B . Sc . I st Year (Is t Semester)

Pa per I (Theory) Inorganic Chemistry **M a x. Ma r ks : 3 0**

CH-101 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Atomic Structure** Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals,, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d orbitals.	22
Unit-II	**Periodic Properties** General principles of periodic table: Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charge, Slater's rules. Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, methods of determination or evaluation, trends in periodic table (in s & p block elements).	23
Unit-III	***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 (BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7 SO_4^{2-}, ClO_4^-)Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, CIF_3, ICI_2^- and H_2O. MO theory of heteronuclear (CO and NO) diatomic. molecules, , bond strength and bond energy, pe rcentage ionic character from dipole moment and electronegativity difference.	22
Unit-IV	**Ionic Solids** Ionic structures (NaCl,CsCl, ZnS(Zinc Blende), CaF_2) radius ratioeffect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy (methamtical derivation exc luded) and Born-Haber cycle, solvation ene rgy and its relation with solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.	

B . Sc . I st Year (Is t Semester)

Pa per II (Theory) Physical Chemistry **M a x. Ma r ks : 30**

CH-102 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Gaseous States** Maxwell's distribution of velocities and energies (derivation excluded) Calculation of root mean square velocity, average velocity and most probable velocity. Collision diameter, co llision number, col lision frequency and mean free path. Deviation of Real gases from ideal behaviour. Derivation of Vander Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor) Explanation of behavior of real gases using Vander Waal's equation.	22
Unit-II	**Critical Phenomenon:** Critical temperature, Critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states, the isotherms of Vander Waal's equation, relationship between critical constants and Vander Waal"s constants. Critical compressibility fac tor. The Law of corresponding states. Lequifaction of gases.	23
Unit-III	**Liquid States** Structure of liquids. Properties of liquids – surface tension, viscosity vapour pressure and optical rotations and their Determination.	22
Unit-IV	**Solid State** Classification of solids, Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements of c rysta ls. Definition of unit cell & space lattice. Bravais lattices, crystal system. Xray diffraction by crystals. Derivation of Bragg equation. Determination o f crystal structure o f NaCl, KCl. Liquid crystals: Difference between solids, liquids and liquid crystals,types of liquid crystals. Applications of liquid crystals.	

B.Sc . Ist Year (Is t Semester)

Pa per III (Theory) Organic Chemistry **M a x. Ma r ks : 30**
CH-103 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**1. Structure and Bonding** Localized and delocalized chemical bond, van der Waals in teractions, resonance: conditions, resonance effect and its applications, hyperconjugation, inductive effect, Electromeric effect & their comparison. **2. Stereochemistry of Organic Compounds-I** Concept of isomerism. Types of isomerism. Optical isomerism elements of symmetry, molecular chirality, enantiomers,stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and eryth ro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization.	22
Unit-II	**Stereochemistry of Organic Compounds-II** Relative and absolute configuration, sequence rules, R & S systems of nomenclature. Geometric isomerism determination of configuration of geometric isomers. E & Z system of nomenclature, Conformational isomerism conformational analysis of ethane and n-butane, conformations of cyclohexane, axial and equatorial bonds,. Newman projection and Sawhorse formulae, Difference between configuration and conformation.	23
Unit-III	**Mechanis m of Organic Reactions** Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Energy considerations.Reactive intermediates carbocations, carbanions, free radicals, carbenes , arynes and nitrenes (formation, structure & stability). Assigning formal charges on intermediates and other ionic species.	22
Unit-IV	***Alkanes and Cycloalkanes*** IUPAC nomenclature of branched and unbranched alkanes , the alkyl group, classi fication of carbon a toms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties.Cycloalkanes nomenclature, synthesis of cycloalkanes and their derivatives photochemical (2+2) cycloaddition reactions, dehalogenation of , -dihalides, , pyrolysis of calcium or barium salts of dicarboxylic acids, Baeyer's strain theory and its limitations., theory of strainless rings.	

B . Sc . Ist Year (IInd Semester)

Pa per IV (Theory) Inorganic Chemistry **M a x. Ma r ks : 3 0**

CH-104 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Hydrogen Bonding & Vander Waals Forces** Hydrogen Bonding – Definition, Types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Vander Waals Forces **Metallic Bond and Semiconductors** Metallic Bond- Brie f introduction to meta llic bond, band theory of meta llic bond Semiconductors- Introduction, types and applications.	22
Unit-II	**s-Block Eleme nts** Comparative study of the elements including , diagonal relationships, salient features of hydrides (methods of preparation excluded), solvation and complexation tendencies including their function in biosystems. **Chemis try of Noble Gases** Chemical properties of the noble gases with emphasis on their low chemical reactivity, chemistry of xenon, structure and bonding of fluorides, ox ides & oxyfluorides of xenon.	23
Unit-III	**p-Block Elements:** Emphasis on comparative study of properties of p-block elements (including diagonal relationship and excluding methods of preparation). **Boron family (13th gp**):- Diborane – properties and structure (as an example of electron – deficient compound and multicentre bonding), Borazene – chemical properties and structure Trihalides of Boron – Trends in fewis acid character structure of aluminium (III) chloride. **Carbon Family (14th group)** Catenation, p□□– d□□ bonding (an idea), carbides, fluorocarbons, silicates (structural aspects), silicons – general methods of preparations, properties and uses.	22
Unit-IV	**Nitrogen Family (15th group)** Oxides – structures of oxides of N,P. oxyacids – structure and relative acid strengths of oxyacids of Nitrogen and phosphorus. Structure of white, yellow and red phosphorus. **Oxygen Family (16th group)** Oxyacids of sulphur – structures and acidic strength H2O2 – structure, properties and uses. **Halogen Fami l y (17th group)** Basic prope r ties of ha logen, interha logens types propert ies , hydro and oxyacids of chlorine – structure and compari son of acid s trength .	

B . Sc . I st Year (IInd Semester)

Pa per V (Theory) Physical Chemistry **M a x. Ma r ks : 30**

CH-105 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Kinetics-I** Rate of reaction, rate equation, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order, first order, second and third order reaction. Half life period of a reaction. Methods of determination of order of reaction,	22
Unit-II	**Kinetics-II** Effect of temperature on the rate of reaction – Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular and bimolecular collision. Transition s tate theory of Bimolecular reac tions.	23
Unit-III	**Electrochemistry-I** Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance, equivalent conductance and relation among them, their vartion with concentration. Arrhenius theory of ionization, Ostwald's Dilution Law. Debye-Huckel – Onsager's equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorfs methods, (numerical included),	22
Unit-IV	**Electrochemistry-II** Kohlarausch's Law, calculation of molar ionic conductance and effect of viscosity temperature & pressure on it. Application of Kohlarausch's Law in calculation of conductance of weak electrolytes at infinite diloution. Applications of conductivity measurements: determination of degree of dissociation, determination of Ka of acids determination of solubility product o f spa ringly soluble salts, conductometric titrations. Definition of pH and pKa, Buffer solution, Buffer action, Henderson – Hazel equation, Buffer mechanism of buffer action.	

B.Sc . Ist Year (IInd Semester)

Pa per VI (Theory) Organic Chemistry **M a x. Ma r ks : 30**

CH-106 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	Nomenclatu re of alkenes, , mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides,. The Saytzeff rule, Hofmann elimination, physical p roperties and relative stabilities o f alkenes. Chemical reactions of alkenes mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration–oxidation, oxymercurationreduction, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$,	22
Unit-II	.**Arenes and Aromaticity** Nomenclatu re of benzene deriva tives:. Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions, annulenes up to 10 carbon atoms, aromatic, anti - aromatic and non - aromatic compounds. 15 Aromatic electrophilic substitution general pattern of the mechanism, mechansim of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Energy profile diagrams. Activating , deactivating subs tituents and orientation.	23
Unit-III	**Dienes and Alkynes** Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of butadiene,. Chemical reactions 1,2 and 1,4 additions (Electrophilic & free radical mechanism), Diels-Alder reaction, Nomenclature, structure and bonding in	22

	alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation of alkynes,	
Unit-IV	**Alkyl and Aryl Halides** Nomenclatu re and classes of alkyl halides, methods of formation , chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides , S_N2 and S_N1 reactions with energy profile diagrams. Methods of formation and reactions of aryl halides, The addition elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.	

B.Sc. I Year

Paper VII (Practicals)
Max. Marks: 80

CH-107 Time: 7 Hrs.
(Spread over two sessions)

Section-A (Inorganic)

Volumetric Analysis

1. Redox titrations: Determination of Fe^{2+}, $C_2O_4^{2-}$ (using $KMnO_4$, $K_2Cr_2O_7$)

2. Iodometic titrations: Determination of Cu^{2+} (using standard hypo solution).

3. Complexometric titrations: Determination of Mg^{2+}, Zn^{2+} by EDTA.

Paper Chromatography

Qualitative Analysis of the any one of the following Inorganic cations and anions by paper chromatography (Pb^{2+}, Cu^{2+}, Ca^{2+}, Ni^{2+}, Cl^-, Br^-, I^- and PO_4 and NO_3^-).

