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
Total	**9 papers**	**2 Papers**	**1 Paper**	**12 Papers**

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/Zoologyunless 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.

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	Compo-sition	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 IIII & 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
Total	**8 Papers**	**4 Papers**	**2 Papers**	**1 Paper**	**15 Papers**

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

Moderation of Results

15. Not withstanding 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 theB.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.

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, thought here 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 interferance, Coherance 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. Einestein'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 vacum. Energy associated with E field. Differential form of Gauss' law, div $E=4\pi\rho$ Poisson's equation, Laplace's equation, boundary conditions and Uniquenese 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, Claussius 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 Satwart's law. Field equations in magne-tostatics. Ampere's law. Fields due to a straight wire, magnetic dipole, circular current and solenoid. Magnetic fields in mattec.

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

Properties of ferromagnatic materials, Langevin's and Weiss theories of dia, para 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 questitions 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, Browman motion-Langevin and Einestein'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. Rankline's method. Effect of temperature and pressure on viscosity.

GROUP-B

(THERMODYNAMICS) : Set 4 questions.

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

Thermodynamics description of phase transition, chemical potential. Latent heat of transition. Clayperon equation. Ehren fest 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

Time - 6 hours

Full Marks-50

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 airs by Rankine's methed.
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. Velosity 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 coordinates. 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 or 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 force 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 theorm 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) dyanamical method.
4. Moment of inertia by inertia table.
5. Surface tension by capillary rise method.
6. Viscocity of liquid by capillary flow method.
7. Viscosity of liquid by Stockes mothod.
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 :-

Logarethmic relations. curve sketchiry 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, hard ware & software. input-output devices. binary. numbers & arithmatic, 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 Walls 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 Bragge qn. Determination of crystal structure of NaCl. KCl & Cs Cl (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 Fmulsifier.

Liquids in Solids (Rels: Classification preparation & properties. general applications of colloids.

(V) Chemicals Kinetics & Catalysis :-

Chemical kinetics its scopes rate of a reaction, factors infuencing 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.

Theories of chemical kinetics. effect of temp. on rate of reaction. Arrheniues 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. Heisenbarg's uncertainly principle. atomic orbitals. Schrodinger's wave equation. significance of ψ and ψ^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 NH_3. H_2O +, SF_3. ClF, ICl_2, and H_2O. 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. radiut ratio effect and co ordination 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. valance 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 tetranittide. 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.

PAPER - II (THEORY) ORGANIC 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

1. **Bonding and structure :-**

Hybridisation (Sp^1. 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. Clatherates and charge transfer complex.

2. **Mechanism of Organic Reactions :-**

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

Formation and stability (Selectivity). Reagents Electrophiles and nucleophiles Formation and reactivity). Types of organic reactions Kinetics. Energy conside actions. 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. Hypereconjugation, 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 butadiens. 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 $KMnO_4$, KIO_4, $Pb(OAC)_4$, SeO_2, & NBS.

Birch reduction. Diels Alder Reaction, Markowni-Koff'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 Organozine Compounds.

7. **Organosulpher 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

1. Qualitative inorganic analysis of mixtures Containing six radicals e.g. those given below but one interfering radical must be there : 24

Basic radicals Ag^+, Hg^{+2}, Pb^{+2}, Bi^{+3}, Cd^{+2}, Sb^{+2}, Sn^{+4}, Fe^{+2}, Al^{+2}, Cr^{+2}, Ni^{+2}, Co^{+2}, Co^{+3}, Zn^{+2}, Mn^{+2}, Ca^{+2}, Ba^{+2}, Sr^{+2}, Mg^{+2}, Na^+, K^+, NH_4^+,

Acid radicals : CO_3^{-2}, So_4^{-2}, So_2^{-2}, S^{-2}, No_3^-, No_4^-, Halides. Oxalate. Acetate, Borate: Phosphate.

2. Preparation of organic compounds : (any one) 16

(a) Acetylation of salicyclic acid, aniline and p-toluidine.

(b) Benzolyation : Preparation of bezanilide 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 Equilibrim : Law of Mass action and its Kinetic derivation. Equilibrium Constant, Relation between K_p K_c and K_x
3. Dilut Solutions : Colligative properties : Osmosis and Osmotic pressure.Lowering of vapour pressure, Elevation of boiling point of solutions. Depression of freez ing 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, Kirchoff 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 - Summerfild model of atom. Introduction to four Quantum numbers. Aufbau Principle. Pauli's exclusion Principle. Hund's rule. Electronic configuration of the elements and effictive nuclear charge.
2. **Pariodic 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 radio rule, lattice defects, lat tice 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, saliant features of hydrides, Oxides, Oxyacids, halides and solvation tandency.

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 solvancy, innert pair effect.

GROUP-C ORGANIC CHEMISTRY

1. (a) Shape and structure of Organic compounds Tetravalency of carbon : Hybridisation (sp^3, sp^2, sp)
   (b) Classification and nomenclature of Organic compounds.
2. Elementary idea of electron displacement effects, Inductive effect, electromeric effect.
3. Alcohol : Classification, nomenclature, distinction between different types of alcohols, Trinydric alcohol : Glycerol.
4. Aldehydes and ketones : General method of preparation, properties, electronic nature of $>C=O$ group.
5. 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.
6. 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

1. Qualitative inorganic analysis of mixtures Containing four radicals : 12
   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^+, 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.
2. Organic Preparation : Preparation of Organic Campound by using following reactions : 8
   (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 Salicylate.
3. Record of Class Work and Viva-voce. 5

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

Full Marks -25

Time - 6 hours

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 GENERAL/SUBSIDIARY

Full Marks -75

Time - 3 hours

Nine questions are to be set, two from each group Five to be answered selecting at least one from each group. Q. 1 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, Puccinia, 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, Lamiaceae, 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)

Time - 3 hours Full Marks -

In all nine questions are to be set out of which Question 1 shall be objective

(1 x 15 marks) which will screen the entire paper. Students will be required to answer five questions, of which Question 1 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 caudetum, 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 1 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 1 will be Compulsory.

GROUP - A

I Bionomics characteristics features and classification of the following entercoelomate 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)

Full Marks -50

Time - 6 hours 10

I Dissection :

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 Pedicillaria.

9 x 2 = 18

III Spotting :

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 Fasicola, 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) Arthopoda - 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/Principal 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 Obeliacolony and Medusa, Scolex and mature proglottid of Taenia, T. S. of Ascaris (Male and female) T. S. of Earthworm through pharynx gizzard, seimnal vessicles, Cntellum and typhlosole. Zoea larva, Bipinnara larva, Pedicellaria, T. S. of Balanoglossus through, collartrunk, 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.

4. Practical Record Regularly signed be given due credit 3
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 partisons; 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. Cayley'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 an I 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

Scaler 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

s-δ definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability :- 1Qn

Succesive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions. Curvature.

INTEGRAL CALCULUS : 1 Qn

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). Biquardratic 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 Trigonomatrical functions. Gregory's series:- 1 Qn

Direct and inverse circular and hyperbolic functions. Summation of series. 1 Qn

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

s-δ definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability :- 1Qn

Succesive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions. Curvature :- 1 Qn

INTEGRAL CALCULUS :

Integration of irrational algebraic functions, and transcondental 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 seperable. Homogeneous equations. Linear equations and equations reducible to the linear form Exact differential equation. First order higher digree equations solvable for x, y, p, Clairaut's form and Singular solutions. Orthogonal trijectories, 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 ;

Standerd Eqution of Parabola. Ellipse and Hyperbola and their properties : 1 Qn

Reduction of the General Equation of Second Degree into standerd forms. Equations of tengents and Normale 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. Parabolids : 1Qn

B. Sc Part III
PHYSICS (Hons)

Paper-V

This paper will be of 100 marks. Question 1 will contain ten objective questions and it will be compulsory. Four question are to be set from group A and group B each. The candidates will be required to Answer two questions from each group. The questions will be of equal value.

Group A

(Quantum Mechanics) : Set 4 questions

Rise and fall of Planck-Bohr quantum theory. Duality of radiation and matter, de-Broglie's hypothesis, derivation of de-Broglie relation and its exporim ental confirmation.

Formation of a wave-packet, illustrations. Uncertainty principle relating to position and momentum, energy and time application. Complementarity principle, photon interpretation of two slit interference.

Einstein-de-Broglie relations as a link between patticle and wave propagation, propagation of matter waves, time dependent and timeindependent Schrodinger equations, physical meaning of conditions to be satisfied by Schrodinger equation as an operator equation. Postulatory approach to wave mechanics, operators, observable and measurements. Simple one dimensional problems particle in a box with rigvil Walls, concept of a potential well, wave functions and energies for the ground and excited states, quantisation of energy, qualitative discussion of the solution for shallow potential well.

Operators, eigenvalues and eigenfunction. Linear operators, product of two operators, commuting and non- commuting operators, simultaneous eigen function , orthogonal functions. Hormition operators, their eigen values, expectation values of an operator.

Simple harmonic Oscillator, step up and step down operators, eigen functions and eigen values of the ground state and excited states, Zero-point energy, Probability density and its variation with degree of excitation, orthogonality of wave functions. Other one-dimensional problems : Step potantials, penetration through a reclangular barrier, transmission Co-efficients, barriers of special shapes, quantum mechanical tunnelling. Particle in a three-dimensional cubical box, degeneracy.

Angular momentum and spin. Orbital angular momentum, operators for its cartesian components, commutation relations, mutual as well as with L^2 operators L^+ and L^-, their interpretation as step operators, eigenvalues of Lz, half integral values for quantum numbers. Angular momentem operators in spherical co-ordinates , evaluation of their eigen functions exphcitly in terms of the co-ordinates, their degenracy, Schrodinger equation for hydrogen atom in spherical polar co-ordinates, seperation Into radial and angular variables and their solutions ground state of hydrogen atom; discussion of spherical harmonics.

Angular momentum and magnetic moment of electron due to orbital motion, Bohr magnetion ,Stern Gerlach experiment, Uhlembaek and Goudsmit's hypothesis of electron spin, Pauli's method of spin variable alongwith the three co-ordinates in Sohrodinger equation. Eigen-values and eigen fuctions of spin operator, Paulispin operators and commutation relations.

Group B

(Statistical Physics) : Set 4 Questions

The fundamental assumptions of statistical mechanics, probability distribution and entropy. Boltzman distribution, Partition function and its conversion to thermo-dynamic function Heimholtz free energy equation and Gibbs' paradox. Elements of ensemble theory and Liouville's therom. Canonical ensemble and thermdynamics. Simple appliation of ensemble theory to perfect gas. Fermi-Dirac distribution, Bose-Einstein distribution and their simple applications. Radial distribution function and its relation to thermodynamic functions. A brief introduction to phase transformation.

Paper - VI

This paper will be of 100 marks. Question 1 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 required to answer two questions from each group. The questions will be of equal value.

GROUP A

(Nuclear physics) : Set 4 questions

Structure of nucleus: disccvery of the nucleus, composition Basic nroperties, charge, mass, size, spin magnetic moment, electric quadrupole moment, binding energey, binding energy per nucleon and its observed variation with mass number of the nucleus. Coulomb energy, volume energy surface energy, other corrections, explanation of binding energy curve. Liquid drop model of the nucleus.

Radioactivity Decay Cunstant and half-life; methods measurement of half-life, Geiger-Nuttall law, Gomow's explanation, Beta decay, Fermi's theory, neutrino and antineutrino.

Detectors of charged particles, Ion chamber, Geiger, counter, resolving time, cloud chamber, photographic emulsions and bubble chambers.

Accelerators : Need for accelerators, Cockroft, Walton, Van de Groat, cyclic accelerators, cyclotron, synchrocy clotron, variable energy Cycloiron.

Artificial radioactivity : Nuclear fission, Neutron reactions Fermi and transuranic elements, chain reaction criticality, moderators.

Discovery of cosmic rays : Hard and soft components, discovery of muon, pion, heavymesons and hyperon, mass and lifetime determination for muon and pion.

Primary cosmic rays : Extensive air showers, solar modulation of primary cosmic rays, effect of earth's magnetic field on the cosmic ray trajectories.

GROUP B

(Solid State Physics) : Set 4 quetions.

