

Ordinance, Scheme & Syllabus for B.Sc. (Pass course)

Course Title:	Bachelor of Science
Abbreviation:	B.Sc. (Pass)
Type of Course:	Three Year Degree Course
Pattern;	Yearly
Award of Degree:	Bachelor of Science Degree will be awarded for those who successfully complete all the components and declared pass in the programme after three Years.

Compulsory Subject:	Core Subjects
1. General Hindi	1. Physics
2. General English	2. Chemistry
3. Elementary Computer Application	3. Mathematics
4. Environmental Studies	4. Zoology
	5. Botany

Scheme of Examination

The term end examination papers will be divided into 3 sections:

Section- A (10x1=10) consists of 10 questions. Each question carries one mark. Attempt all questions.

Section- B (5x3 =15) consists of five questions with internal choice in each unit. Attempt all questions.

Each question carries 3 marks. Word limit (300 -500 words)

Section- C (3x 5 = 15) consists of 5 questions one from each unit. Students are required to attempt any 3 questions. Each question carries 5 marks. (Word limit 500 words & more)

There will be no internal marks in Practical. The paper will be of as per the maximum marks allotted in the syllabus.

In Mathematics paper there is no Practical paper therefore the maximum marks will be 66/ 67 consisting of 13/14 marks internal evaluation and 53 marks for term-end examinations.

The paper shall be divided into 3 sections.

Section A =11 Marks (11x1=11) It consists of 8 very short answer questions of 1 mark. Attempt all questions.

Section B = 25 Marks (6x4 =24) It consists of 8 short answer questions of 4 mark each Students have to attempt any 6 questions.

Section C = 18 Marks (3x6=18) It consists of 5 Long answer type questions of 6 marks each. Students will have to attempt any 3 questions.

The number of paper and the maximum marks for each paper together with the minimum marks required for a pass are shown against each subject separately. It will be necessary for a candidate to pass in each paper separately by securing 36% marks in both Internal evaluation as well as term-end examination.

First Division 60% and Second Division 48% of the aggregate marks prescribed at Examinations.

Division will be awarded at the end of final year examinations (a) Part I (b) Part II Examination, (c) Part III examination, taken together. However the marks obtained in compulsory papers will not be counted while awarding the division. All the rest shall be declared to have passed the examination, if they obtain

the minimum pass marks in each subject viz. 36% of marks. No division shall be awarded at the part I and Part II Examination.

DISTRIBUTION OF MARKS FOR B.A./B.Sc./B.Com (PASS COURSE)

S.No.	Name of the No. of Papers	Duration Hours	Marks Internal		Maximum Marks Term End exams	
			Max.	Min	Max	Min
1	General Hindi	3	20	8	80	28
2	General English	3	20	8	80	28
3	Elementary Computer Application	2	20	8	80	28
4	Environmental Studies	2	20	8	80	28

NOTE:

(i) The Marks secured in the paper of Gen Hindi or Gen. English and Computer Application and Environmental Studies shall not be counted in awarding the division to a candidate. The candidates have to clear compulsory paper in three chances.

(ii) Non appearing or absent in the examination of compulsory paper will be counted a chance.

Subjects:

Any one of the following three groups is to be selected by a student as per the groups given above at the time of admission in B.Sc.(pass) Part-I. Group once selected at the time of admission can not be changed.

Group-A: PCM (Physics, Chemistry, Mathematics)

Group-B : CBZ (Chemistry,Botany, Zoology)

S.No.	Name of the No. of Papers	Papers	Duration Hours	Marks Internal		Maximum Marks Term End exams	
				Max.	Min	Max	Min
Subjects/papers for B.Sc							
1	Physics	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18
2	Chemistry	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18
3	Mathematics	Paper-I	3	13	6	53	19
		Paper-II	3	14	6	53	19
		Paper-III	3	14	6	53	19
4	Zoology	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18
5	Botany	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18

1 सामान्य हिन्दी

यह प्रश्न पत्र सभी प्रथम वर्ष के विद्यार्थियों के लिए अनिवार्य है।

गद्य भाग इकाई – 1

अधिकतम अंक 100 मुल्यांकन आंतरिक मुल्यांकन 20 सत्रांत परीक्षा 80 अंक

नोट— इस प्रश्न पत्र के प्राप्तांक सत्रांत परीक्षा के उपरांत क्षेणी की गणना हेतु सम्मिलित नहीं किये जायेंगे। विद्यार्थियों को अनिवार्य पेपर अधिकतम तीन वर्ष में उर्तीण करने होंगे। परीक्षा में सम्मिलित नहीं होने अथवा अनुपस्थित रहने को भी प्रयास माना जायेगा।

1. भारतवर्ष की उन्नति कैसे हो – भारतेन्दु हरिश्चन्द्र
2. आचरण की सभ्यता – अध्यापक पूर्णसिंह
3. मेघदूत – महावीर प्रसाद द्विवेदी
4. भारतीय संस्कृति की देन – हजारी प्रसाद द्विवेदी
5. गिल्लू – महादेवी वर्मा
6. सवालों की नोक पर – मोहन राकेश
7. निन्दा रस – हरिशंकर परसाई
8. नेता नहीं नागरिक चाहिए – रामधारी सिंह दिनकर
9. हमारा समय और विज्ञान – गुणाकर मुले
10. साफ माथे का समाज – अनुपम मिश्र

इकाई – 2

1. कर्मवीर – अयोध्या सिंह उपाध्याय हरिऔध
2. भू-लोक का गौरव – संदेश यहाँ मैं नहीं स्वर्ग का लाया – भारत भारती मैथिलीशरण गुप्त
3. बीती विभावरी जागरी । अरुण यह मधुमय देश हमारा – जय शंकर प्रसाद
4. तोड़ती पत्थर – सूर्यकांत त्रिपाठी निराला
5. पथ की पहचान – हरिवंश राय बच्चन
6. प्रेत का बयान – नागार्जुन 7. जब-जब मैंने उसको देखा । धरती उस किसान की – केदारनाथ अग्रवाल
8. गीत फरोश –भवानी प्रसाद मिश्र
9. देश की नस्लें, बात करो, अपने – सरल विशारद

इकाई – 3

1. संक्षेपण
2. पल्लवन
3. शब्द युग्म
4. लोकोक्ति
5. शुद्धिकरण – शब्द , वाक्य मुहावरें

इकाई – 4

1. अनुवाद – अर्थ और सिद्धान्त, महत्त्व, आदर्श, अनुवाद की विशेषताएं
2. राजस्थानी एवं अंग्रेजी से हिन्दी अनुवाद एक अनुच्छेद

इकाई – 5

1. किसी एक विषय पर निबंध
2. पत्र-प्रारूप

परीक्षकों के लिए निर्देश :-

1. प्रश्न-पत्र इकाइयों में विभक्त हों।
2. प्रत्येक इकाई से निर्देशानुसार व्याख्यात्मक एवं आलोचनात्मक प्रश्न पूछे जाएंगे।

3. प्रश्न-पत्र वर्तमान में निर्धारित पाठ्यक्रमानुसार हो।

2. General English

Compulsory in 1st year for all streams at undergraduate level

Max. Marks: 100 Internal Evaluation 20 Marks Term-End Examination 80Marks

Note.

1. The marks secured in this paper shall not be counted in awarding the division to a candidate.
2. The candidate has to clear compulsory paper in three years.
3. Non appearing or absent in the examination of compulsory paper will be counted a chance.
4. It is essential to pass in both internal as well as external evaluation separately by securing 36% marks in each.

The syllables and scheme of examination is as under:

A. Grammar

Determiners
Tenses and Concord
Auxiliaries
Prepositions
Basic Sentence Patterns

B. Transformations

Active to Passive Voice
Simple to Compound / Complex
Declarative into Negative/ Interrogative
Direct to Indirect Speech

C. Comprehension

Comprehension of an Unseen Passage
Comprehension (from the following Texts): Comprehension based Questions of 10 Marks each will be asked from Prose, Short Stories, One Act Play and Poetry [40 Marks]

Prose

Digital India
A.P.J. Abdul Kalam: The Power of Prayer
Martin Luther King: I have a Dream
Albert Einstein: The World as I see it

Short Stories

Leo Tolstoy: The Three Questions
Nachiketa

One Act Play

Cedric Mount: The Never Never Nest

Poetry

R.N. Tagore : Heaven of Freedom
John Donne : Death be not Proud
Swami Vivekanand : Kali the Mother

Required Readings: *Emerald* (Macmillan)

D. Written Composition

Precis Writing
Paragraph Writing
Letter Writing(Formal and Informal)
Report Writing

Suggested Readings:

Murphy, Raymond: *Intermediate English Grammar* (OUP)

Huddleton, Rodney: *English Grammar: An Outline* (OUP)

Greenbaum, Sidney: *The Oxford English Grammar* (OUP)

3. ELEMENTARY COMPUTER APPLICATIONS

Compulsory in 1st year for all streams at undergraduate level

Max. Marks: 100 Internal Evaluation 20 Marks Term-End Examination 80Marks

Note.

1. The marks secured in this paper shall not be counted in awarding the division to a candidate.
2. The candidate has to clear compulsory paper in three years.
3. Non appearing or absent in the examination of compulsory paper will be counted a chance.
4. It is essential to pass in both internal as well as external evaluation separately by securing 36% marks in each.

The syllables and scheme of examination is as under:

Introduction to Information Technology, Generation of Computers, Types of computers: Micro, Mini, Mainframe, Super, Architecture of Computer System: CPU, ALU Primary Memory: RAM, ROM, Cache memory, Secondary Memories, Input/Output device, Pointing device.

Number System (binary, octal, decimal and hexadecimal) and their conversions, Logic gates,

Languages: machine, assembly and high level languages including 3GL, 4GL,

Concept of Operating System, need and types of operating systems: batch, single user,

Multiprocessing, and time sharing, introduction to Windows.

Internet: Concept, email services, www, web browsers, search engines, simple programs in HTML, type of HTML document, documents structures: element, type and character formatting, tables, frames and forms, Styli sheet

Computer Networking: Type of networks, LAN, MAN and WAN, concept of topology, bridges, routers, gateways, modems, ISDN leased lines, teleconferencing and videoconferencing.

E-Commerce: Concept of e-commerce, benefits and growth of e-commerce, e-commerce categories, e-Governance, EDI, electronic funds transfer on EDI networks Electronic payment system.

Suggested Books :

1. Computer Fundamental By P.K. Sinha (BPB Publications)
2. Computer Made Easy For Beginners (in Hindi) By Niranjan Bansal, Jayshri Saraogi
3. IT Tools and Applications By Satish Jain, Shashank Jain, Dr. Madhulika Jain (BPB Publication).
4. Rapidex computer Course, Vikas Gupta, Pustak Mahal.

4. ENVIRONMENTAL STUDIES

Compulsory in 1st year for all streams at undergraduate level

Max. Marks: 100 Internal Evaluation 20 Marks Term-End Examination 80Marks

Note.

1. The marks secured in this paper shall not be counted in awarding the division to a candidate.
2. The candidate has to clear compulsory paper in three years.
3. Non appearing or absent in the examination of compulsory paper will be counted a chance.

4. It is essential to pass in both internal as well as external evaluation separately by securing 36% marks in each.

The syllables and scheme of examination is as under:

SCHEME OF EXAMINATION

1. The term-end paper will be of 80 marks.
2. There will be no practical/Field work, instead student should be aware of ecology of local area; the question related to field work of local area can be asked by paper setter.
3. There will be 80 questions in the paper of multiple choice, each question of 1 mark.
4. There will be no negative marking in the assessment. Core Module syllabus for Environmental Studies for Under Graduate Courses of All Branches of Higher Education

Unit-1 : The multidisciplinary nature of environmental studies.

- Definition scope and awareness.
- Need for public awareness.

Unit-2 : Natural Resources :

- Renewable and non-renewable resources
- Natural resources and associated problems.
- Forest resources.
- Use and over-exploitation.
- Deforestation.
- Timber exploitation.

Mining

- Dams and their effects on forests and tribal people.
- Water resources.
- Use and over utilization of surface and ground water.
- Floods
- Drought
- Conflicts over water
- Dams benefits and problems.
- Mineral resources.
- Use and exploitation.
- Environmental effects of extracting and using mineral resources.
- Food resources.
- World food problems.
- Changes caused by agriculture and overgrazing.
- Effects of modern agriculture.
- Fertilizer, pesticide problems.
- Water logging.
- Salinity

Energy resources :

- Growing energy needs.
- Renewable and non-renewable energy resources.
- Use of alternate energy resources.

Land resources :

- Land as a resource.
- Land degradation.

- Man induced land slides.
- Soil erosion & desertification.

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

Unit-3 : Ecosystem:

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

Unit-4 : Biodiversity and its conservation:

- Introduction, definition and diversity at genetic, species and ecosystem level.
- Biogeographically classification of India.
- Value of biodiversity, consumptive use productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, national & local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity - habitat loss poaching of wild life, man-wild life conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity – In situ and Ex-situ conservation of biodiversity.

Unit-5 : Environmental Pollution :

- Definition, causes, effect and control measures of
- Air pollution.
- Water pollution
- Soil pollution.
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards.
- Solid waste management : Causes, effects and control measures of urban industrial wastes.
- Role of an individual in prevention of pollution.
- Disaster management : Flood, earthquake, cyclone and land slides.

Unit-6 : Social issues and the environment :

- From unsustainable to sustainable development
- Urban problems related to energy.
- Water conservation, rain water harvesting, water shed management.
- Settlement and rehabilitation of people, its problem of concerns.

- Environmental ethics-issues and possible solutions. Ozone layer depletion, nuclear accidents.
- Wasteland reclamation.
- Consumerism and waste products.
- Environmental protection Act.
- i. Air () prevention and control of pollution Act
- ii. Wild life protection Act
- iii. Forest conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit-7 : Human Population and the Environment :

- Population growth, variation among nations.
- Population explosion-Family welfare programme.
- Environment and Human health.
- Human rights.
- Value education.
- HIV/AIDS
- Women & child welfare.
- Role of information technology in environment and human health.

Field Work

- Visit to a local area to document environmental assets-river/forest/grassland/ hill/ mountain.
- Visit to local polluted site- Urban/rural/industrial/agricultural.
- Study of common plants, insects. Birds.
- Study of simple ecosystem-Pond, river, hill slope etc.

Suggested Books :

- 1 पर्यावरण अध्ययन – वर्मा, गैना, खण्डेलवाल, रावत
- 2 पर्यावरण विज्ञान – पी.सी. त्रिवेदी, गरिमा गुप्ता
- 3 पर्यावरण अध्ययन – सुरेश आमेता, षिप्रा भारद्वाज
- 4 Environmental studies - Pratap Singh, N.S. Rathore, A.N. Mathur
- 5 पर्यावरण अध्ययन – बाकरे, बाकरे वाघवा
- 6 पर्यावरण अध्ययन – मनोज यादव, अनूपमा यादव

B.Sc. Part-I -PHYSICS

Scheme

Four papers

Max. Marks : 200
Sessional Term-End

Paper I Theory	3 Hours Duration	10	40 Marks
Paper II Theory	3 Hours Duration	10	40 Marks
Paper III Theory	3 Hours Duration	10	40 Marks
Paper IV Practical	5 Hrs. Duration	nil	50 Marks

It is compulsory to pass in internal and external theory papers and practical paper separately by securing 36% marks each.

The term end examination papers will be divided into 3 sections:

Section- A (1x10=10) consists of 10 questions. Each question carries one mark. Attempt all questions.

Section- B (5 x 3 =15) consists of five questions with internal choice in each unit. Attempt all questions. Each question carries 3 marks. Word limit (300 -500 words)

Section- C (3 x 5 = 15) consists of 5 questions one from each unit. Students are required to attempt any 3 questions. Each question carries 5 marks. (Word limit 500 words & more)

There will be no internal marks in Practical. The paper will be of as per the maximum marks allotted in the syllabus.

PAPER -I FRAME OF REFERANCE, MECHANICS AND OSCILLATIONS

Duration : 3 hrs.

Max Marks: 40

UNIT - I

Inertial frames, Galilean Transformation, Non-inertial frames, laws of motion and motion in uniform field, fictious forces, Displacement, velocity and acceleration in rotating co-ordinate systems, centrifugal acceleration, coriolis force and its applications.

UNIT-II

Michelson-Morley experiment, search for ether, Postulates of the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity transformations, variation of mass with velocity, mass energy equivalence. Four vector formulation (qualitative only)

UNIT - III

Motion under central force, Conservation laws, Kepler's law, Gravitational law and field. Potential due to a spherical body, Gauss and Poisson equations for gravitational self energy.

System of particles, centre of mass, equation of motion of single stage and multistage rocket, concepts of elastic and inelastic collisions.

UNIT-IV

Rigid body motion, Rotational motion, Moment of inertia and their coefficients, Principle axes, Euler's equations. Potential well and periodic oscillations, cases of harmonic oscillations, differential equations and its solution, Kinetic and potential energy. Simple harmonic oscillations in - Spring and mass system, Simple and compound pendulum, Torsional pendulum, Bifilar oscillations, Helmholtz resonator, LC circuits, Vibration of bar magnet, Oscillation of two masses connected by a spring.

UNIT-V

Superposition of two simple harmonic motions of same frequency along the same line, Interference, Superposition of two mutually perpendicular simple harmonic vibrations of same frequency, Lissajous figures, Cases of different (multiple) frequency. Damped harmonic oscillators, Power dissipation, Quality factor, Driven 3 harmonic oscillator, Transient and steady state, Power absorption, Two coupled oscillations, normal modes.

Text and Reference Books :

1. "Berkeley Physics Course Vol.-I, Mechanics" (Mc-Graw-Hill)
2. The Feynman Lectures in Physics, vol-1, R.P. Feynman, R.B. Lgnton and M.Sands.
3. P. Khandelwal — "Oscillation and Waves", (Himalaya Publishing House, Mumbai.)
4. R.S. Gambhir — Mechanics, (CBS Publishers and Distributors, New Delhi.)
5. R.K. Ghosh — The Mathematics of Waves and Vibrations, (Macmilan, 1975.)