Section-B (Physical)

1. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetatecatalyzed by hydrogen ions at room temperature.

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

3. To determine the surface tension of a given liquid by drop number method.

4. To determine the viscosity of a given liquid**.**

5. To determine the specific refractivity of a given liquid

17

SECTION – C (Organic)

1. Preparation and purification through crystallization or distillation and ascertaining their purity through melting point or boiling point

(i) Iodoform from ethanol (or acetone)

(ii) m-Dinitrobenzne from nitrobenzene (use 1:2 conc. HNO_3 - H_2SO_4 mixture if fuming HNO_3 is not ava ilable)

iii) p-Bromoacetanilide from acetanilide

iv) Dibenzalacetone from acetone and benzaldehyde

v) Aspirin from salicylic acid

1. To study the process of) sublimation of camphor and phthalic acid,

Distribution of marks

1. Section I 18 marks
2. Section II 18 marks
3. Section III 18 marks
4. Viva-voce 10 marks
5. Lab Record 16 marks

B.Sc. PHYSICS
Semester-I

Paper I- PHY 101 : MECHANICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Mechanics of single and system of particles, conservation of laws of linear momentum, angular momentum and mechanical energy, Centre of mass and equation of motion, constrained motion, degrees of freedom.	22
Unit-II	Generalised coordinates, displacement, velocity, acceleration, momentum, force and potential. Hamilton's variational principle , Lagrange's equation of motion from Hamilton's Principle. Linear Harmonic oscillator, simple pendulum, Atwood's machine.	23
Unit-III	Rotation of Rigid body, noment of inertia, torque, angular momentum, kinetic energy of rotation. Theorems of perpendicular and parallel axes with proof. Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross-section. Acceleration of a body rolling down on an inclined plane.	22

References

1. Classical Mechanics by V.K.Jain (Ane 2009)
2. Classical Mechanics by H. Goldstein (2nd Edition)
3. Berkeley Physics Course, Vol. I, Mechanics by E.M. Purchell

B.Sc. PHYSICS

Paper II- PHY 102 : ELECTRICITY AND MAGNETISM

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	**Mathematical Background :** Scalars and Vectors, dot and cross product, Triple vector product, Scalar and Vector fields, Differentiation of a vector, Gradient of a scalar and its physical significance, Integration of a vector (line, surface and volume integral and their physical significance), Gauss's divergence theorem and Stocks theorem. **Electrostatic Field :** Derivation of field E from potential as gradient, derivation of Laplace and Poisson equations. Elecotric flux, Gauss's Law and its application to spherical shell, uniformly charged infinite plane and uniformity charged straight wire, mechanical force of charged surface, Energy per unit volume.	15-20
Unit-II	**Magnetostatistics :** Magnetic Induction, magetic flux, solenoidal nature of Vector field of induction. Properties of B (i) .B = 0 (ii) xB= J. Electronic theory of dia and para magnetism (Langevin's theory). Domain theory of ferromagnetism. Cycle of Magnetisation - Hysteresis (Energy dissipation, Hysteresis loss and importance of Hysteresis curve).	10-13
Unit-III	**Electromagnetic Theory :** Maxwell equation and their derivations, Displacement Current. Vector and scalar potentials, boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation). Poynting vector and Poynting theorem.	10-12

References :

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India)
2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala (Tata McGraw Hill).

B.Sc. PHYSICS
Paper III Phy- 103
PRACTICALS

Max. Marks : 40
Time : 3 Hrs.

SPECIAL NOTES

1. Do any eight experiments .
2. The students are required to calculate the error involved in a particular experiment (percentage error).

NOTE

1. Distribution of Marks :

Experiment : = 20 marks
Viva Voce : = 10 marks
Lab Record : = 10 marks
Total = 40 marks

For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure :-

1. Each student has to peform a minimum number of experiments prescribed in the syllabus.
2. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoertical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded in their practical note book. These marks will constitue the lab record.
3. To complete the final marks for lab. record a separate register for each class of B.Sc will be maintained. The Student will be assigned a separate page on the register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained willbe divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
4. The lab. record register will be presented to the external practical examiners for lab. record marks. The external examiners will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 103
PRACTICALS

Max. Marks : 40
Time : 3 Hours

1. Moment of Inertia of a fly-wheel
2. M.I. of an irregular body using a torsion pendulum.
3. Surface Tension by Jeager's method.
4. Young's modulus by bending of beam.
5. Modulus of rigidity by Maxwell's needle.
6. Elastic constants by Searle's method.
7. Viscosity of water by its flow through a uniform capillary tube.
8. Thermal conductivity of a good conductor by Searle's method.
9. Mechanical equivalent of Heat by Callendao and Barne's method.
10. 'g' by Bar pendulum.

B.Sc. PHYSICS
SCHEME OF EXAMINATION
Semester-II
Paper I- PHY 201 : PROPERTIES OF MATTER, KINETIC THEORY AND RELATIVITY

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :
1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	**Properties of Matter (Elasticity) :** Elasticity, Hooke's law, Elastic constants and their relations, Poisson's ratio, torsion of cylinder and twisting couple. Bending of beam (bending moment and its magnitude) cantilevers, Centrally loaded beam.	22
Unit-II	**Kinetic Theory of Gases :** Assumptions of Kinetic Theory of gases, Law of equipartition of energy and its applications for specific heats of gases. Maxwell distribution of speeds and velocities (derivation required), Experiomental verification of Maxwell's Law of speed distribution : most probable speed, average and r.m.s. speed, mean free path. Transport of energy and momentum, diffusion of gases. Brownian motion (qualitative), Real gases, Van der Waal's equation.	23
Unit-III	**Theory of Relativity :** Reference systems, inertial frames, Gallilean invariance and Conservation laws, Newtonian relativity principle, Michelson - Morley experiment : Search for ether. Lorentz transformations length contraction, time dilation, velocity addition theorem, variation of mass with velocity and mass energy equivalence.	22

References

1. Properties of Matter by D.S. Mathur.
2. Heat and Thermodynamics (Vth Edition) by Mark W. Zemansky.
3. Berkeley Physics Course, Vol.-I Mechanics by E.M. Purchell.

B.Sc. PHYSICS

Paper II- PHY 202 : ELECTRO MAGNETIC INDUCTION AND ELECTRONIC DEVICES

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	**Electromagnetic Induction :** Growth and decay of current in a circuit with (a) Capacitance and resistance (b) resistance and inductance (c) Capacitance and inductance (d) Capacitance resistance and inductance. AC circuit analysis using complex variables with (a) capacitance and resistance, (b) resistance and inductance (c) capacitance and inductance (d) capacitance, inductance and resistance Series and parallel resonant circuit. Quality factor (Sharpness of resonance).	22
Unit-II	**Diode Rectifiers :** P-N junction half wave and full wave rectifier. Types of filter circuits (L and - with theory). Zener diode as voltage regulator, simple regulated power supply. **Transistors :** Junction Transistors, Bipolar transistors, working of NPN and PNP transistors, Transistor connections (C-B, C-E, C -C mode), constants of transistor. Transistor characteristic curves (excluding h parameter analysis), advantage of C-B configuration. C.R. O. (Principle, construction and working in detail).	23
Unit-III	Transistor Amplifers : Transistor biasing, methods of Transistor biasing and stabilization. D.C.load line. Common -base and common-emitter transistor biasing. Common-base, common-emitteer amplifers. Classification of amplifers. Resistance-capacitance (R-C) coupled amplifer (two stage; concept of band width, no derivation). Feed-back in amplifers, advantage of negative feedback Emitter follower.Oscillators : Oscillators, Principle of scillation, Classification of Oscillator. Condition for self sustained oscillation : Barkhousen Criterion for oscillations. Tuned collector common emitter oscillator. Hartley oscillator. Colpitt's oscillator.	22

References :

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India)
2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala (Tata McGraw Hill).
3. Basic Electronics and Linear circuits by N.N. Bhargava, D.C. Kulshreshtha and S.C. Gupta (TITI, CHD).
4. Soild State Electronics by J.P. Agarwal, Amit Agarwal (Pragati Prakashan, Meerut).
5. Electronic Fundamentals and Applications by J.D. Ryder (Prentice Hall India).

B.Sc. PHYSICS
Paper III Phy- 203
PRACTICALS

Max. Marks : 40
Time : 3 Hrs.

SPECIAL NOTES

1. Do any eight experiments .
2. The students are required to calculate the error involved in a particular experiment (percentage error).

