

# SYLLABUS

NEW SYLLABUS

MAGADH UNIVERSITY  
BODH GAYA

*Courses of Study*

For

B.Sc. PART-II

THREE YEAR INTEGRATED DEGREE  
COURSE FROM SESSION ON WARDS

नोट—NEW SYLLABUS पुनः परिवर्तन किया गया है।

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# संशोधित नवीन पाठ्यक्रम

## B. Sc. Part-II

### PASS, SUBSIDIARY & HONOURS COURSE

#### स्नातक द्वितीय वर्ष

सामान्य हिंदी (हिंदी रचना) हिंदी भाषियों के लिए  
(कला, विज्ञान एवं वाणिज्य के उत्तीर्ण (पास),  
एवं प्रतिष्ठा दोनों वर्गों के विद्यार्थियों के लिए अनिवार्य  
अंक विभाजन

[पूर्णांक : 100]

- समय : तीन घंटे ।
- (क) आलोचनात्मक प्रश्न  
(ख) व्याख्यात्मक प्रश्न  
(ग) लघु उत्तरीय प्रश्न  
(घ) वस्तुनिष्ठ प्रश्न

$$3 \times 15 = 45 \text{ अंक}$$

$$3 \times 10 = 30 \text{ अंक}$$

$$3 \times 5 = 15 \text{ अंक}$$

$$10 \times 1 = 10 \text{ अंक}$$

$$\text{योग} = 100 \text{ अंक}$$

पाठ्यग्रंथ :

1. कुरुक्षेत्र — दिनकर, अथवा, यशोधरा — मैथिलीशरण गुप्त
2. अक्षयवट — सं. डॉ. भूपेन्द्र कलसी

1. यज्ञ-महात्मा गांधी ।

2. हमारा सांस्कृतिक पतन-डॉ. सपूर्णानंद ।

3. दक्षिण गंगा गोदावरी-काका साहेब कलिलकर ।

4. सप्तसागर महादान-वासुदेवशरण अग्रवाल ।

5. आजादी के बाद भारतीय विज्ञान-गुणाकर मूले ।

अथवा, गद्य-प्रवाह-सं. डॉ. विजय कुमार श्रेष्ठ-युनिवर्सिटी बुक हाउस, जयपुर ।

पाठ्यग्रंथ :

- (i) व्यंग्य — मूल्यों का जलटफेर — हरिशंकर परसाई
- (ii) रिपोर्ताज — मुक्ति योद्धाओं के शिबिर में — विष्णुकान्त शास्त्री
- (iii) पत्र साहित्य — इतिहास से शिक्षा — पं. जवाहरलाल नेहरू
- (iv) वैज्ञानिक निबंध — पर्यावरण और सनातन दृष्टि
- (v) ललित निबंध — हल्ली-दूब और दधि-अच्छत — विद्यानिवास मिश्र ।

अभिज्ञात ग्रंथ :

1. हिन्दी के आधुनिक प्रतिनिधि कवि — डॉ. श्री निवास शर्मा
2. मैथिली शरण गुप्त — डॉ. रेवती रमण
3. साठोत्तरी कविता : परिवर्तित दिशाएँ — डॉ. विजय कुमार
4. हिन्दी निबंध और निबंधकार — डॉ. रामचंद्र तिवारी
5. हिन्दी गद्य की नई विधाएँ — डॉ. कैलाशचंद्र भाटिया
1. हिन्दी उपन्यास — रामदरश मिश्र
2. हिन्दी उपन्यास — शिल्प और प्रयोग — डॉ. त्रिभुवन सिंह
3. हिन्दी हानी प्रक्रिया और पाठ — डॉ. सुरेन्द्र चौधरी
4. हिन्दी नाटक — डॉ. बच्चन सिंह
5. एकांकी और एकांकीकार — डॉ. रामचरण महेन्द्र
6. निबंध सिद्धांत और प्रयोग — डॉ. हरिहरनाथ द्विवेदी
7. हिन्दी गद्य की नई विधाएँ — डॉ. कैलाशचंद्र भाटिया ।



(2)

### स्नातक द्वितीय वर्ष

#### सामान्य हिन्दी ( हिन्दी रचना )

उत्तीर्ण (पास) एवं प्रतिष्ठा दोनों वर्गों के लिए

(कला, विज्ञान और वाणिज्य के अहिन्दी भाषियों के लिए अनिवार्य)

समय : 1½ घंटे ।

अंक विभाजन

- (क) अमूल्यनात्मक प्रश्न  
(ख) व्यावहारिक रचना हिन्दी  
(ग) वस्तुनिष्ठ प्रश्न

$$\begin{aligned} 2 \times 15 &= 30 \text{ अंक} \\ 2 \times 5 &= 10 \text{ अंक} \\ 10 \times 1 &= 10 \text{ अंक} \\ \hline \text{योग} &= 50 \text{ अंक} \end{aligned}$$

पाठ्यग्रंथ : 1. विविधा—सं. डॉ. जितेन्द्र वत्स ।

1. पाठ्यांश : साहित्य की विविध विधाएँ
1. अलौपीदीन—महादेवी वर्मा ।
2. कबीर साहब से श्रेष्ठ—रामधारी सिंह 'दिनकर' ।
3. आत्मकथा—आचार्य महावीर प्रसाद द्विवेदी ।
4. ईदगाह—प्रेमचंद ।
5. मुगलों ने सल्तनत बख्शा दी—भागवतीचरण वर्मा ।

अथवा, 2. हिन्दी गद्य-पद्य संग्रह—सं. निदेश प्रसाद सिंह, प्रकाशन—ओरिएंट ब्लैकस्वांस, पटना ।  
पाठ्यांश—गद्य-पद्य : (i) दुलाई बाली

- |                             |                 |
|-----------------------------|-----------------|
| (ii) खून का रिश्ता          | बंश महिता       |
| (iii) बड़े घर की बेटी       | श्रीमम साहनी    |
| (ii) दोनों ओर प्रेम चलता है | प्रेमचंद        |
| (ii) ते चलत वहाँ मुलका देकर | मैथिलीशरण गुप्त |
| (iii) सुरक्षा पत्र          | प्रसाद          |
| (iv) समरशेष है              | महादेवी दिनकर   |

व्यावहारिक हिन्दी रचना में पठनीय—सं. पण, फल्लवन, पत्र-लेखन, आशय-लेखन, वाक्य-संशोधन, शब्द-युग्मों में अंतर ।

अभिस्माकित ग्रंथ : 1. छायावादी कवि और काव्य

— डॉ. देव खरे

2. आधुनिक हिन्दी व्याकरण और रचना — डॉ. बासुदेव नंदन प्रसाद

### ENGLISH COMPOSITION

1. Animal Farm—C. well. 2. The New Icos : An anthology of Prose and Short Story Motilal Banarsidass. Distribution of Marks : 1 question from animal Farm—15, 1 question from Prose & Story—15, 1 essay—20.