PAPER-II**MATHEMATICAL BACKGROUND, PROPERTIES OF MATTER AND ELECTROMAGNETIC WAVES**

Duration : 3 hrs.

Max. Marks : 40

UNIT - I

Scalars and Vectors : Dot & Vector products, triple vector product, gradient of scalar field and its geometrical interpretation, divergence and curl of a vector field, line, surface and volume integral, Flux of vector field, Gauss's divergence theorem, Green's theorem and Stokes theorem. Curvilinear Coordinates.

UNIT - II

Elasticity, Small deformations, Young's modulus, Bulk modulus and Modulus of rigidity for an isotropic solid, Poisson ratio, relation between elastic constants, Theory of bending of beam, Cantilever, Torsion of a cylinder, Bending moment and Shearing forces.

UNIT – III

Kinematics of moving fluids, Equation of continuity, Euler's equation, Bernoulli's theorem, Viscous fluids, Streamline and Turbulent flow, Reynold's number, Poiseulle's law, Capillary tube flow, Stoke's law, Surface tension and surface energy, molecular interpretation of surface tension, Pressure on a curved liquid surface, wetting.

UNIT-IV

Electromagnetic induction, Faraday's law (integral and differential form), Lenz's law, Mutual and Self inductance, Transformers, Energy in a static magnetic field, Measurement of self inductance by Rayleigh's method, Maxwell's displacement current, Maxwell's equations, Electromagnetic field and Energy density.

UNIT-V

Plane electromagnetic wave in vacuum, Wave equation for E and B of linearly, circularly and elliptically polarized electromagnetic waves, Poynting vector, Boundary condition for B, E, H & D, Frasel's relations (E in the plane), Reflection and refraction at a plane boundary of dielectrics, Polarization by reflection and total internal reflection,

Text and Reference Books:

1. Berkeley Physics Course, Electricity and Magnetism, Ed. E.M. Procell (Mc-Graw Hill)
2. Haliday and Resnik, 'Physics'-Vol. II
3. DJ. Griffth "Introduction to Electrodynamics", (Prentice Hall of india.)
4. A.M. Partis, 'Electromagnetic field.'
5. V.V. Savate, 'Electromagnetic field and Waves', (Wiley Eastern Ltd., New Delhi.)
6. S.N. Ghosh, 'Electromagnetic theory and Wave propagation', (Narosa Publishing House.)

PAPER-III ELECTROSTATICS, ELECTRICITY AND MAGNETISM

Duration: 3 hrs.

Max. Marks 40

UNIT – I

Coulomb's law & its vector form, Potential and field of an arbitrary charge distribution at rest, Concept of Multipole, Potentials and field due to Dipole and Quadrupole, Work done on moving a charge in an electrostatic field, expressed as a line integral, Conservative nature of the electrostatic field, Electric potential (ϕ), $\mathbf{E} = -\nabla\phi$, Torque on a dipole in a uniform electric field and its energy, Electrostatic energy of uniformly charged sphere, Classical radius of an electron, Screening of E-field by a conductor.

UNIT – II

Dielectrics, Parallel plate capacitor with partially, or completely filled dielectrics, dielectric constant, Polarization and polarization vector Atomic and molecular polarisability, Displacement vector \mathbf{D} , Molecular interpretation of Clausius Mosotti equation.

UNIT – III

Steady current, Current density \mathbf{J} , Non-steady currents and continuity equation, Charging and discharging of condenser through resistance, Determination of high resistance by leakage method. Rise and decay of current in LR and CR circuits, Decay constant, transients in LCR circuits, AC circuits, Complex number and their applications in solving AC circuits, Complex impedance and reactance, Series and parallel resonance, Q-factor and sharpness of resonance, Power consumed by an AC circuit, Power factor transmission of electric power.

UNIT - IV

Force on moving charge Lorentz force equation and definition of \mathbf{B} , Force on a straight conductor carrying current in a uniform magnetic field, Torque on a current loop, Magnetic dipole moment, Angular momentum and gyro magnetic ratio. Biot and Savart's law, calculation of \mathbf{H} in simple geometrical situations, Ampere's law, $\nabla \cdot \mathbf{B} = 0$, $\nabla \times \mathbf{B} = \mu_0 \mathbf{J}$, Field due to a magnetic dipole, Magnetization current, Magnetization vector, **Hall effect**, Magnetic permeability (linear cases).

UNIT - V

\mathbf{E} as an accelerating field: Electron gun, case of discharge tube, linear accelerator, \mathbf{E} as deflecting field: CRO, sensitivity of CRO. Transverse \mathbf{B} field: 180° deflection, Mass spectrograph, Curvatures of tracks, energy determinations of nuclear particles, Principle of a cyclotron. Mutually perpendicular \mathbf{E} and \mathbf{B} field: Velocity selector, its resolution. Parallel \mathbf{E} and \mathbf{B} field: Positive ray parabolas, discovery of isotopes, elements of mass spectrograph, Principle of magnetic focusing (lens).

Text and Reference Books:

1. Berkeley Physics Course, Electricity and Magnetism, Ed. E.M. Procell (Mc Graw Hill)
 2. Haliday and Resnik, 'Physics'-Vol. II
 3. D.J. Griffith "Introduction to electrodynamics", (Prentice Hall of India.)
 4. A.M. Partis, 'Electromagnetic field.'¹
 5. V.V. Savate, 'Electromagnetic field and Waves', (Wiley Eastern Ltd., New Delhi.)
 6. S.N. Ghosh, 'Electromagnetic theory and Wave propagation', (Narosa Publishing House.)
- PHYSICS**

PRACTICALS

Duration: 5 hrs Min.

Pass Marks 18

Max. Marks 40

Total number of experiments to be performed by the students during the session should be 16, selecting any eight from each section. In examination two experiments are to be performed taking at least one from each section.

Section : A

1. Study of laws of parallel and perpendicular axes for moment of inertia.
2. To find M.I. of an irregular body by inertia table.

3. Study of conservation of momentum in two dimensional oscillations.
4. Study of a compound pendulum.
5. Study of damping of a bar pendulum under various conditions.
6. Study of oscillations under a bifilar suspension.
7. Potential energy curves of a 1 -dimensional system and oscillations in it for various amplitudes.
8. Study of oscillations of a mass under different combinations of springs.
9. Study of bending of a cantilever or a beam.
10. Study of torsion of a wire (static and dynamic methods)
11. Study of flow of liquids through capillaries.
12. Determination of surface tension of a liquid by different methods.
13. Study of viscosity of a fluid by different methods.
14. Determine Y by Hook's law
15. Determine Y , η , σ by Searle's apparatus
16. Determine η by Maxwell needle
17. Determine η by Statical method
18. Determine σ of Rubber tube
19. Determine surface tension of water by Jaeger's method
20. Study the air damping by compound pendulum
21. Variation of magnetic field by tangent galvanometer

Section : B

1. Characteristics of a ballistic galvanometer.
2. I-V Characteristic of a P-N junction diode.
3. I-V Characteristic of a Zener diode.
4. Setting up and using an electroscope or electrometer.
5. Use of a vibration magnetometer to study a field.
6. Study B field due to a current.
7. Measurement of low resistance by Carey-Foster bridge or otherwise.
8. Measurement of inductance using impedance at different frequencies.
9. Measurement of capacitance using impedance at different frequencies.
10. Study of decay of currents in LR and RC circuits.
11. Response curve for LCR circuit and resonance frequency and quality factor.
12. Sensitivity of a cathode-ray oscilloscope.
13. Characteristics of a choke.
14. Measurement of inductance.
15. To verify the inverse square law using photocell
16. Study of Lorentz force.
17. Convert a galvanometer to voltmeter of a given range
18. Convert a galvanometer to ammeter of a given range
19. Study the variation of RC circuit with AC source
20. To verify maximum power transfer theorem
21. Study the charging and discharging of a capacitor (variation of RC circuit with DC)
22. Study of discrete and continuous LC transmission lines.

PRACTICAL-SCHEME OF EXAMINATION

Max. Marks: 50

Min.Marks:18

Time 5 hours

Note: There will be two experiments of 5 hrs duration. The distribution of marks will be as follows:

Two experiments (one from each groups)

Each of 15 Marks

30 Marks

Viva

15 Marks

Record

5 Marks

Total

50Marks

B.Sc. Part- I CHEMISTRY

Four papers

Max. Marks: 200

Sessional

Term-End

Paper I Theory	3 Hours Duration	10	40 Marks
Paper II Theory	3 Hours Duration	10	40 Marks
Paper III Theory	3 Hours Duration	10	40 Marks
Paper IV Practical	5 Hrs. Duration	nil	50 Marks

It is compulsory to pass in internal and external theory papers and practical paper separately by securing 36% each.

The term end examination papers will be divided into 3 sections:

Section- A (1x10=10) consists of 10 questions. Each question carries one mark. Attempt all questions.

Section- B (5x3=15) consists of five questions with internal choice in each unit. Attempt all questions. Each question carries 3 marks. Word limit (300 -500 words)

Section- C (3 x 5 = 15) consists of 5 questions one from each unit. Students are required to attempt any 3 questions. Each question carries 5 marks. (Word limit 500 words & more)

There will be no internal marks in Practical. The paper will be of as per the maximum marks allotted in the syllabus.

PAPER-I : INORGANIC CHEMISTRY

Time : 3 Hours

Max. Marks:40

60 Hours (2 Hours/ week)

Unit-I

(a) Atomic Structure :

Idea of De-Broglie matter/waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of ψ and $\psi^*(\psi^*)$, quantum numbers, radial and angular wave function and probability distribution curves, shapes of s, p,d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charge.

(b) Periodic Properties :

Atomic and ionic radii, ionization energy, electron affinity and electronegativity, different methods of determination, trends in periodic table and applications in predicting and explaining the chemical behavior.

Unit-II

(a) Chemical Bonding :

Covalent Bond - Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VESPR) theory to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2^- and H_2O .

(b) MO theory-Homonuclear and heteronuclear (CO and NO) diatomic molecules, multicentre bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Unit-III

(a) **Ionic Solids** - Ionic Structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber Cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions. Fajan's rule. Metallic bond - Free electron, valence bond and band theories.

Unit-IV

(a) **s- Block Elements** - Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their function in biosystems and introduction to alkyls and aryls

(b) **Chemistry of Noble Gases**-Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

Unit-V

P-Block elements-Comparative study (Including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-17. Chemistry of the following Compounds : Hydrides of Boron, diborane and higher boranes, borazine, fullerenes, carbides, fluorocarbons, silicates, tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

PAPER-II : ORGANIC CHEMISTRY

Time : 3 Hours Max. Marks : 40 60 Hours (2 Hours/ week)

Unit-I

(a) Structure and Bonding:

Hybridization, bond lengths and bond angles. Bond energy, localized and delocalized chemical bond, van der Waals interactions, inclusion compounds, clathrates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

(b) Mechanisms of Organic Reactions :

Curved arrow notation, drawing electron movements with arrows, half headed and double headed arrows, homolytic and heterolytic bond breaking. Types of reagents-electrophiles and nucleophiles. Type of organic reactions, energy considerations. Reactive intermediates- carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples) Assigning, formal charges on intermediates and other ionic species. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects. Kinetic and stereochemical studies).

Unit-II

Stereochemistry of Organic Compounds-Concept of isomerism, types of isomerism. Optical isomerism- elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute, configuration, sequence rules, D & L and R & S systems of nomenclature. Geometric isomerism- Determination of configuration of geometric isomers E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds. Conformational isomerism- conformational analysis of ethane and n-butane. Conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives, Newman projection and sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.

Unit-III

Alkanes and Cycloalkanes- IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (With special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids). physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes : orientation, reactivity and selectivity. Cycloalkanes - nomenclature, methods of formation, chemical reactions. Baeyer's strain theory and its limitations, ring strains in small rings (cyclopropane and cyclobutane), Theory of strainless rings, the case of cyclopropane ring : banana bonds.

Unit-IV

(a) Alkenes, Cycloalkenes, - Nomenclature of alkenes, methods of formation. Mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regio selectivity in alcohol dehydration. The saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes.

(b) Chemical reactions of alkenes- mechanism involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroborationoxidation, oxymercuration- reduction, epoxidation, ozonolysis, hydration, dehydroxylation and oxidation with KMnO_4 , Polymerization of alkenes, Substitution of the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene.

Methods of formation, confirmation and chemical reactions of cycloalkenes.

Unit-V

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, aromatic ions.

Aromatic electrophilic substitution- general pattern of the mechanism, role of sigma(σ) and pi(π) complexes. Mechanism of nitration, halogenations sulphonation, mercuration and Friedel- Craft's reactions, energy profile diagrams. Activating & deactivating substituents, orientation and ortho / para ratio, side chain reactions of benzene derivatives. Birch reduction. Methods of formation and chemical reactions of alkyl benzenes, alkynyl benzenes and biphenyl.

PAPER -III : PHYSICAL CHEMISTRY

Time : 3 Hours

Max. Marks : 40

60 Hours (2 Hours/ week)

Unit-I

(a) Gaseous States : Postulates of kinetic theory of gases, deviation from ideal behaviour, Vander-waals equation of state.

Critical Phenomena : PV isotherms of real gases, continuity of states, the isotherms of Vander-waals equation, relationship between critical constants and Vander-waals constants, the law of corresponding states, reduced equation of state.

(b) Molecular Velocities : Root mean square velocity, average and most probable velocities. Qualitative discussions of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on joule -thomson effect).

Unit-II

(a) Liquid State:

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

Unit-III

(a) Colloidal State:

Definition of colloids, classification of colloids.

Solids in liquids (sols) properties - Kinetic, optical and electrical stability of colloids, protective action, Hardy - Schultze law, gold number.

Liquids in liquids (emulsions) : Type of emulsions, preparation and properties of Emulsions.

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

Unit-IV

Solid State

Definition of space lattice, unit cell. Laws of crystallography-

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

X-ray diffraction by crystals. Derivation of Bragg equation. Determination of Crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).

Unit-V

Chemical kinetics

Chemical kinetics and its scope, rate of reaction, factors influencing the rate of reaction-concentration, temperature, pressure, solvent, light, catalyst, concentration dependence of rates, mathematical characteristics of simple chemical reactions: zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction-differential method, method of integration, method of half life period and isolation method. Radioactive decay as a first order phenomenon.

Experimental methods of chemical kinetics :

Conductometric, potentiometric, optical methods, polarimetric and spectrophotometric.

PRACTICAL

Max. Marks 50

Min. Marks 18

Time: 120 Hours (4 Hours / Week)

(A) INORGANIC CHEMISTRY

Semi micro and Macro analysis, Separation and Identification of Four radicals - two acidic and two basic in a given mixture which may include any one interfering radical and/or combinations of radicals.

(B) ORGANIC CHEMISTRY

1. Laboratory techniques:

(i) Determination of melting point ($^{\circ}\text{C}$)

Naphthalene $80-82^{\circ}\text{C}$, Benzoic acid $121.5-133^{\circ}\text{C}$

Urea $132.5-133^{\circ}\text{C}$, Succinic acid $184.5-185^{\circ}\text{C}$

Cinnamic acid $132.5-133^{\circ}\text{C}$, Salicylic acid $157.5-158^{\circ}\text{C}$

Acetanilide $113.5-114^{\circ}\text{C}$, m-Dinitrobenzene 90°C

p-Dichlorobenzene 52°C , Aspirin 135°C

(ii) Determination of boiling point

Ethanol 78°C , cyclohexane 81.4°C , toluene 110.6°C , Benzene 80°C

(iii) Mixed melting point determination

Urea-cinnamic acid mixture of various compositions(1:4,1:1,4:1)

(iv) Distillation

Simple distillation of ethanol-water using water condenser, Distillation of nitrobenzene and aniline using air condenser.

(v) Green Chemistry - Identification of Safety Symbols

2. Purification Methods

(i).Crystallization

Phthalic acid from hot water (using fluted filter paper and stemless funnel) Acetanilide from boiling water, Naphthalene from ethanol, Benzoic acid from water

(ii).Decolorisation & Crystallization using charcoal

Decolorisation of brown sugar (sucrose) with animal charcoal using gravity filtration, Crystallization and decolorisation of impure naphthalene

(100g of naphthalene mixed with 0.3 g of Congo red using 1 g decolorizing carbon) from ethanol.

(iii) Sublimation (Simple and Vacuum)

Camphor, Naphthalene, phthalic acid and succinic acid.

3. Qualitative analysis

Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable Derivatives

(C) PHYSICAL CHEMISTRY

(i) Chemical Kinetics

1. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To study the effect of acid strength on the hydrolysis of an ester.
3. To compare the strengths of HCl and H₂SO₄ by studying the kinetics of hydrolysis of ethyl acetate.
4. To study kinetically the reaction of decomposition of iodide by H₂O₂.

(ii) Distribution Law

1. To study the distribution of iodine between water and CCl₄
2. To study the distribution of benzoic acid between benzene and water

(iii) Colloids

1. To prepare arsenious sulphide sol and compare the precipitating power of mono-, bi- and trivalent anions.

(iv) Viscosity & Surface Tension

1. To determine the percentage composition of given mixture (non interacting system) by viscosity method.

2. To determine the viscosity of amyl alcohol in water at different concentrations and calculate the viscosity of these compositions.

3. To determine the percentage composition of a given binary mixture by surface tension method (acetone & ethyl-ketene).

Spotting:

Spotting will include Safety symbols, laboratory instruments, techniques etc. During examination in spotting there should be 5 spots related with instruments, techniques, safety etc. from the syllabus; time of spotting is 20 minutes and a separate copy shall be used for the purpose.

PRACTICAL-SCHEME OF EXAMINATION

Max. Marks: 50

Min. Marks: 18

Time 5 hours

INORGANIC CHEMISTRY

1. Analysis: One Exercise

8 Marks

ORGANIC CHEMISTRY

1.Lab Techniques: One experiment from any one techniques-

2.5 Marks

2-Purification Methods: One experiment from any one methods-

2.5 Marks

3.Qualitative Analysis: One Compound

7 Marks

PHYSICAL CHEMISTRY

Any One experiment

10 Marks

SPOTTING

10 Marks

(5 spots)

VIVA

5 Marks

RECORD

5 Marks

BA/B.Sc Maths Part-I

Note: The paper consists of three sections

Section A =11/12 Marks (11/12x1=11/12) It consists of 11/12very short answer questions of 1 mark.