NOTE

1. Distribution of Marks :

Experiment : = 20 marks
Viva Voce : = 10 marks
Lab Record : = 10 marks
Total = 40 marks

For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure :-

1. Each student has to peform a minimum number of experiments prescribed in the syllabus.
2. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoertical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded in their practical note book. These marks will constitue the lab record.
3. To complete the final marks for lab. record a separate register for each class of B.Sc will be maintained. The Student will be assigned a separate page on the register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained willbe divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
4. The lab. record register will be presented to the external practical examiners for lab. record marks. The external examiners will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 203
PRACTICALS

Max. Marks : 40
Time : 3 Hours

1. E.C.E. of hydrogen using an Ammeter.
2. Calibration of thermocouple by potentiometer.
3. Low resistance by Carey Foster's Bridge with calibration.
4. Determination of impendance of an A.C. circuit and its verification.
5. Frequency of A.C. mains and capacity by elctrical vibrator.
6. Frequency of A.C. mains by sonometer using an electromagnet.
7. Measurement of angle dip by earth inductor.
8. High resistance by substitution method.
9. Inductance (L) by Anderson Bridge (A.C. method)
10. To draw forward and reverse bias characteristics of a semiconductor diode.
11. Zener Doide volage regulation characteristics.
12. Verification of Inverse square law by photo-cell.
13. To study the characteristics of a solar cell.

NEW SCHEME

Scheme of Examination of B.Sc. 1st Semester Mathematics
(w.e.f. 2012-2013)

Paper: 12BSM 111 **Max. Marks:**

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix.	22
Unit-II	Applications of matrices to a system of linear (both homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.	23
Unit-III	Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations.	22
Unit-IV	Nature of the roots of an equation Descarte's rule of signs. Solutions of cubic equations (Cardon's method). Biquadratic equations and their solutions.	

Books Recommended :

1. H.S. Hall and S.R. Knight : Higher Algebra, H.M. Publications 1994.
2. Shanti Narayan : A Text Books of Matrices.

3. Chandrika Prasad : Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.

Calculus

Paper: 12BSM 112

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours Note:

The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Definition of the limit of a function. Basic properties of limits, Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.	
Unit-II	Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Newton's method. Radius of curvature for pedal curves. Tangential polar equations. Centre of curvature. Circle of curvature. Chord of curvature, evolutes. Tests for concavity and convexity. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Type of cusps.	
Unit-III	Tracing of curves in Cartesian, parametric and polar co-ordinates. Reduction formulae. Rectification, intrinsic equations of curve.	
Unit-IV	Quardrature (area)Sectorial area. Area bounded by closed curves. Volumes and surfaces of solids of revolution. Theorems of Pappu's and Guilden.	

Books Recommended :

4. Differential and Integral Calculus : Shanti Narayan.
5. Murray R. Spiegel : Theory and Problems of Advanced Calculus. Schaun's Outline series. Schaum Publishing Co., New York.
6. N. Piskunov : Differential and integral Calculus. Peace Publishers, Moscow.
7. Gorakh Prasad : Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.

8. Gorakh Prasad : Integral Calculus. Pothishala Pvt. Ltd., Allahabad.

Solid Geometry

Paper: 12BSM 113

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be

Unit	Contents	No. of Periods
Unit-I	General equation of second degree. Tracing of conics. Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic. System of conics. Confocal conics. Polar equation of a conic, tangent and normal to the conic.	
Unit-II	Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, radical plane of two spheres. Co-oxal system of spheres Cones. Right circular cone, enveloping cone and reciprocal cone. Cylinder: Right circular cylinder and enveloping cylinder.	
Unit-III	Central Conicoids: Equation of tangent plane. Director sphere. Normal to the conicoids. Polar plane of a point. Enveloping cone of a coincoid. Enveloping cylinder of a coincoid.	
Unit-IV	Paraboloids: Circular section, Plane sections of conicoids. Generating lines. Confocal conicoid. Reduction of second degree equations.	

Books Recommended

1. R.J.T. Bill, Elementary Treatise on Coordinary Geometry of Three Dimensions, MacMillan India Ltd. 1994.
4. P.K. Jain and Khalil Ahmad : A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.

NEW SCHEME

Scheme of Examination of B.Sc 2nd Semester Mathematics
(w.e.f. 2012-2013)

Number Theory and Trigonometry

Paper: 12BSM 121

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple) Primes, Fundamental Theorem of Arithemetic. Linear Congruences, Fermat's theorem. Wilson's theorem and its converse. Linear Diophanatine equations in two variables	
Unit-II	Complete residue system and reduced residue system modulo m. Euler's ø function Euler's generalization of Fermat's theorem. Chinese Remainder Theorem. Quadratic residues. Legendre symbols. Lemma of Gauss; Gauss reciprocity law. Greatest integer function [x]. The number of divisors and the sum of divisors of a natural number n (The functions d(n) and □ (n)). Moebius function and Moebius inversion formula.	
Unit-III	De Moivre's Theorem and its Applications. Expansion of trigonometrical functions. Direct circular and hyperbolic functions and their properties.	
Unit-IV	Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity. Gregory's series. Summation of Trigonometry series.	

Books Recommended :

4. S.L. Loney : Plane Trigonometry Part – II, Macmillan and Company, London.
5. R.S. Verma and K.S. Sukla : Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.

6. Ivan Ninen and H.S. Zuckerman. An Introduction to the Theory of Numbers.

NEW SCHEME

Scheme of Examination of B.Sc 2nd Semester Mathematics
(w.e.f. 2012-2013)

Ordinary Differential Equations

Paper: 12BSM 122 **Max. Marks:**

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x,y,p Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.	
Unit-II	Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Self orthogonal family of curves.. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous linear ordinary differential equations.	
Unit-III	Linear differential equations of second order: Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Method of undetermined coefficients.	
Unit-IV	Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators x (d/dx) or t (d/dt) etc. Simultaneous equation of the form dx/P = dy/Q = dz/R. Total differential equations. Condition for Pdx + Qdy +Rdz = 0 to be exact. General method of solving Pdx + Qdy + Rdz = 0 by taking one variable constant. Method of auxiliary equations.	

Books Recommended :

1. D.A. Murray : Introductory Course in Differential Equations. Orient Longaman (India) . 1967
2. A.R.Forsyth : A Treatise on Differential Equations, Machmillan and Co. Ltd. London
3. E.A. Codington : Introduction to Differential Equations.

4. S.L.Ross: Differential Equations, John Wiley & Sons
5. B.Rai & D.P. Chaudhary : Ordinary Differential Equations; Narosa, Publishing House Pvt. Ltd.

NEW SCHEME

Scheme of Examination of B.Sc 2nd Semester Mathematics
(w.e.f. 2012-2013)

Vector Calculus

Paper: 12BSM 123

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be

Unit	Contents	No. of Periods
Unit-I	Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation. Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives.	
Unit-II	Gradient of a scalar point function, geometrical interpretation of grad □ , character of gradient as a point function. Divergence and curl of vector point function, characters of Div f and Curl f as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator.	
Unit-III	Orthogonal curvilinear coordinates Conditions for orthogonality fundamental triad of mutually orthogonal unit vectors. Gradient, Divergence, Curl and Laplacian operators in terms of orthogonal curvilinear coordinates, Cylindrical co-ordinates and Spherical co-ordinates.	
Unit-IV	Vector integration; Line integral, Surface integral, Volume integral. Theorems of Gauss, Green & Stokes and problems based on these theorms.	

Books Recommended:

1. Murrary R. Spiegal : Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murrary R. Spiegal : Vector Analysis, Schaum Publisghing Company, New York.
3. N. Saran and S.N. NIgam. Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.

Shanti Narayna : A Text Book of Vector Calculus. S. Chand & Co., New Delhi.

B . Sc . IInd Year (IIIrd Semester)

Pa per VIII (Theory) Inorganic Chemistry **M a x. Ma r ks : 30**

CH-201 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Chemistry of Elements of Ist transition series:** Definition of transition elements, position in the periodic table, General characteristics & properites of Ist transition elements,. Structures & properties of some compounds of transition elements – TiO_2, $VOCl_2$, $FeCl_3$, $CuCl_2$ and Ni $(CO)_4$	22
Unit-II	**Chemistry of Elements of IInd & IIIrd transition series** General characteristics and properties of the IInd and IIIrd trans ition elements Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry	23
Unit-III	**Coordination Compounds** Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes	22
Unit-IV	**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	

B . Sc . IInd Year (IIIrd Semester)

Pa per IX (Theory) Physical Chemistry **M a x. Ma r ks : 30**

CH-202 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Thermodynamics-I** Defin ition of thermodynamic terms: system,surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work. Zeroth Law of thermodynamics, First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their re lationship. Joule's law – Joule – Thomson coefficient for idea l gass and real gas: and inversion temperature.	22
Unit-II	**Thermodynamics-II** Calculation of w.q. dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reve rsible process, Temperatu re depen dence of enthalpy, Kirchoffs equation. Bond energies and applications o f bond energies.	23
Unit-III	**Chemical Equilibrium** Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatetier's principle and its applica tions Clapeyron equation and Clausius – Clapeyron equation its applications.	22
Unit-IV	**Dis tributioln Law** Nernst distribution law – its thermodynamic derivation, Modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. (ii) Determination of equilibrium constant of potassium tri-iodide complex and process of extraction.	