### URDU (Urdu Composition)

There shall be half paper of Urdu composition and shall carry 50 marks. This paper along with Hindi composition of 50 marks shall be of three hours duration.

Distribution of marks :

(a) Summary and substances of text prescribed 30 marks.  
(i) Question of marks each one from prose selection and from poetry selection will be compulsory.

(b) Essay 10 (c) Grammar (Azaad, Lins, Mohavral 10 marks),  
Books Prescribed : (a) Samaya-e-Adab by Prof. Mumtaz Ahmad, Dr. Aslam Azad, Dr. Jai Arshad, Dr. Israil Raza.

(b) Tarz-e-Nigارش by Sachidananda Sinha.

### B. Sc. Part-II : MATHEMATICS HONS. PAPER-III

Twelve questions will be. e. Six to be answered c. jecting at least one from each group. One question w ll be objective and it will be compulsory. This question will carry 20 marks and est. questions are each of 16 marks.

Real Analysis I & Abstract Algebra I.

(3)

### GROUP-A : Real Analysis-I (Four questions)

Dedekind's theory of real numbers, Sequence and its convergence Cauchy sequences, Cauchy general principle for convergence, Monotonic sequence, Cantor's construction of real numbers, properties of real numbers.

Continuity and differentiability of a function of the variable, properties of continuous and discontinuous functions, Rolle's theorem, Mean value theorem, Taylor's theorem, Lagrange's and Cauchy's forms of remainder Taylor's and MacLaurin's series of elementary functions.

### GROUP-B : Infinite Series (Three questions)

Infinite series and their convergence, Comparison test, Raabe's test, Cauchy's condensation test, Integral test, Leibnitz's tests, Gauss test, Kummer's test, De Morgan and Parmande's test Absolute convergence and rearrangement of series Pringsheim's theorem, Cauchy's multiplication of series and its convergence.

### GROUP-C : Algebra (Four questions)

Binary operation notion of group, Abelian group and non-abelian group with examples, uniqueness of identity elements and inverse elements in a group, Different ways of defining group, Concept of sub-group and cyclic group, with examples, Intersection of sub-groups. Sub-group of cyclic groups concepts of rings integral domains and fields and their examples and general properties. Cancellation law, Division of Zero, A finite integral domain as a field.

Cosets, Order of an element, Lagrange's theorem. Group of residue classes, Permutation groups, Cayley's theorem, Homomorphism and isomorphism of groups, Normal sub-groups, Kernel of a group homomorphism, Isomorphism theorems for cyclic group, Factor groups, Fundamental theorem of homomorphism of groups.

Ring of residue classes, Ring of matrices, Subrings, ideals, Ring homomorphism and ring, Isomorphism, Kernel of a ring homomorphism, Quotient rings, Fundamental theorem of homomorphism rings.

### PAPER-IV

Twelve questions to be set. Six to be answer selecting at least one from each group. One question will be objective and it will be compulsory. This question will carry 20 marks and rest questions are each of 16 marks.

### GROUP-A

#### VECTOR CALCULUS

(Two Questions)

Products of three and four vectors, Differentiation of vectors functions, Differentiation of product of two vectors, Gradient, Divergence and curl of a vector function and deductions, Moments of a localised vector about a point work done by a force, Scalar moment of a vector about a directed line.

### GROUP-B

#### DIFFERENTIAL EQUATIONS (Three Questions)

Formation and solution of differential equations. Differential equation of the first order. Separation of variables, Homogeneous forms, Linear equation of first order, Clairaut's form, geometrical application of first order, differential equations, Linear differential equation of second order with constant coefficients, C.F. and P.I. Orthogonal Trajectories.

### GROUP-C

#### STATICS (VIA-VECTOR) Three Questions

Reduction of a force system to a force and a couple. Equation of the resultant, principle of virtual work in two dimensions, stable equilibrium, Energy test for stability, Catenary, Poinsof's central axis wrench, pitch, null lines.

### GROUP-D : DYNAMICS

S.H.M., Simple pendulum, Elastic strings and springs, Hook's law

(One Question)

Components of velocities and acceleration. Cartesian, radial and transverse, tangential and normal. Projective motion in non-resisted medium.

(One Question)



(4)

Motion of a particle under central force, Differential equation of central orbit in polar and pedal forms. Newton's law of gravitation and planetary orbit, Kepler's law.

### MATHEMATICS (General Course) Part-II

#### PAPER-II

[ Full Marks : 100 ]

Time : 3 Hours ]

Stress should be given on development of ideas and theories rather than on solving problems. Problems should be short and intelligent.

#### Calculus and Analytical Geometry

1. Differential Calculus : Four questions to be set. Three questions to be answered. 2. Integral Calculus : Four questions to be set. Three questions to be answered. 3. Analytical Geometry : Three questions to be set. Two questions of two dimensions to be answered. 4. Analytical Geometry : Three questions to be set. Two questions of three dimensions to be answered.

(1) Differential Calculus : Successive differentiation, Leibnitz's theorem, Statement of Taylor's series and Maclaurin's series expansion using them partial derivatives Euler's theorem, Exact differential, Tangents and Normals Sub Tangent, Subnormal polar sub Tangent, polarsubnormal intrinsic and pedal equations. Curvature, Asymptotes.

(2) Integral Calculus : Integration of rational function, formula, Definite integral as limit of a sum Reduction formula, rectification and quadrature, Surface and volume of single solids of revolution moment of inertia, centre of gravity (Four questions).

(3) Analytical Geometry of two dimensions : System of circles, coaxial, circles change of axis standard equations of parabola ellipse and hyperbola conditions for the general equation of the second degree to represent parabola ellipse and hyperbola and its reduction into standard form, Equation of tangent and normal in case of general equation (using Calculus) and their forms in case of particular conic section (Three questions).

(4) Analytical Geometry of three dimensions : Rectangular spherical, polar and cylindrical co-ordinates, Directions cosines, Angle between straight lines, Equations of planes and straight lines, Shortest distance between lines coplanar lines, Equations of sphere and cylinder (Three questions).

### MATHEMATICS SUBSIDIARY COURSE PART-II

Eight questions to be answered selecting at least two from each group.

#### GROUP-A

Differential Calculus (Three Questions) : Leibnitz theorem, Taylor's series and Maclaurin's series, partial derivatives, Euler's theorem, Indeterminate forms, equations of Tangents and normals Asymptotes, Formula of radius of curvature in different co-ordinates system, Maxima and Minima of functions of single variable.