Attempt all questions.

Section B = 25 Marks (6x4 =24) It consists of 8 short answer questions of 4 mark each Students have to attempt any 6 questions.

Section C = 18 Marks (3x6=18) It consists of 5 Long answer type questions of 6 marks each. Students will have to attempt any 3 questions.

Paper- I (MATRIX AND ALGEBRA)

UNIT-I

Relation between roots and coefficients of general polynomial equation in one variable, transformation of equations, Descarte's rule of signs, Solution of Cubic equations (Cardon Method) Biquadratic Equations (Ferrari Method)

UNIT-II

Symmetric, Skew symmetric. Hermitian and skew Hermitian matrices, Linear Independence of row and column matrices, Rank of a matrix by Echelon form, the characteristic equation of a matrix and eigenvectors. Cayley Hamilton theorem and its use in finding inverse of a matrix, Applications of matrices to a system of linear (both homogenous and non-homogenous) equations, Theorems of consistency of a system of linear equations.

UNIT-III

Definitions and examples of groups, general properties of groups, Permutations groups, even, odd and cyclic permutations, and simple groups.

UNIT-IV

Subgroups, cyclic groups, cosets decomposition, Lagranges theorem and its consequences, Fermats and Euler's theorems.

UNIT – V

Homomorphism and isomorphism of groups, normal subgroups,The fundamental theorem of homomorphism. Kernel of homomorphous and its properties.

REFERENCE BOOKS:

1. Chandrika Prasad : The Text Book of Algebra and Theory of Pothishala Pvt Ltd. Allahabad.
2. Vashitha, A.R. Modern Algebra, Krishna PrakashnaMandir, Meerut
3. Gokhroet. Al.:Matrices (Hindi Ed.) NavkarPrakashan, Ajmer
4. Gokhroet. Al.: Abstract Algebra (English/Hindi)Navkar Prakashan
5. I. N.Herstein : Topics in Algebra Wiley Eastern Ltd. New Delhi
6. Bansal, Bhargava & Agarwal: Abstract Algebra, Jaipur Publishing House, Jaipur
7. P.B. Bhattacharya and Other : Basic Abstract Algebra (2nd Edition)
Camb.University press Indian edition 1997

PAPER-II (CALCULUS)

UNIT-I

Pedal equation of a curve, Envelope and Evolutes, Asymptotes, Curvature: Various Formulae, centre of curvature, chord of curvature and related problems.

UNIT-II

Partial differentiation, chain of variables, Euler's theorem on homogeneous functions, first two differential coefficients of an implicit functions. Taylor's theorem for functions of two variables, jacobians with properties.

UNIT-III

Maximum – Minimum and saddle points of functions of two and three variables connected by a relation. Lagrange's method of undermined multipliers, curve tracing in Cartesian and polar coordinates (standard curves).

UNIT-IV

Differentiation and Integration under the sign of integration, Beta and Gamma functions, double integrals, change of order of integration, transformation in polar coordinates.

UNIT-V

Quardrature, rectification, volume and surface of solid of revolution, Triple integrals

REFERENCE BOOKS:

1. Gorakh Prasad : Text Book of Differential calculus, Pothishala Pvt Allahabad
2. Gorakh Prasad : Text Book of Integral calculus, Pothishala Pvt.
- 3.Gokhroet.al.: Differential Calculus (English/Hindi Edition Navkar Prakashan, Ajmer
4. Gokhroet. al. : Integral Calculus (English/Hindi Ed.) Navkar Prakashan, Ajmer.
5. Erwin Kreyszig : Advance Engineering Mathematics Johm Willey and sons 1999

PAPER-III (VECTOR CALCULUS AND GEOMETRY)

UNIT-I

Scalar and Vector point functions, vector differentiation, directional derivatives, gradient, divergence and curl. Identities involving these operators and related problems

UNIT-II

Vector integration, theorems of Stokes, Green, Gauss and problem based on them (Statement and verifications)

UNIT-III

General equations of second degree in two dimensions, Tracing of conics, Polar equations of conics: tangents, normal equations, asymptotes, chord of contact, pole and polar.

UNIT-IV

Sphere, cone and cylinder

UNIT-V

Central conicoid : Ellipsoid ; tangent planes, polar planes, Paraboloid tangent plane, diameters, diametral planes. Normals, Plane section of conicoids.

REFERENCE BOOKS:

1. Murray R. Spiegel : Vector Analysis Schaum Publishing Co. , New York.
2. N.Saran and S.N. Nigam : Introduction to Vector Analysis Pothishala Pvt. Ltd. Allahabad
3. Shanti Narian : A text book of Vector Calculus S. Chand & Co. New Delhi.
4. Gokhroet. al. :Vector Calculus (English/Hindi Ed.) Navkar Prakashan, Ajmer.
5. N.Saran and R. S. Gupta : Analytic Geometry of three dimension Pothishala Pvt.Ltd. All.
6. Shanti Narian : Analytic Solid Geometry. S. Chand & Co. New Delhi.
7. Golaset. al. : Analytic Solid Geometry
8. Gokhroet. al. : Coordinate Geometry (English/Hindi Ed.) Navkar Prakashan, Ajmer.

B.Sc. Part-I Botany

Four papers

Max. Marks: 200

		Session	Term-End
Paper I Theory	3 Hours Duration	10	40 Marks
Paper II Theory	3 Hours Duration	10	40 Marks
Paper III Theory	3 Hours Duration	10	40 Marks
Paper IV Practical	5 Hrs. Duration	nil	50 Marks

It is compulsory to pass in internal and external theory papers and practical paper separately by securing 36% each.

The term end examination papers will be divided into 3 sections:

Section- A (1x10=10) consists of 10 questions. Each question carries one mark. Attempt all questions.

Section- B (5x3=15) consists of five questions with internal choice in each unit. Attempt all questions. Each question carries 3 marks. Word limit (300 -500 words)

Section- C (3 x 5 = 15) consists of 5 questions one from each unit. Students are required to attempt any 3 questions. Each question carries 5 marks. (Word limit 500 words & more)

There will be no internal marks in Practical. The paper will be of as per the maximum marks allotted in the syllabus.

Paper-I

ALGAE, LICHENS AND BRYOPHYTES

Unit-I

General characters, thallus organization, pigments, reserve food material, reproduction and different types of life cycle in algae Classification with special reference to Firtsch. General account of Cynobacteria, Cell structure and reproduction in *Oscillatoria* and *Nostoc*

Unit-II

General characters of Chlorophyta and Xanthophyta. Morphology and reproduction in-
Chlorophyta -*Volvox*, *Oedogonium*. **Charophyta**- *Chara*. **Xanthophyta** -*Vaucheria*.

Unit-III

General characters of Phaeophyta and Rhodophyta. Morphology and reproduction in **Phaeophyta** – *Ectocarpus* **Rhodophyta** – *Polysiphonia* Economic importance of Algae . **Lichens** - General characters. Habitat, structure, reproduction (with special reference to *Parmelia* and *Usnea*) and economic importance as colonisers and indicators of environment.

Unit-IV

General characters and classification of Bryophytes, Evolutionary trends in thallus and sporogonium in Bryophytes. Morphology and life history of *Riccia* and *Marchantia*

Unit-V

Morphology, life history of Anthoceros and Sphagnum. Economic importance of Bryophytes.

Paper-II

MYCOLOGY, MICROBIOLOGY AND PLANT PATHOLOGY

Unit-I

Characteristics and broad classification of Fungi (Alexopoulos and Mims (1979)). Structure and life history of *Albugo*, *Mucor*, *Penicillium* and *Morchella*.

Unit-II

Structure and life history of *Puccinia*, *Ustilago*, *Agaricus*, and *Alternaria*. General Economic importance of Fungi.

Unit-III

Brief history of Microbiology : Major contributions of Leuwenhoek, Pasteur, Koch, Metchnikoff, Paul Ehrlich, Edward Jenner, Flemming and Waksman. Characteristics, structure, nutrition and reproduction of Bacteria. Gram staining, economic importance of Bacteria.

Unit-IV

Characteristics, structure and economic importance of Mycoplasma, Viruses : nature, structure multiplication and transmission of plant viruses. General account of Viroids, AIDS, Prions.

Unit-V

Principles of Plant Pathology : Symptoms and control measures of following plant diseases; Green ear disease of Bajra. Loose and covered smut of Wheat/ Barley, Black rust of Wheat, Citrus canker, Little leaf of Brinjal, Yellow vein mosaic of Bhindi.

Paper-II

PTERIDOPHYTES, GYMNOSPERMS & PALAEOBOTANY

Unit-I: Characteristics and broad classification of Pteridophyta. Stellar system in Pteridophytes. Geological Time Scale. Types of fossils, process of fossilisation. Applied aspects of Palaeobotany. Structure of *Rhynia* and *Williamsonia*.

Unit-II: Occurrence, structure and life history of *Psilotum*, *Lycopodium* and *Equisetum*

Unit-III: Occurrence, structure and life history of *Selaginella Pteris* and *Marsilea*, Homospory, heterospory and origin of seed habit

Unit-IV: General characters, economic importance and broad classification of Gymnosperms. Occurrence, structure and life history of *Cycas*.

Unit-V: Occurrence, Morphology, Anatomy and life history of *Pinus* and *Ephedra*.

Reference Books:

1. A Text Book of Botany Vol. I & II – Saxena and Sarabhai, Ratan Prakashan Mandir, Agra.
2. A Text Book of Botany – Singh, Pandey and Jain, Rastogi Publication, Meerut.
3. Algae, Lichens and Bryophyta – Gena, Verma and Chaudhary, Alka Publication, Ajmer.
4. Introductory Phycology (2nd Edition)-Kumar, H.D. (1999), Affiliated EastWest Press Pvt. Ltd. Delhi
5. Algae (Diversity of Microbes & Cryptogames)- Sharma, O.P., Mc Grwa Hill Education (India)Private Limited Chennai.
6. Introductory Mycology- Alexopoulos, C.J., John Wiley and Sons, N.Y.
7. Fungi, Microbiology and Plant Pathology – Gena, Verma and Chaudhary, Alka Publication, Ajmer.
8. Pteridophyta, Gymnosperms and Palaeobotany – Tyagi and Saxena, R.B.D., Jaipur.
9. Pteridophyta, Gymnosperms and Palaeobotany– Gena, Verma and Chaudhary, Alka Publication, Ajmer.
10. Botany for Degree Students: Fungi., Vashishta, B.R. (1990), S. Chand & Company Ltd., New Delhi.

11. Practical Botany – Bendre and Kumar, Rastogi Publication, Meerut.
 12. Practical Botany- Purohit, Kukda and Singhvi, Apex Publishing House Udaipur-Jaipur.

Paper IV: Practical

The practical exercises have been divided into following two groups based on the theory papers as detailed below:

Group-I Algae, Fungi, Lichens, Microbiology and Plant Pathology.

Group-II Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany

Group-I : Microscopic preparations and study of the following algal material:

Nostoc, Oscillatoria, Volvox, Oedogonium, Vaucheria, Chara, Ectocarpus and *Polysiphonia*.

Study of different types of Lichen specimens. Microscopic preparation and study of Albugo, Mucor, Morchella, Penicillium, Ustilago, Puccinia, Agaricus, Alternaria. Staining of different types of Bacteria. Study of some locally available plant diseases caused by Viruses. Mycoplasma, Bacteria and Fungi in field/laboratory. Yellow vein mosaic of Bhindi. Little leaf of Brinjal, Citrus canker, Green ear disease of Bajra, Rust and smut of wheat and White rust of Crucifer.

Group-II

Study of External morphology and microscopic preparations of the following Bryophytes :- *Riccia, Marchantia, Anthoceros* and *Sphagnum*.

Microscopic examination of fossil slides, specimen/photographs - *Rhynia* and *Williamsonia*.

Microscopic, temporary, double stained preparations and study of stem/rhizome, anatomy of following Pteridophytes - *Psilotum, Lycopodium, Selaginella, Equisetum* and *Marsilea*.

Study of temporary, single stained microscopic preparations of the followings : Cone of *Lycopodium, Selaginella* and *Equisetum*. Sporophyll of *Pteris* Sporocarp of *Marsilea*.

Microscopic temporary double stained preparations of T.S. of stem of *Pinus* and *Ephedra*, T.S. Leaflet and Rachis of *Cycas* and needle of *Pinus*, T.S. of normal and coralloid root of *Cycas*.

Study of male cone and megasporophyll of *Cycas*.

Microscopic preparation of male cone of *Pinus* and male and female cones of *Ephedra*. Study of female cone of *Pinus*.

Marking Scheme

	Regular Student
1. A double stained section of plant part either of Pteridophyte or Gymnosperm (Glycerine mount).	06
2. Minor preparation of Pteridophyte or Gymnosperm (not covered in Ques. 1)	05
3. Preparation and mounting of the part of	
(a) A Bryophyte	03
(b) A Fungus	03
(c) An Alga	03
(d) Bacteria /Macerations technique	03
(a) One from each group (Algae, Lichen, Bryophyta, Fungi, Fossil, Pteridophyte, Gymnosperm)	14
(b) One pathological specimen for comments	03
5.Viva-Voce	05
6. Practical record	05
Total	50

B.Sc. Part-I ZOOLOGY

Four papers

Max. Marks: 200

		Sessional	Term-End
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PAPER-I TAXONOMY, DIVERSITY AND FUNCTIONAL ANATOMY OF LOWER NON- CHORDATA (FROM PROTOZOA TO NEMATODA)

UNIT-I

General principles of classification, concept of five kingdom scheme, basis of classification of lower non- chordata: Symmetry, coelome, segmentation, embryogeny. General characters and classification of Protozoa; Porifera; Coelenterata; Platyhelminthes and Nematode upto classes with examples emphasizing their diversity and economic importance.

UNIT-II

Protozoa: Habit, habitat, Structure, function and life history of Euglena and paramecium. Parasitic protozoans of man with reference to diagnostic characters, mode of infection, pathogenicity and control of Giardia, Leishmania, Trypanosoma and Trichomonas.

UNIT-III

Porifera: Habit, habitat, structure and function of Sycon . Types of canal system.

Coelenterata: Habit, habitat, structure, function and life history of Aurelia. Polymorphism in coelenterata. A brief account of coral and coral reefs.

UNIT-IV

Platyhelminthes: Habit, habitat, structure, function, life history, pathogenicity and parasitic adaptations of Fasciola and taenia.

UNIT-V

Parasitic nematodes of man with reference to diagnostic characters, mode of infection, pathogenicity and control of Dracunculus, Ancylostoma, Wuchereria. Habit, habitat, structure and function of plant nematode (Heterodera)

PAPER-II.

TAXONOMY, DIVERSITY AND FUNCTIONAL ANATOMY OF HIGHER NON-CHORDATA (FROM ANNELIDA TO ECHINODERMATA)

UNIT-I

Annelida: General characters and classification upto orders. Hirudinaria-habit, habitat, structure, function(External features, digestive, circulatory, excretory, reproductive systems, development and life history. Parasitic adaptations of Leech.

UNIT-II

Arthropoda : General characters and classification upto orders.

Palaemon-Habit, habitat, external features, appendages, digestive, respiratory, circulatory, excretory, reproductive, nervous systems and sense organs. Larval forms of crustacean. Drosophilla-Structure and life history.

UNIT-III

Mollusca: General characters and classification upto orders

Lamellidens-habit, habitat, external features, anatomy(digestive, circulatory, respiratory, reproductive, nervous systems and sense organs)

UNIT-IV

Pila-habit, habitat, external features, anatomy (digestive, circulatory, respiratory, reproductive, nervous systems and sense organs).torsion in Gastropoda.

Echinodermata-general characters and classification of Echinodermata upto orders. External features and water vascular system of Asterias.

UNIT-V

Economic zoology- Apiculture, Sericulture, Social life of termites. Sex determination in termites, Harmful insects (Major insect pests): Rhizopertha, Sitophilus, White grub and locust.

PAPER-III. CELL BIOLOGY, BIOCHEMISTRY AND MICROBIOLOGY

UNIT-I

Cell theory: Introduction to cell, morphology, size, shape, concept of Prokaryote and eukaryote with suitable examples. Ultrastructure of Virus, bacteria and typical animal cell.

UNIT-II

Architecture of cell organelles- Chemical composition and functions of plasma membrane, endoplasmic reticulum, Golgi bodies, centrosome, mitochondria, cilia, flagella, microtubules, lysosomes and nucleus. Active and passive transport.

UNIT-III

Biochemical make up of protoplasm including functions: Inorganic and organic constituents-water, electrolytes, minerals, various forms of carbohydrates, proteins, lipid and their conjugates, nucleic acids, vitamins and enzymes.

UNIT-IV

Metabolic mechanisms (Catabolism) Glycolysis, kreb cycle, Oxidative phosphorylation, oxidation of fatty acids, transamination, deamination and decarboxylation. Metabolic mechanisms (Anabolism)- DNA replication, genetic code, transcription of RNA, translation, lipid synthesis and glycogenesis.

UNIT-V

Bacteria and viruses of medical importance (elementary knowledge)

Gram positive: Cocci- Staphylococci, Streptococci, **Bacilli-** Diphtheria, Tetanus.

Gram Negative: Cocci- Gonorrhoea, Meningitis; **Bacilli-** Pneumonia, Diarrhoea; **Mycobacteria-** Tuberculosis, leprosy, Actinomycetes.

Obligate intracellular agents, AIDS (Causative agents, HIV-I, HIV-II, Transmission, pathogenicity). Secondary disease, symptoms, diagnosis, treatment and prevention.

SARS-Causes, pathogenicity and prevention. Elementary idea of Cancer.

