

U.G.C. MODEL

# GUIDE TO YOUR SYLLABUS

T. M. BHAGANPUR UNIVERSITY

THREE YEARS DEGREE COURSE

B.Sc. PART I

PASS/HONOURS

RS.50/-



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**मातृभाषा - मैथिली (अनिवार्य)**

बी० ए०/ बी० एस० सी/ बी० काम०

त्रिवर्षीय स्नातक खण्ड- एक में मातृभाषा मैथिलीक पूर्णांक 50 तथा परीक्षाक कालावधि डेढ़ घण्टाक होएत । परीक्षार्थी प्रश्नोत्तर देवनागरी वा तिरहुआ मै दए सकैत छथि ।

**अंक विभाजन :**

- |                                       |                                 |
|---------------------------------------|---------------------------------|
| (1) पाठ्य पुस्तक से आलोचनात्मक प्रश्न | - $7 \frac{1}{2} \times 2 = 15$ |
| (2) पाठ्य पुस्तक वस्तुनिष्ठ प्रश्न    | - $2 \times 5 = 10$             |
| (3) निबंध लेखन                        | - $10 \times 1 = 10$            |
| (4) व्याकरण ओ रचना                    | - $5 \times 2 = 10$             |
| (5) तिरहुता लेखन                      | - $5 \times 1 = 05$             |

**निर्धारित ग्रंथ :**

- (i) अत्याधुनिक मैथिली गद्य - डॉ० बिष्णु किशोर झा वेचन भारत बुक डिपो, भागलपुर ।  
(ii) व्याकरण पाठ्यांश :-तद्धित, कृदन्त, प्रत्यय, उपसर्ग, पर्यायवाची शब्द, सन्धि विच्छेद, अनेक शब्दक हेतु एक शब्द, मुहावरा ओ लोकोक्ति ।

**अभिस्तुत ग्रंथ -** (1) मैथिली व्याकरण ओ रचना - युगेश्वर झा, भारती भवन, पटना  
(2) मिथिलाक्षर शिक्षा - आद्या झा मैथिली अकादमी, पटना

**M.B. URDU (Composition)**

B.A. / B.Sc. / B.Com. Part-I (for Non- Hindi Students)

Time: 1.30 Hours

Full Marks 50

There shall be one paper of fifty marks. Distribution of Marks will be as follow :

- |  |      |
|--|------|
| 1. Summary and substance writing of the passages from text prescribed 10 (Marks (Prose) + 10 Marks (Poetry)) | = 20 |
| 2. One essay on General topic  | = 10 |
| 3. Grammar (Azdad, Jins & Mahavrat)  | = 10 |
| 4. Objective type questions from text-5 x2   | = 10 |

**Books Prescribed :** (i) Adabiyat- Compiled by Dr. Abdul Wassey & Qamar Azam

Hashimi Following Portions only :

1. Prose- Page 6 to 46 2. Poetry Page 141 to 146 3. Ghazal Page 168 to 174  
2. Tarz-i-Nigarish- By Sachidanand Sinha.

**M.B. ENGLISH**

(For those students not offering a full paper of Hindi as a compulsory subject)

**PAPER-I**

Duration of examination : 1.30 hrs.

Full Marks-50

**A. Poetry**

The Book Prescribed :-

**THE MYSTIC DRUM** : Eds. Vilas Salunke : Etal Orient Longman

**The Poems Prescribed :**

- |                        |   |                |
|------------------------|---|----------------|
| 1. Men Call you Fayre  | : | E. Spenser     |
| 2. The Invocation      | : | J Milton       |
| 3. The Sunne Rising    | : | J Donne        |
| 4. Easter Wings        | : | G Herbert      |
| 5. To His Coy Mistress | : | A Marveell     |
| 6. Kubla Khan          | : | S.T. Coleridge |
| 7. My Last Dukes       | : | R Browning     |
| 8. Journey of the Magi | : | T.S. Eliot     |



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9. Sailing to Byzantium : W.B. Yeats  
10. Swan and Shadow : J. Hollander

B. Fiction The book prescribed : **Where Angels Fear to Tread** :- E.M. Forster

C. Comprehension

*The Books Recommended*

COMPREHENSION EXERCISE FOR COLLEGE : M.Q. Towheed (Orient Longman)

D. Translation/Phonemic transcription

**The book recommended :**

1. The fourteenth/fifteenth edition of Daniel Jones's ENGLISH PRONOUNCING DICTIONARY
2. The Current edition of the ADVANCED LEARNER'S DICTIONARY
3. The Longman Dictionary of Contemporary English.

**Division of marks :**

1. One question with an alternative on poetry : 10 marks
2. One question with an alternative on fiction : 10 marks
3. One short comprehension passage followed by three Questions, two of which carrying three marks each and one carrying four marks (3+3+4) : 10 marks
4. A passage in English for translation into Hindi : 10 marks
5. Phonemic transcription of ten isolated words from the prescribed texts : 1x10 = 10 marks

## ENGLISH (Higher Standard)

(For non- Indian domicile students)

Duration of examination : 3 hrs. **PAPER- I**

Full Marks : 100

A. Poetry – The book prescribed : **THE NEW GOLDEN TREASURY** Eds. R.C. Prasad and M.Q. Towheed (Motilal Banarsidas)

**The Poems prescribed :**

- |                             |   |                      |
|-----------------------------|---|----------------------|
| 1. A Renouncing of Love     | : | Sir Thomas Wyatt     |
| 2. Prothalamion             | : | Edmund Spenser       |
| 3. Loving in Truth          | : | Sir Philip Sidney    |
| 4. Cleopatra                | : | William Shakespeare  |
| 5. If It Were Done          | : | William Shakespeare  |
| 6. The Pulley               | : | George Herbert       |
| 7. Go, Lovely Rose          | : | Edmund Waller        |
| 8. The Scholar's Life       | : | Samuel Johnson       |
| 9. The Tiger                | : | William Blake        |
| 10. Books and Nature        | : | William Wordsworth   |
| 11. Kubla Khan              | : | S.T. Coleridge       |
| 12. Ode to the West Wind    | : | P. B. Shelley        |
| 13. Ode to a Nightingale    | : | John Keats           |
| 14. The Brook               | : | Alfred Lord Tennyson |
| 16. God's Grandeur          | : | G. M. Hopkins        |
| 17. The Wild Swans at Coole | : | W.B. Yeats           |
| 18. Gerontion               | : | T.S. Eliot           |
| 19. Strange Meeting         | : | Wilfred Owen         |
| 20. Affinity                | : | R.S. Thomas          |

B. A Long Poem The text Prescribed : **THE EVE OF ST AGNES** : John Keats

C. A Modern Play The text Prescribed : **ALL MY SONS** : Arthur Miller



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D. A Travelogue / An Anthology of Prose

The text Prescribed : A PASSAGE TO ENGLAND Nirad C. Choudhuri

**Division of marks**

A. One question to be answered from each of the four prescribed texts

15 x 4 = 60 marks

B. Explanation of two passages out of the prescribed texts containing two passages from each of them

10 x 2 = 20 marks

C. Objective type questions

20 marks

Total 100 marks

**BENGALI M. B. (COMPOSITION)**

Full Marks 50 B.A. / B.Sc. / B.Com. [Hons/Pass] PART - I Time: 1.30 Hours

**Distribution of marks :**

a. One Critical Question.

1 x 15 = 15

b. Ten Objective Type Question.

10 x 1 = 10

c. One essay

15

d. Grammer

10

**পাঠনীয় গ্রন্থসমীহ :**

১। কর্ণ কুন্তী সংবাদ - রবীন্দ্র নাথ ঠাকুর ।

২। সাহিত্য ও সাহিত্যিক - নারায়ন গঙ্গোপাধ্যায় ।

পাঠ্যাংশ, প্যারিচাঁদ - আলালের ঘরের দীলাল , কালী প্রসন্ন সিংহ , হুতোম

পাঁচার নক্সা, বিভূতিভূষনের শিল্পীসত্তা , তারাগংকরের সাহিত্যজগৎ ।

৩। ব্যাকরণ : লিঙ্গপরিবর্তন , বিপরীতর্থক শব্দ , এক কথায় প্রকাশ ।

বিশেষ দ্রষ্টব্য যে কোনো একটি পাঠ্যগ্রন্থ থেকে দশটি বস্তুনিষ্ঠ প্রশ্নের উত্তর দিতে হবে।

**B. SC. ( PHYSICS ) HONOURS**

**Introduction :-** The new syllabus for 3 year degree Honours and 3 year pass Course in Physics has been formulated in view of the U.G.C. guidelines contained in the booklet "UGC. Model Curriculum. 2001" A perusal of the UGC curriculum indicates that most of the contents in theory papers are already being taught in this University for the past several years. though there are differences in the U.G.C. pattern and the pattern being followed in this University. The U.G.C. Model curriculum has devised the Physics honours syllabus in 13 units. whereas in our yearly pattern of examination we are having seven theory papers only ( 2 in degree Part-I, 2 in degree part-II and 3 in degree part III). The new syllabus has been prepared so that the existing pattern may continue but almost all the contents/subject matters suggested in the Model curriculum are included. This has been made possible by compressing the subject matter/contents of about two units in one theory paper.

**PHYSICS HONOURS**

**PAPER - I**

This paper will be of 75 marks. Question I will contain ten objective questions and it will be compulsory. Four questions are to be set from Group A and Group B each. The candidates will be asked to answer two questions from each group. The questions will be of equal value.

**GROUP-A ( OPTICS AND LASER PHYSICS ) : Set 4 questions.**

Fermat's principle-mirror and lens formula. Cardinal points of a thick lens and thick lens formula.



Spherical and chromatic aberration and their reduction by combination of lenses.  
Ramsden's and Huygen's eyepieces.

Interference of light : The principle of superposition, two-slit interference, Coherence requirement for the sources, localised fringes in thin films, transition from fringes of equal thickness to those of equal inclination. Michelson interferometer : its uses for the determination of wavelength. wavelength difference and standardisation of the metre. Intensity distribution in multiple beam interference. Tolansky fringes Fabry-Perot interferometer and etalon.

Fresnel diffraction : Half-period zones, circular apertures and obstacles, straight edge, explanation of rectilinear propagation.

Fraunhofer diffraction : Diffraction at a slit, a circular aperture and a circular disc. Resolution of images; Rayleigh criterion, resolving power of a telescope and a microscope, outline of phase contrast microscopy.

Diffraction grating, Diffraction at N parallel slits plane diffraction grating, concave grating, resolving power of grating and prisms.

Polarisation : Double refraction and optical rotation, double refraction in uniaxial crystals, explanation in terms of e.m. theory, phase retardation plates. Rotation of plane of polarisation, origin of optical rotation in liquids and in crystals.

Dispersion and scattering : Theory of dispersion of light, absorption bands and anomalous dispersion. Theory of Rayleigh scattering, scattering of X-rays and determination of Z of an atom.

