euler Phi function and the properties of Phi function. Application to Cryptography.

Unit 4   Diophantine equations– $ax+by = c$, $ax+by+cz = d$, $x^2+y^2 = z^2$, $x^4+y^4 = z4$. General Integers solution of the equation $x^2+y^2+z^2 = w^2$ ($x,y,z,w = 1$)

Unit 5   Quadratic residues, Quadratic reciprocity. Quadratic congruence. Primitive roots for primes, Composite numbers having primitive roots. Theory of indices.

12. PSYCHOLOGY (HONS.) PY-I- 2014

Scheme :

Four Theory Papers	Duration	Max. Marks	Min. Pass Marks
Paper-I	3 hours	75	
Paper-II	3 hours	75	
Paper-III	3 hours	75	120
Paper-IV	3 hours	75	
Practical	3 hours	100	40

Note : There will be 4 theory papers in subject Psychology in B.A. Honours Part I. There will be common papers for Arts and Sciences.

Question No. 1 will be compulsory and will cover the entire course contents of the paper. Question I will contain two parts A & B. A part of I question will contain 20 questions of multiple choice. Each question will be of 3/4 mark. Thus A part will be of 15 marks. B part will contain 10 questions to be answered in the limit of 20 words. Each question of B part will be of 1½ marks. Thus B Part will be of 15 marks. Separate question paper for this objective type will be provided to each student and answers will be given in this question paper only in the space provided for this purpose in the objective type question paper. Candidates will be given one hour to attempt this first compulsory question out of three hours in total time allotted for this paper.

In the second part of the question paper, three questions of essay type will be attempted selecting at least one from each section. Each question will be of 15 marks. This objective type question will be compulsory to attempt in all four theory papers.

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

Paper-I: Advanced General Psychology

Section-A

1.   Introduction to psychology: Nature, Methods and Recent Trends.

2.   Learning: Classical conditioning, Operant Conditioning-Reward, Punishment, Avoidance and Escape Procedures, Theories (Thorndike, Hull, Skinner).

3.   Verbal learning and Concept learning-   Verbal learning-Nature, Material and Experimental Method, Serial Position Curve, Clustering, Coding. Concept learning-Definition, Paradigm, Determinants and Theories.

Section-B

4.   Perception-   Analysis   of   Perceptual   Process, Determinants of Perception, Gestalt view of perception, Illusion, Depth perception.

5.   Retention and Forgetting-Levels of memory processing, STM, LTM, Proactive and Retroactive inhibition, Causes of Forgetting, Forgetting curve.

6.   Transfer of training- Experimental design and measures of transfer, non-specific transfer, warm up, specific transfer, similarity relations.

Section-C

7.   Motivation and Emotion-Motivation-Nature and Types, Emotion- Elements: Physiology, Expression and Subjective Experience; Physiological correlates of

Emotion, Theories (James-Lange, Cannon Bard, Activation theory).

8.   **Intelligence-** Nature, Determinants, Measurement and Theories.

9.   **Personality-** Nature, **Theories,** Determinants, Measurement.

Reference Books:

1.   Morgan, King & Robinson- Introduction to Psychology, 1986.
2.   Atkinson-Introduction to Psychology
3.   Wood worth, R.S. & Scholosberg, H- Experimental Psychology, Indian Edition, Oxford & I.B.H. publication, Calcutta, 1971.
4.   Baron. R.A. (2003). Psychology. Allyn and Bacon. New Delhi Prentice Hall India.
5.   Gerrig, R.J. and Zimbardo, P.G. (2005). Psychology and Life. New Delhi. Pearson Education.
6.   Ciccarelli, S.K. and Meyer, G.E. (2006).Psychology. New Delhi, Pearson Education.
7.   सिंह. अरुण कुमार (2002). आधुनिक सामान्य मनोविज्ञान. नई दिल्ली, मोती लाल बनारसीदास

Paper-II: Psychopathology

Section-A

1.   **Abnormal Behaviour:** Nature and Concept. Vulnerability, Resilience and Coping Paradigm. Mental Health: Meaning and Components.