Integral Calculus (Three Questions) : Integration by summation method, Reduction formula, Rectification and quadrature with simple examples, Volume and surface of solid of revolution, Moment of Inertia, simple use of double and triple integration and Gamma and Beta function.

Differential equations (Three questions) : Differential equation of 1st order and 1st degree, Separation of variable Homogeneous equations and linear forms, Differential equation of first order and higher degrees, Clairaut's form Linear differential equations of second with constant co-efficients, Orthogonal trajectories.

#### GROUP-B

#### VECTOR ANALYSIS (Three Questions)

Classification of Vector, Triple products, Differentiation of a vector functions, Differentiation of a product of two vectors, Gradient of a scalar, Divergence and curl of a vector in Cartesian co-ordinates.

#### GROUP-C

#### MECHANICS (Three Questions)

Coplanar force system, Necessary and sufficient condition for equilibrium

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of a particles, Necessary condition for a system a particle to be in equilibrium. Definition of equipollent force system, Reduction of a general plane force system, Equation of the line of action of the resultant Principle of virtual work (two questions).

Basic concepts of mechanics, Basic laws of mechanics, Internal frames of reference, Work and Energy Principles, Conservation field and potential energy, principle of conservation of energy for a particle.

Rectilinear motion : Uniformly accelerated motion (including connected system) Resistive motion, Harmonic Oscillate Damped and force vibrations, Elastic spring and strings, Hook's law, vertical and horizontal vibrations of a particle attached to an elastic string.

Motion in plane : Components of velocity and acceleration, Cartesian, radial and transverse, tangential and normal (Three questions).

### BOTANY HONOURS COURSE PART-II

#### Paper-III and Paper-IV (Phanerogams)

Time : 3 Hours ]

[ Full Marks : 75 ]

1. Questions no. 1 will be compulsory consisting of 15 items of objective types questions both converting both Group A and Group B parts of the syllabus. The objective type question will have a statement and four plausible responses marked a, b, c and d out of which only one will be the correct answer. 15 marks

2. Each group (A and B) will have both Short answer type questions and Long answer type questions. Candidates are required to answer both type of questions in each group.

3. Short answer type questions will have 8 items, out of which 5 items are to be answered preferably in four/five sentences.  $15 \times 2 = 30$  Marks

4. Long answer type questions will be of conventional type and one question has to be answered out of a options provided.  $15 \times 2 = 30$

#### PAPER-III

#### Group-A : Gymnosperms

1. Comparative study of the morphological anatomical and embryological features of the following taxa—*Pinus*, *Taxus*, *Gnetum*. 2. Fossils—Definition and scope, conditions for fossilization and made of preservation, uses of fossils. 3. Type study of *Lygopteris* and *Cycadeoides*. 4. A brief idea of the the plant fossils of Bihar.

#### Group-B : Angiosperm Taxonomy

(1) Principles of Plant classification with emphasis on modern trends in taxonomy. (2) A knowledge of system of classification of plant proposed by Bentham and Hooker, Hutchinson and Cronquist. (3) Rules of Botanical Nomenclature. (4) A comparative account of the diagnostic features, relationship and economic importance of the following families : Ruubiaceae, Caparidaceae, Caryophyllaceae, Cucurbitaceae, Oxalidaceae, Rubiaceae, Apocynaceae, Verbenaceae, Acanthaceae, Lamiaceae, Convolvuliaceae, Scrophylariaceae, Amaranthaceae, Nyctaginaceae, Euphorbiaceae, Commelinaceae, Cyperaceae and Poaceae.

#### PAPER-IV

#### (Angiosperm Anatomy, Embryology & Applied Botany)

#### Group-A : Anatomy

[ Full Marks : 75 ]

Time : 3 Hours ]

1. Meristematic tissue—their structure, distribution & function. 2. Mechanical tissue—their structure, distribution & function. 3. Organization of tissue in relation to environment. (Ecological Anatomy). 4. Anomalous secondary growth in—*Begonia*, *Nyctanthes* Achyr, anthes, *Boerhaavin*, *Tecoma*, *Diacacus*. 5. Root-stem transition.

#### Embryology

1. Various development processes in Microsporogenesis, male gametophyte megasporogenesis in female gametophyte, Endosperm, Embryogeny. 2. Importance of anther and embryo culture.



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**Group-B : Applied Botany**

1. Use of plants in medicine and idea about important drug yielding plants
2. Agricultural and horticultural products of Bihar with special reference to oil seeds pulses, cereals, fruits, fibres and timber especially found in Bihar.
3. Idea of tissue culture with special reference to plant propagation.
4. Utilization of wastes and Biogas resources.

**Paper-III & IV (Practical)****Time : 4 Hrs.****(Phanerogams & Applied Botany)****[ Marks : 50 ]**

1. Study of the living and fossil Gymnosperms (Vegetative and reproductive parts).
2. Description and identifications of an angiospermic plant upto Genus only from the families prescribed in the course.
3. Test of Carbohydrates Lipids and proteins in oil seeds, pulses, fruits and vegetables.
4. Internal anatomy of primary and secondary (Both normal and abnormal) of angiospermic plant.
5. Comment upon spots (4) from the syllabus.

**B. Sc. Part-II Botany : General Course****PAPER-II (Theory)**

The examiners are to set five questions from each of the two groups out of which the candidates are required to answer five questions attempting at least two questions from each group.

**GROUP-A****Plant Psychology and Biochemistry**

1. Physiology of water and mineral absorption.
2. Transpiration stomatal movement.
3. Mineral nutrition of the plants—role of macro nutrients.
4. Enzymes—Natures, mode of action factors affecting enzyme activity.
5. Photosynthesis—Mechanism and Factors.
6. Respiration Aerobic and anaerobic (Glycolysis, Krebs's cycle and electron transport).
7. Nitrogen metabolism—Nitrate reduction amino acids, Protein—Structure and types. Symbiotic and assymbiotic-nitrogen fixation.
8. Phytohormones : Auxins and Gibberlin (discovery structure and role)
9. Growth—Measurements, factor affecting growth rule of light, temperature and humidity.
10. Movements—General account.

**GROUP-B : (MICROBIOLOGY)**

1. A general account of bacteria, viruses and their economic importance.
2. Role of microbes in agriculture and industry.
3. Important plant diseases of Bihar.

(ii) Rust of wheat, (iii) Red root of sugarcane, (iv) Tobacco mosaic virus.