Laser System : Purity of a spectral line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients; Coherence of a induced emissions. Conditions for laser action, existence of a metastable state, population inversion by pumping and cavity, Ruby laser, He-Ne laser.

### GROUP-B

( Electrostatics and Magnetism, Waves and Oscillation ) Set 4 questions.

Electric field : Coulomb's law Unit of charge (SI and other systems). Conservation and quantisation of charge, field due to different charge distributions., monopole, dipole, quadrupoles, linecharge, sheet charge, Torque on a dipole in uniform field and non-uniform fields, flux of an electric field. Gauss' Law; application to deduce E fields, force per unit area on the surface of a charged conductor.

Potential : Line integral of electric field and electrical potential, field as the gradient of potential, potential energy of a system of charges, pair of charges, line charge, sheet charge, spherical shell of charge, Charged hollow disc. Field equations for E in vacuum. Energy associated with E field. Differential form of Gauss' law,  $\text{div } E = 4\pi\rho$  Poisson's equation, Laplace's equation, boundary conditions and Uniqueness theorems.

Electric field around conductors. Induced charges, field and potential inside a conductor, field near the surface of a conductor, method of images.

Electric fields in matter : Atomic and molecular dipoles, polarisability tensor, electronic and molecular contributions. Electric field caused by polarised matter, E and D fields, permittivity, dielectric constant. Capacitor filled with a dielectric, field equations in presence of dielectric. The field of a polarised sphere, dielectric sphere in a uniform field. Energy in dielectric systems, polarisability and susceptibility, frequency dependence of polarisability, Clausius Mossotti equation.

Magnetic field : Magnetic field B seen through Lorentz force on a moving charge,



unit for B defined through force on a straight current, torque on a current loop in B field, magnetic dipoles in atoms and molecules, gyromagnetic ratio.

Magnetic field due to currents. Bio and Savart's law. Field equations in magnetostatics, Ampere's law. Fields due to a straight wire, magnetic dipole, circular current and solenoid, Magnetic fields in matter.

Magnetising current, magnetisation vector, H and B fields, magnetic permeability, susceptibility, Comparison of magnetostatics and electrostatics, Field equations for E, D, and H.

Properties of ferromagnetic materials, Langevin's and Weiss theories of diamagnetism, paramagnetism and ferromagnetism.

Differential equation of a wave, Equation of Progressive waves, stationary waves. Compression waves in fluids and in extended solids.

Free, damped and forced oscillations in one dimension. Fourier series, and its applications to rectangular and sawtooth waves. Vibration of a string.

Intensity and loudness of sound and their measurements. Acoustics of buildings.

### PHYSICS HONOURS PAPER - II

This paper will be of 75 marks. Question I will contain ten objective questions and it will be compulsory. Four questions are to be set from group A and group B each. The candidates will be asked to answer two questions from each group. The questions will be of equal value.

**GROUP-A ( Heat and properties of Matter ) :** Set 4 questions.

Derivation of Maxwell's law of distribution of velocities and its experimental verification. Equipartition of energy. Mean free path.

Transport phenomena : Viscosity, conduction and diffusion, Brownian motion-Langevin and Einstein's theories and experimental determination of Avogadro's number.

Rectilinear flow of heat in a metal rod, conductivity by periodic flow method. Relation between thermal and electrical conductivities. Vander Waal's equation of state,

Gravitational potential and field due to bodies of regular geometrical shapes like sphere, hemisphere, circular disc, rod and cone. Motion in central field, Kepler's laws, two particle motion in a central field. Elasticity and elastic constants, relations among elastic constants, Bending of beams and cantilevers. Torsion of a cylinder and rigidity modulus, flat spiral spring, effect of temperature and pressure on elasticity.

Surface tension and surface energy, principle of virtual work and its application to surface tension. Ripples and gravity waves, determination of surface tension by the method of ripples. Effect of temperature on surface tension.

Hydrodynamics Equation of continuity, Euler's equation, Bernoulli's equation, Kelvin-Helmholtz theorem on vorticity. Viscosity of fluids, critical velocity, Poiseuille's formula with correction. Flow of a compressible fluid through a narrow tube-viscosity of gases, Rankine's method. Effect of temperature and pressure on viscosity.

**GROUP-B ( THERMODYNAMICS ) :**

Set 4 questions.

Zeroth law of thermodynamics, definition of temperature, first and second laws of thermodynamics. Carnot's engine and Carnot theorem. Absolute scale of temperature. Clausius' inequality. Entropy, entropy changes in reversible and irreversible process. Enthalpy, Helmholtz and Gibbs' functions, Gibbs-Helmholtz equations. Maxwell's equations and their application to simple physical problems.

Thermodynamics description of phase transition, chemical potential. Latent heat of transition. Clapeyron equation. Ehrenfest scheme of phase transition.



Joule-Thomson effect, liquefaction of gases with special reference to hydrogen and helium. Production and measurement of low temperatures. Blackbody radiation, Kirchoff's law, Stefan's law, Wien's Law. Planck's law and its experimental verification. Einstein and Debye theories of specific heat of solids.

### PRACTICAL PAPER

Full Marks-50

Time - 6 hours

The syllabus shall include the following experiments :

1. 'g' by Kater's pendulum.
2. Young's modulus by flexure of beam.
3. Elastic constants by Searle's method.
4. Rigidity modulus by (i) Barton's apparatus (ii) Maxwell's needle.
5. Moment of inertia by fly-wheel.
6. Surface tension by Jaeger's method.
7. Surface tension by the method of ripples.
8. Surface tension by soap bubble.
9. Viscosity of water by capillary flow method.
10. Viscosity of air by Rankine's method.
11. Viscosity of liquid by Stoke's method.
12. Laws of transverse vibrations of string by a sonometer.
13. Frequency of a tuning fork by Melde's experiment.
14. Velocity of ultrasonic waves in a liquid.
15. "Gamma" of a gas by constant pressure thermometer.
16. "Gamma" of a liquid by sinker method.
17. Specific heat of solid by radiation correction.
18. Specific heat of liquid by cooling method.
19. Thermal conductivity of copper.
20. Thermal conductivity of ebonite by Lee's disc method.
21. 'J' by Joule's calorimeter.

### PHYSICS ( GENERAL/SUBSIDIARY ) COURSE

#### PAPER - I (Theory)

Time - 3 hours

Full Marks -75

Pass Marks - 23

The question paper will consist of groups A, B, C, and D. Group A will have ten objective questions which will be compulsory. Group B will contain four questions from Relativity, Mechanics and Properties of Matter. Group C will contain two questions from Waves and Acoustics and group D will contain three questions from Thermal Physics. The examinees will be required to answer four questions from groups B, C and D, selecting at least one from each group.

#### GROUP - A ( Objective Questions )

#### GROUP - B ( Relativity, Mechanics, properties of Matter ) : 4 questions.

Galilean transformation, Inertial frame of reference, Michelson-Morley experiment, Lorentz, Fitzgerald Contraction Einstein's postulates, Lorentz transformation and its Consequences, Length contraction and time dilation. Addition of velocities. Relativistic Doppler effect on propagation of light waves, variation of mass with velocity. Mass energy relation.

Inertial and non-inertial frames of reference; coriolis and centrifugal forces and their simple applications. Motion in Central field. Kepler's laws. Generalised coordi-



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nates. Constraints (Holonomic and non-holonomic ) Lagrangian equation of motion and its simple applications.

Elasticity and elastic constants. Relation between elastic Constants. Bending of beams and Cantilevers, Torsion of a cylinder and rigidity modulus by flat spiral spring. Effect of temperature and pressure on elasticity.

Surface tension and surface energy. Ripples and gravity waves; surface tension by the method of ripples; Effect of temperature and pressure on surface tension.

Perfect fluids, equation of Continuity Euler's equation for a perfect fluid, Bernoulli's equation.

Viscosity of fluids critical velocity. Poiseuille's formula with correction. Flow of a compressible fluid through a narrow tube; viscosity of gases; Rankine's method Effect of temperature and pressure on viscosity.

#### GROUP - C ( Waves and Acoustics ) :

2 questions

Differential equation of a wave, equation of progressive waves. Stationary waves. Compression waves in fluids and extended solids.

Free, damped and forced oscillations Fourier analysis Vibration of strings. Intensity and Loudness of sound and their measurements Acoustics of building, Ultrasonics.

#### GROUP - D ( Thermal Physics ) :

3 questions

Maxwells law of distribution of Velocities and its experimental verification; Degrees of freedom and equipartition of energy. Mean free path and its experimental determination; Perfect gas equation and Vander Waals equation of state. Law of thermodynamics, absolute scale of temperature. Carnot's theorem and Carnot's cycle Entropy and its Calculation in simple cases. Thermodynamic relations and their applications to simple physical problem. Clausius-Clayperon equation. Joule-Thomson effect, Liquefaction of gases with special reference to Helium, superfluidity in liquid helium.

Kirchhoff's law and black body radiation, Stefan-Boltzmann law its deduction and experimental verification.

#### PAPER-II ( PRACTICAL )

Time - 3 hours

• Full Marks -25

Pass Marks - 10

The syllabus shall include the following experiments :-

1. Determination of  $g$  by bar pendulum.
2. Determination of Young's modulus by flexure of beam.
3. Modulus of rigidity by (i) statical method, (ii) dynamical method.
4. Moment of inertia by inertia table.
5. Surface tension by capillary rise method.
6. Viscosity of liquid by capillary flow method.
7. Viscosity of liquid by Stokes method.
8. Determination of " $\gamma$ " by constant pressure thermometer.
9. " $\gamma$ " of liquid by sinker method.
10. Specific heat of solid with radiation correction.
11. Specific heat of liquid by method of cooling.
12. Thermal Conductivity of Copper.
13. Thermal Conductivity of ebonite by Lee's disc method.
14. ' $J$ ' by Joule's Calorimeter.
15. Frequency of tuning fork by Melde's experiment.



## CHEMISTRY HONOURS

### PAPER-I (THEORY) PHYSICAL CHEMISTRY

Time - 3 hours

Full Marks -50

In all nine questions are to be set - The question no 1 will be objective (10 marks) and will screen the entire paper. Students will be required to answer five questions of which question 1 will be compulsory

#### ( I ) Mathematical Concepts & Computers :-

##### ( A ) Mathematical Concepts :-

Logarithmic relations, curve sketching linear graphs & calculations of slopes, differentiation of functions like  $kx$ ,  $e^x$ ,  $x^n$ ,  $\sin x$ ,  $\log x$ , maxima & minima, partial differentiation & reciprocity relations. Integration of some useful/relevant functions, permutations & Combinations. Factorials, Probability.

##### ( B ) Computers :-

General introduction to Computers different Components of a Computer, hardware & software, input-output devices, binary numbers & arithmetic, introduction to Computer languages, Programming, Operating systems.