2.   **Theoretical Perspectives:** Biological, Psychodynamic, Behavioural, Cognitive, Humanistic, Existential, Community – Cultural, Interactional.

3.   **Symptomatology and Etiology of abnormal behaviour.**

Section-B

4. **Classification and Assessment:** The latest classification system of APA and WHO. Interview and Psychometric assessment: Personality, Behavioural, Cognitive, Relational, Bodily Assessment.

5. **Somatoform and Anxiety disorders:** Nature and Clinical Picture of Pain, Somatization, Conversion-disorders and Hypochondriasis. Nature and Clinical Picture of Generalized Anxiety, Panic, Obsessive-Compulsive and Post-Traumatic Disorder and Phobias.

6. **Personality disorders:** Classification, Nature and Clinical Picture.

Section-C

7. **Schizophrenia and other Psychotic disorders:** Nature, Clinical Picture and Types.

8. **Mood disorders and Substance related disorders:** Nature and clinical picture of Depression, Depressive and Bipolar Disorders. Nature of Substance-use and Substance-induced Disorders. Clinical Picture of Alcohol-related, Nicotine-related and Sedative-Hypnotic or Anxiolytics-Related Disorders.

9. **Treatment and prevention:** Psychotherapies-Client Centered, Cognitive, Psychoanalytic, Behavioural. Prevention: Levels, Situation-Focused and Competency-Focused, Sites of Prevention.

Reference Books:

1. Sarason, I.G. and Sarason, B.R. (2005) Abnormal Psychology. Delhi, Pearson Education
2. Lamm, A (1997): Introduction to Psychopathology N.Y. Sage.
3. Buss, A.H. (1999): Psychopathology, N.Y. John Wiley.
4. Arun Kumar Singh (2002), Adhunik Asamanya Manovigyan, Delhi, Motilal Banarsidas.

Paper-III: Developmental Psychology

Section-A

1. **Human Development:** Nature and Scope: Domains and Periods of Development: Basic Issues: Longitudinal and Cross-Sectional Researches.

2. **Foundations of Human Development:** Biological, Socio-environmental and Cultural Factors: Types of Influences: Internal and External, Normative and Non-Normative, Contexts and Timing of Influences.

3. **Self and Identity:** Self Awareness, Self Concept and Self-Esteem- Cognitive Social and Cultural Influences. Identity: Construction and Influences on Identity Development, Identity Statuses.

Section-B

4. **Psychoanalytic and Psychodynamic Theories of Development:** Freud's Psychoanalytic, Erikson's Psycho-social, Bowlby's Ethological Theory of Attachment.

5. **Social Learning and Cognitive Theories of Development**: Bandura's Social Learning Theory, Piaget's Cognitive – Stage Theory, Vygotsky's Socio-Cultural Theory, Information Processing and Language Development.

6. **Emotional and Moral Development**: Functions of Emotions, Development of Emotional Expression, Temperament and Development. Moral Development: Piaget's and Kohlberg's Theories. Influences on Moral Reasoning.

Section-C

7. **Problem of Adulthood and Aging**: Marriage, Family and Work. Gerontology and Theories of Aging: Damage Theories, Genetic Clock Theories and Bio-Psychosocial Model, Aging Disabilities: Physical and Mental.

8. **Developmental Psychopathologies**: Learning Disabilities, Conduct Disorder, Autism, ADHD, MR.

9. **Stress and Health**: Nature and Types of Stress, Physiology of Stress, Causes and Consequences of Stress, Stress Management.

Reference Books:

1. Berk, L.E. (2003) Child Development. Delhi, Pearson Education.
2. Santrock, J.W. (1999), Lifespan Development. New York, McGraw Hill.
3. Hurlock, E. (2003) Developmental Psychology. Delhi, Tata McGraw Hill
4. Papalia, S. and Feldman, C. (2002) Adult Development and Aging. Delhi, Tata McGraw Hill.
5. Berk, L.E.(2010) Development through the Life Span. Delhi, Pearson Education.

6. Sigelman, C.K. and Rider E.A. (2003) Life Span Human Development. Thomson- Wadsworth.
7. Mishra, G. (1999) Psychological Perspectives on Stress and Health, New Delhi, Concept.

