1.1 Curricular Planning and Implementation

1.1.1 The Institution ensures effective curriculum delivery through a well planned and documented process

Response:

The college emphasizes on providing quality education and ensures effective curriculum delivery. The institute pursues the curriculum provided by the affiliating university i.e. MDU, Rohtak and aims at holistic development of students. Faculty members from the college have been nominated as members of Board of Studies and worked in curriculum forming committees of the university. The curriculum taught inculcates human values in students and sensitizes them towards environmental and gender issues. The institution ensures effective curriculum delivery through a well-planned system.

ACADEMIC CALENDER

- It is provided by the affiliating university at the commencement of every session.
- The college streamlines its academic process by preparing its own schedule of activities accordingly.

ASSESSMENT OF ATTAINMENT OF LEARNING OBJECTIVES

- Formative assessment is done to assess the level of learning of the students.
- Extra classes are conducted for slow learners.
- Students prepare assignments and give presentations.
- Internal assessment is done on the basis of tests and assignments.
- Final assessment is done through university examinations.

LIBRARY

- The college has a well-maintained library with adequate number of books.
- Students get books issued on the days assigned to their respective classes.
- Ample number of magazines and daily newspapers are available for the students to peruse.
- Record is maintained by the library.

LESSON PLAN

- Faculty members prepare lesson plans for their respective subjects to ensure effective delivery of the curriculum.

LABORATORIES

- The college maintains well-equipped laboratories to cater to the needs of the students.
- Practical exams are conducted and students prepare manuals.
- Field work and Project Work are also conducted by different departments.

MENTOR-MENTEE SYSTEM

- Small group of students is allotted to individual faculty members.
- Various academic and other issues are addressed and resolved through these sessions.

TEACHING AIDS

- Besides the traditional chalk and board, the faculty members also use charts, maps, models, etc.
- Quiz, Group-Discussions, Educational Field Trips and Excursions are also organized.
- Role-play and case studies focus on the practical application of knowledge.
- Smart boards and PPTs are used to deliver lectures.
- To tackle the situation actuated by Covid-19 the faculty members made sure the continuity of teaching-learning process through online platforms like Google Meet, WhatsApp, Youtube, etc. Students were also provided with e-content.

TIME-TABLE COMMITTEE

- The Time-Table committee prepares the over-all time-table of the college,
- All the departments make their own time-tables as well which are duly displayed on college website and notice boards.

TEACHER SUPPORT

- The college assures faculty development by encouraging the members to participate in orientation, refresher programmes and workshops.
- Faculty members also participate in workshops related to curriculum development.

FEEDBACK

- The college takes feedback from students, parents and faculty members.
- The college assesses its performance and improves in requisite areas after analyzing the feedback.

Hence, the institute makes every effort to groom the students thus empowering and capacitating them to deal with the challenging future.

Lesson Plan

Session 2020-21

Name of Assistant/Associate Professor:-Mrs. SOPHIA

Class:- BCA-I(1ˢᵗ Semester)

Subject:- BCA-101 :: COMPUTER FUNDAMENTAL

Month : NOVEMBER	
Week	**Topic covered**
Week 3	Introduction to content of paper and its application. Introduction to computer and its various components.
Week 4	**UNIT-1:** Computer Fundamentals: Generations of Computers, Definition, Block Diagram along with its components, characteristics & classification of computers, Limitations of Computers, Human-Being VS Computer.
Month : DECEMBER	
Week	**Topic covered**
Week 1	Applications of computers in various fields. Memory: Concept of primary & secondary memory, RAM, ROM, types of ROM, Cache Memory, flash memory, Secondary storage devices: Sequential & direct access devices.
Week 2	Secondary storage devices: Sequential & direct access devices viz. magnetic tape, magnetic disk, optical disks i.e. CD, DVD, and virtual memory. Queries of Unit-1. Revision of Unit-1. Assignment Submission & Written Test of Unit-1.
Week 3	**UNIT-2:** Computer hardware & software: I/O devices, definition of software, relationship between hardware and software, types of software.
Week 4	Overview of operating system: Definition, functions of operating system, concept of multiprogramming, multitasking, multithreading, multiprocessing, time-sharing, real time, single-user & multi-user operating system.
Week 5	Computer Virus: Definition, types of viruses, Characteristics of viruses, anti-virus software. Queries of Unit-2. Revision of Unit-2. Assignment Submission and Test of Unit-2.
Month : JANUARY	
Week	**Topic covered**
Week 1	**UNIT-3:** Computer Languages: Analogy with natural language, machine language, assembly language, high-level languages, forth generation languages, compiler, interpreter, assembler, Linker, Loader , characteristics of a good programming language.
Week 2	Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation. Structured programming concepts.
Week 3	Programming methodologies viz. top-down and bottomup programming, Advantages and disadvantages of Structured programming. Queries of Unit-3. Revision of Unit-3. Assignment Submission and Test of Unit-3.
Week 4	**UNIT-4:** Overview of Networking: An introduction to computer networking, Network types (LAN, WAN, MAN), Network topologies, Modes of data transmission, Forms of data transmission, Transmission channels(media).
Week 5	Introduction to internet and its uses, Applications of internet, Hardware and Software requirements for internet, Intranet, Applications of intranet. Queries of Unit-4. Revision of Unit-4. Assignment Submission and Test of Unit-4.
Month : FEBRUARY	
Week	**Topic covered**
Week 1	Thorough Revision of Unit-1 & 2 including queries, problem solving and written tests.
Week 2	Thorough Revision of Unit-3 & 4 including queries, problem solving and written tests.