#### ( II ) Gaseous States :-

Postulates of kinetic theory of gases, deviation from ideal behaviour, Vander Waals equation of state.

**Critical Phenomena :-** P.V. isotherms of real gases, Continuity of states, Vander Waals eqn, relationship between Critical Constants & Vander Waals Constants, the law of Corresponding state, reduced equation of State.

**Molecular Velocities :-** Root mean square, average & most probable Velocities Qualitative discussion, of the Maxwell's distribution of molecular Velocities Collision number, mean free path & collision diameters,

#### ( III ) Solid States :-

Definition of space lattice, unit cell. Law 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 eqn. Determination of crystal structure of NaCl, KCl & CsCl (Laue's method & powder method)

#### ( IV ) Colloidal States:-

Definition of colloids Classification of colloids Solids in liquids (Sols); properties-kinetic optical & electrical, stability of colloids, protective action. Hardy-Schulze law, gold number.

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

Liquids in Solids (Gels; Classification preparation & properties, general applications of colloids.

#### ( V ) Chemical Kinetics & Catalysis :-

Chemical kinetics its scope rate of a reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst, Concentration dependence of rate; mathematical characteristics of simple chemical reactions-zero order first order second order, Determination of the order of reaction differential method, method of integration. method of half life period and isolation method.

Experimental methods of chemical kinetics, conductometric, potentiometric, optical methods, polarimetry & spectrophotometer.



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Theories of chemical kinetics. effect of temp. on rate of reaction, Arrhenius equation, concept of activation energy.

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

Catalysis, characteristics of catalysed reactions. Classification of catalysis, miscellaneous examples. Enzyme catalysis.

## PAPER - II (THEORY) INORGANIC CHEMISTRY

Time - 3 hours

Full Marks -50

In all nine questions are to be set - The question no 1 will be objective (10 marks) and will screen the entire paper. Students will be required to answer five questions of which question 1 will be compulsory.

### ( I ) Atomic Structure :-

Idea of de Broglie matter waves. Heisenberg's uncertainty principle, atomic orbitals. Schrodinger's wave equation, significance of  $\psi$  and  $\psi^2$ , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, and d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule, Electronic configurations of the elements, effective nuclear charge.

### ( II ) Periodic Properties :-

Atomic and ionic radii, ionization energy, electron affinity and electronegativity- definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

### ( III ) Chemical Bonding :-

( A ) 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 (VSEPR) theory to  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{SF}_6$ ,  $\text{ClF}_3$ ,  $\text{ICl}_2$ , and  $\text{H}_2\text{O}$ , MO theory, homonuclear and heteronuclear CO and NO ) diatomic molecules, multicenter bonding in electron deficient molecules, strength bond and bond energy, percentage ionic character from dipole moment and electronegativity difference.

( B ) Ionic Solids - Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule. Metallic bond-free electron, valence bond and band theories.

(C) Weak Interactions - Hydrogen bonding, vander Waals forces.

### ( IV ) s-Block Elements :-

Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies an introduction to alkyls and aryls.

### ( V ) p-Block Elements :-

Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16, hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

### ( VI ) Acids and Base :-

Arrhenius, Bronsted-Lowry, Lux-Flood, Solvent system and Lewis concepts of acids and bases.



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## PAPER - II (THEORY) ORGANIC CHEMISTRY

Full Marks -50

Time - 3 hours

In all nine questions are to be set - The question no 1 will be objective (10 marks) and will screen the entire paper. Students will be required to answer five questions of which question 1 will be compulsory

### 1. Bonding and structure :-

Hybridisation ( $sp^3$ ,  $sp^2$  and  $sp$ ), Orbital picture of Ethane, Ethene, Ethyne, Allene, 1, 3 - Butadiene, Benzene, Conjugation and aromaticity, Bond angle, Bond energy Vanderwaal's interaction.

Structure of  $CH_3^+$ ,  $CH_3^-$  &  $CH_2^-$ .

Hydrogen bond, Inclusion compounds, Clathrates and charge transfer complex.

### 2. Mechanism of Organic Reactions :-

Fission of Covalent bonds, Reaction intermediates-Carbocation, Carbanions, free radicals, Carbene arynes, ylides and nitrenes.

Formation and stability (Selectivity), Reagents Electrophiles and nucleophiles Formation and reactivity), Types of organic reactions Kinetics, Energy considerations. Kinetically and thermodynamically controlled products, Methods of determining of reaction mechanism (Products, intermediates, Stereo-chemistry, Kinetics, Catalysis and Solvent effects, substituent effects, isotope effects).

Localised and delocalised bonds. Resonance, Hyperconjugation, inductive effect, Field effect, steric effect. Mechanism of free radical halogenation of alkanes, orientation, Dehydration of alcohols involving regioselectivity, Electrophilic addition to alkene, 1, 2 and 1, 4 additions to butadienes, Dehydrohalogenation of alkyl halides, Electrophilic and nucleophilic addition to alkynes.

### 3. Synthetically useful reactions and reagents :-

Ozonolysis, Hydration, Hydroxylation, Hydroboration and Oxidation Epoxidation, Oxymercuration-Reduction Oxidation with  $KMnO_4$ ,  $KHO_4$ ,  $Pb(OAc)_4$ ,  $SeO_2$ , & NBS.

Birch reduction, Diels Alder Reaction, Markovnikov's rule, Aldol Condensation Cannizzaro Reaction. Pinacol-Pinacolone Rearrangement, Hofmann bromamide Reaction.

### 4. Stereochemistry and Baeyer's strain theory.

### 5. Alcohol :-

Glycerol-Physical properties. Chemical Reactions and structure, Allyl alcohol.

### 6. Organometallic Compounds :-

The Grignard Reagent and Organozinc Compounds.

### 7. Organosulphur Compounds :- Nomenclature, structural features, Methods of formation and chemical reactions of thiols and thioethers.

### 8. Aldehydes & Ketones :- Methods of Preparation, important reactions, Polar nature of $>C=O$ group.

### 9. Monocarboxylic acids and Dicarboxylic acids.

### 10. Problems based on Ag Salt method, Chloroplatinic acid method and organic reactions.

### 11. Organic compounds containing 'N' atom - Urea and Aliphatic amines.

## CHEMISTRY HONS. PRACTICAL

Time - 3 hours

Full Marks -50

- Qualitative inorganic analysis of mixtures Containing six radicals e.g. those given below but one interfering radical must be there :



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**Basic radicals**  $\text{Ag}^+$ ,  $\text{Hg}^{+2}$ ,  $\text{Pb}^{+2}$ ,  $\text{Bi}^{+3}$ ,  $\text{Cd}^{+2}$ ,  $\text{Sb}^{+2}$ ,  $\text{Sn}^{+4}$ ,  $\text{Fe}^{+2}$ ,  $\text{Al}^{+2}$ ,  $\text{Cr}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Co}^{+3}$ ,  $\text{Zn}^{+2}$ ,  $\text{Mn}^{+2}$ ,  $\text{Ca}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Mg}^{+2}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ ,  
**Acid radicals** :  $\text{CO}_3^{-2}$ ,  $\text{SO}_4^{-2}$ ,  $\text{SO}_2^{-2}$ ,  $\text{S}^{-2}$ ,  $\text{NO}_3^-$ ,  $\text{NO}_4^-$ , Halides, Oxalate, Acetate, Borate, Phosphate.

2. Preparation of organic compounds : (any one) 16
  - (a) Acetylation of salicylic acid, aniline and p-toluidine.
  - (b) Benzoylation : Preparation of benzanilide and benzoyl derivative of p-toluidine.
  - (c) Nitration : Preparation of p-nitroacetanilide, picric acid and m-dinitrobenzene.
  - (d) Reduction - Preparation of m-nitroaniline from m-dinitrobenzene.
  - (e) Oxidation : Preparation of
    - (i) benzoic acid from benzaldehyde, and (ii) anthraquinone from anthracene.
  - (f) Esterification : Preparation of ethyl benzoate.

3. Viva and Note book 10

## CHEMISTRY GENERAL/SUBSIDIARY COURSE

### PAPER I (THEORY)

Time - 3 hours

Full Marks -75

1. There shall be three groups -Group A (Physical), Group B (Inorganic) and group C (Organic) each carrying 25 marks. Each group shall contain four questions out of which two are to be answered. Six questions are to be answered in all.

### GROUP-A PHYSICAL CHEMISTRY

1. Gaseous state : Kinetic theory of Gases - Postulates, Kinetic Gas Equation, Deduction of Gas Laws from Kinetic Gas Equation, R.M.S. Velocity, Average velocity and Kinetic Energy of gas Molecules, Deviations from Ideal Behaviour, vander Waal's Equation of State.
2. Chemical Equilibrium : Law of Mass action and its Kinetic derivation. Equilibrium Constant, Relation between  $K_p$ ,  $K_c$  and  $K_x$ .
3. Dilute Solutions : Colligative properties : Osmosis and Osmotic pressure. Lowering of vapour pressure, Elevation of boiling point of solutions, Depression of freezing point of solutions, Experimental determination of Colligative properties, the related laws and applications. Abnormal colligative properties of solutions.
4. Thermodynamics :  
 Thermodynamic terms, Work, Heat and Energy. The First Law of Thermodynamics, Enthalpy, Heat Capacities  $C_p$ ,  $C_v$  Relation between  $C_p$  and  $C_v$  Adiabatic Changes in state, Relation between P-V, V-T and P-T for adiabatic changes for ideal gases, Work done in isothermal processes.
5. Thermochemistry : Hess, Law, Kirchhoff Law, Bond Energies and their calculation.

### GROUP-B INORGANIC CHEMISTRY

1. **Atomic Structure** :- Bohr's atomic model and introduction of spectral lines of hydrogen atom. Bohr - Sommerfeld model of atom. Introduction to four Quantum numbers. Aufbau Principle, Pauli's exclusion Principle, Hund's rule. Electronic configuration of the elements and effective nuclear charge.
2. **Periodic Properties** :- Periodicity of Properties in atomic, ionic and Vanderwaal's radii, ionisation Potential, electron affinity, Electronegativity and their application in predicting and explaining the Chemical behaviour.
3. **Chemical Bonding** :- Ionic Bond : Important factors favouring the formation of ionic bond Properties of ionic solids, ionic structures, radius ratio effect and Co-ordination number, Limitation of radius ratio rule, lattice defects.



lattice energy and Born-Haber cycle. Polarization of ionic and Fajan's rule. Metallic bond-Free electron, valence bond and band theory.

#### 4. S-and P-Block Elements :-

Comparative study of S and P-block elements with special reference to diagonal relationship, salient features of hydrides, Oxides, Oxyacids, halides and solvation tendency.