PRACTICALS

I-General survey of Invertebrates (Museum specimens and slides)

1. **PROTOZOA-** Entamoeba, Polystomella, Monocystis, Euglena, Noctiluca, Leishmania, Nyctotherus, Paramecium, Vorticella.
2. **PORIFERA-** Sycon, Hyalonema, Euplectella, Spongilla, Euspongia.
3. **COELENTERATA-** Obelia colony, Physalia, Porpita, Aurelia, Rhizostoma, Alcyonium, Corallium, Gorgonia, Pennatula, Madrepora, Metridium
4. **PLATYHELMINTHES-** Dugesia, Fasciola, Taenia, Schistosoma
5. **NEMATODA-** Filaria, Dracunculus, Ancylostoma, Wuchereria, Enterobius
6. **ANNELIDA-** Neries, Aphrodite, Arenicola, Pontobdella, Hirudinaria, Peripatus
7. **ARTHROPODA-** Limulus, Spider, Palaemon, Lepas, Balanus, Sacculina, Palaemon, Eupagurus,
8. Crab, Lepisma, Lobster, Odontotermes, Pediculus, Schistocerca, Papilio, Bombyx, Xenopsylla,
9. Rice weevil, Millipede, Scolopendra, Ticks and mites.
10. **MOLLUSCA-** Chiton, Dentalium, Patella, Pila, Turbinella, Aplysia, Slug, Snail, Mytilus, Ostrea, Pinctada, Lamellidens, Terebratulid, Sepia, Octopus, Nautilus.
11. **ECHINODERMATA-** Pentaceros, Ophiothrix, Echinus, Pentaceros, Antedon.

II- Study of the section of organs and developmental stages

1. **PORIFERA-** Sections of Scypha
2. **COELENTERATA-** Planula, Scyphistoma, Ephyra larva of Jelly fish.
3. **PLATYHELMINTHES-** T.S. of Taenia and Fasciola., Scolex of Taenia, mature and gravid proglotid of Taenia, Hexacanth, Bladderworm and cysticercus stages of Taenia, Miracidium, Sporocyst, Redia and Cercaria, Larva of Fasciola.
4. **ANNELIDA-** T.S. of Leech and Neries through different regions, Parapodia of Neries and Heteroneries phase, Trochophore larva
5. **ARTHROPODA-** Nauplius, Zoea, Megalopa, and Mysis larvae, Cyclops.
6. **MOLLUSCA-** T.S. of Lamellidens, Glochidium larva.
7. **ECHINODERMATA-** Pedicellariae

III- Dissections/demonstration (Models, Charts, Computer simulation)

1. **Earthworm-** External features, General anatomy, Digestive, Nervous, Excretory, and reproductive systems.
2. **Palaemon:** External features, appendages, General anatomy, Digestive and nervous system.
3. **Grasshopper/Locust/Cockroach-** External feature, general anatomy, alimentary canal, nervous system.
4. **Pila:** External features, General anatomy, Digestive and nervous system.
5. **Unio:** External features, General anatomy, nervous systems.

IV- Mounting permanent preparations of the following:

PROTOZOA- Euglena, Paramecium, Polystomella, or any other foraminifera. **PORIFERA-** Spicules, spongil fibres, gemmule.

COELENTERATA- Obelia medusa, **PLATYHELMINTHES-** Taenia proglotid **ANNELIDA-** Neries (parapodia)

ARHTOPODA-Statocyst, Hastate plate, of Prawn, Cyclops, Daphnia. MOLLUSCA- **Pila**- Gill lamella, Osphradium, Redulla, **Unio**- Gill lamella.

V- Cell biology

- (a) study of living cell by vital staining
- (b) **Temporary acetocarmine staining** of squashed testis of grasshopper and study of chromosome during mitosis and meiosis.
- (c) Any slide of important bacteria. Photograph of animal tissues and TMV virus .Electron micrograph
- (d) of cell and cell organelles.
- (e) **Cell membrane permeability**(Crenation, and Haemolysis in mammalian (RBC)

VI. Biochemistry Exercise-

- (a) **Protein-** Biuret test
- (b) **Lipid-** Sudan IV test
- (c) **Carbohydrate-** Benedict test
- (d) **Catalase** enzyme in animal tissue
- (e) **Janus green-** Vital test for mitochondria in buccal smears, Cauda epididymis sperm.

(Note-Use of animals for dissection is subject to the condition that these are not banned under the wildlife Protection Act).

S.No	Permanent exercise	Regular	Ex- student
1	Dissection/ demonstration	8	10
2	Preparation	6	7
3	Cell biology	6	7
4	Biochemistry	6	7
5	Spots(07)) 7×3	14	14
6	Record	5	Nil
7	Viva voce	5	5
	Grand Total	50	50

Suggested reading material:

1. Hickman, Roberts and Hickman: Principles of Zoology(Times Mirror)
2. Kotpal, Agrwal and Khetrapal: Modern text book of Zoology: Invertebrate(Rastogi Publications)
3. Nigam: Biology of Nonchordates(S. Nigam, Chand)
4. Parker and Haswell: text book of Zoology Vol:I(Macmillan)
5. Prescott:cell (Jones and Barnett)
6. Russel Hunter: A life of Invertebrate(Macmillan)
7. Wolfe: Biology the foundation(Wadsworth)
8. Panwar, V.S. Lower Nonchordate(CBC, Jaipur)
9. Panwar, V.S. Higher Nonchordate(CBC, Jaipur)
10. Soni, K.C.: Modern Cell Biology(CBC, Jaipur).

B.Sc. PART – II

S.No.	Name of the No. of Papers	Papers	Duration on Hours	Marks Internal		Maximum Marks Term End exams	
				Max.	Min	Max	Min
Subjects/papers for B.Sc							
1	Physics	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18
2	Chemistry	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18
3	Mathematics	Paper-I	3	13	6	53	19
		Paper-II	3	14	6	53	19
		Paper-III	3	14	6	53	19
4	Zoology	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18
5	Botany	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18

B.Sc. PART – II PHYSICS

Scheme

Four papers

Max. Marks : 200

		Sessional	Term-End
Paper I Theory	3 Hours Duration	10	40 Marks
Paper II Theory	3 Hours Duration	10	40 Marks
Paper III Theory	3 Hours Duration	10	40 Marks
Paper IV Practical	5 Hrs. Duration	nil	50 Marks

Paper-I STATISTICAL PHYSICS AND THERMODYNAMICS

Duration: 3 hrs.

Max. Marks: 40

UNIT-1

Phase space, micro and macro states, the statistical basis of thermodynamics:

The $\mu(\square)$ space representation, division of μ space into energy sheets and into phase cell of arbitrary size, Probability and thermodynamic probability, principle of equal a priori probabilities, probability distribution and its narrowing with increase in number of particles. The expressions for average properties. Constraints, accessible and inaccessible states, distribution of particles with a given total energy into a discrete set of energy states. The monoatomic ideal gas, the barometric relations.

UNIT-2

Some universal laws: Equilibrium before two systems in thermal contact, bridge with macroscopic physics. Probability and entropy, Boltzmann entropy relation. Statistical interpretation of second law of thermodynamics. Boltzmann canonical distribution law and its applications; rigorous form of equipartition of energy.

Transition to quantum statistics: 'h' as a natural constant and its implications, cases of particle in a one-dimensional box and one-dimensional harmonic oscillator. Indistinguishability of particles and its consequences, M.B., Bose-Einstein, and Fermi-Dirac statistics and their comparison,

UNIT-3

The laws of thermodynamics: The Zeroth law, various indicator diagrams, work done by and on the system, first law of thermodynamics, internal energy as state function and other applications. Reversible and irreversible changes, Carnot cycle and its efficiency, Carnot theorem and the second law of thermodynamics. Different versions of the second law, practical cycles used in internal combustion engines. Entropy, principle of increase of entropy. The thermodynamic scale of temperature; its identity with the perfect gas scale. Third law of thermodynamics.

UNIT-4

Thermodynamic relationships: Thermodynamic variables; extensive and intensive, Maxwell's general relations, application to Joule-Thomson cooling and adiabatic cooling in a general system, Van-der Waals gas, Clausius Clapeyron heat equation.

Thermodynamic potentials and equilibrium of thermodynamic systems, relation with thermodynamical variables. Cooling due to adiabatic demagnetization, production and measurement of very low temperatures.

UNIT-5

Blackbody radiation: Pure temperature dependence. Stefan-Boltzmann law of radiation. Spectral distribution of blackbody radiation. Wien's displacement law, Rayleigh-Jean's law, the ultraviolet catastrophe, Planck's quantum postulates, Planck's law, complete fit with experiment. Interpretation of behavior of specific heats of gases and solids at different temperature.

Paper- II : WAVES, ACOUSTICS AND KINETIC THEORY OF GASES

Duration: 3 hrs.

Max. Marks: 40

UNIT-1

Ideal Gas: Kinetic model, deduction of Boyle's law; interpretation of temperature, estimation of rms speeds of molecules. Brownian motion, estimate of the Avogadro number. Equipartition of energy, specific heat of monatomic gas, extension to di- and triatomic gases, Behaviour at low temperatures. Adiabatic expansion of an ideal gas, application to atmospheric physics.

Transport phenomena in gases: Molecular collisions, mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

UNIT -2

Real Gas: Van der Waals gas, equation of state, nature of Van der Waals forces, comparison with experimental P-V curves. The critical constants, gas and vapour. Joule expansion of ideal gas, and of a Van der Waals gas, Joule coefficient, estimates of J-T cooling.

Liquifaction of gases: Boyle temperature and inversion temperature. Principle of regenerative cooling and of cascade cooling, liquification of hydrogen and helium. Refrigeration cycles, meaning of efficiency.

UNIT-3

Maxwellian distribution of law of velocity and speed in an ideal gas : Distribution of speeds and of

velocities, experimental verification, distinction between mean, rms and most probable speed and velocity values. Doppler broadening of spectral lines.

Applied acoustics: The acousticity of a hall, reverberation period, Sabine's formula.

UNIT-4

Waves in media: Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves, typical measurements. Waves over liquid surface: ripples. Group velocity and phase velocity, their measurements.

Superposition of waves: Linear homogeneous equations and the superposition principle, nonlinear superposition and consequences.

Standing waves: Standing waves as normal modes of bounded systems, examples, Harmonics and the quality of sound; examples. Chladni's figures and vibrations of a drum. Production and detection of ultrasonic waves and applications.

UNIT-5

Noise and Music: The human ear and its responses; limits of human audibility, intensity and loudness, bel and decibel the musical scale, temperament and musical instruments violin, sitar, flute, harmonium & tabla.

Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection and refraction at a boundary, Measurements of frequency and velocity, impedance matching for transducers, diffraction of sound, principle of a sonar system, sound ranging.

Paper-III OPTICS

Duration: 3 hrs.

Max. Marks: 40

UNIT-I

Fermat's Principle: Principle of extremum path and application to laws of reflection refraction.

General theory of image formation : Cardinal points of an optical system, general relationships, thick lens and lens combinations, Lagrange equation of magnification, telescopic combinations, telephoto lenses and eyepieces.

UNIT-II

Aberration in images: Chromatic aberrations, achromatic combination of lenses in contact and separated lenses. Monochromatic aberrations and their reductions; aplanatic points, oil immersion objectives, meniscus lens.

Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces Ramsden & Huygen's eyepiece.

UNIT-III

Interference: The principle of superpositions, two-slit interference, coherence requirements for the sources, optical path retardations, lateral shift of fringes. Localised fringes Newton's ring; Interference in thin films. Michelson interferometer, its application for precision determination of wavelength, wavelength difference and the width of spectral lines, Fabry-Perot interferometer and etalon.

UNIT-IV

Fresnel diffraction : Fresnel half-period, zones plates, straight edge, rectilinear propagation of light.

Fraunhofer diffraction: Diffraction at a slit, half-period zones. Phasor diagram and integral calculus methods, the intensity' distribution, diffraction at a circular aperture and a circular disc, resolution of images, Rayleigh criterion, resolving power of telescope and microscopic systems, outline of phase contract microscopy.

Diffraction gratings: Diffraction at N parallel slits, intensity distribution, plane diffraction grating,

reflection grating and blazed gratings. Concave grating and different mountings. Resolving power of a grating and comparison with resolving powers of prism and of a Fabry-Perot etalon.

UNIT-V

Laser systems : Purity of a spectral line, coherence length and coherence in time, spatial coherence of a source, Einstein's A and B coefficients. Spontaneous and induced emissions, conditions for laser action, population inversion, Ruby and He-Ne laser.

Holography & Nonlinear optics : Hologram, construction and reproduction mathematical analysis, principle of self focusing, principle of fiber optics and types of optical fiber.

Some Text and Reference Books for papers I, II, III

1. A.K. Ghatak, "Physical Optics"
2. D.P. Khandwal; "Optics and Atomic Physics" (Himalaya Publishing House, Bombay, 1988).
3. F Smith and J.H. Thomson; "Manchester Physics series: Optics" (English Language Book Society and John Wiley, 1977).
4. Bom and Wolf; "Optics"
5. K.D. Moltev; "Optics" (Oxford University Press)
6. Sears; "Optics"
7. Jenkins and White; "Fundamental of Optics" (McGraw-Hill)
8. B.B. Laud; Lasers and Non-linear Optics (Wiley Eastern 1985)
9. Smith and Thomson; "Optics" (John Wiley and Sons).
10. Berkely Physics Course: Vol. III "Waves and Oscillations"
11. I.G. Main: "Vibrations and Waves" (Cambridge University Press)
12. H.J. Pain: "The Physics of Vibrations and Waves" (MacMillian 1975)
13. B.B. Laud, "Introduction to Statistical Mechanics" (MacMillian 1981).
14. F.Reif: "Statistical Physics" (McGraw-Hill, 1988).
15. K.Haug: "StatisticalPhysics" (Wiley Eastern, 1988)

SYLLABUS FOR PHYSICS –PRACTICALS

Duration: 5 hrs. Min. Pass Marks 18

Max. Marks 40

Note : Total number of experiment to be performed by the students during the session should be atleast 16, selecting any eight from each section. In examination two experiments one from each section are to be performed. The laboratory tutorials are to be done in the lab classes so that these may be applied in regular laboratory exercises.

Section 'A'

1. Study of adiabatic expansion of a gas or Determination of ' $\gamma = C_p/C_v$ ' ratio of two specific heats of a gas by Clement & Desort's method.
2. Study of conversion of mechanical energy into heat.
3. Study of temperature dependence of total radiation.
4. Application of resistance thermometry : Determine melting point of wax using platinum resistance thermometer.
5. Application of resistance thermometry : Determine temperature coefficient of resistivity using platinum resistance thermometer.
6. Application of thermo emf : Plot thermo emf versus temperature and find the neutral temperature and an unknown temperature.
7. Conduction of heat through poor conductor: Determine thermal conductivity of a poor conductor by Lee's method.

8. Experimental study of probability distribution for a two option system using a colored dice.
9. Determination of velocity of sound, using CRO microphone, speakers by standing waves.
10. Study of dependence of velocity of wave propagation on line parameters using torsional wave apparatus.
11. Study of variation of reflection coefficient with nature of termination using torsional wave apparatus.
12. Study of interference with two coherent sources of sound.
13. Determine the ballistic constant of a ballistic galvanometer/spot galvanometer.
14. Determine the charge sensitivity of a ballistic galvanometer/spot galvanometer.
15. Determine the high resistance by leakage method using ballistic galvanometer
16. Determine the ratio of capacitance by using a De Sauty bridge
17. Determine the inductance of a coil by Anderson bridge
18. Determine the normal modes in coupled oscillator system
19. Study of Energy transfer in coupled oscillator system
20. Determine Planck's constant "h" by photo cell.
21. Determine the band gap of PN junction diode

Section 'B'

1. Determination of principal points of a combination of lenses.
2. Use of diffraction grating, find wavelength of main spectral lines of Hg source and its resolving power.
3. Determine resolving power limit of resolution of a telescope and study of various eye pieces, (any two).
4. Determine Angular dispersion of Prism
5. Polarization of light by reflection, verify Brewster 's law & law of Malus.
6. Study of optical rotation of plane of polarization of sugar//specific rotation of canesugar, using polarimeter.
7. Study of interference of light with Bi-prism and determine ' λ '.
8. Use of Michelson's interferometer and determine $d\lambda$, ' λ ' for sodiumlight.
9. Use of P.P. Etalon to determine of ' λ ,' for sodiumlight.
10. Study of laser as a monochromatic source with reference to interference.
11. Study of laser as a monochromatic source with reference to diffraction.
12. Determine the wavelength of sodium light by Newton's rings
13. Determine Peak and R.M.S value of voltage in a RC circuit with AC source
14. Characteristics of a transistor.(CB, CE)

PRACTICAL-SCHEME OF EXAMINATION

Max. Marks: 50

Min.Marks:18

Time 5 hours

Note: There will be two experiments of 5 hrs duration. The distribution of marks will be as follows:

Two experiments (one from each groups)

Each of 15 Marks

30 Marks

Viva

15 Marks

Record

5 Marks

Total

50 Marks.

B.Sc. Part- II

CHEMISTRY

Scheme of Examination:

Max Marks: 200

Scheme

Four papers

Max. Marks: 200

Sessional

Term-End

Paper I Theory Marks	3 Hours Duration	10	40
Paper II Theory Marks	3 Hours Duration	10	40
Paper III Theory Marks	3 Hours Duration	10	40
Paper IV Practical Marks	5 Hrs. Duration	nil	50

It is compulsory to pass in internal and external theory papers and practical paper separately by securing 36% marks each.

The term end examination papers will be divided into 3 sections:

Section- A (1x10=10) consists of 10 questions. Each question carries one mark. Attempt all questions.

Section- B (5 x 3 =15) consists of five questions with internal choice in each unit. Attempt all questions. Each question carries 3marks. Word limit (300 -500 words)

Section- C (3 x 5 = 15) consists of 5 questions one from each unit. Students are required to attempt any 3 questions. Each question carries 5 marks. (Word limit 500 words & more)

There will be no internal marks in Practical. The paper will be of as per the maximum marks allotted in the syllabus.

PAPER-I –INORGANIC CHEMISTRY

Time: 3 Hours

Max. Marks: 40

60 Hours (2 Hours/ week)

Unit-I Chemistry of Elements of First Transition Series:

(a) Characteristic properties of d-block elements. Properties of the elements of first transition series, their binary compounds and complexes, illustrating the relative stabilities of oxidation states, coordination number and geometry.