Elements of crystallography. Bravais Jattice, Miller indices. Seven crystal systems, simple crytal structures of Nacl, CaCl and diamond.

Interaction of X-rays. neutrons and electrons with matter, Diffraction of X'rays from a perfect crystal, Bragg's law, Reciprocal lattice, Ewald construction end Brillonin Zones. Crystal binding—Ionic, metallic, covalent and Vanderwaal's binding. Vanderwaal London interaction and cohesive energy of inert gas crystals. Madelung energy and Madelung constant.

Free electron theory of metals. Heat capacity of electron gas. Electrical conductivity of metals Boltzmann Transport equation. Sommerfeld theory of electrical conductivity Band theory or Solids. Bloch's theorem. Kronig Penney model. Distinction between metal, semiconductor and insulator. Instrinic and extrinsic semiconductors. Transistors p-n juction rectifier. Hall effect.

Paper - VII A ELECTIVE

This paper will be of 100 marks. Question 1 will contain ten objective questions which will be compulsory. Four quetions are to be set from group A and group B each. The candidates will be required to answer two questions from each group. The questions will be of equal value.

GROUP A

(Biophysics) : Set 4 questions

What is biophysics? History of biophysics, life-order or chaos.

Plant and animal cells, encosiotic, procariotic cells composition of cell in terms of water, protein, phospho-lipid, lipid etc. Function of cell membrane, cytoplasm, nucleus, mitochondria, microsomes and other cell organelles.

Biololical Molecules, water, glucose, carbohydrates, Lipids, proteins nucleic acids, ATP. Structure and function in relation to bana formation. Genetic code, symmetry, revision or DNA structure. Protein synthesis, transcription translation of Intercellular interactions, molecular recognition.

Neuron anatomy : Cell, dendrift, axon, background of neuron physiology Physical and chemical background of membrane potential.

Nerust equation : Resting potential, ionic pump, poses of different ionic species) action potential. Voltage clamp technique, conduction changes and Hodgkin-Huxley analysis. Cable eqation, propagation of action potential, compound action potential.

Photosynthet'c Process : Quantum efficiency. Photo system I and II, nature of electron transport. Bio energetics. Gibbs free energy, equilibrium constants in Chemical reaction.

Interconversion of energies, electrical and Chemical half cell potentials. Redox potential, ATP structure and reaction, Changes in Gibbs free energy in A T P formation, Redox couple, Bioenergetics in chloroplastis.

GROUP-B

(Information Technology) : Set 4 Questions.

Introduction to computer Hardware, Input Devices, output devices storage devices & CPU, Computer software: operating systems (MS-DOS & its main commands, Windows 95/98/XP), Introduction to MS-Office (WORD, Excel Power point)

Introduction to data communication & network fundamentals. Introduction to Internet, modem, Internet Service Provider, Internet explorer, e-mail, search engine, World Wide Web, websites, creation or website, html.

Introduction to C and C++, Programming C++. Main commands in C++. Basics of programming, input-output statement, functions headerfile Keywords, Data type, operators Tokens.

Programming in C++ for simple mathematical problems, one & two dimensional arrays, matrices addition, subtraction and multiplication of matrices.

[N. B. Out of two elective papers VII A and VII B, the students will study any one of them only.]

Paper- VII B ELECTIVE

GROUP- A Material Science : set 4 question

Full marks-100

Crytal Structure : Unit cell and Bravais Lattice. Different types of Crystal structures. Reciprocal lattice; its mathematical representations and applications. Xray-diffraction methods for (i) determination of lattice para-meters (ii) measurement of Bragg angle and Interplaner spacings Introduction to Neutron and Electron Diffraction.

Imperfection in Solid : Various types of crystalline imperfection. Point defect, Edge and screw dislocations. Origin of dislocations, Role of dislocation in crystal growth. Plastic deformation.

Electronic Conduction in Solids : Electrical conductivity, Free electron theory, Fermi velocity and meanfreepath, Temperature and impurity effect. Temperature dependent resistivity. Introduction to Kondo and spin glass alloys.

Superconducting Materials: Experimental results : d. c. electrical resistivity, Meissner Effect, Critical field, Type I and Type II superconductors. Isotrope effect, specific heat anomaly.

Thermodynamics of Superconducting transiition. London equations Introduction to Cooper pairs. High temperature, Superconductore.

Magnetic Material : Classification of magnetic materials. Exchange Interaction in Magnetic materials, Magnetic Anisotropy and Magnetostriction Hard and Soft Magnatic Materials Ferrite for Microwave applications.

Dielectric Materials : Dielectric constant and polarizability Frequency dependence of polarizability. Insulating Materials, Ferroelectrics, Piezoelectrics, Electrets Applications of d-electric materials.

GROUP-B

Advance Electronics (set 4 questions)

Zener diode characteristic, Design of constant voltage power supply, SCR, Control circuits using SCR UJT. Relaxation oscillator using U J T Enchancement mode and Depletion mode Mosfet, Mosfet Biasing, Amplifier circuits using Mosfet, C M 0 S Inverter. Negative feedback, Effect of negative feedback on gain, landwielb distortion, input and output Impedence, Stability of feedback amplifiers, Nyquist-Criterion. Difference amplifier and its CMRR. Structure of optrational amplifiers. Gain, in put impedence, output impedence of Inverting and non-inverting operational amplifiers Operational amplifier as summor, Log and anti-log amplifier, operational amplifier as Differentiator and Integrator.

Amplitude, frequency and phase modulation sidebands of amplitude modlulated Wave, circuits producing amplitude. modulation, Demodulation. envelop dectection . Block diagram of superhetrodyne receiver and T V.

Paper - VIII (Practical)

Paper VIII wil be a practical paper consisting of two groups-VIII A and VIII B. The whole paper will be of 100 marks. The candidetes will have to perform one experiment each from VIII A and VIII B in the alloteted time of eight hours.

VIII A

The syllabus shall include the following experiments :-

1 Junction diode and Zener diods characteristic.
2 BJT Characteristics.
3 FET characteristics.
4 Static characteristics of tetrode
5 Verification of child-Langmuir law.
6 Frequency response of R C amplifier
7 Effect of negative feedback R. C. amplifier.
8 Properties of Hortley oscillator.
9 Study of a plate modulated amplifier
10 Frequency response of a tuned I - F amplifier.
11 Sensitivity study of a grid leak detector.
12 Diode detector and its Use as a voltmeter.
13 Study of load characteristics of a rectifier.
14 Multivibrator and study of its forms
is Study of logic gates (AND NAND, OR, NOR)

VIII B

The syllabus shall include the following experiments.

1 V erification of Brewster's law.
2. Verification of Fresnel's laws of reflection, and refraction of polarised light.
3 Analysis of elliptically polarised light
4 Inductance by Anderson's btidge.
5 Mutnal inductance by Carey – Foster's bridge .
6 Frequency characteristics of low-pass filter.
7 e/m by Braun's tube.
8. e/m by Helical method.
9. Mesurement of Hall co-efficient.
10 Band gap of semiconductor.
11 Planck's constant by photo cell method.
12 Power factor of an A.G. fan by
(i) Three ammeters method (ii) Three voltmeters method.
13 Copper loss and iron loss of a transformer.
14. Insertion loss variation with load of the T-section of an attenuator.
15 Beta ray absorption coefficient of a metal by G. M. counter.

Solid state amplitude modulator average and envelope detection radio receivers, superhetrodyne receivers simple idea of transmitters (with block diagrams) CRO and its applications Logic circuits - AND, OR NAND and NOR operations with the help of simple logic gates.

Types of computers and its basic components Input and output devices Concepts of Hardware and software BITS and BYTE. Programming of some simple mathematical problems in BASIC language,

Paper-III Practical

Full Marks – 25
Pass Marks –10

Time 3 hours

The syllabus shall include the following experiments :

1. Use of oscilloscope to measure (i) Voltage,(ii) current and (iii) frequency.
2. Determination of c/m of electron.
3. Verification of child Langmur law,
4. Characteritics of a friode valve.
5. Characteritics of BJT.
6. Characteristics of FET.
7. Characteristics of P-N junctions.
8. Frequency response of R. C. coupled amplifier.
9. LCR resonance circuit (i) Series (paralles.)
10. Determination of self and mutual Inductanses.
11. Comparision of capacitus by De-Sauty's bridge.
12. Calibration of prism spectromete.
13. Calibration at grating spectrometer.

CHEMISTRY (Hons)

PAPER - V (Theory)

Physical Chemistry

Time -3 Hours **Full Marks-100**

In all nine questions are to be set. The queltion 1 is ojective (l x 20 marks) and will screen the entire paper. Student will be required to answer five questions of which question 1 is compulsory.

1. Elementary Quantum Mechanics :–

Black body radiation. Planck's radiation law, Photo-electric effect, heat capacity of solids Bohr's model of hydrogen atom (no derivation) and its defects. Compton effect. De- Broglie hypothesis, the Heisenberg's uncertainity principle. Sinusoidal wave equation, Hamiltonian operator. Schrodinger wave equation and its imprtance, Phyaical Interpretation of the wave function. Postulates of quantum mechanics., Particle in a one dimensional box.

Schrodinger wave equation for H-atom, Separation in three equations (without derivation). Quantum numbers & their Importance hydrogen like wave functions, radial wave functions, angular wave functions.

Solid state amplitude modulator average and envelope, detection radio receivers, superhetrodyne receivers .simple idea of transmitters (with block diagrams.) CRO and its applications Logic circuits - AND, OR NAND and NOR operations with the help of simple logic gates.

Types of computers and its basic components Input and output devices Concepts of Hardware and software BITS and BYTE. Programming of some simple mathematical problems in BASIC language.

Paper-III Practical

Full Marks – 25
Pass Marks –10

Time 3 hours

The syllabus shall include the following experiments :

1. Use of oscilloscope to measure (i) Voltage,(ii) current and (iii) frequency.
2. Determination of c/m of electron.
3. Verification of child Langmur law,
4. Characteritics of a friode valve.
5. Characteritics of BJT.
6. Characteristics of FET.
7. Characteristics of P-N junctions.
8. Frequency response of R. C. coupled amplifier.
9. LCR resonance circuit (i) Series (paralles.)
10. Determination of self and mutual Inductanses.
11. Comparision of capacitus by De-Sauty's bridge.
12. Calibration of prism spectromete.
13. Calibration at grating spectrometer.

CHEMISTRY (Hons)

PAPER - V (Theory)

Physical Chemistry

Time -3 Hours **Full Marks-100**

In all nine questions are to be set. The queltion 1 is ojective (1 x 20 marks) and will screen the entire paper. Student will be required to answer five questions of which question 1 is compulsory.

1. Elementary Quantum Mechanics :–

Black body radiation. Planck's radiation law, Photo-electric effect, heat capacity of solids Bohr's model of hydrogen atom (no derivation) and its defects. Compton effect. De- Broglie hypothesis, the Heisenberg's uncertainity principle. Sinusoidal wave equation, Hamiltonian operator. Schrodinger wave equation and its imprtance, Phyaical Interpretation of the wave function. Postulates of quantum mechanics., Particle in a one dimensional box.

Schrodinger wave equation for H-atom, Separation in three equations (without derivation). Quantum numbers & their Importance hydrogen like wave functions, radial wave functions, angular wave functions.

2 Spectroscopy :–

Introduction, electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born oppenheirmer approximation.

Rotational Spectrum :–

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

Vibrational Spectrum :–

Infrared spectrum, Energy levels of simple harmonic pscillator , selection rules, pure vibrational specturm, intesity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional group.

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

Electronic Spectrum :–

Concept of potential energy curves for bonding and antibonding molecular orbital qualitative description of selection rules and Franck-Condon Principles.

Qualitativ, description of δ, μ and n M. O. their energy levels and the respective transitiors.

3 Photochemistry :–

Interaction of radiation with matter, differences between thermal and photochemical processes, laws of photochemistry, Grothus – Drapper law, Stark – Einstein law. Jablonski diagram depicting various processes occuring in the excited State, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing) quantam yield, photosensitized reactions energy transfer processes (simple examples).