5. The Chemistry of the following individual elements :

**GROUP-II Beryllium and Radium :-** Occurance, Extraction, Properties, uses and important compounds.

**GROUP-III Boron :-** Occurance, isolation, properties, Uses and its compounds like Borax, Halides and hydrides. Chemistry of borax bead test.

**GROUP-IV Tin and lead :-** Occurance, Extraction, Properties, uses and their important compounds. Lead Pigments, plumbo solvency, inert pair effect.

### GROUP-C ORGANIC CHEMISTRY

- (a) Shape and structure of Organic compounds Tetravalency of carbon :  
Hybridisation ( $sp^3$ ,  $sp^2$ ,  $sp$ )
- (b) Classification and nomenclature of Organic compounds.
- Elementary idea of electron displacement effects, Inductive effect, electromeric effect.
- Alcohol : Classification, nomenclature. distinction between different types of alcohols, Trinarydric alcohol : Glycerol.
- Aldehydes and ketones : General method of preparation, properties, electronic nature of  $>C=O$  group.
- Carboxylic acids : General methods of preparation properties of monocarboxylic acids, their derivatives ( ester, acid chloride, anhydride, amide ) Origin of acidic properties and electronic nature of  $-COOH$  group and its derivatives.
- Amines : (i) Classification (ii) preparation (iii) properties (iv) separation (v) distinction (iv) origin of basic properties and effect of substituents.

### PRACTICAL

Time - 3 hours

Full Marks -25

- Qualitative inorganic analysis of mixtures Containing four radicals :  
Basic radicals  $Ag^+$ ,  $Hg_2^{+2}$ ,  $Pb^{+2}$ ,  $Cu^{+2}$ ,  $Hg^{+2}$ ,  $Bi^{+2}$ ,  $Cd^{+2}$ ,  $Sb^{+3}$ ,  $Sn^{+2}$ ,  $Sn^{+4}$ ,  $Fe^{+2}$ ,  $Fe^{+3}$ ,  $Al^{+3}$ ,  $Cr^{+3}$ ,  $Ni^{+2}$ ,  $Co^{+2}$ ,  $Zn^{+2}$ ,  $Mn^{+2}$ ,  $Ca^{+2}$ ,  $Ba^{+2}$ ,  $Sr^{+2}$ ,  $Mg^{+2}$ ,  $Na^+$ ,  $K^+$ ,  $NH_4^+$   
Acid radicals :  $CO_3^{-2}$ ,  $SO_3^{-2}$ ,  $S^{-2}$ ,  $SO_4^{-2}$ ,  $NO_3^-$ ,  $NO_5^{-2}$ , Halides, 12
- Organic Preparation : Preparation of Organic Compound by using following reactions : 8
  - acetylation of aniline and p-toluidine.
  - nitration of nitrobenzene.
  - oxidation of benzaldehyde and
  - hydrolysis of esters, like ethyl benzoate and methyl Salicylate. 5
- Record of Class Work and Viva-voce.

### BOTANY HONOURS

#### PAPER - I (Theory)

In all ten questions are to be set. Question I shall be objective. (1 x 15 marks) and will screen the entire paper. Students will be required to answer five questions, at least one from each group. Question I will be Compulsory.



**Diversity, Systematics and Biology of Non-Vascular Plants.**

Time - 3 hours

Full Marks -75

**GROUP - A**

**ALGAE**

1. Occurrence and distribution.
2. Thallus organizations and Evolutionary tendencies.
3. Ultra structure of Algal cell.
4. Criteria for classification.
5. Algae in relation to human welfare.
6. Typical life history of the following : Volvox, Oedogonium, Coleocheate, Vaucheria, Ectocarpus, Sargassum, Polysiphonia, Nostoc, Rivularia

**GROUP - B**

**FUNGI**

1. Occurrence.
2. Cell wall composition.
3. Modern concepts in classification of Fungi.
4. Nutrition.
5. Role of fungi in human welfare.
6. Typical life history of : Pythium, Phytophthora, Mucor, Saccharomyces, Eurotium, Peziza, Puccinia. Agaricus, Alternaria, Colletotrichum.
7. General account of lichen.

**GROUP - C**

**BRYOPHYTA**

1. Classification of Bryophyta.
2. Evolutionary trends in Gametophyte and sporophyte in Bryophyta.
3. Economic importance of Bryophyta
4. Comparative account of morphology and reproduction in : Marchantia , Pellia , Anthoceros , Sphagnum and Funaria.

**PAPER - II (THEORY)**

In all ten questions are to be set. Question I will be objective. (1 x 15 marks) and will screen the entire paper. Students will be required to answer five questions, attempting at least one from each group. Question I will be Compulsory.

**Diversity, Systematics and Biology of Non-Vascular Plants.**

Time - 3 hours

Full Marks -75

**GROUP - A**

**PTERIDOPHYTA**

1. Classification, comparative study of morphology, anatomy and reproduction in : Psilotum, Lycopodium, Seleginella, Equisetum, Merselia, Pteris.
2. Stelar organization.
3. A general account of Rhynia, Sigillaria and calamites.
4. General distribution and Economic Importance.

**GROUP - B**

**GYMNOSPERMS**

1. Occurrence and distribution, classification and Economic Importance.
2. Vegetative organography and anatomy : Reproductive cycle - Sporophytes and Sporangia, Gametophytes, Fertilization, Embryogeny and Seed development of Cycas, Pinus, Taxus and Gnetum.
3. A geneal account of the following fossils : Lyginopteris, Cycadeoides, and Williamsonia.

**GROUP - C**

**ANGIOSPERMS**

1. System of classification - Benthem and Hooker, Engler and Pranti and Takhtajan's systems.
2. Modern taxonomy - Supporting evidence Taxonomy in relation to embryology, Palynology, Cytology, Secondary metabolites ( Chemotaxonomy )



3. Phylogeny of Angiosperm - A general account of Origin and Evolution of Angiosperm ( Special reference to Bennettitalean, Gnetalean and Herbaceous. Origin theories)
4. Important characters of the following Angiosperm families- Ranunculaceae, Magnoliaceae, Euphorbiaceae Acanthaceae, Amaranthaceae, Asclepiadaceae, Cucurbitaceae Poaceae and Cyperaceae.

### **BOTANY PRACTICAL**

Time - 6 hours

Full Marks -25

**Practicals based on Paper I and II :**

1. Study of plant materials as prescribed in Algae, Fungi, Bryophyta Pteridophyta Gymnosperm and Angiosperms.
2. Viva Voce
3. Practical records : Class work records, Herbarium Field Report/Excursion Report.

### **BOTANY**

Time - 3 hours

### **GENERAL/SUBSIDIARY**

Full Marks -75

Nine questions are to be set, two from each group Five to be answered selecting at least one from each group. Q. I will be compulsory (Objective/Short answered type).

#### **GROUP - A**

#### **Algae, Fungi and Microbiology :**

1. Structure, reproduction and life history of the following types :  
Volvox, Oedogonium, Vaucheria, Ectocarpus, Polysiphonia, Phytophthora, Peziza, Agaricus, Pucciniya, Ustilago.
2. A general account of bacteria, viruses and Cyanobacteria and their economic importance.
3. General account of Lichens.

#### **GROUP - B**

#### **Bryophytes and Pteridophytes**

1. Structure and reproduction of the following types :  
Marchantia, Anthoceros, Funaria, Lycopodium, Equisetum and Marsilea.

#### **GROUP - C**

#### **Gymnosperm and Angiosperm**

General account, Classification and Economic Importance of Gymnosperms.

1. Morphology, Anatomy and reproduction of Cycas Pinus.
2. Classification of angiosperm with special reference to system of Bentham and Hooker and Engler and Prantle & Binomial nomenclature. contribution of phytochemistry and Cytology to taxonomy.
3. An account of the diagnostic features and economic importance of the following families:- Ranunculaceae, Acanthaceae, Apocynaceae, Lamipaceae, Euphorbiaceae, Asclepiadaceae and Poaceae.

#### **GROUP - D Utilization of Plants**

1. Food plants - Rice, Wheat, Maize, Potato, Sugarcane.
2. Fibre - Cotton and Jute, vegetable oils - groundnut, mustard, Coconut.
3. General account of Fire wood, Timber, spices, baverages, rubber.

### **BOTANY PRACTICAL**

Time - 3 hours

Full Marks -25

1. Temporary slide preparation and the morphological and Structural details of the genera prescribed in Gr. A, B & C ( One from each group ).
2. Description of angiospermic plant belonging to the families prescribed in course. Identification upto the family level.



3. Viva voce.

4. Class Record.

**ZOOLOGY HONOURS PART - I**  
**PAPER - I (Theory) ( BIODIVERSITY )**

Full Marks -75

Time - 3 hours

In all nine questions are to be set out of which Question I shall be objective. (1 x 15 marks) which will screen the entire paper. Students will be required to answer five questions, of which Question I will be Compulsory.

- I 1. Origin of life. Characteristics and diversity of prokaryotes.
2. Origin of Protists and characteristic of protozoan protists.
- II Bionomics, characteristic features and classification of the following groups : (up to class). Porifera, Cnidaria, Platyhelminthes, Mollusca, Annelida and Arthropoda.
- III Anatomical details and life cycle of the following types.
  1. Protozoan Protists : Paramecium caudatum, Leishmania, donovani, Entamoeba, histolytica, Polystomella, Giardia, Euglena.
  2. Origin of animals (Metazoa) and characteristics of animal body organization.
  3. Porifera : Histology, canal system skeleton and reproduction in sponges.
  4. Cnidaria : Obelia and Aurelia, coral formation and coral reefs.
  5. Ctenophora : General organisation of Hormiphora.
  6. Platyhelminthes : Structure and life cycle of Taenia solium, and Fasciola hepatica.
  7. Aschelminthes : Structure and life cycle of Ascaris lumbricoides, Wuchereria bancrofti.
  8. Mollusca : Unio, Pila and torsion and detorsion in gastropods.
  9. Annelida : Pheretima posthuma. Metamerism and locomotion.
  10. Onychophora : Peripatus and its affinities.
  11. Arthropoda : Larval forms of crustacea, Sacculina and Mouth parts and life cycle of insects.

**PAPER - II (Theory)**

( Animal Diversity [contd.], Ecology & economic Zoology )

Time - 3 hours

Full Marks -75

In all nine questions are to be set. (four from each group). Question I shall be objective. (1 x 15 marks) and will screen the whole syllabus of this paper. Examinees will be required to answer five questions. attempting two from one group. Question I will be Compulsory.

**GROUP - A**

- I Bionomics characteristics features and classification of the following enterocoelomate phyla (up to class only)  
Echinodermata and Hemichordata.
- II. Elementary idea of lophophorate phyla.
- III. Major characteristic features, bionomics and life cycle of the following types / phyla.
  1. Echinodermata : Asterias. Larval forms of echinoderms.
  2. Hemichordata Balanoglossus : Affinities of Hemichordata.