**Time : 3 Hours****PAPER-II (Practical)****[ Full Marks : 25 ]**

1. Experiments in Plant physiology and biochemistry.
  - (a) Test for carbohydrate, protein acids and starch seed.
  - (b) Compare transpiration, mesophytic and xerophytic leaves.
  - (c) O<sub>2</sub> is evolved during photosynthesis.
  - (d) Compare the rate of imbibition of fatty and starch seed.
  - (e) Compare the rate of absorption and transpiration.
  - (f) Moll's experiment.
2. Symptoms and morbid anatomy of the diseases prescribed in the course.
3. Comment upon the spots covering the courses of Paper-II.
4. Class record.

**BOTANY : SUBSIDIARY COURSE****Time : 3 Hours****PAPER-II (Theory)****[ Full Marks : 75 ]****(Angiosperm, Plant Physiology and Environmental Biology)**

Ten questions are to be set four from Group A & B and two from Group C. Out of which two questions from each A & B Groups and one from Group C are to be answered.

(7)

**GROUP-A****1. Angiosperms : (A) Morphology and Taxonomy.**

- (i) Importance Classification of angiosperms with reference system of Bentham & Hooker and Hutchinson.
- (ii) Naming of genus and species.
- (iii) Diagnostic features affinities and economic importance of the following families—(1) Ranunculaceae (2) Cucurbitaceae (3) Euphorbiaceae (4) Aarantaceae (5) Acanthaceae (6) Lamiaceae (7) Apocynaceae (8) Poaceae (9) Cyperaceae.

**2. Anatomy : (i) Cell structure and tissue systems.**

- (i) Meristems.
- (ii) Root stem transition.
- (iii) Initiation and activity of cambium including abnormal behaviour, Primary and Secondary growth in roots and stems.

**3. Embryology : (i) Life cycle of a typical flowering plant based on major events in the development of another, Microspore value. Embryosac fertilization, Endosperm, Embryo and seed.****GROUP-B****4. Plant Physiology :**

1. Water relation, Absorption of water and Salts
2. Transpiration.
3. Mineral nutrition—Role of major and minor element.
4. Enzymes—Nature, properties & Classification.
5. Photosynthesis—Photophosphorylation calvin cycles and factors affecting Photo-synthesis.
6. Translocation of Organic substances.
7. Respiration—Glycolysis, Krebs's Cycle and Factors affecting respiration.
8. Nitrogen metabolism—Nitrogen fixation and Protein synthesis.

**GROUP-C****5. Environmental Biology : 1. Pollution.**

2. Soil—Types, water holding capacity, reclamation.
3. Plant communities and ecosystem.
4. Succession (Hydrosere and Xerosere).

**BOTANY PRACTICAL (Sub. Course)****PAPER-II****[ Full Marks : 25 ]****Time : 3 Hours**

1. To comment upon plant Physiology-experiment; set up among experiments included in the Syllabus : (a) T/A ratio. (b) Ganong's Photometer—Rate of transpiration. (c) Farmer's Photometer—Rate of transpiration. (d) Unequal transpiration by CaCl<sub>2</sub> method. (e) Oxygen evolution during photosynthesis. (f) Rate of Photosynthesis by Wilmott's bubbler. (g) Moll's Experiment. (h) Anaerobic respiration.
2. Description & Identification of the Plants out of the families included in the Syllabi :

3. Microscopic preparations of anatomical specimens.
4. To identify and comment upon spots covering the courses in Paper III.
5. Practical record based on class work field studies conducted through organised botanical excursions will carry.

**B. Sc. Part-II Zoology (Subsidiary/General)****PAPER-II (Theory)****[ Full Marks : 75 ]**

**Time : 3 Hours**  
Five questions are to be set from each group. Students shall answer five questions attempting not more than three from any group.

**GROUP-A (Chordate)**

1. Binomica, (General Characters and Classification up to orders only) of living chordates of the following groups : protochordata. Cystostomata, pisces, Amphibia, Reptilia, Avas and Mammalia.
2. Study of the following types :
  - (i) Urochordata—Herdmania (including retrogressive metamorphosis).
  - (ii) Cephalochordata—Amphioxus. (iii) Fishes—Socoliodon—Type study :



(8)

- differences with that of a Bony fish. (iv) Reptilia—Biting & feeding mechanism of Snakes. (v) Aves—Columba Flight adaptation, elementary idea of bird migration & Sanctuaries of India. (vi) Mammals—Characters, distribution and affinities of Prototheria & Metatheria. Comparative study of the following in Vertebrates Integument. Heart, Aortic Arches and Brain.

### GROUP-B (Embryology)

- (i) Types of vertebrate eggs and their early cleavage.
- (ii) Development of Amphioxus (Up to the formation of Coelom) and chick (up to 3 germ layers).
- (iii) Placenta in Mammals their development, types and functions.

### Biochemistry Physiology and Endocrinology

- (i) Structure and classification of Protein, Carbohydrate & fats.
- (ii) Physiology of Digestion, Excretion and Respiration in mammals.
- (iii) Histophysiology of the following Endocrine glands in mammals: Islets of Langerhans, Testis, Ovary, Thyroid Adrenal & Pituitary.

### Zoology Practical (Sub/Gen. Course)

Time : 5 Hours ] [ Full Marks : 25

1. Dissection  
Scoliodon—Afferent and efferent branchial arteries, Cranial nerves (V, VII) and (IX, X) Internal ear, eye, muscles & their nerves supply, Urinogenital system.
2. Columba—Flight muscles, Arterial and Venous system.  
Mounting Permanent stained preparation.
3. Scales of fishes pecten and Elioplume feather of birds, Ampulla of Lorenzini.
4. Spotting: Museum specimen-1.  
Bones-3. (Limb) girdle, Skull, Vertebrate of varanus and fowl. 2 × 2  
Slides-1 (Endocrinology & Embryology)  
(i) Identification of Permanent slides of the various developmental stages of frog and Chick. (ii) Identification and comment upon the histological structure of various Endocrine glands.
5. Practical Records.

### ZOOLOGY : HONOURS COURSE PAPER-III (Theory)

1. Origin and evolution of chordates.
2. Binomies, General characters and classification of the chordates (upto order) of the following groups. Protochordate, cyclostomata fishes, Amphibia. Reptilia, Aves & Mammalia.
3. Study of the following Types :  
(a) Urochordata—General organisation and life cycle of Horriani & Salpa. (b) Cephalochordata—Amphioxus. (c) Cyclostomata—Petromyzon. (d) Fishes—(i) Labeo or any bony fish scoliodox (ii) Distribution, general organisation and affinities of Dipnoi, Accessory respiratory organs in fishes. (e) Amphibia—(i) Origin evolution of Amphibia (ii) Neoteny. (f) Reptilia—1. Biting and feeding Mechanism in Snakes. 2. Any Lizard. (g) Aves—(i) Columba (ii) Origin of Birds (iii) Flight adaptations. (h) Mammals—(i) Characters and distribution of Prototheria Metatheria (ii) General organisation of primates. Note—In all ten questions are to be set out of which number 1 and 2 shall consist to objective (1 × 15 marks) and short answers (3 × 5) requiring question respectively and both shall span over the whole syllabus in the paper. Student would be required to answer five questions of which question numbered 1 and 2 shall be compulsory.