Lesson Plan

Session 2020-21

Name of Assistant/Associate Professor:-Mrs. SOPHIA

Class:- BCA-II(3rd Semester)

Subject:- BCA-203 :: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM

Month : NOVEMBER	
Week	**Topic covered**
Week 3	Introduction to content of paper and its application. Introduction to computer and its various components.
Week 4	**UNIT-1:** Basic Concepts – Data, Information, Records and files. Traditional file –based Systems-File Based Approach-Limitations of File Based Approach, Database Approach-Characteristics of Database Approach.

Month : DECEMBER	
Week	**Topic covered**
Week 1	Advantages and disadvantages of database system, Components of database system, Database Management System (DBMS), Components of DBMS Environment.
Week 2	DBMS Functions and Components, DBMS users, Advantages and Disadvantages of DBMS, DBMS languages.
Week 3	Roles in the Database Environment - Data and Database Administrator, Database Designers, Applications Developers and Users.Queries of Unit-1. Revision of Unit-1. Assignment Submission & Test of Unit-1.
Week 4	**UNIT-2:** Database System Architecture – Three Levels of Architecture, External, Conceptual and Internal Levels, Schemas, Mappings and Instances.
Week 5	Data Independence – Logical and Physical Data Independence. Classification of Database Management System, Centralized and Client Server architecture to DBMS.

Month : JANUARY	
Week	**Topic covered**
Week 1	Data Models: Records- based Data Models, Object-based Data Models, Physical Data Models and Conceptual Modeling. Queries of Unit-2. Revision of Unit-2. Assignment Submission & Test of Unit-2.
Week 2	**UNIT-3:** Entity-Relationship Model – Entity Types, Entity Sets, Attributes Relationship Types, Relationship Instances and ER Diagrams, abstraction and integration. Basic Concepts of Hierarchical and Network Data Model, Relational Data Model:-Brief History.
Week 3	Relational Model Terminology-Relational Data Structure, Database Relations, Properties of Relations, Keys, Domains, Integrity Constraints over Relations. Queries of Unit-3. Revision of Unit-3. Assignment Submission & Test of Unit-3.
Week 4	**UNIT-4:** Relational algebra, Relational calculus, Relational database design: Functional dependencies, Modification anomalies Ist to 3rd NFs, BCNF, 4th and 5th NFs.
Week 5	Computing closures of set FDs, SQL: Data types, Basic Queries in SQL, Insert, Delete and Update Statements, Views, Query processing: General strategies of query processing, query optimization, Query processor, concept of security, concurrency and recovery. Queries of Unit-4. Revision of Unit-4. Assignment Submission & Test of Unit-4.

Month : FEBRUARY	
Week	**Topic covered**
Week 1	Thorough Revision of Unit-1 & 2 including queries, problem solving and written tests.
Week 2	Thorough Revision of Unit-3 & 4 including queries, problem solving and written tests.

Lesson Plan

Session 2020-21

Name of Assistant/Associate Professor:-Mrs. SOPHIA

Class:- BCA-III(5th Semester)