B.Sc . IInd Year (IIIrd Semester)

Pa per X (Theory) Organic Chemistry **M a x. Ma r ks : 30**

CH-203 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**1.Alcohols** Monohydric alcohols nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols — nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol-pinacolone rearrangement. **2. Epoxides** Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides	22
Unit-II	**.Phenols** Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.	23
Unit-III	**Ultraviole t (UV) absorption spectroscopy** Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones,Woodward- Fieser rules, calculation of λ_{max} of simple conjugated dienes and α,β -unsaturated ketones. Applications o f UV Spectroscopy in structure elucidation of simple organic compounds.	22

Unit-IV	**Carboxylic Acids & Acid Derivatives** Nomenclatu re of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation. Structure , nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative s tability o f acyl derivatives. Phys ical properties, interconvers ion of acid derivatives by nucleophilic acyl substitution. Mechanisms of es ter ifica tion and hydrolysis (acidic and basic).	

B . Sc . IInd Year (IVth Semester)

Pa per XI (Theory) Inorganic Chemistry **M a x. Ma r ks : 30**

CH-204 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Chemis try of f – block elements** **Lanthanides** Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.	22
Unit-II	**Chemis try of f – block elements** **Actinides** General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements .	23
Unit-III	**Theory of Quali tative and Quanti tative Inorganic Analysis-I** Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analys is of basic radicals.	22
Unit-IV	**Theory of Quali tative and Quanti tative Inorganic Analysis-II** Chemistry of analysis of various groups of basic radicals, Theory of precipitation, co-precipitation, Post- precipitation, purification of precipitates.	

B . Sc . IInd Year (IVth Semester)

Pa per XII (Theory) Physical Chemistry **M a x. Ma r ks : 30**

CH-205 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Thermodynamics-III** Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorm, Thermodynamics scale of temperature. Concept of entropy – entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.	22
Unit-II	**Thermodynamics-IV** Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.	23
Unit-III	**Electrochemistry-III** Electrolytic and Galvanic cells – reversible & Irreversible cells, conventional representation of electrochemical cells. EMF of cell and its measurement, Wes ton standard cell, activity and activity coefficients . Calculation of thermodynamic quantities of cell reaction (□G, □H & K). Types of reversible electrodes – metal- metal ion gas electrode, metal –insoluble salt- anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemical series and its applications.	22

Unit-IV	**Electrochemistry-IV** Concentration cells with and without transference, liquid junction potential, application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration (acid- base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.	

B.Sc . IInd Year (IVth Semester)

Pa per XIII (Theory) Organic Chemistry **M a x. Ma r ks : 30**

CH-206 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Infrared (IR) absorption spectroscopy** Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint re gion, characteris tic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Applica tions of IR spectroscopy in structure e lucidation of simple organic compounds.	22
Unit-II	**Amines** Structure and nomenclatu re of amines, phys ical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural featu res affecting basicity of amines. Prepa ration of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabrielphthalimide reaction, Hofmann bromamide reaction. electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.	23
Unit-III	**1. Diazonium Salts** Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO_2 and CN groups, reduction of diazonium salts to hyrazines, coupling reaction and its synthetic application. **2. Nitro Compounds** Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanism of electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium.	22
Unit-IV	**Aldehydes and Ketones**	

	Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridinium chlorochromate (PCC) and pyridinium dichromate., Physical properties. Comparison of reactivities of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction.Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, LiAlH4 and NaBH4 reductions.	

B.Sc. II Year
Paper XIV (Practicals) Max. Marks: 80
CH-207 Time: 7 Hrs.
(Spread over two sessions)
SECTION – I (Inorganic)

1**. Gravimetric Analysis**
Quantitative estimations of, Cu^{2+} as copper thiocyanate and Ni^{2+} as Ni – dimethylglyoxime.

2**. Colorimetry:**
To verify Beer - Lambert law for $KMnO_4/K_2Cr_2O_7$ and determine the concentration of the given $KMnO_4/K_2Cr_2O_7$ so lution.

3. Preparations: Preparation of Cuprous chloride, prussion blue from iron fillings, tetraammine cupric sulphate, chrome alum, potass ium trioxalatochromate (III).

Section-B (Physical)

1. To determine the CST of phenol – water system.
2. To determine the solubility of benzoic acid at various temperatures and to determine the □H of the dissolution process 3. To determine the enthalpy of neutralisation of a weak
acid/weak base vs. strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.
4. To determine the enthalpy of solution of solid calcium chloride
5 .To study the distribution of iodine between water and CCl_4.31

Section-C (Organic)

Systematic identification (detection of extra elements, functional groups, determination of melting point or boiling point and preparation of at least one pure solid derivative) of the following simple mono and bifunctional organic compounds: Naphthalene , anthracene, acenaphthene, benzyl chloride, *p*-dichlorobenzene, *m*-dinitrobenzene, *p*-nitrotoluene, resorcinol , hydroquinone, □ -naphthol, □ -naphthol, benzophenone, ethyl methyl ketone,
benzaldehyde, vanillin, oxalic acid, succinic acid, benzoic acid, salicyclic acid, aspirin, phthalic acid, cinnamic acid, benzamide, urea, acetanilide, benzanilide, aniline hydrochloride, p-toluidine, phenyl salicylate (salol), glucose, fructose, sucrose, *o*-, *m*-, *p*nitroanilines, thiourea.

Distribution of marks

1. Section I 18 marks
2. Section II 18 marks
3. Section III 18 marks
4. Viva-voce 10marks
5. Lab Record 16 marks

B.Sc. PHYSICS
Paper-II PHY 302
Optics – I

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Fourier Analysis and Fourier Transforms : Speed of transverse waves on a uniform string. Speed of longitudinal waves in a fluid, superposition of waves (physical idea), Fourier Analysis of complex waves and its application for the solution of triangular and rectangular waves, half and full wave rectifier out puts. Fourier transforms and its properties. Application of fourier transform to following function. (I) f(x) = e-x2/2 (II) f(x) = I [x] <a 0 [x] >a	22
Unit-II	Geometrical Optics : Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lenses, Chromatic, spherical coma, astigmatism and distortion aberrations and their remedies. Physical Optics	23
Unit-III	Interference : Interference by Division of Wavefront : Fresnel's Biprism and its applications to determination of wave length of sodium light and thickness of a mica sheet, Lioyd's mirror, phase change on reflection.	22

References

1. Mathematical Physics by B.S. Rajput and Yog Prakash Pragati Prakashan.
2. Theory and Problems of Laplace Transforms by Murrari R. spiegel, McGraw Hill Book Company.
3. Optics by Ajay Ghatak, Tata McGraw Hill 1977.
4. Introduction of Optics by Frank L. Pedrotti and Leno S. Pedrotti, Prentice Hall 1987.

B.Sc. PHYSICS

Paper-III Phy- 303
Practicals

Max. Marks : 40
Time : 3 Hrs.

Special Notes

1. Do any eight experiments.
2. The students are required to Calculate the error involved in a particular experiment (Percentage error).

Note:-

1. The practical examination will be held in two sessions of 3 hours.
2. Distribution of Marks :

Experiments :	=	20 Marks
Viva-Voce :	=	10 Marks
Lab. Record :	=	10 marks
Total		40 Marks

For Giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure.

1. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded on their practical note book. These marks will contribute the lab Record.
2. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The students will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
3. The Lab. Record register will be presented to the external practical examiners for lab. Record marks. The external examiner will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 303
PRACTICALS

Max. Marks : 40
Time : 3 Hours

1. To measure the (a) area of a window (b) height of an inaccesible object.
2. Refractive index and dispersive power of a prism material by spectrometer.
3. To draw a graph between wave length and minimum deviation for various lines from a Mercury discharge source.
4. Determination of wave length of Na light and the number of lines per cerntimeter using a diffraction grating.
5. Wave length by Newton's Rings.
6. Resolving power of a telescope.
7. Comparision of Illuminating Powers by a Photometer.
8. Measurement of (a) Specific rotation (b) concentration of sugar solution using polarimeter.
9. Ordinary and extra ordinary refractive indices for calcite or quartz.
10. To find the equivalent focal length of a lens system by nodal slide assembly.