4. Physical properties And Molecular Structure :–

Optical activity, polarization-(clausius Mossotle eqn), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment temperature method and refractivity method, dipole moment and structure of molecules, magnetic properties para-magnetism, dramagnetism and feeromgnetics.

5 Electrochemistry II :–

Type of reversible electrodes – gas metal ion, metal-metal ion, metal-insoluble salt anion and redox electrodes. Electrodes reactions, Nernest equation, derivation of cell E. M. F. and single electrods potential, standard hydrogen electrode-reference electrodes - standard electrode potential, sign conventions, electrochemical series and its significance.

Electrolytic and Galvanic cells–reversible and ineversible cells, conventional representation of electro-chemical cells.

B. M. F. of a cell and its measurements. Computation of cell E. M. F. Calculation of thermodynamic quantities of cell reactions (Δ G, Δ H and K) Polarization, over potential and hydrogen overvoltage concentration cell with and without transport, liquid junction potential, application of Concentration cells, valency of ions, solubility product and activity co-efficient potentiometric titrations.

Definition of pH and pka, determination of pH using hydrogen, quinhydrone and glass electrodes. Buffers, mechanism of buffer action, enderson equation Hydrolyies of salts.

Corrosion–types, theories and methods of combating it

6 Statistical Thermodynamics :–

Parrition fanction. Interprotation of the partition function. Translational rotational vibrational and elctronic partition function, Expressions of internal energy enthalpy, entropy and Gibbs free energy in terms of partition function.

Theory Inorganic Chemistry

Paper-VI

Time-3 Hours **Full Marks - 100**

In all nine questions are to be set. The question 1 is objective (1 X 20 markds) Students will be required to answer five questions of which questions. 1 is Compulsory

I Metal-ligand Bonding In Transition Metal Complexes **10 Hrs**

Limitations of valence bond theory, an elementary idea of Crystal-field theory; Crystal field spliting in octahebedral, tetahedral and square planar complexes, factors affecting the Crystal-field parameters.

II Magnetic Properties of Transition Metal Complexes **7 Hrs**

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

III Electron Spectra of Transition Metal Complexes **7 Hrs**

Types of elictronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series Orgel energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

IV Thermodynamic and Kinetic Aspects of Metal Complexes **5 Hrs**

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

V Organometallic Chemistry **10 Hrs**

Definition, nomenclature and classification of organometalic componads. Preparation, properties, bonding and applications of alkyls and aryls of Li,

Al, Hg, Sn and Ti, a brief account of metal-ethylenic complexes and homogeaneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

VI Bio Inorganic Chemistry **10 Hrs**

Essential and tracs elements in biological processes, metalloperphyrins with special reference to haemoglobin and myoglobin Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}. Nitrogen fixation.

VII Silicones and Phosphazenes **4 Hrs**

Silicones and phosphazenes as examples of inorganic polymers nature of bonding in triphosphazenes

VIII Chemistry of Actinides

General features and chemistr y of actinides chemistry of separation of N_p, P_u, and A_m from U, semilarity between the latter actinides and latter lanthenids

Organic Chemistry (Theory)

Paper -VII

Time-3 Hours **Full Marks-100**

In all nine questions are to be set. The question 1 is Objective (1x 20 marks) Students will be required to answer five questions of which question 1 is compolsory

1 Spectroscopy :–

Nuclear Magnetic Resonance, Chemical shift and structure, Nuclear Shielding and deshielding. Spin-spin splitting and coumpling constants. Identification of kinds of protons, Areas and peaks. Interpretation of PMR spectra of simple organic molecules such as ethyl bromide ethanol acetaldehyde, 1, 1, 2-tribromoethane ethyl acetate toluene and acetophenone.

Problems pertaining to the structure elucidation of simple organic molecules using UV, IR and PMR spectros. copic technique.

2 Mechanism of organic reactions :–

Nucleophilic substitution at a saturated carbon atom study with reference to kinetics (SN^1 and SN^2). Mechanism and Evidence, Stereochemistry. Effect and structure of organochain, nucleophilic polarity of solvent and leavin group. Elimination Reactions- Study with reference Kinetics (E^1 and E^2).

Mechanism, Evidences, Mechanistic Variable Stereochemistry, Satya Zeff's rule, Hofmann's elimination.

3 Condensed Poly nuclear Hydrocarbons :–

Napthalene. Anthracene and phenanthrene–Physic properties, Chemical properties, Structure, Synthesis Derivatives of nephthalene, anthracene and phenanthrene Molecula. overcrowding.

Heterocyclic Compounds :–

Introduction : Molecular or bital picture and aromatic characteristics of pyrrole furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactiors in pyridine derivatives. Comparision of basicity of pyridine piperidine and pyrrole

Introduction to condensed five and six membered heterocyclic Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup's systhesis and Bischler–Napieraiski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Name Reaction :–

Perkin Reaction, Macnich Reaction, Michael Reaction, Beckmann's Rearrangement Fries Rearrangement, Claiseu Rearrangement, Arndt–Eistert synthesis, Darzen's glycidic Ester synthesis, Hofmann's Exhaustive methylation.

6 Ureide and Uric acid–Xanthene, Caffiene.

7 Plant Pigments –Anthocynins, flavones and Isofianones

8. Amino Acids, Peptides, Proteins & Nuclic Acids :–

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelective point and electro-phoresis. Preparation and reactions or a-amino acids.

Structure and Nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination and group analysis, selective hydrolysis of peptides. Classical peptide synthesis, Solid-phase peptide synthesis. Structure of peptides and proteins. Levels of protein structure. Protein denaturation/renaturation.

Nucleic Acid – Introduction. Constituents of nucleic acid. Ribonucleoside and ribonnucleotides. The double helical structure of DNA.

9 Synthetic Dyes

C olour and constotion (electron ic concept). Classification of dyes. Chemistry and Synthesis of Methyl Orange, Congo red, Malachit green, Crystal violet, Phenolthalein, Fluorescein. Alizann and Indigo.

Paper VIII (Practical)

Time -6 hours, **Full Marks-100**

GROUP-A (40 Marks)

1 Determination of molecular weight of volatile liquids by Victor Meyer method.

2 Determination of surface tension of liquid using stalagamometer and calculation of Paracbor values.

3 Determination of co-effiecient of viscosity of liquids using Ostwald viscometer.

4 Determination of partition cofficient of solutes between two immiscible liquds.

5 Determination of rate constant for hydrolysis of Ester catalysed by H^+ ions at room temparature.

6 Thermochemistry : Heat of solution of solute in a solvent, heat of neutralisation.

GROUP-B (40 Marks)

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

GROUP-C

Record of class work and viva-voce. 10+ 10

NOTE One experiment from Group (A) and one from Group (B) to be set for each Candidate.

Group (B) to be set for each Candidate.

B. Sc. Part-III General/Subsidary (Theory)

Paper - III

Time—3 hours **Full Marks-75**

There shall be three Groups A (Physical) Group B (Inorganic) and Group C (Organic) each groop carrying 25 marks. In each group four questions are to be set out of which two are be be answered Six questions are to be answered in all.

Group A (Physical Chemistry)

1 Physical properties and Molecular structure of simple molecules – Surface tension, Parachor, Molar volume Viscosity Diple moment.

2 Colloidal State – Classification, Preparation of colloidal solution and their purification Properties of colloids Precipitation of Colloid, and Protective action of colloids.

3 Absorption – Types of adsorptian. Adsorption isotherm, Freunlich adsorption Isotherm Langmuir Adsorption Isotherms.

4 Catalysis – Characteristics of catalysis, Types of catalysis Enzyme Calatysis, Theory of Catalysis Autocatalysis.

Group-B
Inorganic Chemistry

1 Co-ordination compounds:–

Double salts and Co-ordination compounds Warnar's Co-ordination theory and its exrerimental Verification, Sidwick's theory of effective atomic number, chelates, Nomenclature of co-ordination compounds, Isomerism in co-ordination compounds. Valence bond theory of transition metal complexes.

2 Transition elements :–

General characteristics of transition elements with special reference to 3d-series in respect of electronic configuration atomic and ionic radii, Ionisation Potential oxidation states and their relative stability. Magnetic property, colour complex formation and catalytic property.

3 Chemistry of Lanthanide elements :–

Electronic configuration occurance and Isolation oxidation States, ionic radii and lanthanide contration, complex formation and colour.

4 Organometallic chemistry :–

Defination nomenclature and classification of organometallic compounds, Properties, bonding and application of alkyls and aryls of Li, Al, Hg and Be Metal.ethylenic complexes, carbonyls and nature of bonding in metal carbonyls.

5 The chemistry of individual element and their compounds :–

(i) Molybdenum

(ii) Platinum metals with special reference to palladium and platinum

GROUP-C

Record of class work and viva-voce. 10+ 10

NOTE : One experiment from Group (A) and one from Group (B) to be set for each Candidate.

Group (B) to be set for each Candidate.

B. Sc. Part-III General/Subsidary

Paper - III **(Theory)**

Time—3 hours **Full Marks-75**

There shall be three Groups A (Physical) Group B (Inorganic) and Group C (Organic) each groop carrying 25 marks. In each group four questions are to be set out of which two are be be answered Six questions are to be answered in all.

Group A (Physical Chemistry)

1 Physical properties and Molecular structure of simple molecules – Surface tension, Parachor, Molar volume Viscosity. Diple moment.

2 Colloidal State – Classification, Preparation of colloidal solution and their purification Properties of colloids Precipitation of Colloid, and Protective action of colloids.

3 Absorption – Types of adsorptian, Adsorption isotherm, Freunlich adsorption, Isotherm Langmuir Adsorption Isotherms

4 Catalysis – Characteristics of catalysis, Types of catalysis, Enzyme Calatysis, Theory of Catalysis Autocataysis.

IV Ecology (6)

I Analysis of sell and pond biota.

2 Determination of dissolved O. 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)

B. Sc. Part-III

Zoology Honours

Paper- V (Theory)

(Biochemistry, Mammalian physiology and Endocrirology)

Full Marks-100

Time-3 hours

In all ten questions to be set (three questions from each group) besides question 1 which shall be objective, (1 X 20 marks) and will screen the whole syllabus of this paper. Student s will be required to answer five questions selecting at least one from each group. Questions 1 shall be compulsory.

Group – A

1. **Biochemistry**

(i) Structure and classification of amino acids, structure of protein. structure and classification of carbohydrate (with special reference to mono and disaccharides and hemoglycan polysachandes). Structure and classification of fatty acids, Structure and classification of hpics

(II) Metabolism of Carbodydrates: Glycolysis and Kreb's cycle. glycogenesis and glycogenolysis.

(iii) Vitamin : Their definitions. names and roles.

Group- B

II. Mammalian Physiology with special reference to man..

(i) Digestive enzymes : regulation of their secretion and their action in Gastrointestinal tract.

(ii) Physiology of respiration: ventilation (with an idea external condective conductance of gases and their control, diffusion conductance of gases across lung alveoli Picks equation for diffusive and convective conductane of gases and internal 'connective conductance of gases through blood.

(iii) Physiology muscle contracticion.

(iv) Water and electrolyte metabolism. Osmotic anatomy and water and electrolyte regulation.

(v) Physiology of Nitrogen excretion. Synthesis of urea and its removal.

(vi) Blood acid-base regulation.

(vii) Blood coagulation.

(viii) Immune system and AIDS

(ix) Thermoregulation.

(x) Functional division of cerebral cortex in man.

(xi) Physiology of reproduction : androgens and their actions folliculogenesis. ovulation, corpus lutecum and mestrual cycle, Ovarian hormones and their action

Group – C

III. Endocrinology with special reference to man.

(i) Adenohypophysis: chemical nature of hormones and their functions, feed back mechanisms.

(ii) Neurohypophysis. origin, release, Chemical nature and action of hormones.

(iii) Thyroid : chemistry and action of hormones.

(iv) Adrenal : chemistry of corticosteroids, their actions and control of their secretion.

(v) Islets of Langerhans : chemistry and physiological actions of glucagon, insulin somatostation and pancreatic polypeptides.

Paper VI (Theory)

(Cell Biology, Genetics, Biotechnology and Biometry)

Time-3 hours **Full Marks-100**

In all nine questions are to be set, out of which question 1 shall be objective (1 x 20 marks) and will screen the whole of this paper. Students will be required to answer five question selecting two from one group. Question 1 shall be compulsory.