### PAPER-IV (Comparative vertebrate Anatomy and Embryology)

Time : 3 Hours ] [ Full Marks : 75  
Comparative Anatomy : Study of the following organ systems in the vertebrate groups : (i) Integument; its derivatives and function

(9)

- (ii) Gastrointestinal tract. (iii) Respiratory systems. (iv) Heart, Aortic arches. (v) Brain. (vi) Evolution and fate of kidney, urinogenital ducts, gonads.
- (vii) Evolution of chondra—Splanchno & osteocranium.

Embryology : (i) Fertilization, (ii) Types of vertebrate eggs cleavages patterns, (iii) Development of Amphioxus (upto the formation of coelome), (iv) Development extra-embryonic membranes in chick. (vi) Placenta in mammals its development types and functions, (vii) Organogenesis of Heart, Brain and Eye in chick embryo.

### B.Sc. Part-II : ZOOLOGY PRACTICAL (HONS.) (Paper-III B & IV B) [ Full Marks : 50

Time : 6 Hours ]

1. Dissections:  
(i) Scoliodon and any Bony fish : Afferent and efferent branchial vessels : (V, VII, IX, X) cranial nerves; Eye, muscles and their nerve supply; Internal ear, necessary respiratory organs.
- (ii) Frog—Cranial nerves (V, VII, IX, X).
- (iii) Lizard—Arterial and Venous system.
- (iv) Pigeon—Arterial and venous systems air sacs flight (muscles with the origin and insertion to tendons).
- (v) Mammals Neck nerve, Urino-genital organs.
2. Mounting : Velum and Oralhood of Amphioxus, Ampulla of Lorenzini, respiratory membrane of air, breathing-structures, scales of fishes pecten and feathers, Mounting of chick embryo (24 & 48 hours). 5
3. Permanent stained Preparation of paraffin sections provided. 2
4. Spotting : (i) Museum specimens 4  
(ii) Slides Histology & Embryology 1  
(iii) Bones Limbs 1  
of Frog Girdles-3 Skull 1  
of Frog vertebrae 1  
Varanus vertebrate 1  
Fowl & Rabbit. 1
5. Record and field work 5
6. Viva-voce 5

### B.Sc. Part-II : CHEMISTRY (HONS.) Paper-III(A) (Physical Chemistry)

There shall be four questions from each group and the candidate shall be expected to answer five questions selecting at least one question and not more than two from each group.

#### GROUP-A (STATES)

1. Gaseous State : Critical phenomena and Andrew's experiment, intermolecular forces and liquid faction of gases, critical state : relation between critical constants and vander Waal constants, Law of corresponding states, derivation of reduced equation of state.
2. Liquid State : Critical temperature and structure, Physical properties of liquids : viscosity, refractive index, idea of liquid crystals.
3. Solid State : Bravais lattices and lattice planes, Bragg's Law, Lattice energy and its calculations, crystal structures of NaCl, KCl, ZnS and diamond.
4. Colloids : lyophilic and lyophobic colloids, coagulation, dialysis, Hardy Schulze Law, Tyndall effect, Brownian movement, electrophoresis, origin of charge, gold number, size determination, electrokinetic potential, gel, emulsion.

#### GROUP-B (EQUILIBRIUM)

1. Thermodynamics : Second law of thermodynamics, Carnot Theorem, Carnot Cycle, Entropy and its probability view, entropy change for reversible and irreversible processes and ideal gases entropy of mixing of ideal gases, free energy and work function criteria of chemical reactions, Gibban Helmholtz Equation, Clausius-Clayperon equation and its applications.
2. Ionic Equilibrium : Ostwald's dilution law, conductance measurement of dissociation constant of acetic acid, relative strength of acids and bases and effect of substituents on them. Salt hydrolysis, application of conductance for



determination of solubility product, degree of ionisation, hydrolysis constant. Theory of acid-base indicators.

3. **Phase Equilibrium** : Phase rule, terms and derivation, one component water and sulfur systems, two component solid and liquid systems (Ag-Pb, Mg-Sn, K<sub>2</sub>H<sub>2</sub>O, FeCl<sub>2</sub>-H<sub>2</sub>O), Eutectic mixture, azeotropic mixture, congruent and incongruent compounds.

4. **Distribution Law** : Nernst distribution law, factors affecting partition coefficient, thermodynamic derivation, limitations and application, modification in case of association dissociation and chemical change.

#### GROUP-C (CHANGES)

1. **Chemical Kinetics** : Second order reaction, expression for specific rate constant of second order reaction, half life period and its unit, effect of temperature on reaction rate (Arrhenius equation, effect of catalyst on reaction rate, Energy of activation and its determination. Experimental measurement of order in acid catalysed hydrolysis of methyl acetate, saponification of ester and inversion of cane sugar, first order gas phase reaction (Lindemann theory).

2. **Catalysis** : Definitions and classification of catalyst, characteristics of catalyst, theory of catalysis, acid base catalysis, auto catalysis, enzyme catalysis, promoter, inhibitor, catalytic poison.

3. **Conductance** : Conductance of electrolytes cell constant, specific conductance, equivalent conductance and molecular conductance, effect of dilution on various type of conductance and their measurement. Kohlrausch's law of independent migrations of ions and its applications, conductometric titration.

4. **Electrochemical Cells** : Reversible and irreversible cells and electrodes, E.M.F. of a cell and its measurement, Galvanic cells, electrode potential and its origin, standard electrode potential, Nernst equation, determination of electrode potential, concentration cells, definition, classification, working of concentration cells and their applications, potentiometric titrations (acid-base, redox and precipitation).

#### PAPER-III B

Five questions will have to be answered selecting at least one question from and not more than two each group. Four questions will be set from each group.

#### GROUP-A (FOUNDATION)

1. **Atomic Structure** : Determination of electronic charge and  $e/m$  ratio, Bohr frequency condition, Dual nature of electrons particles or waves, uncertainty principle. Idea of ground state term symbols. Excited state term symbol for  $d^2$  system.