B.Sc. PHYSICS
Semester IV

Paper I- PHY 401 : Statistical Mechanics

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five questions in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Probability, some probability considerations, combinations possessing maximum probability, combinations possessing minimum probability, distribution of molecules in two boxs. Case with weightage (general). Phase space, microstates and macrostates, statistical fluctuations constraints and accessible States Thermodynamical probability.	22
Unit-II	Postulates of Statistical Physics. Division of Phase space into cells, Condition of equilibrium between two system in thermal contact. b - Parameter. Entropy and Probability, Boltzman's distribution law. Evaluation of A and b. Bose-Einstein statistics, Application of B.E. Statistics to Plancks's radiation law, B.E. gas.	23
Unit-III	Fermi-Dirac statistics, M.B. Law as limiting case of B.E. Degeneracy and B.E., Condensation. F.D. Gas, electron gas in metals. Zero point energy. Specific heat of metals and its solution.	22

References

1. B.B. Laud, "Introduction to Statistical Mechanics" (Macmillan 1981).
2. F. Reif, "Statistical Physics' (McGraw Hill 1988).
3. K. Huang, "Statistical Physics" (Wiley Eastern 1988).

B.Sc. PHYSICS
Paper-II PHY 402
Optics – II

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Interference by Division of Amplitude :Colour of thin, films, wedge shaped film, Newton's rings. Interferometers: Michelson's interferometer and its application to (I) Standardisation of a meter (II) determination of wave length. Fresuel's Diffraction : Fresnel's half period zones, zone plate, diffraction at a straight edge, rectangular slit and circular apperture.	22
Unit-II	Fraimhoffer diffraction : One slit diffraction, Two slit diffraction N-slit diffraction, Plane transmission granting spectrum, Dispersive power of a grating , Limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating.	23
Unit-III	Polarization :Polarisation and Double Refraction : Polarisation by reflection, Polarisation by scattering, Malus law, Phenomenon of double refraction, Huytgen's wave theory of double refraction (Normal and oblique incidence), Analysis of Palorised light : Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii)Elliptically polarized light, Optical activity, Fresnel's theory of rotation, Specific rotation, Polarimeters (half shade and Biquartz).	22

References

1. Optics by Ajay Ghatak, Tata McGraw Hill 1977.
2. Introduction of Optics by Frank L. Pedrotti and Leno S. Pedrotti, Prentice Hall 1987.

B.Sc. PHYSICS
Paper-III Phy- 403
Practicals

Max. Marks : 40
Time : 3 Hrs.

Special Notes

1. Do any eight experiments.
2. The students are required to Calculate the error involved in a particular experiment (Percentage error).

Note:-

1. The practical examination will be held in two sessions of 3 hours.
2. Distribution of Marks :

Experiments :	=	20 Marks
Viva-Voce :	=	10 Marks
Lab. Record :	=	10 marks
Total		40 Marks

For Giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure.

1. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded on their practical note book. These marks will contribute the lab Record.
2. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The students will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
3. The Lab. Record register will be presented to the external practical examiners for lab. Record marks. The external examiner will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 403
PRACTICALS

Max. Marks : 40
Time : 3 Hours

Note:- This course will contain two parts (i) Electronics and (ii) Computer experiments. Students have to perform a minimum of four experiments from each part.

(i) Electronics

1. To draw common base and common emitter characteristics of a transistor and calculate transistor and calculate transistor characteristics parameters.
2. To study the ripple factor in a.d.c. power supply.
3. To draw frequency response curve of transistorised R.C. coupled amplifier.
4. To find out the frequency of a tuning fork by Melde's experiment.
5. Study of series and parallel resonance circuits.
6. Electronic Voltmeter measurement of peak, average & R.M.S. valus of signal.
7. Study of voltage doubler and trippler circuits.

(ii) Computer Experiments

1. To print out all natural (even/odd) number between given limits using computer.
2. To find maximum, minimum and range of a given set of numbers using computer.
3. To evaluate sum of finite series. For example, S=.
4. Find the roots of a quadratic equation.
5. To find intergration of a definite integral by trapezoidal rule.
6. To find the area of a triangle, sphere and cylinder.
7. Given value for a,b,c and d and a set of values for the variable x evaluate the function defined by

   F(x)= ax2+bx+c if x<d F(x)= O if
   x=d
   F(x)= ax2+bx-c if x>d
   For each value of x, and print the value of x and (fx). Write a program for an arbitary number of x values.

NEW SCHEME

Scheme of Examination of B.Sc. 3rd Semester Mathematics
(w.e.f. 2013-2014)

Advanced Calculus

Paper: 12BSM 231

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours Note:

The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity, chain rule of differentiability. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives, Indeterminate forms.	
Unit-II	Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials; Composite functions & implicit functions. Change of variables. Homogenous functions & Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables.	
Unit-III	Differentiability of real valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.	
Unit-IV	Curves: Tangents, Principal normals, Binormals, Serret-Frenet formulae. Locus of the centre of curvature, Spherical curvature, Locus of centre of Spherical curvature, Involutes, evolutes, Bertrand Curves. Surfaces: Tangent planes, one parameter family of surfaces, Envelopes.	

Books Recommended:

2. C.E. Weatherburn : Differential Geometry of three dimensions, Radhe Publishing House, Calcutta
3. Gabriel Klaumber : Mathematical analysis, Mrcel Dekkar, Inc., New York, 1975
4. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
5. Gorakh Prasad : Differential Calculus, Pothishala Pvt. Ltd., Allahabad
6. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
7. Shanti Narayan : A Course in Mathemtical Analysis, S.Chand and company, New Delhi

8. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York

Partial Differential Equations

Paper: 12BSM 232

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.	
Unit-II	Linear partial differential equations of second and higher orders, Linear and non-linear homogenious and non-homogenious equations with constant co-efficients, Partial differential eqution with variable co-efficients reducible to equations with constant coefficients, their complimentary functions and particular Integrals, Equations reducible to linear equations with constant co-efficients.	
Unit-III	Classification of linear partial differential equations of second order, Hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order.	
Unit-IV	Cauchy's problem for second order partial differential equations, Characteristic equations and characteristic curves of second order partial differential equation, Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.	

Books Recommended:

5. D.A.Murray: Introductory Course on Differential Equations, Orient Longman, (India), 1967
6. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
7. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
8. Ian N.Sneddon : Elements of Partial Differential Equations, McGraw Hill Book Company, 1988
9. Frank Ayres : Theory and Problems of Differential Equations, McGraw Hill Book Company, 1972
10. J.N. Sharma & Kehar Singh : Partial Differential Equations

Statics

Paper: 12BSM 233

Max. Marks:
7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions (each carrying 7 marks.) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Composition and resolution of forces. Parallel forces. Moments and Couples.	
Unit-II	Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity.	
Unit-III	Virtual work. Forces in three dimensions. Poinsots central axis.	
Unit-IV	Wrenches. Null lines and planes. Stable and unstable equilibrium.	

Books Recommended:

11. S.L. Loney : Statics, Macmillan Company, London

12. R.S. Verma : A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad

NEW SCHEME

Scheme of Examination of B.Sc 4th Semester Mathematics

(w.e.f. 2013-2014)

Sequences and Series

Paper: 12BSM 241

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set, closure of a set in real numbers and their properties. Bolzano-Weiestrass theorem, Open covers, Compact sets and Heine-Borel Theorem.	
Unit-II	Sequence: Real Sequences and their convergence, Theorem on limits of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, Subsequences, Subsequential limits. Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series, Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or p-series.	
Unit-III	Infinite series: D-Alembert's ratio test, Raabe's test, Logarithmic test, de Morgan and Bertrand's test, Cauchy's Nth root test, Gauss Test, Cauchy's integral test, Cauchy's condensation test.	
Unit-IV	Alternating series, Leibnitz's test, absolute and conditional convergence, Arbitrary series: abel's lemma, Abel's test, Dirichlet's test, Insertion and removal of parenthesis, re-arrangement of terms in a series, Dirichlet's theorem, Riemann's Re-arrangement theorem, Pringsheim's theorem (statement only), Multiplication of series, Cauchy product of series, (definitions and examples only) Convergence and absolute convergence of infinite products.	

Books Recommended:

4. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
5. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
6. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
7. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York
8. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
9. Earl D. Rainville, Infinite Series, The Macmillan Co., New York
10.

Special Functions and Integral Transforms

Paper: 12BSM 242

Max. Marks:
7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Series solution of differential equations – Power series method, Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions	
Unit-II	Legendre and Hermite differentials equations and their solutions: Legendre and Hermite functions and their properties-Recurrence Relations and generating functions. Orhogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre & Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.	
Unit-III	Laplace Transforms – Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem, Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, solution of ordinary differential equations using Laplace transform.	
Unit-IV	Fourier transforms: Linearity property, Shifting, Modulation, Convolution Theorem, Fourier Transform of Derivatives, Relations between Fourier transform and Laplace transform, Parseval's identity for Fourier transforms, solution of differential Equations using Fourier Transforms.	

Books Recommended:

4. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
5. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
6. I.N. Sneddon : Special Functions on mathematics, Physics & Chemistry.
7. W.W. Bell : Special Functions for Scientists & Engineers.
8. I.N. Sneddon: the use of integral transform, McGraw Hill, 1972
9. Murray R. Spiegel: Laplace transform, Schaum's Series.