1. Cell Biology

(i) Elementary idea of working principle and magnifying power of an electron microscope. Ultrastructure and function of plasme membrane, Endoplasmic reticulum, Nucleus, Mitochondia, Golgi complex. Ribosomes, Lysosomes, Cell junctions, cell adhesion and extra cellular matrix.

2. Biometry

(i) Normal distribution and its atributes: range, mode, median and arithmatic mean.

(ii) Standard deviation, standard error, simple t-test and Chi-square test.

(iii) Essential parts and functioning of a computer.

Group – B

Genetics and Biotechnology.

(i) Laws of inheritance.

(ii) Genetics ABO blood groups.

(iii) Interaction of genes with reference to coat colour in mammals.

(iv) Structure and replication of DNA. Transcription and translation.

(v) Structure of chromosomes, chromosomal aberration and their significance.

(vi) Sex determination and sex linked inberitance in man.

(vii) Biotechnology : Concept and scope : important products of Biotechnology, culture of animal tissue, artificial breeding in Gangetic carps by hypophysation Basic concepts of genetic engineering.

(viii) Biotechnology, ethical issues and biosafety regulatious.

Paper VII (Theory)

Time : 3 hours **Full Marks – 100**

In all nine questions are to be set, out of which question I shall be objective (1 x 20 marks) and will screen the whole of this paper. Student will be required to answer five questions attempting two from each group. Question 1 shall be compulsory.

Group – A

I Paleozoology

(i) Geological ers : Their duration, and characteristic fauns.

(ii) Continental drift.

(iii) Fossils : Their formation and age determination.

II Evolutionary history

(i) Fossil history of horse.

(ii) Origin and evolution of man.

III Zoogeography

(i) Zoogeographical realms of the world, their boundaries climatic peculiarities and mammalian launa

(ii) Theories and principles of animal distribution.

Group – B

IV Mechanism of Evolution

(i) Sources of hereditary variations and their role in evolution.

(ii) Theories of evolution, Darwinism, and Neo-Darwinism.

(iii) Isolating mechanism and their role in evolution.

(iv) Hardy-Winberg Law and genetic equilibrium, genetic drift. B. Evolutionary history.

V. Animal Behaviour

(i) Innate and learned behaviour.

(ii) Terretoriality and reproductive behaviour

(iii) Social behaviour in insects and primates.

(iv) Parental care in fishes and birds.

(v) Migratory behaviour in birds.

(vi) Biological clock.

Paper VIII (Practical)
(Based on paper V, VI & VII)

Full Marks – 100

Time – 6 hours

I Biochemistry (10)

1 Determination of RI value of any four amino acids using paper chromatography.

2 Determination of pK of an amino acid.

II Hematology of frog/mammal. (8)

1 Enumeration of total RBC.

2 Determination of ESR of blood.

3 Estimation of hemoglobin in blood.

4 Determination of bleeding and clotting time.

III Physiology (12)

1 Determination of O_2 uptake by an equatic animal.

2 Simple heart beat and muscle contraction curve by drum method (Kymograph).

IV Dissection to show four of the following endocrine glands of a mammal : Ovary Testis, Thyroid, Adrenal, Pancreas, Pituitary. (8)

V Identification and comment upon the histological slides of any three of the following : Pituitary, Adrenal, Ovary, Testis, Islets of Langerhans, Thymus, Thyroid, Parathyroid and Vaginal smears. (12)

VI Cell Biology (10)

A.

1. Vital staining of mitochondria in buccal epithelium and secretary granules in salivary glands of cockroach.

2. Acetocarmine preparation of chromosomes of Chironomous/Drosophila larva. Root tip of onion, Testes of hopper.

B. Comments upon 2 cytological slides showing stages of mitosis and first prophase of meiosis. (2 x 4 =8)

VII Evolution and Palaeontology (4)

1 Serial homology as exhibited by appendage of Prawn and dentition of a mammal.

2 Adaptive radiation as exhibited by beaks of birds.

3. Homology as exhibited by the fore limbs of tree frog, Calotes, Hemidactylus, rat, bat and bird.

4 Analogy as exhibited by the wings of bird, patagium of bat and wings of insects.

5 Study of fossils.

VIII Comments on one specimen exhibiting animal behaviour. (4)

1 Mendelism linkage and crossing over.

2 Sex determination and sex-linked inheritance in man.

III Cell Biology

1. Ultrastructure and function of plasma membrane, Endoplasmic reticulum, Mitochondria, Golgi Body, Lysosome and Chromosome.

2. Gametogenesis, Fertilization and parthenogenesis.

Paper III B (Practical) (General Course)

Time 3 hours

Full Marks – 25
Pass Marks – 10

1 Determination of dissolved oxygen in water with the help of Winkler's Volumetric Method. (6)

2 Determination of PH of different water samples. (4)

3. Identification and comment on the Zoo-biota present in water. (4)

4. Squash preparation to slow stages of mitosis (Onion root tips, Meiosis (Grasshopper) and giant Chromosomes of Chironomus, Drosophila larva. (4)

5. Vital staining of mitochondria in the buccal epithelium and secretary granules in salivary glands of cockroach. (4)

6. Class record. (3)

IX Instrumentation, working of PH meter, colorimeter, Centrifuge, hemocytometer and Kymograph. (4)

X Class record (Regularly signed work be given credit) (10)

XI Excursion report and viva related to the subject matter covered in this practical paper. (10)

B.A./B.Sc. Part - III
MATHEMATICS (Hons)
Paper – V

Total number of questions 12 (Twelve). Answer any six questions selecting at least one from each group. Q. No. 1 will be objective and compulsory.

Group – A

Real Analysis :

Riemann integral, Integrability of continuous and monotonic function. The fundamental theorem of integral calculus, Mean value theorems of integral calculus : - 1 Qn.

Improper integrals and their convergence, comparison tests, Abel's and Dirichlet's tests' Frullani's integral, Integral as a function of a parameter, continuity, Derivability and integrability of an integral of a function of a parameter – 1 Qn.

Series of arbitrary terms, convergence divergence and oscillation, Abel's and Dirichlet's test, Multiplication of series - 1 Qn.

Partial derivation and differentiability of real valued functions of two variables, Schwarz and Young's theorem : - 1 Qn.

Fourier series, Fouries expansion of piecewise monotinic functions- 1 Qn.

Group – B

Complex Analysis :

Complex numbers as ordered pairs, Geometric representation of complex numbers, Sereographic projection, Equation of a line through two given points Z_1 and Z_2 Equation of a circle – 1 Qn.

Continuity and differentiability of complex functions, Analytic functions, Cauchy's Kiemann equations, Hermonic Functions :– 1 Qn.

Elementary functions, Mapping by elementary functions, Mobius transformations Fixed points, Cross ratio, Inverse points and critical mappings, Conformal mappings – 1 Qn.

Group – C

Metric Spaces :

Definition and examples of metric space, Neighbourhoods, Limit points, Interior points, Open and closed sets, Closure and interior, Boundary points, Sub – space of a metric space, Cauchy sequences, Completeness, Cantor's inter section theorem, Contraction principle, Construction of a real numbers as the completion of the incomplete metric space of retionals, Real numbers as a complete ordered field, Dense subsets, Baire category's theorm, Separable, Second countable and first countable spaces, Continuous functions, Extension theorem, Uniform continuity, Isometry and homomorphism, Equivaleot metrics, Equivalect metrics, Completeness, Sequential compactness, Totally bounded spaces, Finite intersection property, Continuous functions and compact sets, Connectedness, Components, Comuous functions and conected sets. – 3 Qns

Paper – VI

Total number of questions 12 (Twelve)

Answer any six questions selecting at least one from each group. Q.No 1 will be objective and compulsory.

Group – A

Abstract Algebra :

Centre, Normalizer, Conjugacy relation, Class equation, Solvable group, Finite groups, Cauchy's theorems, Sylows first theorem, P-sylow subgroup, Group automorphisms, Inner authomorphism, automorphism groups and their computation, Abelianizing of a group and its universal property, Structure theorem for finite abelian groups – 4 Qns

Group – B

Ring Theory

Division ring, Ring homomorphism, Ideals and Quotient Rings, Field of Quotients of Integral dom air Euclidean Rings, Polynomial Rings, Polynomials over the Rational Field, Eisenstein Criterion, Polynomial Rings over commutative rings, Unique factorization domain, Unique factorization domain, implies so in R $[x_1, x_2, x_3 \ldots\ldots x_n]$, Modules & its properties – 4 Qns

Group – C

Linear algebra :

Difinition and examples of vector spaces, subspaces, Sum and direct sum of subspaces, Linear span, Linear dependence, independence and their basic properties, Basic, Finite dimensional vector spaces, Existence theorem for bases, Invariance of the number of elements of a basis set, Dimension, Existence of compementary subspace of a finite dimensional vector space, Dimension of subspaces, Quotient space and its dimension, Linear transformations and their representation as matrices, The Algebra of linear

transformation, The rank nullity theorem, Change of basic, Dual space, Bidual space and natural isomorphism, Adjoint of a linear transformation, Eigen values and eigen vectors, of a linear transformation, Diagonalization, Annihilator of a subspace, Bilinear, Quadratic and Hermitian forms – 3 Qns

Paper – VII

Total number of questions 12 (Twelve). Answer any six questions selecting at least one from each group. Q. No. 1 will be objective and compulsory.

GROUP – A

Numerical Analysis :

Solution of equations, Hesection, Secant, Regula Falsi, Newton's Method, Roots of Polynomial interpolation Formulas Using differences, Numerical Differentiation, Numerical Quadrature, Newton-Cote's Formulas, Gauss Quadrature Formulas, Tchybycheff Formulas, Linear Equations, Direct methods for solving systems of linear Equations (Gauss Elimination, LU Decomposition, Cholesky Decomposition), Iterive Methods (Jacobi, Gauss-Seidel, Relaxation Methods).

The algebraic Eigenvalue Problem, Jacobi's Method, Givens Method, Householder Method, Power Method, QR Method, Lanczos's Method, Ordinary Differential Equations, Euler Method, Single Step Methods, Runge-Kutta Methods, Multi Step Methods, Milne Simpson Method, Methods based on Numerical integration, Methods based on Numerical differentiation, Boundary value Problems, Eigenvalue problems, Approximation, Different Types of Approximations, Least square polynomial Approximation, Polynomial Approximation using orthogonal polynomials, Approximation with Trigonometrical Functions, Exponential Functions, Tchybycheff Polynomials, Rational Functions – 3 Qns

GROUP – B

Probability Theory :

Motion of Probability, Random experiment, Sample space, Axiom of probability, Elementary properties of probability, Equally likely outcome problems, Random variables, Concept, Cumulative distribution function, discrete and continuous random variables, expectations, mean Variance, Moment generating function, Discrete random variable, Bernoulli random variable, binomial random variable, Geome ric random variable, Poisson random variable, Continuous random variable, Uniform random varible, exponential random variable, Gamma random varible, normal random variable, Conditional probability and conditional expectations, Bayes theorem, Independence, Computing expectation by conditioning, some applications a list model, a random graph, Polya's urn model, Bivariate random variables, Joint distribution, Joint and conditional distribution, the correlation coefficient, Functions of random variables, sum of random variables :– 3 Qns

GROUP – C

Optimization :

The linear programming problem, Problems formulation, Linear programming in matrix notation, Graphical solution of linear programming problems

ome basic properties of convex sets, Convex function and concave functions Theory and application of the simplex method of solution of a linear programming problem, Charne's M.Technique, The two phase method, Principle of duality in linear programming problem . Fundamental duality theorem simple problems . The transpertation and Assignment problems :– 3 Qns.

Paper – VIII

Total number of questions 12 (Twelve) Answer any six questions selecting at least two from each group. Q. No. 1 will be objective and compulsory.

Group – A

Mechanics

Dynamics of Rigid Bodies :

Moments and Product of inertia, The Momental Ellipsoid, Equimomental systems, Principal axes – 1 Qn.

D. Alembert's principle, The general equations of motion of a rigid body. Motion of the centre of inertia and motion relative to the centre of inertia – 1Qn.