2. **Bonding Model** : (a) Expansion of valence Bond Theory, qualitative treatment, simple applications. Sidgwick-Powell theory, structures of  $\text{BF}_3$ ,  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{PCl}_5$ ,  $\text{SF}_6$ ,  $\text{I}_2$ ,  $\text{SF}_6$  and  $\text{IF}_7$  and bonds.

(b) **Metallic bond**—idea of free electron theory and V.B.T. explanation, conductors, semi conductors.

3. **Co-ordination Chemistry** : Double salts and co-ordination compounds, Werner's postulates, EAN rule. Shapes of d-orbitals, valence bond method of explaining structures of co-ordinations compounds, isomerism-types with examples.

4. (a) **Nomenclature of inorganic Compounds** : IUPAC nomenclature of co-ordination compounds including complexes with unsaturated molecules or groups and bridging groups.

(b) **Chemistry in aqueous and non-aqueous solutions** : Protic/aprotic solvents. Inorganic reactions in liq.  $\text{NH}_3$  and liq.  $\text{SO}_2$  Solutions of metals in liq.  $\text{NH}_3$ .

#### GROUP-B : SYSTEMATIC CHEMISTRY OF THE ELEMENTS

1. General Chemistry, structure and bonding of—(a) Noble gas compounds, (b) Pseudo halogens and polyhalides.

2. **Introductory transition metal chemistry** : General features including variable oxidation states, complexes, atomic/ionic sizes and magnetism. General Chemistry of the following elements with special reference to periodic position, oxidation states, reactivity, oxides, halides, complexes, organometallic chemistry and uses : (a) Fe, Co, Ni (b) Ti, Zr, Hf (c) V, Nb, Ta (d) Fe, Co, Ni

3. **Chemistry of Group 14 elements** : C, Si and Ge : Carbides, silicates and tetrahalides. Idea of fullerenes and zeolites.

#### GROUP-C : SOME APPLICATIONS AND MISC. TOPICS

1. **Spectroscopy** : Elementary qualitative idea of regions principles and simple applications of the following : i.e. spectroscopy, UV-vis spectroscopy.

#### 2. Analytical Chemistry :

(a) Use of complexation reactions in qualitative inorganic mixture analysis. Organic reagents in inorganic analysis : E.D.T.A, dimethyl glyoxime, oxime  $\alpha$ -nitroso  $\beta$ -naphthol, cupferon, thio-salicylic acid.

(b) Theory behind the group separation in inorganic qualitative cationic analysis.

3. **Oxidation and Reduction** : Applications of the Concept : Redox half reactions, kinetic factors, Redox stability in water, oxidation by atmospheric oxygen.

4. (a) Outline of the chemistry involved in the following and allied phenomena : cement, steel, water, fuel and industrial gases.

(b) Idea of major chemical pollutants in environment.

#### PAPER-III C : ORGANIC CHEMISTRY

Four questions will be set from each group. Five questions will have to be answered selecting at least one question and not more than two from each group.

#### GROUP-A (FOUNDATION)

1. **Stereochemistry-I** : Stereoisomerism, projection formula elements of symmetry, geometrical and optical isomerism, E-Z, D-L and R-S, modes of nomenclature, threo and erythro, elementary idea of configuration, diastereoisomerism, Asymmetry and dysymmetry.

2. **Stereochemistry-II** : Tautomerism, keto and enol tautomerism estimates and enolic content.

3. **Reaction Mechanism** : Electrophilic substitution in benzene nucleus, mechanism of nucleophilic substitution at saturated carbon.

4. **Name Reactions** : Name reactions involving topics in group-B.

#### GROUP-B

#### DETAILED STUDY OF DIFFERENT CLASSES OF COMPOUNDS

1. Nomenclature, classification, structure and configuration of glucose and fructose. Ring structure, Ruff degradation, Kiliani Fischer Synthesis, Osazone and inter conversions.

2. Aromaticity and Hucke's rule.

3. Detailed preparation and properties of benzene, toluene, benzene sulfonic acid, nitrobenzene, aniline, diazonium salt, benzaldehyde, benzoic acid.

4. **Hydroxy acids** : Lactic acid, citric acid, general methods of preparation and distinction between  $\alpha$  and  $\beta$  hydroxy acids. Stereochemistry of hydroxy acids.

5. Polymethylenes and Baeyer's Strain Theory including preparation and properties.

#### GROUP-C

#### APPLIED ORGANIC CHEMISTRY

1. Synthetic applications of the following reagents in organic chemistry





(12)

2. Brief introduction of TLC, paper and gas chromatography.
3. (a) Organic polymers and resins. (b) Brief idea of proteins.
4. Test of functional groups.

### CHEMISTRY PRACTICAL

Time : 6 Hours |

PAPER-IV  
GROUP-A

[ Full Marks : 5 ]

1. Determination of Molecular weight of volatile liquids by Duma's dull method.
2. Determination of molecular weight of volatile liquids by Victor Meyer method.
3. Determination of surface tension of liquids using stalagmometer and calculation of parachor values.
4. Determination of co-efficient of viscosity of liquids using Ostwald viscometer.
5. Determination of partition coefficient of solutes between two immiscible liquids.
6. Determination of rate constant for hydrolysis of ester catalysed by  $H^+$  ions at room temperature.
7. Determination of refractive index of liquids by Abbe refractometer and calculation of molecular refractivity.
8. Thermochemistry : Heat of solution of solute in a solvent, heat of neutralisation.

GROUP-B

15 Marks

1. Gravimetric Analysis : Estimations of  $Ag^+$ ,  $Ba^{2+}$ ,  $Ni^{2+}$ ,  $Cu^{2+}$ ,  $Cl^-$  &  $SO_4^{2-}$

GROUP-C

10 Marks

1. N. B. and Viva.

### B. Sc. Part-II : CHEMISTRY (Subsidiary)

Five questions will have to be answered selecting at least one question and not more than two from each group. Four questions will be set from each group.

1. States of Matter : (a) Gaseous State : Vander Waal equation (no derivation), critical constants collision no. collision frequency, mean free path. (b) Solid State : Bravais lattices and lattice planes, elementary idea of types of lattices and stoichiometric, and non-stoichiometric defects in simple ionic solids.

2. Thermodynamics : Definitions of terms : system, extensive, intensive properties. First and second laws of thermodynamics. Carnot theorem at Carnot Cycle.

3. (a) Ionic Equilibrium : Ostwald's dilution law, conductance measurement of dissociation constant of acetic acid. Salt Hydrolysis. Idea of theory of acid bases indicators.

- (b) Phase rule : Terms, equation (no derivation required),  $H_2O$  system, S-system.