Part-A (Theory)
Paper:12BSM 243

Programming in C and Numerical Methods

5 x 2 = 10
1.5 x 6 = 9

Total = 30
Time: 3 Hours

Note:- The question paper will consist of **five** sections. Each of the first two sections ***(I-II)*** will contains two questions (each carrying 5.5 marks). Each of the **IIIrd** and **IVth** sections will contain two questions (each carrying 5 marks). The students shall be asked to attempt **one** question from each section ***(I-IV)***. **Section-V** will contain **six** short answer type questions (each carrying 1.5 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Programmer's model of a computer, Algorithms, Flow charts, Data types, Operators and expressions, Input / outputs functions.	
Unit-II	Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops, Switch Statement & Case control structures. Functions, Preprocessors and Arrays.	
Unit-III	Strings: Character Data Type, Standard String handling Functions, Arithmetic Operations on Characters. Structures: Definition, using Structures, use of Structures in Arrays and Arrays in Structures. Pointers: Pointers Data type, Pointers and Arrays, Pointers and Functions. Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method. Newton's iterative method for finding pth root of a number, Order of convergence of above methods	
Unit-IV	Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Crout's method, Cholesky Decomposition method. Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.	

Books Recommended:

4. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
5. V. Rajaraman : Programming in C, Prentice Hall of India, 1994
6. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd., 1998
7. M.K. Jain, S.R.K.Lyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996

8. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
9. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd.
10. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co. Ltd.
11. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co. Ltd.
12. Babu Ram: Numerical Methods, Pearson Publication.
13. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.

Part-B (Practical)

Max. Marks: 20

Time: 3 Hours

There will be a separate practical paper which will consist simple programs in C and the implementation of Numerical Methods, studied in the paper 12BSM 243 (Part-A).

B.Sc . IIIrd Year (Vth Semester)

Pa per XV (Theory) Organic Chemistry **M a x. Ma r ks : 30**

CH-301 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Metal-ligand Bonding in Transition Metal Complexes** Limitations of valence bond theory, an elementary idea of cr ystal-f ield theory, crystal field split ting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-f ield parameters.	22
Unit-II	**Thermodynamic and Kinetic Aspects of Metal Complexe** A brief outline of thermodynamic stability of metal complexes and factors affec ting the s tab ility, substitution reac tions of square planar complexes of Pt(II).	23
Unit-III	**Magnetic Properties of Transition Metal Complexe** Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of □s and □eff values, orbital contribution to magnetic moments, application of magnetic moment data for 3dmetal complexes.	22
Unit-IV	**Electron Spectra of Transition Metal Complexes** Types of electronic transitions, selection rules for d-d trans itions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d1 and d9 states, discussion of the electronic spectrum of [Ti(H2O)6]3+ complexion.	

B.Sc . IIIrd Year (Vth Semester)

Pa per XVI (Theory) Physical Chemistry **M a x. Ma r ks : 30**

CH-302 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Quantum Mechanic s-I** Black-body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids, Compton effect,wave function and its significance of Postulates of quantum mechanics , quantum mechanical operator, commutation relations, Hamiltonial operator, Hermitian operator, average value of square of Hermitian as a positive quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance ,	22
Unit-II	**Physical Properties and Molecular Structure** Optica l activity, polarization – (clausius – Mossotti equation). Orientation of dipoles in an electric field, dipole moment, included dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Applica tion of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetics.	23
Unit-III	**Spectroscopy-I** **Introduction**: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Bornoppenheimer approximation, Degrees of freedom. **Rotational Spectrum**	22

	Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules, spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotor, isotope effect.	
Unit-IV	**Spectroscopy-II** **Vibrational spectrum** Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effects of anharmonic motion and isotopic effect on the spectra., idea of vibrational frequencies of different functional groups. **Raman Spectrum**: Concept of polarizibility, pure rotational and pure vibrational Raman spectra of diatomic molecules, selectin rules, Quantum theory of Raman spectra.	

B.Sc . IIIrd Year (Vth Semester)

Pa per XVII (Theory) Organic Chemistry **M a x. Ma r ks : 30**

CH-303 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**NMR Spectroscopy-I** Principle of nuclear magnetic resonance, the PMR spectrum,number of signals, peak areas, equivalent and nonequivalent protons positions of signals and chemical shift,shielding and deshielding of protons, proton counting,splitting of signals and coupling constants, magnetic equivalence of protons.	22
Unit-II	**NMR Spectroscopy-II** Discuss ion of PMR spectra of the molecules: ethyl bromide, npropyl bromide, isopropyl bromide, 1,1-dibromoethane, 1,1,2-tribromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone..Simple problems on PMR spectroscopy for structure determination of organic compounds.	23
Unit-III	**Carbohydrates-I** Classification and nomenclature. Monosaccharides, mechanism of osazone formation, inte rconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose in to mannose. Formation of glycos ides, ethers and esters. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+)-glucose & D(-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose.	22
Unit-IV	**1. Carbohydrates-II** An introduc tion to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination. **2. Organometallic Compounds** Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.	

B.Sc . IIIrd Year (VIth Semester)

Paper XVIII (Theory) Inorganic Chemistry **M a x. Ma r ks : 30**

CH-304 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Organometallic Chemistry** Definition, nomenclature and classification of organometallic compounds. Preparation, properties, and bonding of alkyls of Li, Al, Hg, and Sn a brief account of metal-ethylenic complexes, mononuclear carbonyls and the nature of bonding in metal carbonyls.	22
Unit-II	**Acids and Bases, HSAB Concept** Arrhenius, Bronsted – Lowry, the Lux – Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids & Bases. Symbiosis, electronegativity and hardness and softness	23
Unit-III	**Bioinorganic Chemistry** Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca2+. Nitrogen fixation.	22
Unit-IV	**Sil icones and Phosphazenes** Silicones and phosphazenes, their preparation, properties,structure and uses	

B.Sc . IIIrd Year (VIth Semester)

Paper XIX (Theory) Physical Chemistry **M a x. Ma r ks : 30**

CH-305 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Spectroscopy-III** **Electronic Spectrum** Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle. Qualitative description of sigma and pie and n molecular orbital (MO) their energy level and respective transitions.	22
Unit-II	**Photochemistry** Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grotthus-Drapper law, Stark-Einstein law (law of photochemical equivalence) Jablonski diagram depiciting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).	23
Unit-III	**Solutions:** **Dilute Solutions and Colligative Properties** Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution,Colligative properties, Raolut's law, relative lowering of vapour pressure, molelcular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.	22
Unit-IV	**Phase Equillibrium** Statement and meaning of the terms – phase component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component system –Example – water and Sulpher systems. Phase equilibria of two component systems solid-liquid equilibria, simple eutectic Example Pb-Ag system, desilerisation of lead	

B.Sc . IIIrd Year (VIth Semester)

Pa per XX (Theory) Organic Chemistry **M a x. Ma r ks : 30**

CH-306 **Time: 3 Hrs.**

Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing six short answer type questions covering the entire syllabus and will be of six marks. Further, examiner will set two questions from each section and the Candidates will be required to attempt one question from each section which will be of six marks each.

Unit	Contents	No. of Periods
Unit-I	**Heterocyclic Compounds-I** Introduction: Molecular orbital p icture and aromatic characteris tics 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 reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole	22
Unit-II	**1. Heterocyclic Compounds-II** Introduction to condensed five and six- membered heterocycles. Prepration and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of, quinoline and isoquinoline **2. Organosulphur Compounds** Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine. Synthetic detergents alkyl and aryl sulphonates.	23
Unit-III	**1. Organic Synthesis *via* Enolates** Acidity of □ -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. 2. **Synthetic Polymers** Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensat ion or step growth polymerization. Polyesters , polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy re sins and polyurethanes. Natural and synthetic rubbers.	22
Unit-IV	**Amino Acids, Peptides& Proteins** Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of □ -amino acids Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid–phase peptide synthesis. Structures of peptides and proteins:Primary & Secondary structure.	

B.Sc. III Year
Paper XXI (Practical)

CH-307 Time: 7 Hrs. **Max. Marks: 80**
(Spread over two sessions)

SECTION – I (Inorganic)

Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding insoluables):
Pb^{2+}, Hg^{2+}, Hg_2^{2+}, Ag^{+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Fe^{3+}, Cr^{3+}, Al^{3+}, Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}, NH_4^{+}, CO_3^{2-}, S^{2-}, SO_3^{2-}, $S_2O_3^{2-}$, NO_2^{-}, CH_3COO^{-}, Cl^{-}, Br^{-}, I^{-}, NO_3^{-}, SO_4^{2-}, $C_2O_4^{2-}$, PO_4^{3-}, BO_3^{3-}

Section-B (Physical)

1. To determine the strength of the given acid solution (mono and dibasic acid) conductometrically.
2. To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically
3. To determine the strength of given acid solution (mono and dibasic acid)/$KMnO_4$ – Mohr salt potentiometrically.
4. To determine the molecular weight of a non-volatile solute by Rast method.
5. To standardize the given acid solution (mono and dibasic acid) pH metrically.