Paper-IV: Statistical Foundations of Psychological Research

Section-A

1. Overview of experimentation- (i) Problem, (ii) Hypothesis, (iii) Experimental Plan, (iv) Experimental control, (v) Dependent and independent variables.

2. Designs- (i) Factorial (ii) Randomised groups.

Section-B

3. Descriptive Statistics – (i) Setting of Frequency of Distribution, (ii) Frequency Polygon and Histogram, (iii) Measures of Central Tendency- Mean (grouped data), Assumed Mean, Median, Mode, (iv) Measures of Variability – Range, QD, AD and SD, (v) Co-efficient of Variation.

4. Inferential Statistics- (i) Normal Distribution- Meaning, Importance and Properties, (ii) Standard Error Formula- Mean, Median, SD, (iii) Sampling.

Section-C

5. Test of Significance- (i) Chi-Square Test (Equal and Normal Probability), (ii) Null Hypothesis, (iii) Mean Difference ('t' test), (iv) Significance of Difference of SD, (v) Significance of Difference of Percentages, (vi) One-way Analysis of Variance.

6. Correlation- Meaning, Product Moment Method, Correlation by Rank.

Reference Books:

1. Aron, A. Aron, E. and Coups, E. (2007). Statistics for psychology. (IV edition). New Delhi, Pearson Education.
2. Garrett, H. (1981) Statistics in psychology and education. Mumbai: Vakil febber and Simons.
3. Guilford, J.P. (1975) Fundamental statistics in psychology and education. New York: McGraw Hill
4. Siegel, S. (1988) Nonparametric Statistics for Behavioural Sciences. New York, McGraw Hill.

Practicals:

1. Method of Average Error- Muller Lyer Illusion.
2. Figure Ground Reversal
3. Serial Position Effect
4. Assessment of Anxiety
5. Assessment of Mental Health
6. Measurement of Personality
7. IQ Assessment.
8. Bilateral Transfer of Training
9. Concept Formation
10. Maze Learning
11. Social Maturity
12. Parent Child Relationship Scale

8. GEOGRAPHY (HONS.)

Scheme :

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

Paper-I	Physical Geography	Max. Marks 80
Paper-II	Human Geography	Max. Marks 80
Paper-III	Economic Geography	Max. Marks 80
Paper-IV	Cultural Geography	Max. Marks 80
Practical		Max. Marks 80

Notes :

1. Students are permitted to use the stencils, simple calculator and log tables wherever needed in the examination.
2. There will be a common paper for Science and Arts.
3. Nine questions will be set with three questions from each section.
4. Q.1. will be compulsory and will cover the entire course contents of the paper. Q.No. 1 of 20% marks of the total be set in two parts;
   (a) Question on map (to be supplied) of 10% marks.
   (b) Question objective type (multiple choice and very short answer of 10% marks).
5. The candidates will attempt five questions selecting at least one question from each section.
6. For practical paper each student will attend a survey & Eco-camp and write a report. The camp will be at least four days duration within the district of Jaipur. The report should be supported by maps and diagrams.
7. The students will have to pass separately in theory and practical.
8. Annual Theory examination will be of 3 hours duration.

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Paper-I : Physical Basis of Geography
Section A

Definition and scope of physical geography, Recent trends in physical geography. The constitution of the Earth's Interior-The evidence of Seismology, Zoning of the earth's interior, Thermal state of earth's interior.

Theory of isoslassy-Views of Airy and Pratt.

The origin of continents and oceans-continental drift theories and plate tectonics.

Earth moement-secular and sudden movements and related geological structures. Mountain building theories and mountain building episodes-Kober, Joly, Jeffreys, A. Holms.

Sub-aerial denudation—Weathering and erosion, concept of cycle of erosion—W.M. Davis, W. Penck, L.C. King.

Geomorphology of the following regions—Karst, Arid and Glacial.

Section B

Structure of atmosphere, layers of atmosphere, Insolation—Factors affecting insolation. Vertical and horizontal distribution of temperature, inversion of temperature.

Pressure—Pressure belts, pressure and wind circulation.

Humidity and precipitation. Air masses.