4. (a) Chemical kinetics : Second order reaction, expression for specific rate constant of second order reaction, half life period and its unit. Effect of temperature on reaction rate, Arrhenius equation. Idea of catalytic activity at surfaces and catalytic processes such as hydrogenation, oxidation, cracking and reforming.

### GROUP-B : INORGANIC CHEMISTRY

1. (a) Atomic Structure and Bonding : Idea of duality and matter waves, de Broglie relation, Schrödinger equation (no derivation), and idea of its applications, idea of orbital overlap, hybridisation of orbitals, vander Waal forces, Metallic bonding.

- (b) Idea of complex formation : double salts and complexes, Werner postulates.

2. Introductory transition metal Chemistry : General features including variable oxidation states, ideas of complexes, magnetism of transition metals.

3. Chemistry of group 14 elements : C, Si, brief introduction of fullerene and zeolites. Idea of major chemical pollutants in environment.

4. Chemistry of the following elements and their important compounds : (a) Fe, Co, Ni, (b) Cr (c) Mn.

(13)

### GROUP-C : ORGANIC CHEMISTRY

Structure and Mechanism : Different types of isomerism, idea of E-Z notations, Electrophilic substitution in benzene nucleus and mechanism of nucleophilic substitution at saturated carbon (general idea).

Natural Products : (a) Carbohydrates : Nomenclature, Classification, Non-detailed structures of glucose and fructose, Elementary idea of glycosides. (b) Elementary idea of alkaloids and terpenes (no structural elucidation needed).

- (a) Structure of benzene preparation and uses of benzene diazonium chloride.

- (b) Lactic acid, citric acid

- (a) Test of common functional groups.

- (b) Brief idea of polymers, resins, proteins and sulfa drugs.

### CHEMISTRY PRACTICAL (SUBSIDIARY)

GROUP-A

[ Full Marks : 25 ]

Qualitative inorganic analysis of mixtures containing four radicals. Basic

radicals  $Ag^+$ ,  $Hg_2^{2+}$ ,  $Pb^{2+}$ ,  $Cu^{2+}$ ,  $Hg^{2+}$ ,  $Bi^{3+}$ ,  $Cd^{2+}$ ,  $Sb^{3+}$ ,  $Sn^{2+}$ ,  $Sn^{4+}$ ,  $Fe^{3+}$ ,

$Al^{3+}$ ,  $Cr^{3+}$ ,  $Ni^{2+}$ ,  $Co^{2+}$ ,  $Zn^{2+}$ ,  $Mn^{2+}$ ,  $Ca^{2+}$ ,  $Ba^{2+}$ ,  $Sr^{2+}$ ,  $Mg^{2+}$ ,  $Na^+$ ,  $K^+$ ,  $NH_4^+$ .

Acid radicals :  $CO_3^{2-}$ ,  $SO_3^{2-}$ ,  $S^{2-}$ ,  $SO_4^{2-}$ ,  $NO_2^-$ ,  $NO_3^-$  halides.

GROUP-B

8 Marks

Organic Preparations : Preparation of Organic-Compounds by using following reactions.

- (a) acetylation of aniline and p-toluidine.

- (b) nitration of nitrobenzene.

- (c) oxidation of benzaldehyde and

- (d) hydrolysis of esters like ethyl benzoate and methyl Salicylic acid.

Record of Class work and Viva-voce.

### B. Sc. Part-II : CHEMISTRY (GENERAL)

Five questions will have to be answered selecting atleast one question and not more than two from each group. Four questions will be set from each group.

GROUP-A

States of Matter : (a) Gaseous State : Vander Waal equation (no derivation), critical constants collision no. collision frequency, mean free path. (b) Solid state : Bravais lattices and lattice planes, elementary idea of types of lattices and stoichiometric and non-stoichiometric defects in simple ionic solids.

Thermodynamics :

Definitions of terms : System, extensive, intensive properties. First and second laws of thermodynamics. Carnot theorem and Carnot Cycle.

- (a) Ionic Equilibrium : Ostwald's dilution law, conductance measurement of dissociation constant of acetic acid. Salt Hydrolysis. Idea of theory of acid bases indicators. (b) Phase rule : Terms, equation (no derivation required),  $H_2O$  system, S-system.

- (a) Chemical Kinetics : Second order reaction, expression for specific rate constant of second order reaction, half life period and its unit. Effect of temperature on reaction rate, Arrhenius equation. Idea of catalytic activity at surfaces and catalytic processes such as hydrogenation, oxidation, cracking and reforming.

- (a) Atomic Structure and Bonding : Idea of quality and matter waves, de Broglie relation, Schrödinger equation (no derivation), and idea of its applications, Idea of orbital overlap, hybridisation of orbitals, vander Waal forces, Metallic bonding.



(15)

**GROUP-B**  
(Electromagnetic theory)

**8 Questions**

## GROUP-C: ORGANIC CHEMISTRY

**B. Sc. Part-II : CHEMISTRY (GENERAL)**  
**PRACTICAL** [ Full  
 Time : 3 Hours ]

**GROUP-A : 12 Marks**

**Acid Radicals:**  $\text{CO}_2^-$ ,  $\text{SO}_2\text{-S}^{2-}$ ,  $\text{SO}_4^-$ ,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ , halides

**GROUP-B (8 Marks)**

(a) Acetylation of aniline and p-toluidine. (b) Nitration of nitrobenzene  
(c) Oxidation of benzaldehyde. (d) Hydrolysis of esters like ethyl benzoate  
and methyl salicylic.

VIVA-VOCA.

6 to be answered 4 from

### GROUP-A (Optics)

**Diffraction : Fresnel's & Fraunhofer's diffraction: Half period zone**

Zone plate, Fresnel's uniaxial, a straight edge and single narrow wire. Fraunhofer's diffraction at slits and circular aperture. Plane diffraction grating, conceive grating and Engle's mounting. Resolving power of prism, telescope and microscope, Cornu's spiral and its use diffraction problems.

Quarter wave plate, Babinet's compensator analysis of elliptically polarisee light Rotary polarisation and polarimeter. Principle of Laser action, Ruby laser, He, Ne Laser.

(12 questions to be set, 6 to be answered selecting at least two from Group B and Group C)

### Electrostatics Magnetism (1, 1 questions)

Boundary condition at the surface of separation of two dielectrics and action of lines force.

Solar potentials in Electrostatics. The potential of a system of charges, Pole and Quadripole moment Energy stored in an electrostatic field Poisson's Laplace's equation in Cartesian, Polar and cylindrical co-ordinates and their solutions for simple geometries dielectric polarisation, Relation between E. & P.