Section-C (Organic)

1. Laboratory Techniques
(a) Steam distilla tion (non evaluative)
Naphthalene from its suspension in water
Separation of *o*-and *p*-nitrophenols
(b) Column chromatography (non evaluative)
Separation of fluorescein and methylene blue
Separation of leaf pigments from spinach leaves
2. Chromatography Method
Determination of R_f values and iden tification o f organic compunds
(a) Separation of green leaf pigments (spinach leaves may be used)by paper chromatographic method
(b) Separation of a mixture of coloured organic compounds using common organic solventsby TLC.
3. Synthesis of the following organic compounds:
(a) To prepare o-chlorobenzoic acid from anthranilic acid.
(b) To prepare p-bromoaniline from p-bromoacetanilide.
© To prepare m-nitroaniline from m-dinitrobenzene.
(d) To prepare S-Benzyl-iso-thiouronium chloride from thiourea.
1. Section I 18 marks
2. Section II 18 marks
3. Section III 18 marks
4. Viva-voce 10 marks
5. Lab Record 16 marks

B.Sc. PHYSICS
SCHEME OF EXAMINATION
Semester -V

Paper I- PHY 501 : SOLID STATE PHYSICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Crystalline and gallssy forms, liquid crystals. Crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and primitive cell, Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais tattices in two and three dimensions.	22
Unit-II	crystal planes and Miller indices, Interplanner spacing, Crystal structures of Zinc sulphide, Sodium Chloride and diamond, X-ray diffraction, Bragg's Law and experimental x-ray diffraction methods, K-space.	23
Unit-III	Reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c and f.c.c. Specific heat : Specific heat of solids, Einstein's theory of specific heat, Debye model of specific heat of solids.	22

References

1. Introduction to solid state Physics (5_{th} Ed.) by kittel, Wiley eastern Limited

B.Sc. PHYSICS
Paper I- PHY 502 : QUANTUM MECHANICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Failure of (Classical) E.M. Theory. quantum theory of radiatio (old quantum theory), Photon, photoelectric effect and Einsteins photoelectric equation compton effect (theory and result). Inadequancy of old quantum theory, de-Broglie hypothesis. Davisson and Germer experiment. G.P. Thomson experiment. Phase velocity group velocity, Heisenberg's uncertainty principle. Time-energy and angular momentum, position uncertainty Uncertainty principle from de-Broglie wave, (wave-partice duality). Gamma Ray Maciroscope, Electron diffraction from a slit.	15-20
Unit-II	Derivation of time dependent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Normalization of wave function, concept of observable and operator. Solution of Schrodinger equation for harmomic oscillator ground states and excited states.	10-13
Unit-III	Application of Schrodinger equation in the solution of the following one-dimensional problems : Free particle in one dimensional box (solution of schrodinger wave equation, eigen function, eigen values, quantization of energy and momentum, nodes and antinodes, zero point energy). i) One-dimensional potential barrie $E>V_0$ (Reflection and Transmission coefficient. ii) One-dimensional potential barrier, $E>V_0$ (Reflection Coefficient, penetration of leakage coefficient, penetration depth).	10-12

References :

1. Quantum Mechanics by L.I. Schiff, McGraw Hill Book Company, Inc.
2. Quantum Mechanics by B. Crasemand and J.D. Powel (Addison Wesley.
3. Quantum Mechanics by A.P. Messiah.

B.Sc. PHYSICS
Paper -III Phy- 503
(Practicals)

Max. Marks : 40
Time : 3 Hrs.

Special Notes

1. Do 6 experiments from section (i)& 4 experiments form Section (ii).
2. The students are required to calculate the error involved in a particular experiment (percentage error).
3. Use of simple non-programmable scientific calculate is allowed.

Note :

1. The practical examinations will be

Experiments	=20 marks
Viva-Voce	=10 marks
Lab Record	= 10 marks
Total	= 40 marks

For giving marks under Lab. Record each college maintain practical assessment record by using the following procedure.

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II. After the completion of a practical the teacher concerned will check the note-book and conduct the Viva-voce of each student to find out how much concept related to the theoretical and experimental part of the experimental part of the experiment he/she has under stood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded While taking the final average the total marks obtained will be divided by the total no of required practicals instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.

IV. The lab. Record register will be presented to the external practical examiner for lab. Record marks. The external examiner will verify the record randomly.

B.Sc. PHYSICS

Paper III- PHY 503
PRACTICALS

Max. Marks : 40
Time : 3 Hours

This course will consist of two parts :
i) Solid State Electronics
ii) Computer Experiments
Student have to perform a minimum of four experiments from each part. **i) Solid State Electronics**

1. e/m by Thomson method.
2. Transistor as voltage Amplifier in C-B Configuration.
3. Transistor as voltage Amplifier in C-B Configuration.
4. Study of B-H Curve by C.R.O.
5. Study of Hartley Oscillator (Calibration of Gang Condenser).
6. To study Hall effect.
7. Measurement of Energy Gap of Four Probe Method.
8. a) To Draw the Plateau of G.M. Counter.
   b) To Determine the Mass Attention Coefficient by G.M.Counter.

ii) Computer Experiment :

1. Program of compute product of two matrics A and B of different dimensions. This is an exercise to illustrate the use of subscripted variable and implied Do loops.
2. Evaluate the difine integral 1=h *f* f(x)dx. through Simpson's one. third rule.
3. USe of the least-quare curve fitting to fit a straight line to a given set of data.
4. Consider and array X with subscripted variables x; i = 1. 2 .....N.
   It is desired to find the average and the standard deviation using the formulas.
5. Compute the sum of an infinite series upto three significant figures. For example, compute.
   for different x using Do loops. Calculate factorials through function subprogram.
6. Let there be N(Say=100) students in a class. Arrange their marks in descending or ascending orders.
7. Write a Fortran Program which evaluates v and y as function of verying between and increments of using the relation.

B.Sc. PHYSICS

SCHEME OF EXAMINATION
Semester -VI

Paper I- PHY 601 : ATOMIC MOLECULAR AND LASER PHYSICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed

Unit	Contents	No. of Periods
Unit-I	Vector atom model, quantum numbers associated with vector atom model, penetrating and non-penetrating orbits (qualitiative description), spectral lines in different series of ailkali spectra, spin orbit interaction and doublet term seperation LS or Russel-Saunder Coupling jj coupling (expressions for inteaction energies for LS and jj coupling required).	22
Unit-II	Zeeman effect (normal and Anormalous) Zeeman pattern of D_1 and D_2 lines of Na-atom, Paschen, Back effect of a single valence electron system. Weak field Strak effect of Hydrogen atom. Diseete set of electronic energies of molecules. quantisation of Vibrational and ratiational energies Raman effect (Quantitative description) Stoke's and anti Stoke's lines.	23
Unit-III	Main features of a laser : Directionality, high intensity, high degree of coherence, spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer, life time of a level, kinetics of optical obsorption. Threshold condition for laser emission, Laser pumping, He-Ne laser and RUBY laser (Principle, Construction and Working). Applications of laser in the field of medicine and industry.	22

References

1. Introduction to Atomic and Molecular Spectroscopy by V.K.Jain, Narosa (2007)
2. Introduction to Atomic Spectra by H.B. White.
3. Atomic spectra by G. Herzberg.
4. Molecular Spectra and Molecular Structure by G. Herzberg.
5. Fundamentals of molecular spectroscopy by Colin N. Banwell and Elaine M.Mc-Cash.
6. Lassers, Theory and Application (2nd Ed.) by Thagrajan and Ajay Ghatak.
7. Laser and Nonlinear Optics by B.B. Laud (2nd Ed.)
8. Introduction to Optics by Frank L. Pedrotti and Lens S. Pedrotti, Prentice Hall, 1987.

B.Sc. PHYSICS

Paper II- PHY 602 : NUCLEAR PHYSICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Nuclear mass and binding energy, systematics nuclear binding energy, nuclear stability, Nuclear size, spin, parity, statistics magnetic dipole moment, quadrupole moment (shape concept), Determination of mass by Bain-Bridge, Bain-Bride and Jordan mass spectrograph, Determination of charge by Mosley law Determination of size of nuclei by Rutherford Back Scattering.	22
Unit-II	Interaction of heavy charged particles (Alpha particles), alpha disintegration and its theory Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Energetics of alpha -decay, Range and straggling of alpha particles. Geiger-Nuttal law.Introduction of light charged particle (Beta-particle), Origin of continuous beta -spectrum (neutrino hypothesis) types of beta decay and energetics of beta decay, Energy loss of beta-particles (ionization), Range of electrons, absorption of beta-particles. Interaction of Gamma Ray, Nature of gamma rays, Energetics of gamma rays, passage of Gamma radiations through matter (photoelectric, compton and pair production effect) electron position anhilation. Asborption of Gamma rays (Mass attenuation coefficient) and its application.	23
Unit-III	Nuclear reactions, Elastic scattering, Inelastic scatting, Nuclear disintegration, photoneclear reaction, Radiative capture, Direct reaction, heavy ion reactions and spallation Reactions, onservation laws. Q-value and reaction threshold. Nuclear Reactors General aspects of Reactor design. Nuclear fission and fusion reactors (Principles, construction, working and use) Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators. onization chamber, proportional counter, G.M. counter detailed study, scintillation counter and semiconductor detector.	22

references :

1. Atomic and nuclear Physics, Vol. II by S.N. Ghashal.
2. Nuclear Physics by D.C. Tayal, Umesh Prakashan, 125, Goblind Dev Khurja (UP).
3. Concept of Modern physics by arther Besier, Tata McGraw Hill Publications.
4. Nuclear Physics by W.E. Burcham.
5. Nuclear Radiation Detectors by S.S. Kapoor
6. Experimental Nuclear Physics by M. Singru.