Motion of a rigid body in two dimensions under finite and impulsive forces – 1Qn.

Conservation of Momentum and Energy, Lagrange's equation, Initial Motions :– 2 Qns

Group – B

Hydrostaties :

Pressure equation, condition of equllibrium, Lines of force. Homogeneous and hetergeneous fluids. Elastic Fluids, Surface of equal pressure. Fluid at rest under action of gravity. Rotation fluids, Fluid Pressure on plane surffaces. Centre of pressure, Resultant pressure on curved surfaces – 3 Qns

Equilibrium of floating bodies. Centre of bouyancy surface of buoyancy stablity of equilibrium of floating bodies, Meta centre, work done in producing a displacement vessel consaining liquid, Gas laws, Mixture of gases, Internal Energy, Adiabatic exparsics, work done in compressing a gas, Isothermal atmosphere, convective equilibrium – 3 Qns

Other Optional Papers :

1. Differential Geometry
2. Discrete Mathematics
3. Special theory of Relativity.

B.A./B.Sc. Part - III (General) Mathematics

Paper - III (Pass)

BMG 30

Total number of questions 16 (Sixteen)

Answer any eight questions selecting at least one from each group. Q. no. 1 will be objective and compulsory.

Group A

BOTANY (Hons.)

Paper – V (Theory)

Time – 3 Hours **Full Marks – 100**

In all nine questions are to be set, five from Group A and three from Group B. Question I shall be objective (1 x 20) and compulsory covering entire paper. Students will be required to answer five questions attempting not more than two from Group B.

Group – A **Physiology**

1. Plant water relations : Duffusin, osmosis, water potential, Absorption of water, water transport through xylem, transpiration and its significance, Mechanism of stomatal movement.
2. Mineral Nutrition : Criterian of essentiality of elements, Micro and Macro-nutrients, Mineral deficiency symptoms and plant disorders. Nutrient uptake nad transport with special reference to role of cell membrane and ion pumps and carriers.
3. Photosynthesis : Photosynthetic pigments , electron transport pathway in chloroplast. Photophosphorylation, Calvin cycle, C_4 – Carbon cycle. Brief account of Photorespiration and productivity.
4. Respiration Glycolysis, TCA cycle. Electron transport system Oxidative phosphorylation.
5. Nitrogen metabolism. Nif genes, regulation of nitrate reductaseland Nitrogenase, Nitrate and ammonium assimilation.
6. Growth and Development : General aspects, seed dormancy and germination, photoperiodism, physiology of flowering. Vernalization, Auxin, Gibberellin, Cytokinin, Abscissic acid, ethyleue (Structure and role).
7. Plant Movement : A general account.

Group B **Biochemistry**

1. Carbohydrates — Classification and characteristics structure of some representative of Mono, Oligi, Polysaecharids Stereoisomers.
2. Lipid : — Classificaton and characteristics saturated and unsaturated fatty acids, Oxidation of fatty acids. Biosynthesis of Fatty acids.
3. Protein — Classification and characteristics of Protein and Amino acids, Primary, Secondary, Tertiay and Quarternary structure of protein . Protein biosynthesis.
4. Enzyme — Classification, properties, mechanism of action, factors affecting enzyme action, Immobilization of enzymes, Co-enzyme, Allosteric enzymes.

Paper – VI (Theory)

Time : 3 Hours Full Marks : 100

In all nine question are to be set. Five from Group A and three from Group B. Question 1 shall be objective (1 x 20) and compulsory covering the entire paper. Students will be required to answer five questions attempting not more than two from group B.

GROUP – A (Cytogenetics)

1. Cell division – Mitosis and Meosis.
2. Cell cycle and regulation – Apoptosis
3. Prokaryotic and Eukaryotic chromosome structure, lampbrush and Polytene chromosome.
4. Mendel's experiment and principles of inheritence
5. Gene interaction and modified dihybrid rations (Epistatic complimentary, Supplementary and Duplicate factors)
6. Linkage and crossing over.
7. Sex-linked inheritancein Drosophila and Man, mechanism of sex determination.
8. Chromosomal abberation.
9. Mutation – Spontaneous and induced
10. Polyploidy – Types and effects of auto and allopolyploidy, origin and meiosis in Nullisomics, monosomics and trisomics.
11. Methods of plant improvement – Hybridization, hybrid vigour
12. Standard error, standard deviation and chi-square test.

GROUP – B (Molecular Biology)

1. Composition of nucleic acid, DNA structure, B and Z forms of DNA, Denaturation and renaturation of DNA.
2. Hetero and Euchromatins, DNA replication, Transcription.
3. Forms of RNA and their role, translation.
4. Gene structure – Gene organisation in prokaryotes and Eukaryotes.
5. Operon concept, (Lac & Tryp.) Gene regulation in prokaryotes and Eukaryotes (in brief).
6. Recombinant DNA technology – Restriction endonucleases, prokaryotic and eukaryotic vecters, genomic and C DNA libraries, DNA finger printing, Polymerase chain reaction. Transgenic plants.

Paper – VII (Theory)

Time : 3 Hours **Full Marks :100**

In all nine question are to be set, Four each from Ground A and Group B. Question 1 shall be objective (1 x 20) and will screen the entire paper. Students will be required to answer five questions attampting two from each group form. Question 1 will be compulsory.

GROUP – A (Plant Ecology)

1. Interrelationship between the living world and the environment.
2. **Earth as a system** – The biosphere, the hydrosphere, the lithosphere, atmosphere , components within biosphere.

3. **Population** : Basic concept, interaction and regulation.
4. **Community** : Characteristics and their measurement species diversities, ecological niche.
5. **Ecosystems** : Types, structure and functins.
6. **Food chain**: Food web, trophic levels, ecological pyramids.
7. Biogeochemical cycles.
8. **Productivity** : Concept and types.
9. **Ecological succession** : Hydrosere and xerosere.

GROUP – B (Environmental Biology)

1. Plant indicators and their role in environmental monitoring.
2. Soil conservation : Principles and management.
3. Renewable and non-renewable natural resources and th management.
4. Conservation of endangered species, wild life management
5. Afforestation, Social and agroforestory.
6. Major sources of environmental pollution and their control.
7. Major vegetational belts in India .
8. Environmental education and organisations.

Paper –VIII (PRACTICAL)

Time – 6 Hours. **Full Marks – 100**

Practicals based on Papers V, VI and VII

Experiments on Plant Physiology

1. Imbibition of fatty and starchy seeds.
2. Measurement of OP by plasmolytic method.
3. Effect of CO_2 concentration on Photosynthesis.
4. Effect of light intensity on Photosynthesis.
5. Effect of cuticle on the rate of transpiration.
6. Measurement of rate of transpiration by Potometer.
7. Separation of chloroplast pigments by chromatography.

Biochemistry

1. Detection of Carbohydrate.
2. Detection of Protein.
3. Detection of Lipids.
4. Detection of alkaloids/sterols.

Cytogenetics and Plant Breeding

1. Study of stages of mitosis and meiosis.
2. Emasculation and Pollination technique.
3. Genetical problems.

Plant Ecology and Environmental Biology

1. Minimum size of the quadrate by species area curve method.
2. Measurement of frequency and density in a grassland
3. Water holding capacity of soil.
4. Measurement of PH.

Viva – Voce

Class – records

PHYSICS

(General/Subsidiary Course)

Time:3 Hours Full Marks- 75 Pass Marks - 23

9 questions to be set, 5 to be answered.

Group A consisting of Objective questions will be Compulsory. Groups B and C will contain 4 questions each and two questions will have to be answered from each of them.

GROUP - A (Objective questions)

GROUP - B (Electrostatics and Magnetism)

Boundary conditions at the surface of separation of two dielectrics. Electric doublets, Dipole moment, Dielectric polarisation. Electrical images-problems involving Infinite conducting plane and thin conducting spherical shell only.

Magnetic shell, Langevin's and Weiss' theory of diapara and ferromagnetism. Curie's law, Production and measurement of strong magnetic fields, Magenetic circuit and Electromagnets.

(Current Electricity and Modern Physics):

Thermodynamic treatment of Seeback, Peltier and Thomson effects and their applications. Moving coil aperiodic and ballistic gabranometers. Growth and ecay of currents in electric circuits. Oscillatory discharge of a condenser.

A.C. and A.C. circuts: Use of vectors and complex quantities in A.C. circuits theory (L.R,C.R. and I.C.R. circuits), Desauty's bridge, Auderson's bridge and Carey Foster's bridge.

Measurement of electronic charge by Millkan's method and specific charge of an electron by Thomson's method. Natural radioactivity. Rutherford & Soddy's theory of radioactive decay Geiger-Muller counter. Dicovery of neutrons. Isotopes. Artificial radio-activity. Elementary ideas about nucleus and its structure. Nuclear fission. Reactors, Aston's mass spectrograph.

Photoelectric emission, Einsten's photoelectric equation, Photo - electric, photo-conductive and photo voltaic cells.

Compton effect Bragg's law and determination of x-ray wavelength.

Cathode ray Oscilloscope and its uses in amplitude, frequency and pha measurements. Solid state rectifier. One stage R.C. amplifier. Principles amplitude modulation and demodulation Radio receiver through Block diagra

GROUP - C (OPTICS)

Fermat's principle, Newton's ring. Micheloson's interferometer Fresne diffraction at straight edge. Fraunhoffer's diffraction single slit, double slit, pla transmission gratings. Resolving power of microscope and telescop Polarisation, production of plane. Circularly and elliptically polarisled ligh Nicol's prism. Quarter wave plate. Half-shade polarimeter Babine compensator,

Bohr's theory of hydrogen spectra. Priciple of laser action Ruby laser.

Maxwell's equation. Equation of plane electromagnetic waves and i solution.

PRACTICAL

Time -3 Hours Full Marks. -25

The Sllabus shall include following experiments.

1. Refractive index by Spectrometer.
2. Wavelength by Newton's ring method.
3. Wavelength by plane transmission grating.
4. Magnifying power of telescope.
5. Magnifying power of microscope.
6. Resolving power of telescope.
7. Measurement of dip by (i) Dip-circle (ii) Earth's inductor
8. Figure of merit of moving coil galvanometer.
9. Calibration of Ammeter and voltmeter by Potentiometer.
10. B.G. Constant and Log decrement.
11. Measurements of low and high resistance.
12. Temperature variation of electrical resistance.
13. Characteristics of valve and semi conductor diodes.

PHYSICS HONOURS

PAPER- III

This paper will be of 75 marks. Question 1 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 required to answer two questions from each group . The questions will be of equal value.

GROUP A

(Mathematical physics and relativity): Set 4 questions.

Curvilinear co-ordinates, cartesian, spherical polar and cylindrical co-ordinates. Orthogonal transformation of co-ordinates. Scalar and vactor quantities. Divergence and curl. Line, surface and volume integrals. Theorems of Gauss and Stokes.

Partial differential equation and its solution by seperation of variables. Laplace equation and its solution. Poisson's equation.

Galilean transformation. Inertial frame of reference Michelson - Morley experiment. Lorentz Fitzerald contraction. Einstein's postulates. Lorentz transformation and its consequences, length contraction and time dilation. Addition of velocities Dragging of light by moving medium. Relativistic Doppler effect for propagation of light waves Aberration of light Variation of mass with velocity, mass energy relation. Relativistic formula for momentum and energy.

GROUP B

(Electronics) : Set 4 questions.

Basic circuit analysis: Circuit models, Kirchoff's law, single equation loops, single mode pan circuit, voltage and current divider rules, principle of superposition. Thevenin's and Nortan's theorems, two-post analysis of an electrical network.

Semiconductor diodes: p-n junction diode, I-V characteristics, Schockley model, application in rectifiers, clippers and limtters, Zener diode and its applications, optoelectronic diodes; LED, photodiodes, optocouplers.

Bipolar junction transistors (BJT): pnp and npn structure; active and Saturation regions, characteristics of BJT, common emitter configuration, input and output caracteristics, B-parameter, common - base configuration, output characteristics, Two post analysis of a transistor, definition of h-parameters, loadline common base configuration concept, emither follower, biasing methods, stability factor, low frequency model.

Field effect transistor (FET): Classification of various types of FET, constructional details of junction field effect transistor, chain characteristics of JFET, biasing of JFET, operating regions, pinch off voltage, idea of metal oxide semiconductor (MOS) transister.