(b) Chemistry of elements belonging to II and III transition series comparative study of post lanthanide transition metals with the members of 4d series with special emphasis on ionic radii, oxidation states, magnetic & spectral properties. Stereochemistry of their compounds.

Unit-II

Oxidation and reduction :

Use of redox potential data-Analysis of redox cycle. Redox stability in water. Frost, Latimer and Pourbaix diagram . Principles involving in the extraction of elements.

(a) Chromatography – Definition, classification, R_f-value , law of differential migration eluant and elution, Paper, TLC, Chromatographies and their applications.

Unit-III

Coordination Compounds:

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates,

nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.

Unit-IV: (a) Chemistry of Lanthanide Elements :

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds. (b) **Chemistry of Actinides :**

General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides.

Unit-V

(a) Error, Statistical data analysis and presentations : Types of errors, Making and Recording Measurements. SI Units and their use. Scientific method and design of experiments. Choosing and using statistical tests. Chemometrics. Analysis of variance (ANOVA), Correlation and regression, Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals, General polynomial fitting, linearizing transformations, exponential function fit, r and its abuse. Basic aspects of multiple linear regression analysis.

(b) Laboratory guidelines Awareness about material safety data sheet (MSDS), storage, transportation, usages; handling of special chemicals / reagents, such as perchloric acids, formaldehyde, mercury, corrosives, flammables, toxins / poisons, peroxides, labeling of chemicals, Chemical waste. Safety equipments, such as ventilation, fume-hood, fire extinguishers, eye washes, safety showers, first aid kit. Emergency response in case of fire, injury, spills, incident reports, evacuation.

PAPER II: ORGANIC CHEMISTRY

Time : 3 Hours

Max. Marks : 40

60 Hours (2 Hours/ week)

Unit-I 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. Bathchromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones. Infrared (IR) absorption spectroscopy, molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurements of IR spectrum, fingerprint region, characteristic absorption of various functional groups and interpretation of IR spectra of simple organic compounds.

Unit-II

(a) Alcohols

Classification and nomenclature.-Monohydric alcohols-nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols-nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol- pinacolone rearrangement.

Trihydric alcohols-nomenclature and methods of formation, chemical reactions of glycerol.

(b) Phenols:

Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols- electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis; Hauben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Unit-III

(a) Ethers and Epoxides

Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions-cleavage and autoxidation, Ziesels method.

Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.

(b) Aldehydes and Ketones

Nomenclature and structure of carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1, 3-dithianes, synthesis of ketones from nitriles and from carboxylic acid. Physical properties. Mechanism of nucleophilic addition to carbonyl group with particular emphasis on benzoin, Aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Use of acetate as protecting group. oxidation of aldehydes, Baeyer-villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, LiAlH_4 and NaBH_4 reductions, Halogenation of enolizable ketones. An introduction to α , β unsaturated aldehydes and ketones.

Unit- IV

(a) Carboxylic Acid :

Nomenclature, structure and bonding, physical properties, acidity Carboxylic acids, effect of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation Methods of formation and chemical reactions of halo acids, hydroxy acids: malic, tartaric and citric acids. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids : Methods of formation and effect of heat and dehydrating agents.

(b) Carboxylic Acid derivatives

Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Preparation of carboxylic acid derivatives, chemical reactions. Mechanisms of esterification and Hydrolysis,(acidic and basic).

Unit-V Organic Compounds of Nitrogen

Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Halonitroarenes : Reactivity; Structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity, of amines. Amine salts as phase-transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reaction of amines, electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid. Synthesis, transformation of aryl diazonium salts, azo coupling.

PAPER-III: PHYSICAL CHEMISTRY

Time: 3 Hours

Max. Marks : 40

60 Hours (2 Hours/ week) Unit-I

Thermodynamics-I : Definition of thermodynamics terms : system, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics: statement, definition and internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law-joule-Thomson coefficient and inversion temperature. Calculation of w , q , dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry: Standard state, standard enthalpy of formation-Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy, Kirchhoffs equation.

Unit-II

Photochemistry

Interaction of radiation with matter, difference between thermal and photochemical processes, laws of photochemistry: Grothus- Drapper law, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, inter system crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples)

Unit-III

(a) Chemical Equilibrium :

Equilibrium constant and free energy. Thermodynamic derivation of law of mass action, Le Chatelier's principle. Reaction isotherm and reaction isochore-Clapeyron equation and Clausius- Clapeyron equation, applications.

(b) Phase Equilibrium:

Statement and meaning of the terms-phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system-water, CO₂ and S systems. Phase equilibria of two component system-solid-liquid equilibria .simple eutectic-Bi-Cd, Pb-Ag systems, desilverisation of lead. Solid solutions-compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H₂O), (FeCl₃-H₂O) and (CuSO₄-H₂O) system. Freezing mixtures, acetone-dry ice. Liquid-liquid mixtures-Ideal liquid mixtures, Raoult's and Henry's law. Non- ideal system-azeotropes-HCl-H₂O and ethanol-water systems.

Partially miscible liquids-Phenol-water, trimethylamine, nicotine-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature Immiscible liquids, steam distillation. Nernst distribution law-thermodynamic derivation, applications.

Unit - IV

Electrochemistry-I

Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number- Definition and determination by Hittorf method and moving boundary method. Applications of conductivity measurements : Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Unit-V

Electrochemistry-II

Types of reversible electrodes-gas-metal ion, metal-insoluble salt anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell

E.M.F. and single electrode potential, standard hydrogen electrode reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance.

Electrolytic and Galvanic cells-reversible and irreversible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic quantities of cell reactions (ΔG , ΔH and K) polarization, over potential and hydrogen over voltage. Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations. Definition of pH and pK_a determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods. Buffers-mechanism of buffer action, Henderson-Hassel equation. Hydrolysis of salts. Corrosion-Types, theories and methods of combating it.

PRACTICALS INORGANIC CHEMISTRY

1. Calibration & Preparation of solutions

Calibration of fractional weights, pipettes and burettes. Preparation of standard solutions. Dilution 0.1 M to 0.001 M solutions. '

2. Analysis

For examination, alternatively, one exercise either from (I) or (II) be given

(I) Volumetric Analysis

- (i) Determination of acetic acid in commercial vinegar using NaOH.
- (ii) Determination of alkali content-antacid tablet using HCl.
- (iii) Estimation of calcium content in chalk as calcium oxalate by permanganometry.
- (iv) Estimation, of hardness of water by EDTA. (v) Estimation of ferrous and ferric by dichromate method, (vi) Estimation of copper using thiosulphate.

(II) Gravimetric Analysis

- (i) Analysis of Cu as CuSCN.
- (ii) Analysis of Ba as BaSO₄

ORGANIC CHEMISTRY

1. Chromatography: Determination of R_f values and identification of organic compounds.

- (i) Preparation and separation of 2, 4-dinitrophenylhydrozone of acetone, 2-butanone, hexan-2- and 3-one using toluene and light petroleum (40 :60). (Thin layer chromatography)
- (ii) Separation of a mixture of dyes using cyclohexane and ethyl acetate(8.5 : 1.5). (Thin layer chromatography)
- (iii) Separation of a mixture of phenylalanine and glycine. Alanine and aspartic acid. Leucine and glutamic acid. Spray reagent-ninhydrin. (Paper chromatography : Ascending and Circular),
- (iv) Separation of a mixture of D, L-alanine, glycine and L-Leucine using n-butanol: acetic acid : water (4:1:5), spray reagent-ninhydrin. (Paper chromatography : Ascending and Circular).
- (v) Separation of monosachharides-a mixture of D-galactose and D-fructose using n-butanol: acetone: water (4:5:1) spray reagent-aniline hydrogen phthalate. (Paper chromatography: Ascending and Circular).

2. Qualitative Analysis:

Analysis of given organic mixture containing two solid components Using water ,NaHCO₃ or NaOH for separation and preparation of suitable derivatives.

PHYSICAL CHEMISTRY

- 1 - Determination of the transition temperature of the given substance by thermometric/dialometric method (e.g. MnCl₂.2H₂O/SrBr₂.2H₂O.)
2. To study the effect of a solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquids (e.g. phenol- water system) and to determine the concentration of that solute in the given phenol water system.
3. To construct the phase diagram of two component (e.g. diphenylamine- benzophenone) system by cooling curve method.
4. To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
- 5.. To determine the enthalpy of neutralisation of weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.
6. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

Note : Similar exercise may be set in question paper as per availability

PRACTICAL-SCHEME OF EXAMINATION PRACTICAL

Max. Marks: 50

Time: 5 hours

Min. Marks:- 18

INORGANIC CHEMISTRY

- | | |
|--|----------|
| 1. Calibration and preparation of solution – | 5 Marks |
| 2. Analysis: One Exercise from 2(i) or 2(ii) | 10 Marks |

ORGANIC CHEMISTRY

- | | |
|--------------------------------|----------|
| 1-Chromatography: One Exercise | 5 Marks |
| 2-One Organic mixture | 10 Marks |

PHYSICAL CHEMISTRY

Any One experiment 10 marks

VIVA

5 Marks

RECORD

5 Marks

B.Sc. Part- II

MATHEMATICS

Scheme of Examination:

Max Marks: 200

Scheme

Four papers

Max. Marks: 200

Sessional Term-End

Paper I Theory	3 Hours Duration	13	53 Marks
Paper II Theory	3 Hours Duration	14	53 Marks
Paper III Theory	3 Hours Duration	14	53 Marks

Paper I Higher Calculus

UNIT-I

Limit ϵ - δ definition of the limit of a function, Limit of functions of one and two variables, Continuity, classification of discontinuities, Sequential continuity, Properties of continuous functions, Uniform continuity, Continuity of functions of two variables.

UNIT - II

Differentiability, Chain rule of differentiability, Differentiability of functions of two variables, Darboux's intermediate value theorem for derivatives, Mean Value Theorems, Taylor's theorem with various forms of remainders, Taylor's theorem for functions of two variables.

UNIT - III

Riemann integral, Partition, Lower and Upper integrals, monotonic functions, fundamental theorem of Integral Calculus, Mean value theorems of Integral Calculus.

UNIT - IV

Real sequence, definition, Theorems on limits of sequences, Bounded and monotonic sequences, Cauchy's convergence criterion, Comparison tests, Ratio tests, Raabe's, logarithmic, De Morgan tests, Alternating series, Leibnit's theorem,

UNIT - V

Uniform convergence of series of functions, Weierstrass M-test, Abel's and Dirichle'ts test for uniform convergence. **Improper integrals** and their convergence.

Books Recommended:

1. Real Analysis: Shanti Narayan
2. Real Analysis: G. N. Purohit
3. Real Analysis: Bhargava & Goyal

4. Advanced Calculus : Gokhroo et. al. (English / Hindi Ed.)
5. Theory of Convergence: Gokhroo et. al. (English / Hindi Edn.) Navkar Prakashan, AJMER

PAPER – II: DIFFERENTIAL EQUATIONS

Unit-I

Degree and order of a differential equations, Equations of first order and first degree, Equations in which the variables are separable, Homogeneous equations, Linear equations and equations reducible to the linear form, Exact differential equations, Integrating Factors, First order and higher degree equations solvable for x , y , p ,

Unit-II

Linear differential equations with constant coefficients, Homogeneous Linear ordinary differential equations, Ordinary simultaneous differential equations, Total differential equations.

Unit-III

Linear differential equations of Second order, Transformation of the equation by changing dependent variable/the independent variable. Methods of variation of parameters,

Series solution of differential equations, Power series method, Bessel, Legendre equation and their properties and recurrence relations,

Unit-IV

Partial differential equations of the first order, Lagrange's solution, Charpit's general method of solution,

Unit- V

Partial Differential equations of second order and higher orders, Classification of linear Partial differential equations of second order, Homogeneous and non homogeneous equations with constant coefficients, Partial differential equations reducible to equations with constant coefficients,

Books Recommended:

1. Differential Equations : Ray and Chaturvedi
2. Differential Equations : Sharma and Gupta
3. Differential Equations : Bansal and others
4. Ordinary Differential Equations : Gokhroo et. al. (English / Hindi Ed.)
5. Partial Differential Equations : Gokhroo et. al. (English / Hindi Ed.) Navkar Publication Ajmer
6. Ordinary Differential Equations and Partial Differential Equations Engineering Mathematic H.K. Das s. Chand Publication New Delhi

PAPER – III MECHANICS

Unit-I: Analytical conditions of equilibrium of coplanar forces, friction.

Unit-II: Simple problems on Virtual Work, Catenary, Forces in three dimensions,

Unit-III; Velocities and accelerations along radial and transverse directions, and along tangential and normal directions, Simple Harmonic Motion, Rectilinear motion under variable laws.

Unit-IV; Hook's law, related problems on horizontal and vertical elastic strings. Constrained motion, Circular and Cycloidal motion,

Unit-V: Central forces, Central orbits, p - r equation, ApSES, Time in an orbit, Kepler's laws of planetary motion.

Books Recommended:

- | | | |
|---------------------------------|---|------------------------------------|
| 1. Statics | : | R. S. Verma |
| 2. Statics (English/Hindi Ed.) | : | Gokhroo et. al. |
| 3. Statics | : | S. M. Mathur |
| 4. Text book of Dynamics | : | M. Ray |
| 5. Dynamics | : | Gupta and Juneja |
| 6. Dynamics (English/Hindi Ed.) | : | Gokhroo et. al., Navkar Prakashan, |

Zoology B.Sc Part-II**Four papers****Max. Marks: 200****Sessional****Term-End**

Paper I Theory	3 Hours Duration	10	40 Marks
Paper II Theory	3 Hours Duration	10	40 Marks
Paper III Theory	3 Hours Duration	10	40 Marks
Paper IV Practical	5 Hrs. Duration	nil	50 Marks

It is compulsory to pass in internal and external theory papers and practical paper separately by securing 36% marks each.

The term end examination papers will be divided into 3 sections:

Section- A (1x10=10) consists of 10 questions. Each question carries one mark. Attempt all questions.

Section- B (5 x 4 =20) consists of five questions with internal choice in each unit. Attempt all questions.

Each question carries 4 marks. Word limit (300 -500 words)

Section- C (2 x 5 = 10) consists of 5 questions one from each unit. Students are required to attempt any 2 questions. Each question carries 5 marks. (Word limit 500 words & more)

There will be no internal marks in Practical. The paper will be of as per the maximum marks allotted in the syllabus.

PAPER-I CHORDATA AND EVOLUTION**UNIT-I**

Chordate classification: Protochordates, Hemichordata and cyclostomes. Habit, Habitat, External features and anatomy of Herdmania (Excluding development) Ascidian larva and retrogressive metamorphosis, Affinities of Urochordata and cephalochordate. Habit, habitat and External features of Petromyzon and Myxine. Ammocoete larva and affinities.

UNIT-II

Classification of vertebrates(excluding extinct form) upto orders(Subclass in case of mammals). Poisonous and nonpoisonous snakes and biting mechanism. Basic plan of skull, skull types in reptiles, jaw suspension, axial and appendicular skeleton Comparison of the following organ systems of vertebrates with special reference to evolutionary aspects Scoliodon, Rana, Uromastix(or any lizard), Columba, Oryctolagus (or any mammals). Integument including structure and development of placoid scales, feathers, hair, nails and claws. Alimentary canal

Unit-III: Heart and evolution of aortic arches. 2. Respiratory system 3. Urinogenital system

UNIT-IV

Evolutionary thought: Lamarckism, Drawinism, origin of life, evidences of organic evolution, genetic basis of evolution, Hardy -WeinBerg's law, natural selection, isolating mechanism, speciation, variation, adaptation with special reference to flight adaptation, aquatic adaptation and desert adaptations

UNIT-V

Geological time scale, fossils, dating of fossils and imperfection of the geological records. Principle zoogeographical regions of the earth and their mammalian fauna, Extinct forms: Archaeopteryx, Dinosaurs, evolution of horse.

PAPER-II: MAMMALIAN PHYSIOLOGY AND IMMUNOLOGY

UNIT-I

Physiology of Digestion- nature of food stuffs and various types of digestive enzymes(Carbohydases, proteinases, lipases) and their digestive action on corresponding food stuffs in the alimentary canal of mammals. Hormonal control of digestive functions. Mechanism of absorption of various products of digestion. elementary idea of common disorders related to digestive systems.

Excretory physiology- Structure of kidney, kind of nitrogenous excretory products. Role of liver in the formation of these products. Relation between nature of excretory products and habitat (fresh water, marine and terrestrial) functional architecture of mammalian kidney tubule and formation of urine. elementary idea of common disorders related to excretory systems.

UNIT-II

Circulatory physiology- Blood groups, Rh factors, blood clotting, heart beat, cardiac cycle, blood pressure, body temperature regulation, elementary ideas of cardiovascular disorders, hypertension, angina pectoris, myocardial infraction, pericarditis.

Respiratory physiology- Mechanism of breathing, exchange of gases, transportation of oxygen and carbon dioxide in blood, regulation of breathing, elementary idea about asthma and emphysema.

UNIT-III

Muscle Physiology- Functional architecture of skeletal muscle, mechanism of contraction and relaxation of muscle fibers. elementary idea of common disorders related to muscles.

Sensory physiology- Physiology of vision, hearing, pain and touch. Origin and Functional architecture of a neuron. propagation of nerve impulse, synaptic transmission, central control of reflex action, reflex arc. Elementary idea of common sensory and nervous disorders

UNIT-IV

Immunology- History, definition, types of immunity (innate, acquired direct and indirect, humoral and cell mediated) Antigen, Antigenicity of molecules, Antibody definition, types(IgG, IgA, IgM, IgD,IgE), Properties of each class and their function, production of monoclonal antibody and their applications.

UNIT-V

Cells of immunity, macrophage lymphocytes, B and T type, T helper cells, T Killer cells, Suppressor T cells, Plasma cell and memory cell their functions only. Antigen- antibody reactions, major histocompatibility complex, precipitation reaction, agglutination reaction, neutralizing reaction, complement and lytic reaction.autoimmune disease, AIDS

PAPER-III: DEVELOPMENTAL BIOLOGY

UNIT-I

Historical perspective, aims and scope of developmental biology, definition and phases of development, theories of development, epigenesis and preformation, mosaic, regulative, gradient, spemanns, theory of organizers, gametogenesis, origin of PGC, spermatogenesis, morphology of

mature sperm, types of sperms, oogenesis, general feature of mature ovum, polarity of egg, symmetry of egg, types of egg.