B.Sc. PHYSICS
Paper -III Phy- 603
(Practicals)

Max. Marks : 40
Time : 3 Hrs.

Special Notes

1. Do 8 experiments.
2. The students are required to calculate the error involved in a particular experiment (percentage error).
3. Use of simple non-programmable scientific calculate is allowed.

Note :

1. The practical examinations will be

Experiments	=20 marks
Viva-Voce	=10 marks
Lab Record	= 10 marks
Total	= 40 marks

For giving marks under Lab. Record each college maintain practical assessment record by using the following procedure.

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II. After the completion of a practical the teacher concerned will check the note-book and conduct the Viva-voce of each student to find out how much concept related to the theoretical and experimental part of the experimental part of the experiment he/she has under stood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The student will be assigned a seperate page on this register. On this page the marks obtained by the student in different practicals will be recorded While taking the final average the total marks obtained will be divided by the total no of required practicals instead of the number of practicals performed by the student. This record will be signed by the concerned teacher
.

IV. The lab. Record register will be presented to the external practical examiner for lab. Record marks. The external examiner will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 603
PRACTICALS

Max. Marks : 40
Time : 3 Hours

Wave length of Sodium light by fresnel's biprism. Velocity f ultrasonic waves by grating formation in CC14.Diameter of Lycopodium powder particies by Carona rings. To study double sit interference by He-Ne laser. Diameter of a thin wire by diffraction method (using He-Ne Laser). Young's modulus by Newtons rings method. Resolving power of a prism. Thickness of a thin plate using air wedge. resolving Power of plane transmission grating. Rydberg constant by Hydrogen gas spectrum.

NEW SCHEME

Scheme of Examination of B.Sc. 5th Semester Mathematics

(w.e.f. 2014-2015)

Real Analysis

Paper: 12BSM 351

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Riemann integral, Integrabililty of continuous and monotonic functions, The Fundamental theorem of integral calculus. Mean value theorems of integral calculus.	
Unit-II	Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of a parameter. Continuity, Differentiability and integrability of an integral of a function of a parameter.	
Unit-III	Definition and examples of metric spaces, neighborhoods, limit points, interior points, open and closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction Principle	
Unit-IV	Continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness , components, continuity in relation with connectedness.	

Book s Recommended:

6. P.K. Jain and Khalil Ahmad: Metric Spaces, 2nd Ed., Narosa, 2004
7. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
8. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
9. D. Somasundaram and B. Choudhary : A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997

10. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
11. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
12. G.F. Simmons : Introduction to Topology and Modern Analysis, McGraw Hill, 1963.

Groups and Rings

Paper: 12BSM 352

Max. Marks:
7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Definition of a group with example and simple properties of groups, Subgroups and Subgroup criteria, Generation of groups, cyclic groups, Cosets, Left and right cosets, Index of a sub-group Coset decomposition, Largrage's theorem and its consequences, Normal subgroups, Quotient groups,	
Unit-II	Homoomorphisms, isomophisms, automorphisms and inner automorphisms of a group. Automorphisms of cyclic groups, Permutations groups. Even and odd permutations. Alternating groups, Cayley's theorem, Center of a group and derived group of a group.	
Unit-III	Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homomorphisms, ideals (principle, prime and Maximal) and Quotient rings, Field of quotients of an integral domain.	
Unit-IV	Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion, Polynomial rings over commutative rings, Unique factorization domain, R unique factorization domain implies so is R[X1 , X2……Xn]	

Books Recommended:

3. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
4. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2^{nd} edition).
5. Vivek Sahai and Vikas Bist : Algebra, NKarosa Publishing House.
6. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Norsa Publishing House.

7. J.B. Gallian: Abstract Algebra, Narosa Publishing House.

Dynamics

Paper: 12BSM 353

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration. Simple harmonic motion. Elastic strings.	
Unit-II	Mass, Momentum and Force. Newton's laws of motion. Work, Power and Energy. Definitions of Conservative forces and Impulsive forces.	
Unit-III	Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.	
Unit-IV	General motion of a rigid body. Central Orbits, Kepler laws of motion. Motion of a particle in three dimensions. Acceleration in terms of different co-ordinate systems.	

Books Recommended:

2. S.L.Loney : An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956
3. F. Chorlton : Dynamics, CBS Publishers, New Delhi
4. A.S. Ramsey: Dynamics Part-1&2, CBS Publisher & Distributors.

NEW SCHEME

Scheme of Examination of B.A./B.Sc 6th Semester Mathematics
(w.e.f. 2014-2015)

Real and Complex Analysis

Paper: 12BSM 361

Max. Marks:
7 x 4 = 28
2 x 6 = 12
Total = 40
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Jacobians, Beta and Gama functions, Double and Triple integrals, Dirichlets integrals, change of order of integration in double integrals.	
Unit-II	Fourier's series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Co-efficients, Dirichlet's conditions, Parseval's identity for Fourier series, Fourier series for even and odd functions, Half range series, Change of Intervals.	
Unit-III	Extended Complex Plane, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions.	
Unit-IV	Mappings by elementary functions: Translation, rotation, Magnification and Inversion. Conformal Mappings, Mobius transformations. Fixed pints, Cross ratio, Inverse Points and critical mappings.	

Books Recommended:

5. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
6. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
7. D. Somasundaram and B. Choudhary : A First Course in Mathematical, Analysis, Narosa Publishing House, New Delhi, 1997
8. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
9. R.V. Churchill & J.W. Brown: Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990
10. Shanti Narayan : Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.

Linear Algebra

Paper: 12BSM 362

Max. Marks:

7 x 4 = 28
2 x 6 = 12
Total = 40

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections(***I-IV***) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit	Contents	No. of Periods
Unit-I	Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vactor space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.	
Unit-II	Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vactor spaces, Vactor space of all the linear transformations Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimentional vactor spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,	
Unit-III	Algebra of Liner Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.	
Unit-IV	Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt, Orthogonalization process, Adjoint of a linear transformation and its properties, Unitary linear transformations.	

Books Recommended:

14. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
15. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2nd edition).
16. Vivek Sahai and Vikas Bist : Algebra, Narosa Publishing House.

I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Narosa Publishing House.

Numerical Analysis

Part-A (Theory)
Paper: 12BSM 363

Max. Marks:
5.5 x 2 = 11
5 x 2 = 10
1.5 x 6 = 9
Total = 30

Time: 3 Hour

Note:- The question paper will consist of **five** sections. Each of the first two sections ***(I-II)*** will contains two questions (each carrying 5.5 marks). Each of the **IIIrd** and **IVth** sections will contain two questions (each carrying 5 marks). The students shall be asked to attempt **one** question from each section ***(I-IV)***. **Section-V** will contain **six** short answer type questions (each carrying 1.5 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Finite Differences operators and their relations. Finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae, Hermite Formula.	
Unit-II	Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula. Probability distribution of random variables, Binomial distribution, Poisson's distribution, Normal distribution: Mean, Variance and Fitting.	
Unit-III	Numerical Differentiation: Derivative of a function using interpolation formulae as studied in Sections –I & II. Eigen Value Problems: Power method, Jacobi's method, Given's method, House-Holder's method, QR method, Lanczos method.	
Unit-IV	Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one-third and three-eighth rule, Chebychev formula, Gauss Quadrature formula. Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.	

Books Recommended:

1. Babu Ram: Numerical Methods, Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.

3. M.K. Jain, S.R.K.Iyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
4. M.K. Jain, S.R.K. Iyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
5. C.E. Froberg : Introduction to Numerical Analysis (2^{nd} Edition).
6. Melvin J. Maaron : Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York
7. R.Y. Rubnistein : Simulation and the Monte Carlo Methods, John Wiley, 1981

8. Radhey S. Gupta: Elements of Numerical Analysis, Macmillan Publishing Co.

Part-B (Practical)

Max. Marks: 12

Time: 3 Hours

There will be a separate practical paper which will consist simple programs in C and the implementation of Numerical Methods, studied in the paper 12BSM 363 (Part-A).