Amplifiers: frequency response of amplifiers, LC and CR response, bandwidth and rise time, amplifier, flat band equivalent circuits with and without input and output loading, Cascade connections. Decibel power, gain and loss. Conversion to voltage and current gain, Bode's plots.

Oscillators and wave-form generators: positive feed back, Barkhausen criterion, RC oscillator, wien Bridge oscillator, phase shift oscillator, colpitt's oscillator, Hartley Oscillator, operational amplifier, square wave generator, calculations of frequency and amplitude of oscillator, unijunction oscillator.

Digital circuits: binary system, Boolean algebra, AND, OR, NAND, NOR gates, TTL logic families, NMOS and CMOS circuits, ECL gates, binary address, Arithmetic function circuits digital comparator/decoder, demultiplexer data selector, encoders, ROM, address in of ROM PROM, EROM SR, JK flip-flops, ripple counters, synchronous concentres, elements of MP, CPU, busses, 1/OS, memories.

PAPER - IV

This paper will be of 75 marks. Question 1 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 required to answer two questions from each group. The questions will be of equal value.

GROUP A

(Current Electricity and atomic physics) : Set 4 questions

Current Electricity : Thermodynamic treatment of seeback, Peltier and Thomson effect and their applications. Self inductance and mutual inductance. Growth and decay of current in LC and LCR circuits, simple applications

of these circuits. Moving coil galvanometer- a periodic and ballistic galvanometers. A. C. and A.C. circuits; use of vectors and complex numbers in A.C. circuit theory. Series and parallel resonant circuits. Power in A.C. circuits, Wattweter A.C. Bridges: (i) De Sauty's bridge (ii) Anderson's 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. Transformers-equivalent circuit and vector diagram, iron and copper losses in transformers.

Photoelectric effect : Elenstein's photoelectric equation; photoelectric, photoconductive and photovoltaic cells.

Compton effect, Bragg's law and determination of X-ray wavelength.

Atomic Physics: Back ground from quantum theory the four quantum numbers. Spectral terms arising from L.S. coupling, S, p, d, f rotation, selection rules, Half life of excited states, width of a spectral line, spectra of mono and divalent atoms; Doublet fire structure of hydrogen lines, screening constants for monovalent atoms, series limits, doublet structure of alkali spectrum, spectra of helium and alkaline earth atoms, singlet and triplet series.

Effect of magnetic field on energy levels, Gyromagnetic ratios for orbital and spin motions; vector model, Lande g factor, strong and week field effects, illustrative cases of H, Na, Ca and Hg.

X-ray spectra: The continuum X-ray spectrum, Duane and Hunt limit characteristic X-rays; Moseley's law, doublit fine structure, H- like character of X-ray states. X-ray absorption spectra, absorption edges.

GROUP - B

(Molecular Physics and classical electrodynamics): Set 4 Questions.

Molecular Physics: Sharing of electrones, formation of molecular orbitals, H_2^+ ion, H_2 molecule, electronic levels, singlet and triplet characters. Rotational energy levels, internuclear distance. Vibrational energy levels, force constants. anharmoncity dissociation energy isotope effects on rotational and vibration energies.

Spectra of diatomic molecules: Pure rotation spectra; selection rules. Vibration-rotation spectra; selection rules, P.O. and R branches. Electronic band systems, sequences and progressions. Franck Condon Principle.

Triatomic and Complex molecules: Normal modes of a triatomic molecule; selection rules for infrared absorption, molecular orbitals in complex molecules, approximation for treating H.O.C, vibrations relative to 'rest' og the molecule.

Raman effect. Raman shifts, stokes and anti stokes lines, selection rules ir. Raman versus IR spectra.

Classical Electrodynamics:

Time - dependent fields and Maxwell's equation; Motion of charged particles in E and B fields. Case of cathode ray Oscillograph, positive ray parabola, velocity selectro, magnetic focussing cyclotron and betatron, mass spectrography.

Maxwell's equation for time dependent electromagnetic field in vacuum, and in material media, boundary conditions.

Electromagnetic potentials, Magnetic vector potential A and scalar potential ϕ, Poission's equation fro A in terms of current density, solutions for line and surface currents, coulomb and Lorntz gauge transformation, Lorentz law in terms of potentials.

Electromagnetic Waves: Maxwell's equations and electromagnetic waves, plane-wave solution for Maxwell's equations, Orthogonality of E,B and propagation vector Poynting vector, energy and momentum propagation, reflection and transmission at dielectric boundaries, normal incidence, obligue inciduce, polarisation by refrection Blewster's angle.

Electromagnetic waves in conductors : Modified field equation attenuation of the wave, reflection at and transmission through a conducting surface.

Radiation from accelerated charges: Modification of coulomb's law to include velocity and acceleration dependent terms in E field. Radiation from an oscillating dipole and its polarisation concept of retarded potentials.

PRACTICAL PAPER

Time 6 Hours Marks -50

The course shall include the following experiments

1. Refractive index by spectrometer.
2. Calibration of prism spectrometer
3. Determination of Cauchy's constant.
4. Wavelength by plane transmission grating and identification of gas in a discharge tube.
5. Determination of Rydberg's constant.
6. Wavelength by Newton's ring.
7. Wavelength by biprism.
8. Resolving power of telescope.
9. Magnifying powers of telescope and microscope.
10. Specific rotation by polarimeter.
11. Angle of dip by dip circle and Earth inductor.
12. Hysterisis loop of a rod shaped specimen.
13. Measurement of magnetic field with a search coil.
14. Calibration of Ammeter and Voltmeter by potentiometer.
15. B.G. Constant and log decreament.
16. Figure of merit of a moving coil galvanometer.
17. Measurement of low and high resistances.
18. Temperature variation of electrical resistance.
19. Temperature Variation of e.m.f. of thermocouple.
20. Use of oscilloscope to measure voltage, current, frequency and phase.
21. Study of series and parallel resonance circuits.
22. Capacitance by De-Sauty's bridge.

CHEMISTRY

B.Sc. (Chemistry) Pass/Subsidiary

PAPER - II (Theory)

There shall be three groups A (Physical) Group B (Inorganic) and Group C (Organic) each carrying 25 marks. Each group shall contain four questions

out of which at least one is to be answered from each group. Six questions are to be answered in total. Question one will be objective and compulsory.

Time- 3 hours Full Marks- 75

Group A (Physical)

1. Chemical kinetics - Rate of reactions, Order and Molecularity of reactions, Kinetics of first order and second order, Determination of order of reactions Effects of temparature on reaction rates, Activation energy. Arhenius theory
2. Electrochemistry: Conductance of electrolytes. Weak and strong electrolytes, Specific conductance, Equivalent conductance and Molecular conductance and their experimental determinations. Variation of conductance with dilution, Kohlrausch's Law, Ostwald's Dilution Law, Solubility Product, Application of solubility product, concept in various precipitation reactions, Hydrolysis of salts.
3. Acids and Bases - Modern concepts, pH and pOH, Buffer Solutions, Common ion effect.
4. Electrochemical Cells : Reversible and Irreversible electrodes and cells, Electrode potential, Origin of electrode potential, Concentration cell, E.M.F. of concentration cell without transference, Applications of E.M.F measurements for the determination of solubility of sparingly soluble salts and valency of ions.
5. Radioactivity: Alpha, beta and gamma rays, Isotopes, Isobars and Isotones, Group displacement law, Induced radioactivity. Balancing of nuclear reactions, Half life, Average life, Radioactive series, Radiocarbon dating.

GROUP - B

Inorganic Chemistry

1. Atomic Structure: Idea of de-Broglis matter and wave concept, de-Brogil's wave equation Heisnburg uncertainty Principle, atomic orbitals, Significance of ψ and ψ^2, Schrodinger wave equation and its significance, radial and angular Wave functions and probability distribution Curves.
2. Chemical Bonding -

   Co-Valent Bonds.- Valence bond theory and its limitations, directional Characteristics of Co-valent bond, Hybridisation and shapes of simple inorganic molecules and ions. VSEPR. theory to NH_3, H_2O, SF_4, FiF_8. H_2O.

   M.O theory: homonuclear and hetronuclear (Co and No) diatomic molecules, Multicenter bonding in electron defficient molecules, bond length and bond energy.
3. Chemistry of Noble gases: Discovery Isolation and seperation, Chemical Properties of noble gases, Chemistry of Xenon, Structure and Bonding in Xenon Compounds.
4. Gr V Nitrogen - Hydrazene, Hydroxylamine, Hydrazoic acid, Nitrogenous, fertilizers Vanadium: Occurance, extractions, Properties, uses Compounds of Vanadium in different oxidation states.
5. Gr. VI Sulphur: Peroxy acids of sulphur and their Compounds, Sodium

thiosulphate Thionic acids. Chromium: Occurance, Extraction, properties and uses, Important Compounds of Chromium in different Oxidation states

6. Gr. VII.- Fluorine and hydrogen fluoride Manganese:-Occurance, extraction, Properties and uses, important Compounds in different oxidation states.
7. Gr. VIII: Cobalt and Nickel: - Occurance Extraction. Properties and uses. important Co (II) and (III), Ni (II) Compounds. Principle of gravimeteric estimation of nickel from nickel Compounds.

GROUP - C (ORGANIC CHEMISTRY)

1. Isomerism: (a) Structural (b) Stereoisomerism
2. Dicarboxylic acids: Oxalic, malonic acids (Synthesis and properties).
3. Hydroxy acids: Lactic acid, tartaric acid, Citric acid Isolation, synthesis, properties, constitution and optical isomerism of lactic acid and tartaric acid; elements of symmetry, Resolution of racemic compounds.
4. Carbohydrates: Classification nomenclature, structure of glucose and fructose, defects of open chain structure and mention of ring structure (derivation of ring structure not required) elementary idea about configuration.
5. Benzene and its monosubstituted products: Toluence, nitrobenzene, aniline, benzene diazonium chloride, phenol, benzeldehyde, benzene sulphonic acid, benzoic acid [preparation, properties and uses]. The important reactions involved in the study, eg. Perkin's rk. Friedel-Craft rk, Cannizaro rk, Kolbe rk, Reimer- Tiemann rk. Sandmeyer's rk.
6. Elementary idea of electrophilic substitution reaction. Mechanism of nitration, halogenation and sulphonation in aromatic, ring. Directive influence of hydroxy amino. halogen, alkyl, nitro and SO_2H groups.

B.SC. CHEMISTRY HONS. (PART-II)

PAPER - III (Theory), Physical Chemistry)

Time- 3 Hours Full Marks- 50

In all nine questions are to be set. The question no. 1 wil 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. THERMODYNAMICS

Definition of thermodynamic terms: System, surroundings etc. Types of systems, intensive & extensive properties. State & path functions & their differentials, Thermodynamic process. Concept of heat & work.

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

Thermochemistry:-

Standard enthalpy of formation. Hess' Law of heat summation & its applications. Heat of reaction at constant pressure & at constant volume. Enthalpy of neutralization, Bond dissociation energy & its calculation from

therme-chemical data, temperature dependence of enthalpy, Kirchoff's eqn.

2. THERMODYNAMICS II

Second Law of thermodynamics need for the law, different statements of the law Carnot cycle & its efficiency. Carnot theorem. Thermodynamic scale of temperature.

Concept of entropy, entropy as a state function, entropy as a function of V & T, entropy as a criteria of spontancity & equilibrium. Entropy change in ideal gases & mixing of gases.

Third law of thermodynamics

Nernst heat theorem, statement & concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs & Helmholtz functions. Gibbs function (G) & Helmholtz function (A) as thermodynamic quantities. A & G as criteria for thermodynamic equilibrium & spontaneity, their advantage over entropy chage variation of G & A with P, V & T. equilibrium constant & free energy. Reaction isotherm & reaction isoehore clapeyron equation. Clausius-Clapeyron equation, applications, Termodynamic derivation of relation between molecular weight & elevation in boiling point & depression in freezing point.

3. LIQUID STATE

Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids & gases.

Liquid crystals:- Differences between liquid crystal, solid, liquid, Classification, Structure of nematic & phases. Thermography & seven segment cell.