**GROUP - B**

**III. ECOLOGY**

1. Concepts of Biosphere ( atmosphere, hydrosphere and lithosphere)  
Biogeochemical cycles.



2. Ecosystem definition, structure, and function of a typical (pond) ecosystem, Energy flow.
3. Elementary idea of biomes (=Major ecosystems of the world such as polar, grass land, desert and forest ecosystem.)
4. Community structure and its ecological succession.
5. Pollution and its hazards at national and global levels.
6. Conservation of wild life in India.

#### IV. ECONOMIC ZOOLOGY

1. Sericulture, apiculture, composite carp culture and prawn culture.
2. Three important pests of paddy, wheat fruits and vegetable and their control.

#### PRACTICAL PAPER (COVERING PAPERS I AND II)

Time - 6 hours

Full Marks -50

##### I Dissection :

10

1. Alimentary canal, Reproductive organs and nervous system of Pheretima.
2. Nervous system of prawn.
3. General anatomy and reproductive organs of cockroach.
4. Organs of pallial complex, alimentary canal and nervous system of pila.
5. Alimentary canal and nervous system of Unio.

##### II Carmine stained permanent preparation of the following :

6

Paramecium, gemmules, spicules, Obelia colony, nephridia and ovary of Pheretima, statocyst of prawn, Osphradium, radula and gill of Pila, gill of Unio, Glochidium, larva, larva of crustacea and Echinodermata Pedicellaria.

##### III Spotting :

9 x 2 = 18

1. Museum specimens-3
2. Any one appendage of prawn showing sexual dimorphism-1
3. Histological slides-4 out of the following 30 slides (Head/Principal has the responsibility that these slides must remain in the custody of the department and shown to the students.

Paramecium (W.M.& conjugation), Polystomella, Sycon (T.S.) Gemmule and spicules, Obelia medusa, scyphistoma and Ephyra of Aurelia, Scolex and mature proglottid of Taenia Miracidium, Redia and Cercaria larva. T. S. of Fasciola, T. S. of male and female. Ascaris, T. S. of Earthworm passing through pharynx. gizzard, seminal vesicle, clitellus, and typhlosole, Zoea larva, T. S. of Peripatus, Glochidium, larva and T. S. of the gill of Unio, Bipinnaria larva, Pedicellaria, Echinopluteus larva, T. S. of Balanoglossus through Proboscis, Collar, trunk, hepatic region, T. S. of arm of starfish.

4. One of the following specimens relating to economic Zoology-1  
Life cycle stage of silkworm, sealing wax, beehive, Prawn, Labeo, rohira, Wallago attu, Channa punctate, Puntius stigma, Silver/common carp.

##### IV Ecology

6

1. Analysis of soil and pond biota.
2. Determination of dissolved  $O_2$  in pond water provided (at least one set of instruments for each batch of 5 students.

##### V Class work record (Regularly signed record be given due credit)

5

##### VI Field work and viva related to the subject matter covered in this practical paper

5



## ZOOLOGY GENERAL/SUBSIDIARY

### PAPER - IA (Theory)

Time - 3 hours

Full Marks -75

Pass Marks -25

Four questions are to be set from each group Students are required to answer five questions attempting not more than two from one group. Question. I shall be objective (1 x 15 and Compulsory and will screen the entire paper.

#### GROUP - A

1. Bionomics, general characters and classification (up to class) of the following groups, Protozoan protists. Porifera, Cnidaria. Platyhelminthes, Aschelminthes, Mollusca, Annelida, Arthropoda, Echinodermata and Hemichordata.
2. Structure and life history of the following types :
  - (i) Protozoan Protists, Entamoeba histolytica, Leishmania donovani, Paramoecium caudatum.
  - (ii) Porifera-Sycon.
  - (iii) Cnidarian-Obelia.
  - (iv) Platyhelminthes-Taenia solium.
  - (v) Aschelminthes-Ascaris lumbricoids, Wuchereria bancrofti.
  - (vi) Mollusca-Pila
  - (vii) Annelida-Pheretima posthuma.
  - (viii) Arthropoda - Prawn.
  - (ix) Echinodermata-Asterias.
  - (x) Hemichordata-Balanoglossus.

#### GROUP - B

1. Paleozoology - Different geological eras of the World. their climatic conditions and Characteristic fauna, fossils, their formation and age determination. Elementary idea of origin and evolution of man.
2. Evolution - Sources of hereditary variations and their role in evolution. Darwin's theory of Natural Selection and Neo- Drwinism. Isolating mechanism and their role in evolution.
3. Economic Zoology :-
  - (i) Sericulture, Lac culture, Apiculture, Prawn culture and composite carp culture, Daify technology.
  - (ii) Elementary idea of three important pests of paddy, wheat, fruit, sugarcane and their control.

### PAPER - IB (PRACTICAL)

Time - 3 hours

Full Marks -25

Pass Marks -10

1. Dissection :-
  - Pheretima-Alimentary canal nervous system and reproductive system.
  - Cockroach-General anatomy.
  - Pila - Alimentary canal, organs of pallial complex and nervous system. 6
2. Mounting ( Temporary single stained preparations )Septal nephridia. ovary and setae of earthworm Radula and osphradium of Pila 2
3. Spotting :-
  - (i) Museum specimen-2 6 x 2 = 12
  - (ii) Slides -2 Two out of atleast twenty (20) of the following slides (Head/Principa has the responsibility that these twenty slides should remain in the custody of the department) Paramoecium (W. M.) Paramoecium (Conjugation) T. S. of Sycon.



Gemmule of Porifera, Spicules of porifera Obelical colony and Medusa, Scolex and mature proglottid of Taenia, T. S. of Ascaris (Male and female). T. S. of Earth worm through pharynx gizzard, seminal vesicles, Cntellum and typhlosole. Zoea larva, Bipinnaria larva, Pedicellaria, T. S. of Balanoglossus through, collar trunk, hepatic region and T. S. of arm of Starfish.

( iii ) Evolution and Paleozoology-1

( iv ) Economic Zoology-1 out of the following specimens-Life cycle stages of silk worm, sealing wax, Bee hive, Prawn, Labeo rohita, Wallago attu and Channa punctatus.

3

4. Practical Record Regularly signed be given due credit
5. Viva

## MATHEMATICS

**Introduction :-** The new syllabus for 3 year degree Honours and 3 year pass in Mathematics has been formulated in view of the UGC guidelines contained in the booklet "UGC Model Curriculum, 2001" A perusal of the UGC curriculum indicated that mole of the contents in theory papers are already being taught in this University for the past several years though there are differences in the UGC pattern and the pattern being followed in this University The UGC Model curriculum has divided the Mathematics honours syllabus in 13 units. Whereas in our yearly pattern of examination we have eight theory papers only. The new Syllabus has been prepared so that the existing pattern may continue but almost all the contents/subject matters suggested in the Model curriculum are included. This has been made possible by compressing the subject matter/contents of about two units in one theory paper.

### GENERAL/SUBSIDIARY

#### PAPER-I

Q. no. 1 is objective and compulsory and then after answer any five questions selecting at least one from each group.

#### GROUP-A

##### SET THEORY.

Mapping, Equivalence relations and partitions; Congruence modulon : 2 Qn

##### Theory of Equations :

Relation between the roots and coefficients of general polynomial equation in one variable, Transformation of equations, Descarte's rule of signs. 1 Qn

Solution of cubic equations (Cardon method), Biquadratic equations. 1 Qn

#### GROUP-B

##### MODERN ALGEBRA

Definition of a group with examples and simple properties, Subgroups, Generation of groups, Cyclic groups, Coset decomposition, Lagrange's theorem and its consequences, Fermat's and Euler's theorems, Permutation groups, Even and odd permutations, The alternating groups, Caytey's theorem :- 2Qn

##### MATRIX ALGEBRA

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices, Elementary operations on matrices, Inverse of matrix, Rank of a matrix 2Qns

#### GROUP - C

##### TRIGONOMETRY :

De Moiver's theory and its applications, Logarithm a complex quantity, Expansion of trigonometrical functions, Gregory's series :-

Direct and inverse circular and hyperbolic functions, Summation of series :-



## VECTOR ANALYSIS

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Scalar and vector Product of three vectors Product of four vectors, Reciprocal vectors : 1 Qn  
Vector differentiation, Gradient, Divergence and curls 1 Qn

### GROUP - D

## DIFFERENTIAL CALCULUS

$\epsilon$ - $\delta$  definition of the limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Differentiability :- 1Qn  
Successive differentiation, Leibnitz theorem, Maclaurin and Taylor series expansions, Curvature. 1 Qn

## INTEGRAL CALCULUS :

Integration of irrational algebraic functions, and transcendental functions, Reduction formula, Definite integrals, Quadrature, Rectification : 1+1Qns

## MATHEMATICS HONOURS

### PAPER-I

Q. No.1 will be objective and compulsory and then after answer any five questions selecting at least one from each group.

#### GROUP - A (objective)

##### Set Theory

Mapping Equivalence relations and partitions Congruence modul on 2 Qns

##### Theory of equation

Relation between the roots and coefficients of general polynomial equation in one variable, Transformation of equation, Descarte's rule of signs :- 1qn  
Solution of cubic equations (Cardon method), Biquadratic equations :- 1Qn

#### GROUP-B

##### Modern Algebra :

Definition of a group with examples and simple properties, Subgroups, Cyclic groups, Coset decomposition, Lagrange's theorem and its consequences, Fermat's and Euler's theorems, Permutation groups, Even and odd permutations, the alternating groups, cayley's theorem 2 qns

Normal subgroups, Homomorphism and Isomorphism , Quotient groups, The first fundamental theorem of homomorphism : 1 Qn

Introduction of rings, Subrings, Integral domains and field. Characteristic of a ring & field - 1 Qn

#### GROUP-C

## MATRIX ALGEBRA

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices, Elementary operations on matrices , Inverse of a matrix, Linear independence of row and column matrices, Row rank, Column rank and rank of matrix, Equivalence of Column and row ranks : 1Qn

Eigen values, eigenvectors and the characteristic equation of a matrix , Cayley Hamilton theory and its use in finding inverse of a matrix :-

## TRIGONOMETRY :

De moivre's theorem and its applications, Logarithm of a complex quantity, Expansion of Trigonometrical functions, Gregory's series:- 1 Qn  
Direct and inverse circular and hyperbolic functions, Summation of series. 1 Qn

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**PAPER- II**

Q.No. 1 will be objective and compulsory and then after answer any five questions selecting at least one from each group.