Cyclones and anticylones—Origin of tropical and temperate cyclones and anticyclones, weather conditions related with them.

Classification of climate of the world—Koppen and Thornthwaite (1931, 1948).

Section C

Temperature of ocean water distribution. Salinity in the ocean water and causes of variation and distribution. Classification of coast line and shore-lines. Topography of ocean basins. Ocean deposits. Formation of coral reefs and atolls, main theories.

Books Recommended :

1. Wooldridge and Morgan : Physical Basis of Geography

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Longmans, London.
2. Strahler, A.N. & Strahler, A.H. : Physical Geography, John Wilery & Sons.
3. Strahler A.N. & Strahler A.H. : Modern Physical Geography, John Willey, New York, London.
4. Strahler, A.N. : Earth Sciences.
5. Steers, J.A. : Unstable Earth.
6. Monkhouse, F.J. : Principles of Physical Geography, University of London Press, London.
7. Gresswel, R.K. : Physical Geography, Macddnal & Even Ltd. London.
8. Chauhan, Virendra Singh : Bhautic Bhoogol, Rastogi & Sons. Meerut.
9. Savindra Singh : Bhautic Bhoogol.
10. Trewartha, G.T. : An Introduction of Climate, MJcGraw Hill Book Company, New York.
11. Patterson, S. : Introduction to Meteorology, Longmans London.
12. David, Greenland & Marin J. De Blij : The Earth's Profile; A Physical Geography, Harper & Row, New York.
13. Strahler, A.N. & Strahler, A.H. : Geography and Man's Environment, John Wiley & Sons, New York.

Paper-II : Human Geography

Section A

Definition, aims and scope of Human Geography and its relationship with other social sciences.

Principles of Human Geography, Modern schools of thought in Human Geography-possibilism, determinism, racialism and neo-determinism. Contribution of Fredrich, Ratzel, Miss Ellen Semple, Jeans Brunhes, Vidal de La Blache and Ellsworth, Huntington.

Section B

Man and his environment, Critical study of the principle of optimum adaptation—Khirgis, Eskimos, Pygmies and Bedouins. Man as a geographic factor, appreciation of man as a moderating force of terrestrial phenomena. House types and building materials. Human

settlements-Types and patterns of rural settlements. Evolution and growth of urban centers. Market towns, transport focus and centers of specialized services. Internal structure of cities.

Section C

Distribution, density and agglomeration of population, population migrations during ancient, medieval and modern times. Causes of migration and types of migration-secular and periodic, Chief characteristics and distribution of some important races—Negrito, Mongoloid, Negroid, Nordics, Cavcasoids and Mediteranian stocks. Study of the mode of life of Bhils, Santhals, Gonds, Lapchas and Nagas.

Books Recommended :

1. Brunhes J. : Human Geography
2. Blache, Vidal, de La : Principles of Human Geography, Orient Longkmans, Bombay.
3. White and Renner : Human Geography.
4. Huntington, E. : Human Geography, Chapman & Halls Ltd., London, John Viley & Sons. Inc., New York.
5. Huntington & Shaw : Principles of Human Geography, Chapman & Hall Ltd., London.
6. Taylor, G. : Environmental, Race and Migration.
7. Bryan, W. : Man's adaptation of Nature.
8. Mooney, D.C. : Introduction to Human Geography, University Tutorial Press Ltd., London.
9. Mamoria, C.B. & Pritam Singh : Principles of Human Geography, Kitab Mahal, Allahabad.
10. Hussain, Majid : Human Geography, Rawat Bros, Jaipur.

Paper-III : Economic Geography

Section A

Meaning and scope of Economic Geography. Study of the Geographical factors affecting production, consumption and distribution of principal raw materials and food stuffs.

Section B

Man/s utilization of natural resources and their conservation. Agricultural types and agricultural regions of the world. Irrigation

system. Important minerals and their distribution : Iron, Copper, Aluminum, Uranium, Coal and Petroleum.

Section C

Industrial Region of the world. Major Manufacturing industries and their localization—Iron and Steel, textile and chemical. Study of Economic regions—Damodar Valley, Hooghly and Ruh region. World trade and transport trade and trade routes-Sea. River, Air and Pipe lines.