4. PHASE EQUILIBRIUM

Statement & meaning of the terms - phase, component & degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system - water, CO_2 & S system.

Phase equilibria of two compontant system -Solid -liquid equilibria. simple eutectic - bi-cd, Pb-Ag systems, desilverisation of lead.

Solid solutions- Compound formation with congruent melting point (Mg-Zn) & in-congruent melting point, ($NaCl$-H_2O, ($FeCl_3$ - H_2O) system.

Liquid Liquid mixtures - Ideal liquid mixtures, Raoults & Henry's law. Non-ideal system-azeotropes (ethanol water)system.

Partially miscible liquids - Phenol water, trimethyl amine - water systems, Lower & upper consolute temperature. Effect of impurity on Consolute temperature.

Immiscible Liquids, steam distillation Nernst distribution Law - Thermodynamic derivation, applications.

5. ELECTRO CHEMISTY- I

Electrical transport - Conduction in metals & in electrolyte solutions, specific conductance & equivalent conductance, measurement of equivalent conductance, variation of equivalent & specific conductance with dilution.

Migration of ions & kohlrausch law, Arrhecius theory of electrolytic dissociation & its limitations, weak & strong electrolytes Ostwalds dulution law

its uses & limitations Debye-Huckle-Onsager's equn for strong electrolyte & (elementary treatment only). Transport number, definition & determination by Hittorf method & moving boundary method.

Applications of conductinity measurements, determination of degree of dissociation, determination of Ka of acids, determination of solubility. Product of sparingly soluble salt, conductometric titrations.

B.SC CHEMISTRY HONS.(PART -II)

Paper IV (Theory) Inorganic Chemistry)

Time: 3 Hours Full Marks- 50

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

I. Chemistry of Elements of first Transition series

Characteristic properties of d - block elements.

Properties of the elements of the first transition series their binary compounds and complexes illustrating relative stability of their oxidation states, cordination number and geometry.

II. Chemistry of Elements of Second and third Transition Series.

General Characteristics, comparative treatment with their 3rd-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

III. Oxidation and Reduction

Use of redox potential data - analysis of redox cycle, redox stability in water - Frost, Latime and Pourbaix diagrams. Principles involved in the extraction of the elements.

IV. Co-ordination Compounds:

Werner's coordination theory and its experimental verification, effective atomic number concept. chelates nomenclature of coordination compounds. isomerism in coordination compounds. valence bond theory of transition metal complexes.

V. Chemistry of Lanthanide Elements

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

VI. Chemsitry of Noble gases

Chemical properties of the Noble gases, Chemistry of Xenon, structure and bonding in xenon compounds

VII. Non-aqueous Solvents

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

VIII. Hard and soft acids and bases (HSAB)

Classification of acids and bases as hard and soft, Pearson's HSAB concept, acid base strength and hardness and softness, symbiosis theoretical basis of hardness and softness, electronegativity and hardness and softness.

PAPER - IV (THEORY) ORGANIC 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. Electromagnetic spectrum, Absorption spectrum

UV absorption spectroscopy - absorption laws (Beerlambert law). molar absorptivity, presentation and analysis of UV spectra, types of eletronic transitions, effect of conjugation:. Concept of chromophore and auxo chrome Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones.

Infrared (IR) absorption spectroscopy - molecular vibrations. Hooke's law- selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, Characteristic absorption of various functional groups and interpretation of IR spectrs of simple organic compounds.

2. Mechanism

Aromatic electrophilic substitution. Directive influence of group, Mechanism of nitration, Sulphonation and halogenation of benzene. Relative strength of acids and substituted acids, Phenols and substituted phenols, Relative strength of basicity of allphatic amines, aromatic amines and substituted aromatic amines, Decarboxylation of acids, Synthesis of derivatives of acids, Hydrolysis of esters, Acid & Base, Catalysed opening of epoxide ring.

3. Hydroxy Acids

α, β & γ - Hydroxy acids - preparation and reactions of lactic acid, tartaric acid and citric acid.

4. Organic Synthesis era Enolates- Acidity of hydrogen atom of a carboxylic group. Active methylene group. Keto Enol tautomerism. Ethyl acetoacetate and Diethl malonate.

5. Carbohydrates:- Classification, Monosaccharides Ascending the aldose series, Descending the aldose series, Inter conversion of aldose to Ketose and wice-versa configuration of monosaccharides, mechanism of Osazone formation, Mutarotation, Epemerisation, Erythro and threo diastereomers, Structure of D (+) glucose.

6. Name reactions- Friedel Craft's reaction Reimer Tiemann reaction, Reformatsky reaction, Gattermann's Synthesis, Claisen Condensation, Houben Hoeseh reaction. Kolbe's reaction, Sandmeyer's reaction.

7. Phenols - Isolation from Coaltar, Methods of prepn Important rkn, uses,

8. Aromatic amines and Diazonium salt

9. Fats, Oils & Detergents

Natural fats, edible and industrial oils of vegetable origin. Common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value, Soaps, Synthetic detergents alkyl and aryl suphonates.

10. Synthetic Polymers

Addition or chain-growth polymerisation Free radical Vinyl polymerisation, ionic vinyl polymorisation, Zieger - Natta polymorisation and vinyl polymers

condensation or step growth polymerisation. Polysters, Polyamides, Phenols, formaldehyde resins, Urea-formaldehyde resins, Epoxy resins and polyurethanes. Natural & Synthetic rubbers.

PRACTICAL

Time -6 Hours Full Marks - 50

1. Volumetric analysis . 24
   (a) Acidimetry and alkalimetry
   (b) Use of Potassium Permaganate, Potassium Dichromate and Sodium Thiosuphate
2. Detection of Nitrogen, Sulphur and Halogen in Organic compounds and identification of organic compounds containing one functional group including monosaccharides. 16
3. Note book and Viva-Voce. 10

BOTANY

B.Sc Part II General /Subsidiary

Paper II (Theory)

Time: 3 Hours Full Marks- 75 Pass Marks- 23

Ten questions are to be set - Three from each group. Five to be answered selecting not more than two from each group. Q. 1 will be compulsory (objective/ Short answered type)

Group - A Structure, development and reproduction

1. Root-shoot apical meristem and its histological organization.
2. Cambium and its function, formation of secondary Xylem and secondary phloem, Periderm.
3. T.S. of Stem - Cucurbita, Boerhaavia, Dracaena, and T.S. of Dorsiventral and Isobilateral leaf.
4. Microsporogenesis and Microgametogenesis, Megasporogenesis and megagametogenesis.
5. Double fertilization, Endosperm, Embryo, significance of seed - Unit of genetic recombination

Group - B Plant Physiology

1. Plant water relation - Importance of water of Plant life, diffusion, Osmosis, Ascent of sap and Transpiration.
2. Mineral nutrition - Role of micro and macro elements.
3. Photosynthesis - Historical aspect, photosynthetic pigments, mechanisms, C_3 and C_4 cycles photospiration.
4. Respiration - Glycolysis, Kreb's cycle, Pentose phosphate Pathway.
5. Growth and movement - Phases of growth and development, Kinetics of growth, Phototropism, Geotropism, Seismonasty, Auxins, Gibberellins, Cytokinins.

Group - C Biochemistry and Biotechnology

1. Enzyme - Discovery, nomenclature, characteristics and mode of action.
2. Amino acids and Proteins - Types and structure.
3. Lipid - Structure and function of lipid, biosynthesis of lipid. oxidation.
4. Biotechnology - Definition, basic aspects of tissue culture, vector for gene delivery and marker genes.
5. Genetic engineering an elementary idea.

BOTANY GENERAL/ SUBSIDIARY PRACTICAL PAPER

Time : 3 Hours Full Marks: 25

1. Study of T.S of the plant materials prescribed in course.
2. Simple physiological experiments (any one)
   (i) Compare the rate of absorption and transpiration.
   (ii) Compare transpiration of mesophytic and xerophytic leaves.
   (iii) To show that CO_2 is essential for Photosynthesis.
   (iv) To show that O_2 is evolved during photosynthesis.
   (v) Expt. on anaerobic respiration.
2. Viva-voce
4. Class record.

B.SC. BOTANY HONOURS

PAPER - III

Time: 3 Hours Full Marks- 75

In all nine questions are to be set. Question 1 shall be objective short answered type and will screen the entire paper. Students will be required to answer five questions attempting two from each group Question 1 will be compulsory.

GROUP - A
Structure Development and Reproduction

1. Meristem: Root and Shoot- Organization, tissues and tissue systems.
2. Primary and Seconday plant body; Vascular Cambium, Secondary Xylem, Basic structure of wood, Secondary Phloeum and Periderm.
3. Abnormal secondary growth: Boerhavia, Bignonia, Amaranthus, Tinospora, Dracaena.
4. Environmental influences, Hydrilla, Nerium, Vanda.
5. Microsporogenesis and Development of male gametophyte.
6. Ovules, megasporogenesis and Development of female gametophyte.
7. Fertilization and endosperm.
8. Embryogenesis and Seed formation.

GROUP - B
Utillzation of Plants

1. General account of Wheat, Rice, Maize, Potato and Sugarcane.
2. Legumes: Chickpea (Gram), Pigeon Pea (Arhar).
3. Vegetable oils, sources : Mustard, Groundnut and Coconut.
4. Plant fibres: Cotton, Jute and Coir.
5. Timber and fire wood species, A general account of use of properties of any ten plants of the region.
6. Medicinal Plants: A brief account of ten plants drugs and their constitunets, used in indegenous and allopathic sytems of medicine.
7. Natural rubber, essential oils and dyes.

PAPER IV

Time- 3 Hours Full Marks- 75

In all nine questions are to be set. Question 1 shall be objective short answered type and will screen the entire paper. Students will be required to answer five questions attempting two from each group. Question 1 will be compulsory.

GROUP - A MICROBIOLOGY

1. History of Microbiology, Classification of Micro organisms and Characteristics of diffierent groups.
2. Methods in Microbiology : Basic principles of micrometry, Staining, sterillization methods Culture Media, Population estimation and growth determination.
3. Structure: Ultrastructure of prokaryotic micro organisms, Viruses - Properties and Classification host - Virus interaction, Bacteriophage, TMV.
4. Bacteria - Structure, genetic recombination, Mycoplasma and Actinomycetes - General Account.
5. Role of Miro-organisms in biogeochemical cycling of nitrogen and Carbon, Biological nitrogen fixation.
6. Industrial application of micro-organisms: organic acids, alcohol, food processing, milk products. antibiotics and biopesticide.

GROUP - B PLANT PATHOLOGY

1. Historical development.
2. Pathogen attack and defense mechanisms: Physical, Physiological, Biochemical.
3. Plant disease epidemiology : Transmission and spread of Pathogens, Disease cycles.
4. Plant disese management, Chemical, Biological, Development of transgencies.
5. Genetics of resistance and succeptibility.
6. General account of some diseases of crop plants:
   a. Tobacco mosaic b. Citrus canker c. Red rot of Sugercan
   d. Rust of Wheat e. Smut of Barley f. Late blight of Potato
   g. Ergot of Rye.

BOTANY PRACTICAL

Time : 6 Hours Full Marks: 50

Practicals based on Papers III and IV.

Structure, Development and Reproduction

1. Internal organization of primary and secondary structures.
2. Abnormal secondary growth in Boerhavia, Bignonia, Amaranthus, Tinospora and Dracaena.
3. Ecological anatomy of Hydrilla, Nerium and Vanda.
4. Studies of Microsporogenesis, Mega sporogenesis, Male and Female gametophytes. Fertilization , Endosperms and Embryogenesis with the help of permanent slides.
5. Embryo dissection: Tridex/Citrus/Ladyfinger.

Utillzation of Plants

6. Importance of plants/parts as prescribed in the theory syllabus.

Microbiology and Plant Pathology

7. Preparation of culture media and sterilization.
8. Inoculation technique
9. Bacterial staining.

10. Studies on the host-parasite relations of the diseases as prescribed in the theory syllabus.
11. Viva voce
12. Class records

ZOOLOGY
(GENERAL/SUBSIDIARY COURSE)
Paper 2 A (Theory)

Time: 3 Hours Full Marks- 75 Pass Marks- 2

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 1 shall be objective (1x15). will cover both the groups A and B and will be compulsory.