**GROUP-A**

**DIFFERENTIAL CALCULUS**

$\epsilon$ - $\delta$  definition of the limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Differentiability :- 1Qn  
Successive differentiation, Leibnitz theorem, Maclaurin and Taylor series expansions, Curvature :- 1 Qn

**INTEGRAL CALCULUS :**

Integration of irrational algebraic functions, and transcendental functions, Reduction formula, Definite integrals, Quadrature, Rectification : 1+1Qns

**GROUP - B**

**Ordinary differential Equations :**

Degree and order of a differential equation, 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 equation. First order higher degree equations solvable for x, y, p, Clairaut's form and Singular solutions: Orthogonal trajectories, Linear differential equations of second order with constant coefficients. Complementary functions and particular Integrals :- 1 Qn

**Vector Analysis :**

Scalar and vector product of three vectors. Product of four vectors, Reciprocal vectors : 1Qn  
Vector differentiation, Gradient. Divergence and Curl : 1Qn

**GROUP - C**

**Analytical Geometry of two Dimensions ;**

Standard Equations of Parabola, Ellipse and Hyperbola and their properties : 1 Qn  
Reduction of the General Equation of Second Degree into standard forms, Equations of tangents and Normals Polar equation of a conic : 1 Qn

**Analytical Geometry of three dimensions ;**

Direction cosines, the plane, the straight line. the shortest distance between two skew straight lines. Sphere : 1 Qn

Cone, Cylinder, Central Conicoids (including Ellipsoid), conjugate Diameters, Paraboloids : 1Qn

**STATISTICS HONOURS**

Introduction :- The new syllabus for 3 year degree honours and 3 years pass in Statistics has been formulated in view of the UGC guidelines contained in the booklet "UGC. Model Curriculum, 2001" A perusal of the UGC curriculum indicates that most of the contents in theory papers are already being taught in this University for the past several years, though there are differences in the UGC pattern and the pattern being followed in this University, The UGC Model Curriculum has divided the Statistics honours syllabus in 13 units, whereas in our yearly pattern of examination we have seven theory papers only (2 in degree Part I 2 in degree Part-II and 3 in degree Part-III) The new syllabus has been prepared so that the existing pattern may continue but almost all the contents /subject matters suggested in the Model curriculum are included. This has been made possible by compressing the subject matter/contents of about two units in one theory paper.



# REGULATIONS FOR BACHELOR OF SCIENCE (GENERAL/HONOURS) EXAMINATION (THREE YEARS DEGREE COURSE)

## Duration of Course

1. The Bachelor of Science (General/ Honours) Course shall cover a period of three academic years and shall be known in the first year of study as the B.Sc. ( General/ Honours) Part- I, in the Second year of study as the B.Sc. (General/ Honours) Part-II and in the third year of study as the B.Sc. (General/ Honours) Part- III course.

## Qualifications for Admission.

2. A student may be admitted to the course of instructions for the degree of Bachelor of Science (General/ Honours) if he has passed the Intermediate examination in Science of a Board/University established or incorporated by Law or any other examination recognised by the University as equivalent to.

Provided that for admission to the course of instructions for the Honours degree in any subject it shall be necessary for a student to have obtained not less than 45% marks at the Intermediate examination in the subject offered for Honours study or in an allied subject as determined by the Academic Council in case the subject was not prescribed for study at the Intermediate level.

## Subjects for B.Sc. (Gen.) examination and structure of courses.

3. 1 A candidate for the B.Sc. (General) examination shall be required to offer and be examined in three optional subjects comprising nine papers, and one/two languages as comprising two papers, and one paper on General Studies, totalling twelve papers, divided into four papers for each part of the course according to the following structure.

Examination	Optional Subjects	Composition	General Studies	Total
B.Sc. Gen. Part-I	3 Papers (Paper - I from three subjects)	1 Paper Paper I		4 Papers
B.Sc. Gen. Part-II	3 Papers (Paper -II) from three Subjects)	1 Paper Paper II		4 Papers
B.Sc. Gen. Part-III	3 Papers (Paper-III) from three Subjects)		1 Paper	4 papers
<b>Total</b>	<b>9 papers</b>	<b>2 Papers</b>	<b>1 Paper</b>	<b>12 Papers</b>

3.2 Each of these papers shall carry 100 marks including 25 marks for practical examination where ever practical examination is prescribed.

3.3 (i) A candidate for the B.Sc. (General) examination shall choose any three of the following optional subjects.

1. Physics 2. Chemistry 3. Botany 4. Zoology 5. Mathematics 6. Geography 7. Statistics 8. Geology 9. Anthropology and 10. Electronics

Provided that a candidate shall not choose (i) Mathematics or Statistics unless he has passed the I.Sc. examination in Mathematics (ii) Physics unless he has passed the I.Sc. examination in Physics and Mathematics (iii) Chemistry unless he has passed the I.Sc. examination in Chemistry (iv) Botany/Zoology unless he has passed the I.Sc. examination in Biology. (v) Geography/Geology unless he has passed the I.Sc. examination in Geography/Geology. (vi) Electronics unless he has passed the I.Sc. examination in Physics and Mathematics.



**PAPER I**

Nine questions are to be set four from each group. Candidates are required to answer any Five questions choosing two from each group. Question one is objective and compulsory.

**GROUP-A (PROBABILITY)**

4 Questions

Random Experiment : trial, sample point and sample space, event, operations of events, concepts of mutually exclusive and exhaustive events.

Definition of probability : Classical and relative frequency approach. Discrete probability space, Properties of probability . Independence of events, Conditional probability, total compound probability rules, Bayes' theorem and its applications.

Discrete random variable [rv]; its probability mass function [pmf] and cumulative distribution function [cdf], Joint pmf of several discrete rvs. Marginal and conditional pmfs. Independence of rvs. Expectation of a rv and its properties. Moments. measures of location and dispersion of rv. their properties and uses.

Standard univariate / bivariate discrete distributions degenerate, discrete uniform binomial, hypergeometric, Poisson, Geometric and negative binomial distributions. Marginal and conditional distributions, Distributions of functions of discrete rvs, reproductive property of standard distributions.

**GROUP-B (MATHEMATICAL METHODS)**

4 Questions

Vector space with real field ; linear combination of vectors : subspaces ; Examples in  $\mathbb{R}$  with geometrical interpretation ; Linear dependence and independence of vectors ; Dimension and basis of a vector space

Matrices ; types of matrices; operation on matrices ; partitioned matrices ; determinants; singular and nonsingular matrices.

Rank of matrix ; row rank and column-rank. Properties of rank, rank of sum and product of matrices ; Inverse of matrix, Orthogonal matrix; Idempotent matrix.

Linear equations, homogeneous and non homogeneous system of equations ; solution space; consistency and general solution.

Sequences and series of real number, convergence, Cauchy criterion and simple tests for convergence.

**PAPER - II**

75 Marks

Nine questions to be set Examinees are required to answer any Five questions, question no. 1 is objective and compulsory.

**DESCRIPTIVE STATISTICS**

(8 Questions)

Types of Data : Concepts of a statistical population and sample from a population ; qualitative and quantitative data nominal and original data ; cross sectional and time series data; discrete and continuous data ; frequency and non frequency data. Different types of scale- nominal ordinal ratio and interval.

Collection and Scrutiny of Data; Primary data designing a questionnaire and a government publications Complete enumeration, controlled experiments, observational studies and sample surveys Scrutiny of data for internal consistency and detection of errors of recording Ideas of cross validation.

Presentation of Data : Construction of tables with one or more / factors of classification, Diagrammatic and graphical representation of non- frequency data. Frequency distributions, cumulative frequency distributions and their graphical and diagrammatic representation - column diagram histogram, frequency polygon and gives, Stem and leaf chart, Box plot.



Analysis of Quantitative Data : Univariate data : Concept of central tendency or location, dispersion and relative description. skewness and kurtosis, and their measures including those based on quantities and moments. Sheppard's correction for moments for grouped data (without derivation). Measures of inequality - Gini's coefficient and Lorenz Curve.

Bivariate data : Scatter diagram. Product moment correlation coefficient and its Properties. Coefficient of determination. Coefficient ratio. Concepts of regression. Principal of least squares. Fitting of linear and quadratic regression and related result. Correlation index . Fitting of curves reducible to polynomials by log and inverse transformation. Fitting of curves by the method of group averages. Intra-class correlation coefficient with equal and unequal group sizes. Rank correlation - Spearman's and Kendall's measures.

Multivariate data : Multiple regression multiple correlation and partial correlation in 3 variable. Their measures and related results.

Analysis of Categorical data ; Consistency of categorical data. Independence and association of attributes. Various measures of association for two way and three way classified data. Odds ratio.

Scaling of Data : Motivation for scaling. Measurement for Psychological traits. Scaling of items according to difficulty. Scaling of test scores. Scaling of rates and ranks.

### COMPUTER APPLICATIONS AND PRACTICAL 50 Marks

Historical evolution of Computers, Generations of Computer, Classification of Computers, Hardware, CPU, I/O Devices, Block diagrams System Software, MS-DOS: Filenames Creating editing a printing of Files . Other File Management Commands. Disk-Management Commands

Windows : The user Interface, The Desk Top, The Task Bar, The control Panel. The Find Features Properties, font : Management, System Tools, Character Map. Note Pad, The My Computer, Icon, Folders . Short cuts.

Word processing : Creating and Saving a Document. Editing the Text, Printing Documents.

Working with Software Package : Ms.Excel, Minitab. SFSS of SYSTAT.

1. Classification, Tabulation and Frequency Tables
2. Bar Graph DOT. Diagram and Histogram.
3. Stem and Leaf Plots.
4. Box Plot.
5. Summary Statistics.
6. Two way tables and Plots.
7. Product moment correlation coefficient. Rank Correlation coefficient.
8. Curve fitting by method of least squares : Exponential and polynomial (up to the three degree) equations.
9. Regression Lines.
10. Correlation Ratio
11. Multiple and partial correlation coefficients. Regression Equations for three variables only
12. Gram Schmid orthogonalization process.
13. Rank and inverse of a matrix
14. Solution of set of linear equations.
15. fitting of Binomial. Poisson Negative Binomial. Normal and Gamma Distributions.



# STATISTICS & COMPUTER APPLICATION SUBSIDIARY

## PAPER- I

75 Marks.

Candidates are required to answer 5 question at least two from each group. Question one is objective and compulsory.

### GROUP - A (PROBABILITY THEORY)

4 Questions

Important Concepts in Probability : Definition of probability classical and relative frequency approach to probability. Richard Von Mises, Cramer and Kolmogorovs approaches to probability, merits and demerits of these approaches only general ideas to be given. (5L)

Random Experiment : Trial, sample point and sample space, definition of an event. Operation of events mutually exclusive and exhaustive events, Discrete sample space, properties of probability based on axiomatic approach, conditional probability, independence of events Bayes' theorem and its application. (15 L)

Random Variables ; Definition of discrete random variables, probability mass function, idea of continuous random variable, probability density function, illustrations of random variable and its properties expectation of a random variable and its properties moments, measures of location dispersion, skewness and Kurtosis, Probability generating function (if it exists) , their properties and uses (20L)

Standard univariate discrete distributions and their properties ; Discrete Uniform, Binomial, Poisson, Hypergeometric, and Negative Binomial distributions. (20L)

Continuous univariate distributions uniform, normal Cauchy, Laplace, Exponential, Chi-Square, Gamma and Beta distributions, Bivariate normal distribution (including marginal and conditional distributions (25L)

Chebyshev's inequality and applications, statements and applications of weak law of large number and central limit theorems. (5 L)

### References

Bhat B.R. Srivenkatramana T and Rao Madhava K. S. (1997) : Statistics ; A Beginner's Text Vol. II New Age International (P) Ltd.