UNIT-II

Reproductive cycles(estrous and menstrual cycles).Events of fertilization, Mechanism of sperm transfer, polyspermy preventing mechanism. Errors in fertilization and significance of fertilization, Parthenogenesis, evolution of viviparity.

UNIT-III

Cleavage-Definition, types, pattern and planes of cleavage, morulation, blastulation, types of blastula, gastrulation, types of gastrulation mechanisms. Fate maps (with suitable examples),Morphogenetic cell movement and their significance in gastrulation. Embryonic induction, organizers, competence

UNIT-IV

Differentiation and organogenesis- Differentiation, growth and organogenesis, regeneration, developmental defects (teratology), Senescence and ageing. Brief idea of animal tissue culture, In vitro fertilization, stem cells and culture media

UNIT-V

1. Embryonic adaptations exemplified by
 - (a) Extra embryonic membranes in chick and salient features of development of chick development upto 72hrs.
 - (b) Placentation in mammals: definition, types, classification on the basis of morphology and histology, functions of placenta.
2. Amphibian Metamorphosis including endocrine regulation.

PRCATICALS

(1) Study of Chordates: Balanoglossus, Herdmania, Ciona, Botrylus, Salpa, Doliolum, Pyrosoma, Amphioxus, Ammocoete larva, Petromyzon, Myxine, Zygaena, Torpedo, Chamaera, Acipenser, Amia, lepidosteus, Labeo, Clarias, Anguilla, Hippocampus, Exocoetus, Echineis, Pleuronectes, Protopterus, Ichthyophis, , Proteus, Ambystoma, larva (Axolotl), Siren, Alytes, Hyla, Testudo, Chelone, Tortoise., Sphenodon, Hemidactylus, Phrynosoma, Draco, Chameleon, Eryx, Hydrophis, Naja, Viper, Bungarus, Crocodilus, Alligator, Archaeopteryx,(Model), Pavo cristatus, Ornithorhynchus, Macropus, , Bat, Loris, Scaly ant eater (Model)

(2) Permanent Slides: Mammalian histology, V.S. of Skin, T.S. of Spinal cord, T.S. of Pituitary gland, T.S. of Testis,,

T.S. of Ovary, T.S. of Placenta, Bone, Lung, Pancreas, Kidney, Liver, Blood cell types, Oral hood, Velum, pharyngeal wall, T.S. of Amphioxus through various regions. T.S. of Balanoglossus, Whole mount of Amphioxus, Tadpole larva of Ascidia.

(3) Dissection/demonstration(Models, charts, computer simulation: carp or any other commercial fish/Scoliodon/Labeo- External features, Placoid scale, general anatomy, afferent and efferent branchial vessels, Cranial nerves, Internal ear, digestive system, Eye ball and its muscles, Urinogenital system.

(4) Permanent mounting, Spicules and pharyngeal wall of Herdmania, Ampulla of lorenzini,placoid scale, Striped muscle fiber, Blood film

(5) Osteology: Comparative study of articulated and disarticulated bones of Frog, Varanus, Fowl and Rabbit.

(6) Study of Development of Chick : With the help of W. M. slides through various regions of 18- 72 hrs embryo. Live material 18 hrs, 24 hrs, 36hrs, 48 hrs, 72 hrs. Histological study of development of frog / toad, through preserved material (whole embryo or sections) eggs, early

cleavage, blastula, gastrula, neurula, tail bud, external gill, mature tadpole larva. Study of metamorphosis (Frog/ toad) through preserved material and chart /model. Drosophila / Limnea as embryological material. Study of spermatogenesis and oogenesis through slides/ models/ chart in frog. Study of fertilization through slides/ models/ charts.

(7) **Experiments in physiology:** Estimation of Haematocrit value in a blood sample, Total Haemoglobin, RBC and WBC counting, Demonstration of enzyme activity, ESR value, Blood coagulation time experiment, Blood urea estimation, Estimation of blood glucose level, study of reflex action.

(8) Exercise in evolution-serial homology in appendages of Prawn, Analogy and homology(wings of birds and insects, forelimb of bat and rabbit.

(Note-Use of animals for dissection is subject to the condition that these are not banned under the wildlife Protection Act).

DISTRIBUTION OF MARKS

S.No	Permanent exercise	Regular	Ex- student
1	Dissection/ demonstration	6	8
2	Preparation	5	7
3	Developmental Biology/ Exercise in evolution	5	5
	Physiology	6	8
5	Spot(8)	12	12
6	Record	8	Nil
7	Viva-voce	8	10
	Grand Total	50	50

Suggested reading material

1. Medical Physiology by Ganong
2. Human physiology by C.C.Chaterjee
3. Animal physiology and Immunology by K.C.Soni
4. Immunology by Janis Kubby
5. Immunology by T. Kanan
6. Human Anatomy and physiology by Tortora
7. Embryology by P.S. Verma
8. Modern developmental Biology By K.C.Soni
9. Developmental Biology by Scot. F. Golbert
10. Text book of vertebrate by R.L.Kotpal
11. Chordata by S.K.Sharma
12. Text book of vertebrate by H.C. Nigam.

Botany B.Sc Part-II

Paper- I

TAXONOMY AND EMBRYOLOGY OF ANGIOSPERMS

Unit-I

Herbarium technique. Important Herbaria and Botanical gardens of India. Principles of classification. Basic evolutionary tendencies in flowering plants. Nomenclature of Angiosperms. System of classification of Bentham and Hooker's & Hutchinson's. Flora and Icons, Flora of Rajasthan.

Unit-II

Range of vegetative and floral characteristics and economic importance of Ranunculaceae, Capparidaceae, Papilionaceae (Fabaceae, Caesalpinaceae, Mimosaceae, Cucurbitaceae, Apiaceae (Umbelliferae) and Asteraceae (Compositae).

Unit- III

Range of vegetative and floral characteristics and economic importance of Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae (Labiatae), Euphorbiaceae, Liliaceae and Poaceae (Gramineae).

Unit-IV

Structure of stamen and pistil. Pollen Pistil Interaction & Self Incompatibility Microsporogenesis- Structure and germination of pollen-grains. Megasporogenesis, types of ovules. Development and types of embryo-sacs (mono, bi and tetrasporic embryo sacs), Fertilization.

Unit-V

Endosperm- Structure, types and development. Types of endosperm haustoria, nature of endosperm. Types of embryogeny. Seed structure and types. Apomixis, polyembryony and parthenogenesis. Experimental embryology- culture of anther and embryo.

Paper-II

ANATOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Unit-I

Meristems and various theories related to organization of apical meristems (root and stem). Simple and complex permanent tissues and their functions, secretory tissues, tissue systems.

Unit-II

Primary internal structure of root, stem and leaves. Structure of leaf epidermis, trichomes and stomata, origin of lateral roots. Primary anomalous structure (Monocot & Dicot Root & Stem), Periderm and abscission of leaves.

Unit – III

Normal Secondary growth in dicot root and stem. Periderm Heart wood sap wood, tylosis annual ring & secondary anomalous growth in roots and stems.

Unit-IV

Origin, cultivation and improvement of Wheat, Rice, Maize, Potato and Sugarcane, Study of economic botany of following group of plants.-

Fibre yielding- Cotton, Jute

Oil yielding- Groundnut, Mustard, Sunflower and Coconut.

Timber yielding- *Tectona*, *Dalbergia*, *Tecomella*.

Unit-V

General account and economic importance of following group of plants-

Medicinal plants with special reference to- *Cinchona*, *Rauwolfia*, *Papaver*, *Withania* and *Aloe*.

Spices and condiments with special reference to- Red pepper, Clove, Coriander, Zinger, Heeng, Turmeric.

Beverages- Tea, Coffee.

General account of Rubber plants.

Ethnobotany: Definition methods of study and importance.

Paper-III

CYTOGENETICS, PLANT BREEDING, EVOLUTION AND BIOSTATISTICS

Unit-I

Concept of cell and cell theory. Structure, composition and function of cell wall and cell membrane.

Types, structure and functions of cell organelles. Cell divisions.

Unit-II

Mendel's laws of inheritance. Monohybrid and dihybrid ratio. Incomplete dominance, lethal gene. Gene interaction- epistasis. Complementary supplementary Duplicate Physical and chemical structure of chromosome, types of chromosomes lampbrush and supernumerary. Chromosomal mutations.

Unit – III

Structure and functions of nucleic acids. Types of RNA and DNA. Replication of DNA. Evidences of DNA as genetic material. Synaptonemal complex, crossing over, chiasma, linkage and mapping of genes.

Unit-IV

Principles of Plant breeding. Methods of breeding; Introduction and acclimatisation, selection (mass, pureline and clonal), hybridization, pedigree analysis, hybrid vigour, use of mutation and polyploidy in breeding.

Unit-V

Lamarckism and neo-Lamarckism. Darwinism and neo-Darwinism. De Vries concept, origin of species, Elementary study of biostatistics mean, mode, median, standard error, chi-square test, standard deviation.

PRACTICALS

Note: The practical exercises have been divided into following two groups.

Group-I: Taxonomy, Embryology and Economic Botany.

Group-II: Anatomy and Cytogenetics etc.

Group-I : Taxonomy

1. Ranunculaceae: *Ranunculus*, *Delphinium*
2. Capparidaceae : *Cleome*, *Capparis*.
3. Leguminosae: *Albizia*, *Cassia*, *Clitoria*
4. Cucurbitaceae: *Citrullus*, *Cucumis*
5. Apiaceae: *Coriandrum*, *Foeniculum*
6. Asteraceae: *Helianthus*, *Tagetes*
7. Apocynaceae: *Catharanthus*, *Nerium*
8. Aselepiadaceae: *Calotropis*, *Laptadenia*
9. Solanaceae: *Datura*, *Solanum*
10. Lamiaceae: *Ocimum*, *Salvia*
11. Euphorbiaceae: *Ricinus*, *Euphorbia*
12. Liliaceae: *Asphodelus*, *Aloe*
13. Poaceae: *Triticum*

(Locally available plants be substituted, if necessary)

Embryology : Slides/Specimens.

Placentation : Axile, free central, parietal, marginal and basal.

Ovules : Anatropous, and Orthotropous

Ovary : Different types.

T.S. anther, L.S. mature seed, pollinium whole mount.

Inflorescence : Cyathium, Hypanthodium, Capitulum, Verticillaster and Umbel.

Economic Botany:

Drugs : *Cinchona*, *Rauwolfia*, *Papaver*, *Withania*, *Aloe*.

Fibres: Cotton, Sunnhemp.

Oil Seeds: Groundnut, Mustard, Sunflower.

Timber: Heartwood, sap-wood, annual rings.

Spices & condiments: Red pepper, Clove, Coriandrum, Zinger, Turmeric and Heeng .

Beverages: Tea, Coffee.

GROUP II: ANATOMY AND CYTOGENETICS ETC.

Anatomy: Stem: *Borehaavia*, *Achyranthes*, *Bignonia*, *Bougainvillea*, *Laptadenia*, *Nyctanthes*, *Salvadora*, *Casuarina*. *Dracaena*.

Root : Hygroscopic roots of Orchids, Assimilatory roots of *Tinospora*, Prop roots of *Ficus*.

Leaf : *Nerium*, *Ficus*, *Maize*, epidermal studies. Types of stomata.

Cytology : Smear preparation of root tips, floral buds of onion for different stages of cell division.
 Plant breeding: Monohybrid and dihybrid crosses. Emasculation.

Suggested Books:

1. Taxonomy of Angiosperms and Embryology - Gena, Verma and Chaudhary, Alka Publ. Ajmer.
2. Anatomy of Angiosperms and Economic Botany-Gena, Verma and Chaudhary, Alka Publ., Ajmer.
3. Cytology, Genetics, Plant Breeding, Evolution and Biostatics- Gena, Verma and Chaudhary, Alka Publications, Ajmer.
4. A text book of Botany - Singh, Pandey and Jain, Rastogi Publications, Meerut.
5. Cytology, Genetics, Biotechnology and Biostatistics -P.K.Gupta, Rastogi Publications, Meerut.
6. Practical Botany - Bendre and Kumar, Rastogi Publication, Meerut.
7. Practical Botany- Trivedi, Sharma, Sharma and Dhankhad, RBD Publications, Jaipur.

Marking Scheme

	Regular Student
1. Material for anatomical study with	06
(i) double stained T.S. preparation	
(ii) Labelled cellular sector diagram	
(iii) identification with characters	
(iv) special anatomical characters	
2. Description in semi technical language of given flower with:	06
(i) diagrams (ii) description (iii) identification and systematic position with characters (iv) Floral Formula & Floral diagram	
3. Economic Botany (Two specimen)	04
4. Embryology	04
5. Smear preparation: two stages of cell division	06
6. Emasculation technique	02
7. Exercise on breeding/ Genetics	02
8. Spots 5 (one each from Anatomy, Taxonomy, Economic Botany, Embryology, Cytology)	10
9.Viva-Voce	06
10. Practical record	04
Total	50

B.Sc Part-III

S.No.	Name of the No. of Papers	Papers	Duration on Hours	Marks Internal		Maximum Marks Term End exams	
				Max.	Min	Max	Min
Subjects/papers for B.Sc							
1	Physics	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18
2	Chemistry	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18
3	Mathematics	Paper-I	3	13	6	53	19
		Paper-II	3	14	6	53	19
		Paper-III	3	14	6	53	19
4	Zoology	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18
5	Botany	Paper-I	3	10	4	40	14
		Paper-II	3	10	4	40	14
		Paper-III	3	10	4	40	14
		Practical	5	Nil	-	50	18

Physics

PAPER -1

Quantum Mechanics, Atomic and Molecular Physics

Duration : 3 hrs.

Max Marks: 40

Unit I

Origin of Quantum theory : Failure of classical Physics to explain the phenomenon such as black body spectrum. Planck's radiation law. photoelectric effect and Einstein explanation. Compton effect, "de-Broglie" hypothesis, evidence for diffraction and interference of particles. Uncertainty principle and its consequences: diffraction at a single slit, particle in a box and its applications (i) Non existence of electron in nucleus, (ii) Ground state energy of H-atom (iii) Ground state energy of harmonic oscillator. Energy-time uncertainty.

Unit II

Schrodinger equation- Time dependent and time independent form. Physical significance of the wave function & its interpretation. Probability current density, Operators in quantum mechanics, linear and Hermitian operators. Expectation values of dynamical variables, the position, momentum, energy, fundamental postulates of quantum mechanics, eigen function and eigen value, degeneracy. orthogonality of eigen functions' commutation relations. Ehrenfest theorem, concept of group and phase velocities, wave packet.

Unit III

Simple Solutions of Schrodinger equation : Time independent Schrodinger equation and stationary state solution. Boundary and continuity conditions on the wave function, particle in one dimensional box. eigen function and eigen values . discrete energy levels, extension of results for three dimensional case and degeneracy of levels. Potential step and rectangular potential barrier. Calculation of reflection

and transmission coefficient. Qualitative discussion of the application to alpha decay (tunnel effect), square well potential problem, calculation of transmission coefficient.

Unit IV

Bound State Problems : Particle in one dimensional infinite potential well and finite depth potential well energy value and eigen functions, simple harmonic oscillator (one dimensional) eigen function energy values zero point energy. Schrodinger equation for a spherically symmetric potential. Separation of variables. Orbital angular momentum and its quantisation spherical harmonics, energy levels of H-atom. shape of $n=1$, $n=2$ wave functions, comparison with Bohr model and Correspondence principle,

Unit V

Atomic and Molecular Physics : Frank-Hertz experiment spectra of hydrogen, spectral terms, fine structure, screening constant for alkali spectra for s, p, d, f states, selection rules. Discrete set of electronic energies of molecules, quantisation of vibrational and rotational energies, determination of internuclear distance pure rotational and rotation vibration spectra, transition rules for pure vibration and electronic vibration spectra. Raman effect.

Text and Reference Books:

1. H. S. Mani and G.K.Mehta. Introduction to modern Physics. (Affl. East West Press 1989)
2. A. Baiser. Prospective of modern Physics
3. H.E. White. Introduction to Atomic Physics.
4. Barrow. Introduction to Molecular Physics.
5. D.P. Khandelwal. Optics and Atomic Physics (Himalaya Pub. House Mumbai 1988)

Paper-II

Nuclear and Solid State Physics

Duration: 3 hrs.

Max.Marks:40

Unit I

Rutherford theory of alpha particle scattering, properties of nucleus quadrupole moment and nuclear ellipticity. Quadrupole moment and nuclear spin. parity and orbital angular momentum. Nuclear potential and properties of nuclear forces. Semi-empirical mass formula.

Unit II

Theory of nuclear fission and liquid drop model, Barrier penetration theory of spontaneous fission. Nuclear fission as a source of energy, chain reaction and condition of controlled chain reaction, the principle of nuclear reactor, uses of atomic energy.

Unit III

Nuclear fusion. energy production in stars by p.p and carbon cycle. Interaction of charge particles and neutron with matter and regions of multiplicative operation, working of nuclear detectors G.M. counter, proportional counter, scintillation counter cloud and spark chamber, Linear accelerator. cyclotron, synchrocyclotron. Betatron. Electron synchrotron.

Unit IV

Space lattice and crystal structure, Bravais lattice. Miller Indices, spacing of planes in crystal lattice. unit cell, wigner-seitz cell Atomic packing. common crystal structures. Laue's theory of X-ray diffraction. Bragg's law. laue pattern., Concept of phonon, classical view of lattice specific heat of solid, the Einstein model, Debye model, thermal conductivity.

Unit V

Band Structure : Formation of bands .periodic potential of a solid, Bloch theorem. Kroing Penny model, Drude-Lorentz theory of electrical conductivity, Boltzmann transport equation Sommerfeld theory of electrical conductivity thermal conductivity & Widemann Frenz law, Hall Effect.