GROUP - A

1. Bionomics, general characters and classification (Up to orders) or living chordates of the following groups: Urochordata, Agnatha, Chondrichthyis, Osteichthyls, Amphibia. Reptilia, Aves and Mammalia.
2. Study of the following types:-
   (i) Urochordata: Herdmenia (including retrogressive metamorphosis)
   (ii) Cephalochordata - Amphioxus
   (iii) Chondrichthysis - Scoliodon
   (iv) Osteichthyis - Labeo rohita
   (v) Amphibia - External morphology and neuteny in Salamander
   (vi) Reptitia - Biting and feeding mechanism in snake.
   (vii) Aves - Flight adaptation
   (viii) Mammalia Characters and distribution of Prototheria and Metatheria Primates.
3. Comparative study of the following organ systems of animal types mentioned above: Integument, Heart, Aortic arches and Brain.

GROUP B

1. Embryology
   (i) Development of Amphioxus (up to the formation of coelom) and chick (up to three germ layers)
   (ii) Placenta in mammals, their types, development and functions.
2. Physiology and Endocrinology of mammals.
   (i) Physiology of digestion, respiration and excretion, blood coagulation.
   (ii) Histophysiology of the pituttary, thyroid, islets of Langerhan's, adrenal, testis and ovary.
3. Animal Behaviour
   (i) Innate and learned behaviour (ii) Parental care in fishes and birds.
   (iii) Social behaviour in insects and mammals.
   (iv) Migratory behaviour in birds.
4. Zoogeography
   Zoogeographical realms of the world, their boundaries and mammalian fauna.

PAPER II B (PRACTICAL)

Time- 3 Hours Full Marks- 25 Pass Marks- 10

I. Dissection: 7
   (i) A Teleost or Frog: afferent and efferent branchial arteries. 5th, 7th and 9th , 10th cranial nerves, Eye muscles and their nerve supply, Internal ear, Urinogenital organs.

II. Mounting (temporary stained preparation) 4
   Scales of fishes, filoplume feathers of birds.

III. Spotting: 6
   Museum specimen - I
   Bones - 2 (Limb, Girdle, Skull, Vertebrae of Varnus and Fowl)
   Slides - 3 (i) Mammalian histological slides.
   (ii) Histological structure of various endocrine glands.
   (iii) Slides of the various developmental stages of Frog and Chick.

IV. Class work record (Regularly signed work be gievn due credit) 4

V. Field work and viva. 4

B.SC. ZOOLOGY HONOURS PAPER III THEORY
(Chordata Evolution and Type study)

Time: 3 Hours Full Marks- 75

In all nine questions are to be set out of which questions 1 shall be objective (1x15 marks) and will screen the whole of this paper. Students will be required to answer five questions of which questions 1 will be compulsory.

I. Origin and evolution of chordates (i.e. Origin of vertebrates amphibia. reptiles, aves and mammals).

II. Major anatomical features and life cycle of the following:

1. Urochordata: Herdmania, Pyrosoma
2. Cephalochordata: Amphioxus
3. Agnatha: Myxine, Petromyzon, Osmoregulation.
4. Chondrichtyes: Scoliodom
5. Osteichthyes, Labeo, Distribution and general organisation of Dipnoi. Importance of air breathing.
6. Amphibia: Neoteny.
7. Reptilia: Skull types, Biting and swallowing mechanism of snakes, present status of sphenodon and crocodiles, Extinct reptiles, Poisonous snakes of India.
8. Aves: Flight adaptation.
9. Mammalia : Prototheria, Metatheria, Eutheria, Primates.

PAPER IV (THEORY)
Chordate Diversity, Comparative Anatomy and Embryology

Time- 3 Hours Full Marks- 75

In all nine questions are to be set; out of which question 1 shall be objective (1x15 marks) which will screen the whole of this theory paper Students will be required to answer five questions of which questions 1 will be compulsory.

I. Bionomics, characteristic feature and classification of living chordates (up to orders) as follows:
   Urochordata Chondrichthyes Osteichthyes, Amphibia, Reptilia, Aves and Mammalia (Eutheria only)

II. Comparative study of the following organ systems with reference to Scoliodon, Labeo, Rana, Calotes, Columba (or any bird) and Rabbit.
   (i) Integument, (ii) gastro-intestinal tract. (iii) Respiratory organs (iv) Heart (v) Aortic arches (vi) Brain (vii) Evolution of kidney and urinogenital ducts.

III. Embryology:
1. Type of eggs, early cleavage, gastrulation and coelom formation in ampl
2. Development of Amphioxus (up to formation of coelom)
3. Development of chick up to the formation of 3 germ layers.
4. Development and function of extra embryonic membranes in chick.
5. Placenta in mammals: its development, types and functions.
6. Organogenesis of heart, brain and eye in chick embryo.
7. Natural and artificial parthenogenesis in vertebrates.

PRACTICAL PAPER

(for Paper III and IV)

Full Marks-

Time- 6 Hours

I. Dissection
(i) A teleost fish: Internal anatomy and gut contents, Afferent and efferent branchial arteries; 5th , 7th and 9th, 10th cranial nerves , eye muscles and their nerve supply, Internal ear. Accessory Respiratory organs of Channa punctatus and Heteropneustes fossilis.
(ii) Cranial nerves (5th, 7th,9th and 10 th) of Internal anatomy and gut contents of Rana.
(iii) Internal anatomy and gut contents of Calotes.
(iv) Mammals- Neck nerves and urinogenital organs.

II. Whole mount
Scales of fishes, feathers, fish spawn fry and tadpole larva of frog.

III. Microtomy & spreading of sections. Permanent double stained preparation of paraffin sections provided: Respiratory membrane of air breathing organs of Channa punctate and Heteropneustes fossilis and blood film of frog.

IV. Spotting:

I. Instrumentation:-1 2 x 10 = 2
Instrumentation: Study of parts working and magnification power of dissecting and compound light microscopes, incubator and microtome

2. Museum specimen -2 (Invertebrate chordate to fishes 1, tetrapod-1)
Herdmania, Pyrosoma, Botrylus, Salpa, Amhioxus, Saw fish, Torpedo, Catla, Mystus, Anabas, Notopterus, Hilsa, Setipina, Bufo, Rhacophorus, Salamander, Necturus, Axlotle, Phrynosoma, Cobra, Krait, Maina, Parrot, Pteropus, Bat, Mole, a primate.

3. Slides - Histology - 2 (amphioxus - 1 and mammals-1) Embryology-1 (frog and chick-whole mounts)

4. Osteology: Limb bones of frog- I. Girdle bones of frog/Rabbit-1, Varanus skull bone 1 Fowl and Rabbit vertebrate-1

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

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

(Collection and preservation of chordates collected from a visit to sea coast, Fish seed collection site. Lake or any other fish culture site or as suggested by the Head of the Department.

MATHEMATICS

B.A./B.Sc. (Honours) PART - II

Paper - III Total number of questions 13 (Thirteen)
Answer any Six questions selecting at least one from each group. Q. No. 1 will be objective and compulsory.

GROUP - A

Advanced Calculus :

Continuity, Sequential continuity, Properties of continuous functions. Uniform continuity, differentiability : – 1 Qn.

Mean value theorems and their geometrical interpretations, Darboux's intermediate value theorem for derivatives, Taylor's theorem with various forms of remainders : – 1 Qn.

Limit and continuity of functions of two variables, Partial differentiation, change of variables, Euler's theorem on homogeneous functions : – 1 Qn.

Taylor's theorem for functions of two variables, Maxima, Minima and saddle points of functions of two variables, Lagrange's multiplier method :– 1 Qn.

GROUP - B

Beta and Gamma functions. Double and triple integrals, Dirichlet's integrals, Change of order of integration in double integrals : – 1 Qn.

Definition of a sequence, Theorems on limits of sequences, Bounded and monotonic sequences, Cauchy's Convergence Criterion :– 1 Qn.

Series of non negative terms, Comparison tests, Cauchy's root test, Ratio tests, Raabe's Test, Logarithmic Test, De Morgan and Bertrand's test, Cauchy's Condensation test :– 1 Qn.

Alternating series, Leibnitz's theorem, Absolute and conditional convergence : – 1Qn.

GROUP - C

Statics

Analytical conditions of equilibrium of coplanar forces:– 1 Qn.

Virtual work, Stable and unstable equilibrium :– 1 Qn.

Catenary : 1 Qn.

Forces in three dimensions Poinsot's central axes, Wrenches, Null lines and planes :– 1 Qn.

PAPER - IV Total number of questions 13 (Thirteen)
Answer any five questions selecting at least one from each group.
Q. No. 1 will be objective and compulsory

GROUP-A

Differential Equations :

Series solution of differential equations - Power series Method, Bessel, Legendre and Hypergeometric equations. Bessel, Legendre and Hypergeometric functions and their properties - convergence, recurrence and generating relations, Orthogonality of functions, Sturm Liouville problem, Orthogonality of eigen-functions, Reality of eigenvalues, Orthogonality of Bessel functions and Legendre polynomials . – 2 Qn.

Laplace Transformation - Linearity of the Laplace transformation, Existence theorem for Laplace transformation, Laplace transforms of derivatives and integrals, Shifting theorem, Differentiation and integration of transforms,

Convolution theorem. Solution of integral equations and systems of differential equations using the Laplace transformation :– 2 Qn.

GROUP - B

Partial differential equations of the first order. Lagrange's solution, Some special type of equations which can be solved easily by methods other than the general method, Charpit's general method of solution :– 2 Qn.

Partial differential equations of second order and higher orders, Classification of linear partial differential equations of second order, Homogeneous and non-homogeneous equations with constant coefficients, Partial differential equations reducible to equations with constant coefficients, Monges method. 2 Qn.

GROUP - C

DYNAMICS :

Velocities and accelarations along radial and transverse directions and along tangential, normal directions, Simple harmonic motion, Elastic string :– 1 Qn.

Motion on smooth and rough plane curve, Motion in a resisting medium, 1 Qn.

Motion of particle of varying mass :– 1 Qn.

Central orbits, Kepler's law of motion :–

Motion of a particle in three dimensions, Acceleration in terms of different coordinate systems :– 1 Qn.

MATHEMATICS

B.A., B.Sc. (General / Subsidary)

PAPER - II Total number of questions 17 (Seventeen)

Answer any eight questions selecting at least one from each group. Q. No. 1 will be objective and compulsory.

GROUP – A

Ordinary Differential Equations :

Degree and order of a differential equation, Equation of first order and first degree, Equations in which the variables are separable, Homogeneous equations, Linear equations and equations reducible to the linear form, Exact differential equations, First order higher degree equation 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 :- 4 Qn.

GROUP - B

Analytical Geometry of two Dimensions :

Standard Equations of Parabola Ellipse and Hyperbola and their properties 1Qn.

Reduction of the general equation of second degree into standard forms, Equations of tangents and normals :– 1 Qn.

Analytical Geometry of three Dimension :

Direction Cosines, The plane, The straight, the shortest distance between two skew-straight lines, Sphere 1Qn

Cone, Cylinder, Central conicoids (including Ellipsoid), Conjugate drameters, Paraboloids – 1 Qn.

GROUP - C

Statics :

Analytical condition of equilibrium of coplanar forces :– 1 Qn.

Catenary : 1 Qn.

Dynamics :

Velocities and accelerations along radial and transverse directions, and along tangential, normal directions Simple harmonic motion, Elastic Sting :–1 Qn.

Motion on smooth and rough Plane, Motion in a resisting medium, Motion of praticle of varying mass :– 1 Qn.

GROUP - D

Advanced Calculus :

Continuity; sequential continuity, Properties of continuous Functions, Uniform continuity, Chain rule of differential ability : 1 Qn.

Mean value theorems and their geometrical inter pretatlons, Darboux's intermediate value theorem for derivaties, Taylor's theorem with various forms of remainders :– 1 Qn.

Limit and continuity of functions of two variables, Partial differential, Change of variables, Euler's theorem on homogeneous functions :– 1 Qn.

Taylor's theorem for functions of two variables, Maxima, Minima and saddle points of functions of two variables, Logrange's multiplier method :– 1 Qn.