(Questions will be on the basis of world regions and not on countries).

Individual Books Recommended :

1. Shaow, E.B. : World Economic Geography, John Willey, New York.
2. Jones, C.F. & Darkenwald, G.G. : Economic Geography (Macmillan & Co. New York).
3. Alexander, J.W. : Economic Geography, Prentice Hall, New York.
4. Thomas, S.R. : Geography of Economic Activity. McGraw Hill Book Co., New York.
5. Bengston & Royen : Fundamentals of Economic Geography, Prentice Hall.
6. Stamp, LD. : A Commercial Geography, Longmans Green and Co., London.
7. Dubey, R.N. : Economic and Commercial Geography, (Hindi & English Edition, Kitab Mahal, Allahabad.)
8. Jain, Purshottam : Arthik Bhugol Ki Samiksha, Rastogi and Sons, Merrut.
9. Dass Gupta : Economic & Commercial Geography, Mukerjee & Co., Delhi.
10. Mamoria, C.B. : Arthik and Vinijya Bhugol, Gaya Prasad and Sons, Agra.
11. Das Gupta : Economic & Commercial Geography Mujkerjee, Calcutta.
12. श्रीकाशीनाथ सिंह एवं जगदीश : आर्थिक भूगोल के मूल तत्त्व (तारा पब्लिकेशन, वाराणसी)

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Paper-IV : Cultural Geography
Section A

Scope and contents of Cultural Geography, the rise of cultural Geography, cultural areas and distribution, cultural boundaries and Ethnographic maps, cultural origins and dispersals of various culture, the main stages in socio economic evolution from a geographic point of view.

Section B

Habits of man and the origin of the cultivated points of the world, Domestication of animals as functions of Human Society, the propagation of innovation waves, Landscape and ecology.

Section C

Major agricultural regions of the Earth, the geography of Diet., Social organization and Environment, the origin and causes of settlement types, House types, the origin and spread of grid pattern towns, the humanization of the Earth, the Pliestocene inheritance, Main invasions of the Earth, the Diversity and unity in South East Asia.

Books Recommended :

1. Spencer, J.E. and William L. Thomos, JR : Cultural Geography, John Wiley and Sons. New York.

2. एस.एम. रिजवी : सांस्कृतिक भूगोल, हिन्दी ग्रंथ अकादमी, जयपुर

Geography Practical

Scheme :

Max. Marks 80   Min. Pass Marks : 30

Distribution of marks for purpose of examination

		Marks	Time
1.	Written Test (Attempt Three question out of five)	30	3 hours
2.	Field Survey and viva	15(10+5)	
3.	Eco-camp report and viva	15(10+5)	
4.	Record work and viva	20+12+8)	
	Total	**80 Marks**	

Syllabus : The Nature and scope of Cartography. classification of maps, scales, plain, diagonal and comparative, vernier. Methods of showing relief : Hachures, Hill shading. contours and layer tint

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representation of important Physical features by contours, Profiles : serial, longitudinal, transverse, superimposed, composite, projected and their use in landform study.

Enlargement and reduction of maps use of Pantograph, Representation of temperature, pressure and rainfall data, use of line and barographs, isotherms, isobars and isohytes, construction and significance of climograph and Hythergraph.

Study and interpretation of weather maps of India (Particularly July and January).

Prismatic Compass survey-Methods and eliminating of errors.

Books Recommended :
1. Monkhouse, F.J. : Maps and Diagrams, Metheuen & Co., London, Latest Edition.
2. Singh, R.L. and Dutt, P.K. : Elements of Practical Geography, Students, Friends , Allahabad, Latest Edition.
3. Misra, R.P. and Ramesh, A. : Fundamentals of Cartography, Mac Millan, New Delhi, 1986.

Reference Books :
1. Gamett, A. : Geographical Interpretation of Topographical Maps, George Harrap & Co., London.
2. Brich. T.W. : Maps : Topographical & Statistical, Clarenden Press, Oxford.
3. Robinsons, A.H. and others : Elements of Cartography, John Wiley and Sons, New York, Latest Edition.

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