Text and Reference Books:

1. H. S. Mam and G.K.Mchta. Introduction to modern Physics. (Afll East West Press 1989)
- 2 A. Beiscr. Prospective of modern Physics
3. C Kittel. Introduction to Solid State Physics.
4. J.S.Blackmore, Solid State Physics(Cambridge Univ. Press)
5. H.A.Enge, Introduction to Nuclear Physics.

Paper-III

Electronics and Solid State Devices

Duration: 3 hrs.

Max.Marks: 40

Unit I

Network some definitions loop, nodel equations Driving point and transfer impedance four terminal networks parameters. Open circuit short circuit and hybrid network theorems super position, Thevenin, Norton, Reciprocity, Compensation and Maximum power transfer theorem. T and π Networks

Unit II

Intrinsic semiconductor, extrinsic semiconductor, Fermi level calculation of electron and hole concentration along with their temprature dpendance, law of mass action . Semiconductor devices, p-n junction , majority and minority carriers , diode. zener and tunnel diodes. light emitting diode, solar cell. Rectification : halfwave and full wave rectifiers, bridge rectifier ripple factor. different types of filters (shunt capacitor, inductor filter, L section and π filters), voltage stabilization, voltage multiplier circuits.

Unit III

Transistors :Notations and volt-ampere relation for bipolar junction transistor concept of load line and operating point, hybrid parameters. CB.CE.CC configuration. their characteristics curves and their equivalent circuits, Analysis of a transistor amplifier using h-parameter (A_i , A_v , Z_{in} , Z_o), fixed and emitter bias, bias stability in transistor circuit. FET, its characteristics and constants, biasing JFET and operation of JFET.

Unit IV

Small signal amplifiers : General principles of operation, classification, distortion, RC coupled amplifier, gain frequency response.

Operational Amplifiers : Differential amplifier DC level shifter input & output impedance . input offset current application unity gain buffer adder, subtractor integrator differentiator. Numbers systems, Binary arithmetic, fundamental Logic gates, Boolean theorems and circuit realization of logic functions using diodes (DL).

Unit V

Amplifiers with feed hack : Concept of feed back, Effect of negative feed back on stabilization of gain, output and input impedence, reduction of nonlinear distortion, voltage & current feed back circuits.

Oscillators Feed back requirement for oscillator, basic oscillator analysis. Colpitt and Hartley Oscillators.

Text and Reference Books

1. Stanley : Electronic devices circuits and applications.
- 2 J D. Ryder: Electronics Fundamental and applications.(PHI 1988)
3. Millman and Gabel: Microelectronics (McGraw Hill)

PHYSICS PRACTICALS

Duration: 5 hrs

Min. Pass Marks 18

Max. Marks 40

Total number of experiments to be performed by the students during the session should be 16, selecting any eight from each section.In examination two experiments are to be performed taking atleast one from each section.

Section: A

1. Determination of Planck's constant.

2. Determination of e/m using Thomson's Tube.
3. Determination of e/m using magnetron method.
4. Determination of e/m using helical method.
5. Absorption spectrum of Iodine vapour.
6. Study of spectra of Hydrogen and Deuteron (Rydberg constant and ratio of masses of electron to proton).
7. Study of Zeeman effect for determination of Lande g-factor.
8. Study of absorption of alpha and beta rays.
9. Study of statistics in radioactive measurement.
10. Hysteresis Curve of transformer core.
11. Study of L and π filter in Half wave rectifier
12. Study the characteristic of an R-C transmission line.
13. Study the characteristic of an L-C transmission line.
14. Study the characteristic of F.E.T. and determine r_p , g_m , and μ
15. Study the frequency response of LCR series/ parallel resonance circuit with and without damping.

Section - B

1. Characteristics of a transistor.
2. Characteristics of a tunnel diode.
3. Study of voltage regulation system.
4. Study of Lissajous figures using a CRO.
5. Study of VTVM.
6. Study of RC coupled amplifier.
7. Study of AF and RF oscillators.
8. Determination of a energy gap of a semiconductor.
9. Determination of dielectric constant.
10. Analysis of a given band spectrum.
11. Hall-probe method for measurement of magnetic field.
12. Study the application of an operational amplifier as inverting and non- inverting amplifier.
13. Determine the value of Stefan constant.
14. Study of voltage multiplier as a doublers, tripler and quadrupole.
15. Construct OR, AND, NOT, XOR gate from NAND gate and verify their truth table Study the recovery time of the given diodes.

PRACTICAL-SCHEME OF EXAMINATION

Max. Marks: 50

Min.Marks:18

Time 5 hours

Note: There will be two experiments of 5 hrs duration. The distribution of marks will be as follows:

Two experiments (one from each groups)

Each of 15 Marks

30 Marks

Viva

15 Marks

Record

5 Marks

Total

B.Sc. Part- III Chemistry

Scheme

Four papers

Max. Marks: 200

Ses. Term-End

Paper I Theory	3 Hours Duration	10 40 Marks
Paper II Theory	3 Hours Duration	10 40 Marks
Paper III Theory	3 Hours Duration	10 40 Marks
Paper IV Practical	5 Hrs. Duration	nil 50 Marks

It is compulsory to pass in internal and external theory papers and practical paper separately by securing 36% marks each.

The term end examination papers will be divided into 3 sections:

Section- A (1x10=10) consists of 10 questions. Each question carries one mark. Attempt all questions.

Section- B (5 x 3 =15) consists of five questions with internal choice in each unit. Attempt all questions. Each question carries 3 marks. Word limit (300 -500 words)

Section- C (3 x 5 = 15) consists of 5 questions one from each unit. Students are required to attempt any 3 questions. Each question carries 5 marks. (Word limit 500 words & more)

There will be no internal marks in Practical. The paper will be of as per the maximum marks allotted in the syllabus.

PAPER-I –INORGANIC CHEMISTRY

Unit-I

(a) Metal-ligand Bonding in Transition Metal Complexes

Limitation of valence bond theory, an elementary idea of crystal-field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal field parameters

(b) Thermodynamic and Kinetic Aspect of Metal Complexes

A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

Unit-II

(a) Magnetic Properties of Transition Metal Complexes

Types of magnetic behavior, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of χ_s and χ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d-metal complexes.

(b) Electron Spectra of Transition Metal Complexes

Types of electronic transition, selection rules of d-d transitions, spectroscopic ground state, spectrochemical series. Orgel-energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.

Unit-III

Organometallic Chemistry

Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyls and Aryls of Al, Zn, Hg and Ti a brief account of metat- ethylene complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Nuclear Chemistry

Stability of nucleous n/p ratio, Einstein mass –energy relation. Types of Radioactivity, Group displacement law, Disintegration series, Q-values, nuclear cross-section, spallation, Applications of radio activity.

Unit-IV

(a) Bioinorganic Chemistry

Essential and trace elements in biological processes, metalloporphyrins with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+} , nitrogen fixation.

(b) Silicones and Phosphazenes

Silicones and phosphazenes as examples of organic polymers, nature of bonding in triphosphazenes.

Unit-V

(a) Hard and Soft Acids and Bases (HSAB)

Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and Softness. Lux-Flood concept of acid base and its limitation. Lewis concept and its limitation Usanovich concept. A generalized acid –base concept.

(b) Non-aqueous Solvents:

Physical properties of a solvent, types of solvent and their general characteristics reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2 .

PAPER II : ORGANIC CHEMISTRY

Unit-I

Spectroscopy

Nuclear Magnetic resonance (NMR) spectroscopy. Paramagnetic resonance (^1H NMR) spectroscopy, nuclear shielding and deshielding chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2,-tribromoethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and NMR spectroscopic techniques.

Unit-II

(a) Heterocyclic Chemistry

Nomenclature , preparation and properties of compounds having one heteroatom with five and six member ring (Pyrrole, Thiophene, Furan and Pyridine)

(b) Fats, Oil and Detergents

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides. hydrogenation of unsaturated oils. saponification value, iodine value, acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates.

Unit-III

(a) Organic Synthesis Via Enolates

Acidity of α -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate:, the Claisen condensation, Keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3- dithianes. Alkylation and acylation of enamines.

(b) Amino Acids, Peptides, Proteins and Nucleic Acids

Classification, structure and stereochemistry of amino acids. Acid base behavior, electrophoresis. Preparation and reactions of α -amino acids, structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure .determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis. solid-phase peptide synthesis. Structures of peptides and proteins, level of protein structure. Proteins denaturation/renaturation.

Nucleic acids: Introduction, Constitution of nucleic acids-Ribonucleosides and ribonucleotides. The double helical structure of DNA. '

Unit IV

Carbohydrates

Classification and nomenclature. Monosaccharides. mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+)-glucose. Mechanism of mutarotation. Structure of ribose and deoxyribose.

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides e.g. starch and cellulose (without involving structure determination.)

Unit-V

(a) Synthetic Polymers

Addition of chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers.

Condensation or step growth polymerization. Polyesters, polyamides, phenol- formaldehyde resins, urea- formaldehyde resins, epoxy resins and polyurethanes.

(b) Synthetic Dyes

Color and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of Methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.

PAPER III : PHYSICAL CHEMISTRY

Unit-I

Elementary Quantum Mechanics

Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect.

De Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the **wave** function, postulates of quantum mechanics, particle in a one dimensional box. Schrödinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

Unit-II

Molecular orbital theory, basic ideas-criteria for forming. M.O from A.O, construction of M.O's by LCAO, H_2^+ ion, calculation of energy levels from 'wave functions, physical picture of bonding: and antibonding wave functions, concept of orbitals and their characteristics. Hybrid

orbitals- sp , sp^2 , sp^3 , calculation of coefficients of A.O's used in these hybrid orbitals.
Introduction to valence bond model of H_2 , comparison of M. O. and V. B. models.

Unit-III

Spectroscopy

Introduction: electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

Rotational Spectrum

Diatomic molecules, Energy levels of a rigid rotator (semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell- Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect.

Vibrational spectrum

Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of an harmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

Raman Spectrum concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

Unit – IV

Thermodynamics -II

Second law of Thermodynamics : Need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature.

Concept of entropy: Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

Third Law of Thermodynamics : Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function

(A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantages over entropy change. Variation of G with A and P, V and T.

Unit-V

Solutions, Dilute Solutions and Colligative Properties

Ideal and non-ideal solutions, method of expressing concentration of solutions, activity and activity coefficient.

Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

PRACTICALS
Min. Marks:- 18
INORGANIC CHEMISTRY

Max. Marks: 50

Time:5 hours

A. Instrumentation

(i) Colorimetry

- (a) To determine Metal- Ligand ratio of complexes by Jobs method
- (b) To determine Metal- Ligand ratio of complexes by Mole Ratio method
- (c) Determination of adulteration in Food Stuffs.
- (d) Effluent or waste water analysis.
- (e) Ground Water Analysis.

(ii) Solvent Extraction: Separation and estimation of Mg(II) and Fe(II) ions.

(iii) Exchange Method: Separation and estimation Mg(II) and Zn(II) ions.

B. Synthesis & Analysis (i)Inorganic Synthesis

- (a) Sodium trioxalato ferrate (III), $\text{Na}_3 [\text{Fe}(\text{C}_2\text{O}_4)_3]$
- (b) Ni-DMG complex, $[\text{Ni} (\text{DMG})_2]$
- (c) Copper tetrammine complex $[\text{Cu}(\text{NH}_3)_4 \text{SO}_4]$.
- (d) Cis-and trans-bisoxalato diaqua chromate (III) ion.

(ii) Analysis

Semi micro and Macro analysis , Separation and Identification of Six radicals - three acidic and three basic from a mixture with one interfering radicals and/or combinations of radicals.

ORGANIC CHEMISTRY

(i) Laboratory Techniques

- (a) Steam Distillation
- (b) Naphthalene from its suspension in water
- (c) Clove Oil form Cloves
- (d) Separation of o-and p-nitrophenols
- (e) Column Chromatography
- (f) Separation of fluorescene and methylene blue
- (g) Separation of leaf pigments form spinach leaves
- (h) Resolution of racemic mixture of (\pm) mandelic acid

(ii) Stereochemical Study of Organic Compounds via Models

- (a) R and S configuration of optical isomers.
- (b) E and Z configuration of geometrical isomers.
- (c) Conformational analysis of cyclohexanes and substituted cyclohexanes.

(iii) Determination of following parameters of oils & fats

- (a) Saponification Value
- (b) Iodine Value and /or (c)R.M. Value

(iv) Green Chemistry Synthesis – Solventless synthesis of aldol derivative or any other compound

PHYSICAL CHEMISTRY

To determine the strength of the given acid conductometrically using standard alkali solution.

To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.

To study the saponification of ethyl acetate conductometrically.

To determine the ionisation constant of a weak acid conductometrically.

To titrate potentiometrically the given ferrous ammonium sulphate solution using KMnO_4 / $\text{K}_2\text{Cr}_2\text{O}_7$ as titrant calculate the redox potential of $\text{Fe}^{++}/\text{Fe}^{+++}$ system on the hydrogen scale.

To verify law of refraction of mixtures (e.g. of glycerol and water) using Abbe's refractometer.

To determine the specific rotation of a given optically active compound.

Determination of molecular weight of a non-volatile solute by Rast method/Backmann freezing point method.

Determination of the apparent degree of dissociation of an electrolyte (e.g- Na Cl) in aqueous solution at different concentrations by ebullioscopy.

To verify Beer-Lambert law for KMnO_4 / $\text{K}_2\text{Cr}_2\text{O}_7$ and determine the concentration of the given solution of the substance.

Books Suggested (Laboratory Courses)

Vogel's Qualitative Inorganic Analysis, revised, Svehla, Orient Longman.

Vogel's Textbook of quantitative Inorganic Analysis (revised), J. Bassett, R.C. Denney, G.H. Heffery and J Mendham, ELBS.

Standard Methods of Chemical Analysis, W.W. Scott, The Technical Press.

Experimental inorganic Chemistry, W.G. Palmer, Cambridge.

Handbook of Preparative Inorganic Chemistry, Vol, I & II Brauer, Academic Press.

Inorganic Synthesis, McGraw Hill.

Experimental Organic Chemistry Vol. I&II, P.R.Singh, D.S.Gupta and

K.S. Bajpai, Tata McGraw Hill.Laboratory Manual in Organic Chemistry, R.K. Babsal, Wiley Eastern.

Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.

Experiments in General Chemistry, C.N.R; and U.C. Agarwal, East- West press.

Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw hill.

Advanced Practical Physical Chemistry, Vol. I-Physical, J.B. Yadav, Goel Publishing House.

Advanced Experimental Chemistry, Vol. I-Physical, J.N. Gurju and R. Kapoor, S Chand & Co.

Selected Experiments in Physical Chemistry, N.G. Mukherjee. J.N. Ghose & Sons.

Experiments in Physical Chemistry, J.C. Ghosh, Bharati Bhavan.

PRACTICAL -SCHEME OF EXAMINATION

Max. Marks: 50

Min. Marks:- 18 Time:5

hours

INORGANIC CHEMISTRY

1. Instrumentation: Any one exercise –8 Marks 2.Synthesis & Analysis: Any one exercise 7 Marks **ORGANIC CHEMISTRY**

Any Two exercises taking not more than one from (i) to (iv) 5+10Marks

PHYSICAL CHEMISTRY

Any One experiment 10 marks

VIVA 5 Marks

RECORD 5 Marks.

MATHEMATICS

Paper I Advanced Algebra

Unit-I

RING THEORY: Introduction to Rings, Zero divisors, Integral Domain and Fields, their examples and properties. Characteristic of a ring and integral domain. Sub rings, subfields, Prime field, Ring homomorphism, Embedding of Rings, Field of quotients of an integral domain.

UNIT-II

Ideals and their properties. Principal ideal and principal ideal ring, Prime ideal, Maximal ideal. Ideals and Quotient rings, Euclidean rings, Unique Factorization Domain, Polynomial rings, Remainder theorem, factor theorem,

UNIT-III

Linear Algebra: Vector Spaces : Definition and examples of a vector spaces, subspaces, sum and direct sum of subspaces, linear span, linear dependence, Independence and their basic properties, Basis, finite dimensional vector spaces, Existence theorem for basis, invariance of the number of elements of a basis set, Dimension, existence of complimentary subspace of a subspace of a finite dimensional vector space, dimension of sums of subspaces, quotient space and its dimension.

UNIT - IV

Linear transformations : Linear Transformations and their representation as matrices, Rank-Nullity theorem, changes of basis, Dual space, Dual Basis, Bidual space, Adjoint of a linear transformation, Annihilator of a sub space.

UNIT - V

Eigen values and Eigen vectors, similar matrices, equivalent matrices, Similarity of Linear transformations, Reduction to triangular form,

Books Recommended for Reference:

- | | | |
|--------------------|---|---------------------------------------|
| 1. I.N. Herstein | : | Topics in Algebra |
| 2. Lang, S. | : | Linear Algebra |
| 3. Hoffman & Kunz | : | Linear Algebra |
| 4. A.R. Vashistha | : | Modern Algebra |
| 5. Gokhroo et. al. | : | Ring Theory (English / Hindi Edn.) |
| 6. Gokhroo et. al. | : | Linear Algebra (English / Hindi Edn.) |

Paper - II Analysis

UNIT – I

Metric Spaces: Real Number System as a complete Ordered Field. The point set theory, Open and Closed sets, Limit point of a set, Neighborhood, Bolzano-Weierstrass theorem, Heine-Borel theorem, Compactness, connectedness, cantor's ternary set.

UNIT-II

Definition and example of a metric space, Diameter of a set, Bounded set, Open sphere, Interior point and Interior of a set, Derived and Closure of set, Closed set, Closed Sphere, Properties of Open and Closed sets, Boundary point of set, Convergent and Cauchy sequences, complete metric space, Dense subset,

UNIT-III

Limit of a function, Continuous function, theorem on necessary and sufficient conditions for continuity of a function, Uniform continuity, Contracting mapping, Banach Fixed Point theorem, Equivalent matrices,

UNIT - IV

Complex Analysis: Complex Numbers as ordered pairs, Complex plane, Geometrical representation, Connected and compact sets, Curves and region in the complex plane, Statement of Jordan curves theorem, Extended complex plane and stereographic projection, Complex valued functions limits, Convergence, continuity, Differentiability in the extended plane, Analytic functions. Cauchy-Reimann equations (Cartesian & Polar forms).