Edward P.J. Ford J.S. and L in (1974) : Probability for Statistical Decision-Making, Press Calcutta.

Mood A.M. Graybill F.A. and Boes D.C. (1974) Introduction to the Theory of Statistics, McGraw Hill,

### Additional References

Cooke, Cramer and Clarke O : Basic Statistical Computing, Chapman and Hall.

David S (1996) : Elementary Probability, Oxford Press Hoel P.G. (1971) : Introduction to Mathematical Statistics , Asia Publishing House.

Meyer P.L. (1970 ) : Introductory Probability and Statistical applications. Addison Wesley.

### GROUP-B (DESCRIPTIVE STATISTICS)

4 Questions

Types of Data : Concepts of a statistical population and sample from a population ; qualitative and quantitative data nominal and ordinal data ; cross sectional and time series data ; discrete and continuous data ; frequency and non frequency data. Different types of scale- nominal ordinal ratio and interval.

Collection and Scrutiny of Data; Primary data designing a questionnaire and a schedule, checking their consistency, Secondary data-its major sources including some government publications. Complete enumeration, controlled experiments, observational studies and sample surveys Scrutiny of data for internal consistency and detection of errors of recording Ideas of cross validation. (5L)



Presentation of Data : Construction of tables with one or more / factors of classification, Diagrammatic and graphical representation of groups data. Frequency distributions, cumulative frequency distributions and their graphical representation - histogram, frequency polygon and gives, Stem and leaf chart, Box plot. (15)

Analysis of Quantitative Data : Univariate data : Concept of central tendency or location, dispersion and relative description. skewness and kurtosis, and their measures including those based on quantities and moments. Sheppard's correction for moments for grouped data (without derivation). (20L)

Bivariate data : Scatter diagram. Product moment correlation coefficient and its Properties. Coefficient of determination. Correlation ratio. Concepts of error in regression. Principle of least squares. Fitting of linear regression and related result. Fitting of curves reducible to polynomials transformation. Rank correlation - Spearman's and Kendall's measures. (20L)

Multivariate data : Multiple regression multiple correlation and partial correlation in three variables. Their measures and related results. (15L)

Analysis of Categorical data ; Consistency of categorical data./ Independence and association of attributes. Various measures of association for two way and three way classified data. Odd ratio. (10L)

#### References

Bhat B.R. Srivenkatramana T and Rao Madhva K. S. (1996) Statistics : A Beginner's Text Vol. I, New Age International (P) Ltd.

Croxtan F.E. Cowden D.J. and Kellin S (1973) : Applied General Statistics, :Prentice Hall of India.

Goon A.M. Gupta M.K. Das Gupta B. (1991) Fundamentals of Statistics, Vol. I. World Press. Calcutta.

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Aderson T.W. and Sclove S.L. (1978) An Introduction to the Statistical Analysis of Data. Houghton Mifflin/Co

Cooke, Cramer and Clarke O. Basic Statistical Computing Chapman and Hall.

Mood A.M. Grayball F.A. and Boes D.C. (1974) : Introduction to the Theory of Statistics Mc Graw Hill.

Snedecor G.w. and Cochram W.G. (1967) : Statistical Methods. Iowa State University Press.

Spiegel, M.R. (1967) Theory & Problems of Statistics, Schaum's :Publishing Series.

#### PRACTICAL

25 Marks

1. Presentation of data by Frequency tables, Diagrams and graphs.
2. Calculation of Measures of Central tendency, dispersion; skewness and Kurtosis.
3. Product Moment Correlation and correlation ratio.
4. Fitting of Curves by the least square method.
5. Regression of two variables.
6. Soear man's Rank correlation and Kendall's tau.
7. Multiple regression of three variables.
8. Multiple correlation and Partial correlation.
9. Evaluation of probabilities using Addition and Multiplication theorems. Conditinal probabilitles. And Baye's theorems.
10. Exercises on mathematical ! expectations and finding measures of central tendency. dispersion skewness and kurtosis of univariate probability distributions.
11. Fiting of standard univariat ; and continuous distributions.(30 Practicals)



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3.3 (ii) A candidate shall choose either (a) or (b) for composition.

(a) Hindi - One full paper of 100 marks for each of the Part- I and Part - II examinations.

(b) Hindi (50 marks) and one of the following languages (50 marks) for each of the Part-I and Part-II examinations.

Bhojpuri, Magahi, Maithili, Urdu, Bengali, Oriya, Nepali, Santhali, Mundari, Ho, Nagpuri, Khariya, Kurukh, Kurmali and English, or any other language recognised by Academic Council for the purpose.

Provided that a candidate of non-Indian domicile may take a full paper in English (higher standard) in lieu of (a) or (b) above.

### Subjects for B.Sc. (Hons.) Examination and structure of Course.

4. 1 A candidate for the B.Sc. (Hons.) Examination shall be required to offer and be examined in one Honours subject comprising eight papers two subsidiary subjects comprising four papers one/two languages as composition comprising two paper and one paper on General Studies totalling fifteen Papers, divided into five papers for each part of the course according to the following structure.

#### STRUCTURE

Examination	Honours Subjects	Subsidiary Subjects	Composition	General Studies	Total
B.Sc.(Hons). Part - I	2Papers (Paper I & II)	2 Papers (Paper I from Two subject	1Paper (Paper I)	-	5 Papers
B.Sc.(Hons) Part - II	2 Papers (Paper III & IV)	2 Papers (Paper II from two subject	1 Paper (PaperII)	-	5 Papers
B.Sc.(Hons) Part - III	4 papers (Papers V, VI, VII & VIII)			1 paper	5 papers
<b>Total</b>	<b>8 Papers</b>	<b>4 Papers</b>	<b>2 Papers</b>	<b>1 Paper</b>	<b>15 Papers</b>

4.2 Each of these papers shall carry 100 marks .

Provided that wherever practical examination is prescribed (i) in case of a subsidiary subject, each of the two papers shall include 25 marks for practical examination and (ii) In case of an Honours subject, Papers I and II shall carry 75 marks each and a practical examination of 50 marks. Papers III and IV shall carry 75 marks each and a practical examination of 50 marks and paper VIII shall be a full paper of practical examination carrying 100 marks. Papers V, VI and VII shall be a full theory papers each carrying 100 marks .

4.3 (i) A candidate for the B.Sc. (Honours) examination shall choose one Honours subject and two subsidiary subjects from the following.

1. Physics 2. Chemistry 3. Botany 4. Zoology 5. Mathematics 6. Geography 7. Statistics 8. Geology 9. Anthropology and 10. Electronics.

Provided that a candidate shall not choose (i) Mathematics or Statistics unless he has passed the I.Sc. examination in Mathematics (ii) Chemistry unless he has passed



the I.Sc. examination in Chemistry (iii) Botany/Zoology unless he has passed the I.Sc. examination in Biology and (iv) Geography/Geology unless he has passed the I.Sc. examination in Geography/Geology; and if he take up Honours in Statistics he shall choose Mathematics a subsidiary subjects.

4.3 (ii) A candidate shall choose either (a) or (b) for composition.

(a) Hindi – one full paper of 100 marks for each of the Part I and Part II examination.

(b) Hindi (50 marks) and one of the following languages (50 marks) for each of the Part - I and Part - II examinations.

Bhojpuri, Maghi, Maithili, Urdu, Bengali, Oriya, Nepali, Santhali, Mundari, Ho, Nagpuri, Khariya, Kurukh, Kurmali and English, or any other language recognised by Academic Council for the purpose.

Provided that a candidate of non-Indian domicile may take a full paper in English (Higher standard) in lieu of (a) or (b) above.

### Identical Syllabi

5.1 The Syllabi of Mathematics, Geography, Statistics and Anthropology as Honours/ Subsidiary/ Optional Subjects shall be Identical with those for the B.A. Examination.

5.2 The Syllabi of Composition and General Studies shall be identical for the Honours and General course as also with those for the B.A. and B.Com. Examinations.

### Minimum requirement of instructions.

6. Notwithstanding anything contained in the Regulations concerning minimum requirement of teaching periods to be arranged a particular subject.

(i) No fewer than five lectures in a week shall be delivered in each paper (other than a full practical paper) except in Composition and General Studies in which no fewer than two lectures shall be delivered.

Provided that if the Composition is in two languages at least one lecture shall be delivered in each language.

(ii) At least two practical classes, each of two periods duration in a week shall be arranged in every subject in which practical examination is prescribed.

Provided that the practical classes in an Honours subject shall each be of three period's duration.

(iii) At least one period of tutorial instructions shall be arranged in a week in every subject in which no practical examination is prescribed except in Composition and General Studies.

Provided that the number of tutorials in an Honours subjects shall not be less than two.

### Examination

7.1 There shall be University examination at the end of the first, the second and the third years of study to be known respectively as the B.Sc. (General/ Honours) Part-I, Part-II and Part-III examination. No student shall be admitted to the B.Sc. (General) or, B.Sc. (Honours) Part II class unless he has passed the B.Sc. (General) or B.Sc. (Honours) Part I examination and to the part III class unless he has passed the part-II examination.

Provided that if a student fails in or fails to appear at not more than two subjects at the B.Sc. (General/ Honours) Part-I/II examination he shall be promoted to the next higher class but he shall not be eligible for admission to the B.Sc. (GENERAL) or



B.Sc. (HONOURS) Part- III Class unless he has passed the B.Sc. (Honours) Part- I examination in the subject/ subjects concerned.

Provided further that this facility for appearing in such carry over subject/subjects shall be available to a student at not more than three consecutive examinations.

7.2 If a student of the B.Sc. (Honours) course after having passed the B.Sc. (Honours) Part I examination does not like to continue with the Honours course it shall be permissible for him to change over to the B.Sc. (General) course in which case he shall be admitted to the B.Sc. (General) Part II class and his Honours and Subsidiary subjects shall become his optional subjects and the marks secured by him in those subjects at the B.Sc. (Honours) Part-I examination shall be treated accordingly. Provided that the average of the marks secured in the Honours Papers shall be treated as the marks secured in that optional subjects.