Properties of ferromagnetic materia. Hysteresis curve method for obtaining  $H_c$  curve, Energy loss per cycle of magnetisation, Magnetic circuit and application to electromagnet. Measurement of Magnetic flux density ( $B$ ) by (a) B. C. and search coil (b) Grassot fluxmeter. Energy stored in a magnetic field. Measurement of susceptibility of liquid by Quink's method. Langevin's Weiss theories of dia, para and ferromagnetism.

GROUP-B

## Current electricity

## 5 Questions

Thermodynamic treatment of seeback, Peltier and Thompson effect and their application, self Inductance and Mutual Inductance. Growth and decay of current in circuits containing L. C. and R. Simple applications of these circuits. Moving coil galvanometer, a periodic and ballistic galvanometers (iii) A. C. and A. C. circuit: Use of vectors and complex number in A. C. circuits (iv) Series and parallel resonant circuit. Power in A. C. circuits, Watt meter (v) Bridges (i) De Sauty's bridge (ii) Anderson bridge (iii) Carey Foster's bridge (iv) Schering bridge. Three phase A. C. Systems, Mutually coupled circuits Rotating magnetic fields polyphase and single phase induction motors transformer equivalent circuit and vector diagram, Iron and Copper losses in transformer.

## GROUP-C

## Modern Physics

## 5 Questions

Measurement of charge by Millikan's method and specific charge of an electron by Thomson's method, Natural radioactivity. Rutherford Saddy's theory of  $\alpha$  particle,  $\beta$  particle and  $\gamma$  rays, Half life period, Decay constant, Radioactive disintegration, Radioactive decay, Geiger, Muller counters, Discovery of Neutron isotopes, Artificial Radioactivity, Elementary ideas about nucleus and its structure, Nuclear Reactions, Aston's mass spectrograph Cyclotron and Betatron.

Photoelectric emission, Einstein, Photoelectric equation, photo conductive  
Photo-Voltain cells.

Compton effect, Bragg's law and determination of X-ray wave length.  
Cathod ray Oscilloscope and its uses in amplitude frequency and phase  
measurement solid state rectifier and one stage R. C. amplifier.

Primary and secondary cosmic rays, Penetrating components of cosmic rays, Attitude and latitude variation of cosmic ray, intensity E. W. Asymmetrical ray showers Fossi curve outline of cascade origin of cosmic rays.

**B. Sc. Part-II : PHYSICS (Gen./Sub. Course)**

The course shall consist of one theory paper (Paper I) theory of 70 marks. The pass marks will be 21 and the examination will be of 3 Hours duration in the pass paper. There will be also one practical paper (paper II practical) of 30 marks.



marks. The pass marks will be 12 and the examination will be 6 hours duration in this paper.

The following will be the detailed course :

**Time : 3 Hours I**

**PAPER-II**

**[ Full Marks : 70**

12 questions to be set; 6 to be answered, one from Group A, 3 from Group B and 2 from Group C.

#### **GROUP-A**

#### **Electrostatics and Magnetism**

**2 (1+1) Questions**

Boundary conditions at the surface of operation of two dielectrics. Electric dipoles, Dipole moment, Dielectric polarisation. Electrical Image—problem involving infinite conducting plane and thin conducting spherical shell only.

Magnetic shell, Langevin's and Weiss theory of dia, para and Ferro magnetism, Curie Law, Production and measurement of strong magnetic fields. Magnetic circuit and Electromagnets.

#### **GROUP-B**

#### **Current electricity, Modern Physics (6 Questions)**

Thermodynamic treatment of Seebeck, Peltier and Thomson effects and the application. Moving cell, a periodic and ballistic galvanometers, Growth and decay of currents in electric circuit. Oscillatory, discharge of condenser.

AC and DC circuits : Use of Vectors and complex quantities in AC. Circuit theory (LR, CR, AND LCR, circuits) De. Sauty's bridge, Anderson bridge, Carey Foster's bridge.

Measurement of charge by Milliken's method and specific charge of an electron by Thompson method, Natural radioactivity, Rutherford Soddy's theory of radio active decay, Geiger, Muller, counter. Discovery of Neutron Isotopes. Artificial radioactivity. Elementary ideas about nucleus and structure, Nuclear fission Reactors, Asters mass spectrograph, Photoelectric emission, Einstein's photoelectric equation, photo-conductive and photo-voltaic cells.

Compton effect, Bragg's law and determination of X-ray's wave length. Cathode ray oscilloscope and its uses in amplitude, frequency and phase measurements, Solid state rectifier. One stage R-C amplifier, Principle of amplitude modulation and demodulation, Radio receiver through block diagram.

#### **GROUP-C**

#### **OPTICS**

**(4 Questions)**

Fermate's principle, Newton's ring, Michelson's interferometer, Fresnel's diffraction at straight edge, Fraunhofer's diffraction, single slit, double slit, plane transmission, grating, Resolving power of microscope and telescope, Polarization, production of plane circularly and elliptically polarized lights, Nicol's prism. Quarter waveplate Half shade polarimeter Babinet's compensator.

Bohr's theory of hydrogen spectra, principle of laser action, Ruby laser. Maxwell equations, Equation of plane electromagnetic waves and its solution.

#### **PRACTICAL**

#### **PAPER-II**

**[ Full Marks : 30**

**Time : 6 Hours I**

The course shall include following experiments :

1. Refractive index by Spectrometer.
2. Wavelength by Newton's ring.
3. Wavelength by plane transmission grating.
4. Magnifying power of telescope.
5. Magnifying power of microscope.
6. Resolving power of telescope.
7. Did by (i) Dip circle (ii) Earth's inductor.
8. Figure of merit of moving Galvanometer.
9. B. G. Constant and Long decrement.
10. Measurements of low and high resistance.
11. Temperature variation of electrical resistance.
12. Characteristics of value and Semiconductor diodes.



The paper will be 12 and 14 respectively with 6 and 8 pages  
The following will be the subject matter:  
1. The history of the paper  
2. The history of the paper  
3. The history of the paper

Electronics and Magnetism

The following will be the subject matter:  
1. The history of the paper  
2. The history of the paper  
3. The history of the paper

GROUP 2

The following will be the subject matter:  
1. The history of the paper  
2. The history of the paper  
3. The history of the paper

The following will be the subject matter:  
1. The history of the paper  
2. The history of the paper  
3. The history of the paper

OPTICS

The following will be the subject matter:  
1. The history of the paper  
2. The history of the paper  
3. The history of the paper

PAPER 2

The following will be the subject matter:  
1. The history of the paper  
2. The history of the paper  
3. The history of the paper

The following will be the subject matter:  
1. The history of the paper  
2. The history of the paper  
3. The history of the paper