UNIT - V

Harmonic functions, Construction of an analytic function, conformal mapping, Bilinear transformation and its properties,

Books Recommended for Reference:

1. Shanti Narain : Complex Variables, S. Chand, New Delhi.
2. Gupta, KP : Complex Analysis
3. Sharma J.N. : Metric Spaces, Krishna Prakashan Mandir, Meerut.
4. Gokhroo et.al. : Metric Spaces (English / Hindi Edn.)
5. Gokhroo et.al. : Complex Analysis (English / Hindi Edn.) Navkar

Paper - III

Numerical Analysis and Optimization Techniques

UNIT - I

Difference operators and factorial notation. Relation between difference and derivatives. Difference of polynomial. Newton's formulae for forward and backward interpolation for equal intervals.

UNIT - II

Divided difference. Relation between divided differences and simple differences. Newton's general interpolation formula. Lagrange's interpolation formula. Gauss central difference formula. Stirling and Bessel interpolation formula,

UNIT - III

Numerical differentiation and integration. Trapezoidal rule, Simpson's 1/3.3/8 rules. Weddle's rule. Solution of algebraic Transcendental equations. Bisection method. Regular Falsi method. Newton-Raphson method,

UNIT - IV

Linear programming problems. Convex and concave sets, feasible and basic feasible solutions, Simplex Method for LPP Problem, Duality in Linear programming problems, Formation of dual problem,

UNIT - V

Assignment problems and Transportation Problems

Books Recommended:

1. Saxena, H. C. : Numerical Analysis
2. Goyal and Mittal : Numerical Analysis
3. Gokhroo et. al. : Numerical Analysis (Hindi / English Edn.) Navkar prakashan,
4. Bansal and Ojha : Numerical Analysis (Hindi Edition)
5. Gokhroo et. al. : Linear Programming (Hindi / English Edn.) Navkar Prakashan, Ajmer
6. Hadley G. : Linear Programming Problems

B.Sc. Zoology III Year

PAPER-I: MAMMALIAN NEUROENDOCRINOLOGY AND BEHAVIOUR

UNIT-I

Types of endocrine glands and their disorders: Pituitary, Pineal, Adrenal, Thyroid, Islets of langerhans, Testis and Ovary. Chemical Nature of Hormone, Hormone action (including role of cyclic AMP in Hormone action). Preliminary idea of neurosecretion; hypothalamic control of pituitary functions. Endocrine glands in insects. Neurotransmitters.

UNIT-II

Endocrine glands: ovary and placenta, Ovarian cycles and their neuroendocrine control.. Endocrinology of ovulation, implantation, parturition and lactation. MTP and related social issues.

UNIT-III

Endocrine glands: testis, testicular cycle and its hormonal control. Hormonal control of reproduction, using mammalian and insect examples. Reproductive disorders, birth control devices. Pheromones and their role in reproductive functions and behaviour.

UNIT-IV

Introduction and history of ethology, methods of studying behaviour, neuroanatomical, neurophysiological, neurochemical, focal and scan sampling technique. Human brain and behaviour. Biological clock/circadian rhythms. Social behaviour and social organization of Black buck and rhesus monkey. Social communication among animals, acoustic, tactile, olfactory and language of bees.

UNIT-V

Migration of fishes, pheromones and hormones and their role in behaviour, Fixed action pattern, sign stimulus, innate releasing mechanism, action specific energy, motivation, imprinting and learning, orientation, taxes and kinesis, Neurotoxin and behavior, Cryopreservation.

PAPER-II: GENETICS AND BIOTECHNOLOGY

UNIT-I

Mendelian Genetics: Mendel's laws of inheritance. Monohybrid and dihybrid cross, dominance, incomplete dominance. Current status of Mendelism. gene interactions, supplementary, complimentary, Epistasis and inhibitory and polymorphic gene.

UNIT-II

Multiple allele-ABO, Rh and MN blood groups and their inheritance, Sex determination XX-XY, XO-XY, and ZW mechanisms, sex linked inheritance (X-linked and Y linked). Colour blindness, Haemophilia,

UNIT-III

Genetic variation: variation in chromosome number (Euploidy and Aneuploidy). Types of chromosomal mutations, molecular basis of gene mutation, mutagens, crossing over and linkage. Genetic disorders in Human beings (Down's, Turner's, klinefelter's and Edward Syndromes).

UNIT-IV

Molecular genetics: Nucleic acids, structure, function and types of DNA, Structure, function and types of RNA, genetic code, Transcription. Protein synthesis, gene structure (Recon, Muton, Cistron) and regulation of gene (Lac operon: inducible and repressible system). Bacterial genetic transformation, transduction and conjugation. Lytic and lysogeny cycle. Elementary idea about wugenics. Elementary idea about genetic engineering, gene cloning and recombinant DNA technology (vectors for gene transfers, plasmids and phages). Restriction enzymes.

UNIT-V

Introduction, historical perspective, animal cell hybridoma, major areas and future prospects of biotechnology. Medicines and Biotechnology, Microbes in medicine. Antibiotics, Vaccine, Antibodies, Antigens, Environmental biotechnology: Use of microorganisms in metal and petroleum recovery, pest control, waste treatment, processing of industrial waste. Degradation of xenobiotic compounds including pesticides and surfactants. Surfactants and oil pollutants. Food and drink biotechnology, ferment food, dairy products, food preservation, microbial spoilage, alcoholic beverages. Vinegar, Monoclonal antibodies and their applications.

PAPER-III: ANIMAL ECOLOGY AND BIOSTATISTICS

UNIT-I

Introduction to ecology, definition, history, subdivisions and scope of ecology. Environmental factors-Physical factors-Soil, water, air, temperature. Biotic factors- interspecific and intraspecific relations, neutralism, mutualism, commensalisms, antibiosis, parasitism, predation, competition. Concept of limiting factors, Leibig's law of minimum, Shelfords law of tolerance, combined concept of limiting factors.

UNIT-II

Concept of niches. Population and community ecology. Measurement of population density. Factors affecting population growth, growth curves, dispersal, migration. Characteristics of community. Concept of ecosystem. Trophic levels- food chain and food web. Ecological pyramid. Energy flow in an ecosystem, biogeochemical cycles Co₂, N₂, O₂, S and P. Prospects and strategies of sustainable environment.

UNIT-III

Aquatic ecology-Physicochemical nature of fresh water habitat, lentic habitat(Lake and ponds), lotic(stream and river). Fresh water fauna and their adaptations. Characteristics of marine habitat, zonation of marine environment, marine water fauna and their adaptations, deep sea fauna and their adaptations, estuarine habitat-their fauna and adaptations.

UNIT-IV

Terrestrial and applied ecology- Characteristics of terrestrial habitat, forest ecosystem(forest types), desert ecosystem- characteristics of desert environment, desert fauna and their adaptations with special reference to Rajasthan. Pollution types of pollution(water, air, and ground, thermal, noise, industrial and chemical). Radiation, nuclear fallout and biological effects of radiation. Green house effects. fossil fuels, coal and petroleum, nuclear fuels, management of environment. Wild life conservation with special reference to Rajasthan.

UNIT-V

Introduction and understanding of concepts of descriptive and inferential statistics, frequency distribution, graphical presentation, mean, mode, median, standard deviation, standard error of mean. Productivity distribution, correlation and regression. Test of significance, Chi square and t-test. Biostatistical analysis of gene distribution in population.

PRACTICALS

I. Analysis of environment:

1. Soil pH
2. Water analysis-pH, Alkalinity, Acidity, Dissolved oxygen and CO₂
3. Salinity (Chloride)
4. Qualitative estimation of zooplanktons in a given sample of water

II-Ethology

1. Visit to zoo- Identification and general information about Zoo animals. General information about local amphibian fauna(Frog, toads), reptiles(Snakes and lizards), bird fauna(crow, kite, house sparrow, parrot, pigeon, peacock, vultures) and mammalian fauna(Kangaroo, Echidina, Hedgehog, Indian Mongoose, camel, mice, rabbit).Behavioral study of social organization of Black buck, Rhesus monkey and Honey bee.

Note- Student must produce a project report based on animal pollution, ethology, field trip, local habitat, wild life sanctuary, national parks

2. Antennal grooming in cockroach / wing cleaning in *Musca domestica*

3. Study of phototactic response of Tribolium / Housefly. Response of Paramecium to touch, Chemicals and light. Study of local habitat, collection and examination of microscopic fauna (Pond and terrestrial ecosystem)

III. Biostatistics

1. Construction of frequency tables, Histogram, polygons, pie charts.
2. Exercise on Mean, Median and Mode.
3. Test of significance:t- test and Chi square test

IV. Endocrinology

1. Demonstration of major endocrine glands in mice/rat by using Models/Charts/ Computers
2. Histological slides of major endocrine glands including gonads of mammalian and sub mammalian groups.T.S. endocrine glands.

V. Genetics

Drosophilla life cycle and idea about its culture. Identification of wild and mutant (yellow and ebony body), Vestigial wings, white eye, vestigial and ebony mutants, prepared slides of Drosophilla, Sex comb and Salivary gland chromosomes, Barr bodies of Human chromosomes. Identification of blood groups (ABO and Rh factor). Simple problems based on Monohybrid/ Dihybrid cross.Use of colour beads for exercise in genetics, genetic exercises based on widow peak, rolling of tongue, ear lobes, hypertrichosis, finger locking.

VI. Mounting/permanent preparation

Drosophila, Wild mutant, white and red eyed, male/ female. Zooplankton:daphnia, Cyclops, cypris.

VII. Spots

Preserved animals of amphibian, reptiles, birds, mammals of wildlife importance, prepared slides, any apparatus used in ecology, physiology, endocrinology, ethology, genetics, biotechnology may be put up.

(Note-Use of animals for dissection is subject to the condition that these are not banned under the wildlife Protection Act and UGC guidelines).

DISTRIBUTION OF MARKS

S. No	Exercise	Regular student	Ex- student
1	Ecology	5	6
2	Genetics	4	6
3	Biostatistics	4	6
4	Ethology	4	6
5	Permanent preparation	4	5
6	Endocrine gland	4	5
7	Project report	4	Nil
8	Spots(5)	10	10
9	Record	5	Nil
10	Viva- voce	6	6
	Grand Total	50	50

Suggested reading material

1. Endocrinology and animal behavior By V.S. Panwa
2. Endocrinology and animal behavior by S. K.Sharma
3. Animal behavior by John Alcock
4. Gene tics. By M.S. Gardner
5. Concept of genetics by Clug and cummings

6. Molecular biology of the gene by J.D. Watson
7. Genetics and biotechnology By K.C.Soni
8. Animal ecology and biostatistics By K.C.Soni
9. Animal ecology by veerbala Rastogi
10. Ecology by P.S. Verma
11. Ecology by P.D Verma +
12. Ethology by Reena Mathur

B.Sc. Part-III BOTANY

Paper- I

ECOLOGY AND PHYTOGEOGRAPHY

Unit-I

Plant Ecology: Definition, scope, branches, Ecological factor affecting the vegetation.

Ecosystem: Structure, its biotic and abiotic components, food chain and food web, ecological pyramids, energy flow, biogeochemical cycles.

Unit-II

Productivity: Primary and secondary productivity and their measurements.

Plant succession: causes. Process types: Hydrosere, Xerosere (Lithosere and Psammosere).

Community : Structure and development.

Unit- III

Pollution of air, water, Noise, their causes, consequences and control. Resources: Renewable and non-renewable, management problem of depletion of natural vegetation; endangered plants. Red data book. National parks and sanctuaries.

Unit-IV

Plant adaptations: Hydrophytes, Xerophytes and Halophytes (morphological, anatomical and physiological adaptations).

Ecology of Rajasthan desert.

Unit-V

Biodiversity Phytogeography Introduction, continuous and discontinuous distribution, Phytogeography of India, Vegetational regions of India, Plant indicators

Paper-II

PLANT PHYSIOLOGY AND BIOCHEMISTRY

Unit-I

Osmosis, plasmolysis, deplasmolysis Adsorption. Absorption of water. Ascent of sap.

Concept of water potential. Transpiration (mechanism of opening & closing of stomata) factors affecting transpiration and its importance Role of macro and micro elements.

Unit-II

Photosynthesis: Photosynthetic pigments (Chlorophylls, caratenoids and phycobilins)- structure and function. Light reactions mechanism of carbon fixation in C3 and C4 plants.

Brief description of C.A.M. plants., compensation point. Factors affecting photosynthesis.

Unit – III

Respiration: Glycolysis, Krebs cycle, electron transport system and oxidative phosphorylation, Photo-respiration factors affecting respiration. Fats: synthesis and degradation.

Unit-IV

Plant growth regulators: Auxins, gibberellins, cytokinins, ethylene and abscissic acid, their discovery, structure, physiological effects and applications. Seed dormancy, senescence, photoperiodism and vernalization.

Unit-V

Enzymes General Characteristics, classification, mode of action, inhibitors. Principles and use of following instruments, techniques: pH measurement, centrifugation, colorimetry, chromatography (PC, TLC).

Paper-III

MOLECULAR BIOLOGY & BIOTECHNOLOGY

Unit-I

Gene concept from Mendel to molecular level, Genetic code, DNA types: DNA replication and transcription in prokaryotic system. Nif gene and nitrogen fixation.

Unit-II

Plasmids, kinds and their uses as vectors, principle of genetic engineering and recombinant DNA technology. Tools of genetic engineering (PCR, gene sequencing, restriction enzymes, genomic library).

Unit – III

Interaction and expression of trans genes, Bt-toxin, Methods of gene transfer in higher plants, vector mediated gene transfer. Brief account of vectorless gene transfer (Particle gun, liposomes, chemical methods).

Unit-IV

History and scope of plant tissue culture. Basic techniques and tools of plant tissue culture. Brief amount of protoplast culture and fusion. Plant tissue culture in agriculture and forestry. Micropropagation and somatic embryogenesis.

Unit-V

Plant tissue culture in industry, secondary plant products: definition types and uses of alkaloids, factors affecting production of secondary products in cultures grown in bioreactors (fermentors).

PRACTICALS

PAPER I: ECOLOGY AND PHYTOGEOGRAPHY

1. Find out the density, frequency & abundance of herbaceous species by quadrat method.
2. To find out the minimum size of the quadrat.
3. Plant adaptive modifications. Specimens/slides.
Opuntia, Euphorbia, Capparis, Leptadenia, Hydrilla, Eichhornia and Typha.
4. Soil analysis: Field tests.
(a) Soil texture (b) Soil moisture (c) Soil pH
5. Water analysis:
(a) Hardness of water (b) Water temperature (c) Carbonate, bicarbonate & chloride tests.
6. Ecological instruments and their working.
(a) Maximum and minimum thermometer (b) Oven.

PAPER II: PLANT PHYSIOLOGY AND BIOCHEMISTRY

1. Demonstration of following colloidal systems: Suspension, Emulsoid, Brownian movement.
2. To observe streaming movement of protoplasm (*Hydrilla*).
3. Demonstration of phenomenon of plasmolysis using *Rhoeo discolor* leaves.
4. Demonstration of phenomenon of osmosis by potato osmoscope.
5. Demonstration of unequal transpiration in dorsiventral leaf using cobalt chloride paper.
6. Effect of various wavelengths of light on the process of photosynthesis.
7. Demonstration that light, CO₂ and chlorophyll are necessary for photosynthesis.
8. To demonstrate evolution of oxygen in photosynthesis.
9. Determine the value of respiratory quotient (RQ) of different respiratory substrates by

- Ganong's respiroscope.
10. Demonstration of respiratory enzymes (peroxidase, catalase, dehydrogenase) in plant tissue samples.
 11. Introduction and demonstration of the following instruments/ techniques-pH meter, centrifuge, calorimeter, paper chromatography.
 12. Phytochemical tests of the following: glucose, starch, proteins, fats, tannins, ascorbic acid and anthocyanins.

PAPER III: MOLECULAR BIOLOGY AND BIOTECHNOLOGY

1. Principle and application of the following- Laminar air flow/sterile bench, autoclave, ultrafiltration.
2. Preparation of culture media for microbial growth (Nutrient agar and P.D.A) and solutions of nutrient and growth regulators.
3. Demonstration of inoculation technique, aseptically transfer of explants and microbial transfer techniques.
4. Demonstration of resistance sensitivity using antibiotic discs.
5. Germination of pollen of *Catharanthus roseus* in 10% sucrose solution.

Suggested Books :

1. Ambasht, R.S. : A Text-book of Plant Ecology, Studies Friends and Co., Varanasi, 1975.
2. Bhatia, K.N. and Parasher, A.N. : Plant Physiology, Krishna Brothers, Jullundhur, 1975.
3. Daubenmire, R.F.: Plants and Environment, John Wiley & Co., London, 1970.
4. Gopal, B.: Padap Paristhiti Avam Padap Bhugol Ke Mool Tantra, Rajasthan Hindi Granth Academy, 1977.
5. Misra, R.: Ecological Workbook, Oxford and IBH Publishing, New Delhi, 1968.
6. Mishra, R. and Puri, G.S.: Bhartiya Padap Paristhiti Vigyan, Rajasthan Hindi Granth Academy, Jaipur, 1974.
7. Nair, P.K.G.: Principles of Environmental Biology, Minalaya Publishing House, Delhi, 1990.
8. Pandey, S.N. and Sinha, B.K.: Plant Physiology, Vikas Publishing House, Delhi, 1996.
9. Rao, K.N. Partha, T.S. and Rao, G.S.: Outline of Physiology, S. Chand And Co., New Delhi, 1975.
10. Smith, R.L.: Ecology and Field Biology, Harper and Raw, 1972.
11. Verma, V: A Textbook of Plant Physiology, Emkay Publication, Delhi, 1972.
12. Noggle, G. Ray and Fritz, J., George : Introductory Plant Physiology, Prentice Hall 1976.

Marking Scheme

	Regular Student
1. Physiology experiment	08
2. Ecological exercise -Morphology & Anatomy	06
3. Soil Water tests and Field Exercise	04
4. Experiments in tissue culture	05
5. Phyto-chemical tests (two)	05
6. Spots (six). Two from each paper	12
7. Viva-Voce	05
8. Practical record	05
Total	50