8. Any registered student of the University may be admitted to the B.Sc. (General/ Honours) Part I, Part II and Part III examination. If he produces a certificate from the Principal of a College of (a) good conduct. (b) completion of regular course of study in the college by fulfillment of the prescribed requirement of attendance at lectures tutorials and / or practical and by satisfactory record of tutorial and / or practical work and (c) having passed the college. Test or any other equivalent examination, for making him eligible for the University examination.

Provided that a candidate who has failed at any of these examinations or having completed the regular course of study by fulfilling all the requirements is prevented from appearing at the examination for reasons accepted as adequate by the principal of the college and who has not joined a college again may appear as a non-collegiate student at and up to three immediately following examinations without attendance at lecture and tutorials if he produces a certificate from the Principal of the college where he completed his regular course of study stating that nothing is known to the Principal against his moral character and also a certificate of having taken again a course of practical work at the college for at least 16 periods in each subject in which practical examination is prescribed along with his application for admission to the examination.

Provided further that if a candidate for the B.Sc. (General/Honours) Part III examinations has passed in other subject/subjects and failed to pass only in General Studies he shall have the option to appear in that single subject at the next examination and if he passes there in it shall be taken into consideration in determination of results.

### **Practical Examination**

9. The examination in all the subjects shall include practical examination except in Mathematics, Anthropology, Composition and General Studies.

### **Methods of Examination.**

10. The examination (other than practical) shall be conducted by means of question-papers which shall be the same at every place where the examination in a paper is held on the same day.

11. In a subject in which practical examination is prescribed the practical notebook of each candidate offering the subject shall be inspected by the examiners who shall take the same into consideration while awarding marks for the practical examination. The practical notebook which has not been signed at regular intervals by the teacher under whom the candidate worked shall not be accepted. The practical notebook shall carry ten percent of the marks prescribed for the Practical Examination. The Practical Examination shall include a viva examination carrying ten percent of the marks



(6)

prescribed for the practical examination.

### **Duration of Examination.**

12. The examination in the theory paper or theory portion of a paper shall be of three hours duration and the examination in a paper for practical portion of a paper/papers shall be six hours duration.

### **Pass Marks and Divisions in B.Sc. (General) Examination**

13. 1 In order to pass the B.Sc. (General) Part I or Part II or Part III examination a candidate must obtain not less than 33% of the total marks in each subjects of the examination provided that in subjects involving practical examination he must obtain not less than 23 marks in the theory portion and 10 marks in the practical portion of each of the papers.

Provided further that if he has offered two languages in composition he must obtain at least 15 marks in each language and 33 marks in paper as a whole.

13. 2 In order to pass the B.Sc. (General examination) a candidate must have passed the B.Sc. (General) Part-I, Part- II and Part- III examination separately.

13.3 A candidate who passes the B.Sc. (General) Examination obtaining not less than 60% of the total marks in all three parts of the examination taken together shall be placed in the first division.

13.4 A candidate who passes the B.Sc. (General) Examination obtaining less than 60% but not less than 45% of the total marks in all the three parts of the examination taken together shall be placed in the second division.

13.5 the remaining successful candidates shall be placed in the third division.

13.6 A candidate who passes the B.Sc. (General) examination obtaining 75% or more marks in any subject in all the three parts of the examination taken together shall be declared to have passed with Distinction in the subject.

### **Pass Marks and Classes in B.Sc. (Honours) Examination.**

14. 1 In order to pass the B.Sc. (Honours) Part-I or Part-II or Part-III examination a candidate must obtain not less than 45% of the total marks in the Honours subject and 33% of the total marks in each of the other subject of the examination.

Provided that in subjects involving practical examination he must obtain (i) in case of an Honours subjects not less than 67 marks in papers - I and II taken together and 23 marks in the practical portion of these papers or not less than 67 marks in the Paper-III and IV taken together and 23 marks in the practical portion of these papers or not less than 135 marks in V, VI and VII taken together and 45 marks in Paper- VIII as the case may be and (ii) in case of a subsidiary subjects not less than 23 marks in the theory portion and 10 marks in the practical portion of each of the papers.

Provided further that if he has offered two languages in composition he must obtain at least 15 marks in each language and 33 marks in the paper as a whole.

14.2 In order to pass the B.Sc. (Honours) examination a candidate must have passed the B.Sc. (Honours) Part-I, Part II and Part III examination separately.

14.3 A candidate who passes the B.Sc. (Honours) examination obtaining not less than 60% of the total marks in the Honours subject in all the three parts of the examination taken together shall be placed in the first class.

14.4. The remaining successful candidates shall be placed in the second class.

14.5 A candidate who passes the B.Sc. (Honours) examination obtaining 75% or more marks in any subjects in all the three parts of the examination taken together



(7)

shall be declared to have passed with Distinction in the subjects.

### **Moderation of Results**

15. Notwithstanding anything contained in the Regulations concerning moderation of examination results.

(i) If a candidate for the B.Sc. (General) Part III examination fails to pass in any one subject by not more than 5% marks in any two subjects by not more than 3% marks in each subject, he shall be awarded the marks required to enable him to pass in the subject/subjects concerned and his result shall be declared accordingly.

(ii) If a candidate for the B.Sc. (Honours) Part III examination fails to secure first or second class by not more than 5 marks in the Honours subject but has passed in General studies, he shall be awarded the marks required to enable him to secure first or second class as the case may be and his results shall be declared accordingly.

(iii) If a candidate for the B.Sc. (Honours) Part III examination who has passed in the Honours subject fails to pass in General Studies by not more than 5 marks he shall be awarded the marks required to enable him to pass in the subject and his result shall be declared accordingly.

(iv) In a subject involving practical examination where separate passing is necessary in part of it the shortage shall be calculated on the basis of the full marks in that part but failure in different parts shall be deemed to be failure in one subject only.

(v) The provisions for moderation of results shall not be applicable in case of B.Sc. (General/Honours) Part, I and Part II examinations.

### **Publication of Result.**

16. 1 As soon as possible after the examination the Vice Chancellor shall cause a list of successful candidates at the B.Sc. (General/Honours) examinations to be published.

16.2 (i) The list of successful candidates at the B.Sc. (General) examination shall be published collegewise in three categories in the first division in order of merit and in the second and third division in alphabetical order. Separate collegewise list shall be published for non-collegiate candidates.

16.2 (ii) The list of successful candidates at the B.Sc. (Honours) examination shall be published subject wise in two categories in order of merit in the first class and in the second class indicating the name of the college against each candidate.

16.3 If a candidate has obtained Distinction in any subject it shall be mentioned against his name.

### **Award of Degree**

17. Each successful candidate at the B.Sc. (General/Honours) Examination shall receive, in token of his degree a diploma in the prescribed form in Hindi specifying the name of the college and the division/class in which he was placed and in case of Honours Degree also the Honours subject in which he was examined. The English version of the diploma may be issued on payment of the prescribed fee.



## राष्ट्रभाषा हिन्दी

अनिवार्य भाषा पत्र (कला/ वाणिज्य/ विज्ञान : सभी विद्यार्थियों के लिए)

पूर्णांक : 100

अंक विभाजन :

- |                                       |   |                 |
|---------------------------------------|---|-----------------|
| 1. वस्तुगत (सम्पूर्ण पाठ्य पुस्तक से) | : | 1 x 20 = 20 अंक |
| 2. पाठ्यपुस्तक से परिचयात्मक प्रश्न   | : | 15 x 2 = 30 अंक |
| 3. अर्थ-लेखन                          | : | 5 x 2 = 10 अंक  |
| 4. भाषा अनुप्रयोग                     | : | 10 x 4 = 40 अंक |

निर्धारित पाठ्यपुस्तक :

भाषा दर्शन : सम्पादक डॉ० विद्यारानी एवं प्रो० रामचन्द्र घोष, प्रकाशक : भारत बुक डिपो

निर्धारित पाठ :

काव्य-खण्ड :

- |                              |  |
|------------------------------|--|
| 1. वर दे वीणावादिनी - निराला | 2. मैं नीर भरी दुख की बदली - महादेवी वर्मा   |
| 3. हिमालय का संदेश - दिनकर   | 4. मेरा देश बड़ा गर्बीला - गोपाल सिंह नेपाली |
| 5. अकाल के बाद - नागार्जुन   | 6. ताल-जल - नरेश मेहता                       |

गद्य-खण्ड :

- |                                    |                                 |
|------------------------------------|---------------------------------|
| 1. उत्साह - रामचन्द्र शुक्ल        | 2. शतरंज के खिलाड़ी - प्रेमचन्द |
| 3. करवा का व्रत - यशपाल            | 4. अपने देश के लोग - कमलेश्वर   |
| 5. परमात्मा का कुत्ता - मोहन राकेश | 6. मजबूरी - मन्नू भण्डारी       |

भाषा-विवेचन खण्ड

- |                      |                             |                    |
|----------------------|-----------------------------|--------------------|
| 1. परिभाषिक शब्दावली | 2. अनुवाद                   | 3. पत्राचार        |
| 4. हिन्दी में पदनाम  | 5. शब्दशुद्धि/ वाक्यशुद्धि, | 6. संक्षेपण/पल्लवन |

## राष्ट्रभाषा अहिन्दी

पूर्णांक : 50

(अहिन्दी भाषी विद्यार्थियों के लिए कला/ वाणिज्य/ विज्ञान)

निर्धारित पाठ्यपुस्तक : हिन्दी गद्य-पद्य संग्रह : सम्पादक (1) डॉ० शिवभूषण अवस्थी

अंक विभाजन :

- |                                     |   |                 |
|-------------------------------------|---|-----------------|
| 1. पाठ्यपुस्तक से परिचयात्मक प्रश्न | : | 10 x 2 = 20 अंक |
| 2. वस्तुगत                          | : | 1 x 10 = 10 अंक |
| 3. अर्थ-लेखन                        | : | 5 x 2 = 10 अंक  |
| 4. व्याकरण एवं रचना                 | : | 5 x 2 = 10 अंक  |

निर्धारित पाठ : गद्य - खण्ड

- |   |  |
|---|--|
| 1. पंच परमेश्वर - प्रेमचंद                  | 2. प्राचीन भारत की एक झलक - महावीर प्रसाद द्विवेदी |
| 3. कहानी का प्लॉट - शिवपूजन सहाय            | 4. भारत एक है - रामधारी सिंह दिनकर                 |
| 5. हिन्दी का भविष्य - हजारी प्रसाद द्विवेदी |  |

पद्य - खण्ड

- |                |                |                  |                     |
|----------------|----------------|------------------|---------------------|
| 1. साखी - कबीर | 2. दोहे - रहीम | 3. सवैया - रसखान | 4. जन्मभूमि - गुप्त |
|----------------|----------------|------------------|---------------------|
- व्याकरण : शब्द ज्ञान (पर्याय, विलोम, श्रुति सम भिन्नार्थक), मुहावरे, अनेक शब्दों के लिए एक शब्द, लिंग निर्णय