Subject:- BCA-302 :: COMPUTER GRAPHICS

Month : NOVEMBER	
Week	**Topic covered**
Week 3	Introduction to content of paper and its application. Introduction to computer and its various components.
Week 4	**UNIT-1:** Graphics Primitives: Introduction to computer graphics, Basics of Graphics systems, Application areas of Computer Graphics. Overview of graphics systems, video-display devices, and raster-scan systems.
Month : DECEMBER	
Week	**Topic covered**
Week 1	Random scan systems, graphics monitors and workstations and input devices, Output Primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms.
Week 2	Filled area primitives: Scan line polygon fill algorithm, boundary fill and flood fill algorithms. Queries of Unit-1. Revision of Unit-1. Assignment Submission & Test of Unit-1.
Week 3	**UNIT-2:** 2-D Geometrical Transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates.
Week 4	Composite transforms, transformations between coordinate systems. 2-D Viewing: The viewing pipeline, viewing coordinate reference frame. Sutherland –Hodgeman polygon clipping algorithm.
Week 5	Queries of Unit-2. Revision of Unit-2. Assignment Submission and Test of Unit-2.
Month : JANUARY	
Week	**Topic covered**
Week 1	**UNIT-3:** 3-D Object Representation: Polygon surfaces, Quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves.
Week 2	Bezier and B-Spline surfaces. Basic illumination models, polygon-rendering methods. Queries of Unit-3. Revision of Unit-3. Assignment Submission and Test of Unit-3.
Week 3	**UNIT-4:** 3-D Geometric Transformations: Translation, rotation, Scaling, reflection and shear transformations, composite transformations.
Week 4	3-D Viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.
Week 5	Queries of Unit-4. Revision of Unit-4. Assignment Submission and Test of Unit-4.
Month : FEBRUARY	
Week	**Topic covered**
Week 1	Thorough Revision of Unit-1 & 2 including queries, problem solving and written tests.
Week 2	Thorough Revision of Unit-3 & 4 including queries, problem solving and written tests.

Lesson Plan

Session 2020-21

Name of Assistant/Associate Professor:-Mrs. SOPHIA

Class:- BCA-III(5th Semester)

Subject:- BCA-301 :: MANAGEMENT INFORMATION SYSTEM

Month : NOVEMBER	
Week	**Topic covered**
Week 3	Introduction to content of paper and its application. Introduction to computer and its various components.
Week 4	**UNIT-1:** Introduction to system and Basic System Concepts, Types of Systems, The Systems Approach, Information System.
Month : DECEMBER	
Week	**Topic covered**
Week 1	Information System: Definition & Characteristics. Types of information, Role of Information in Decision-Making, Sub-Systems of an Information system
Week 2	Sub-Systems of an Information system: EDP and MIS management levels, EDP/MIS/DSS. Queries of Unit-1. Revision of Unit-1. Assignment Submission & Written Test of Unit-1.
Week 3	**UNIT-2:** An overview of Management Information System: Definition & Characteristics, Components of MIS. Introduction of Frame Work for Understanding MIS
Week 4	Frame Work for Understanding MIS: Information requirements & Levels of Management, Simon's Model of decision-Making.
Week 5	Structured Vs Un-structured decisions, Formal vs. Informal systems. Queries of Unit-2. Revision of Unit-2. Assignment Submission and Test of Unit-2.
Month : JANUARY	
Week	**Topic covered**
Week 1	**UNIT-3:** Developing Information Systems: Analysis & Design of Information Systems, Analysis of Information Systems
Week 2	Design of Information Systems: Implementation & Evaluation, Pitfalls in MIS Development.
Week 3	Queries of Unit-3. Revision of Unit-3. Assignment Submission and Test of Unit-3.
Week 4	**UNIT-4:** Functional MIS: A Study of Personnel, Financial and production MIS, Introduction to e-business systems, ecommerce – technologies and applications.
Week 5	Decision support systems – support systems for planning, control and decision-making. Queries of Unit-4. Revision of Unit-4. Assignment Submission and Test of Unit-4.
Month : FEBRUARY	
Week	**Topic covered**
Week 1	Thorough Revision of Unit-1 & 2 including queries, problem solving and written tests.
Week 2	Thorough Revision of Unit-3 & 4 including queries, problem solving and written tests.

Lesson Plan

Session 2020-21

Name of Assistant/Associate Professor:-Mrs. SOPHIA

Class:- BCA-III(5th Semester)

Subject:- BCA-303 :: DATA COMMUNICATION AND NETWORKING

Month : NOVEMBER	
Week	**Topic covered**
Week 3	Introduction to content of paper and its application. Introduction to computer and its various components.
Week 4	**UNIT-3:** Data Link Layer: Framing, Flow Control, Error Control; Error Detection and Correction; Sliding Window Protocols; Media Access Control: Random Access Protocols
Month : DECEMBER	
Week	**Topic covered**
Week 1	Token Passing Protocols; Token Ring; Introduction to LAN technologies: Ethernet, switched Ethernet, VLAN.
Week 2	Fast Ethernet, gigabit Ethernet, token ring, FDDI, Wireless LANs; Bluetooth; Network Hardware Components: Connectors, Transceivers.
Week 3	Network Hardware Components: Repeaters, Hubs, Network Interface Cards and PC Cards, Bridges, Switches, Routers, Gateways.
Week 4	Queries of Unit-3. Revision of Unit-3. Assignment Submission and Test of Unit-3.
Week 5	**UNIT-4:** Switching and Multiplexing; Dialup Networking; Analog Modem Concepts; DSL Service, Network Layer and Routing Concepts: Virtual Circuits and Datagrams.
Month : JANUARY	
Week	**Topic covered**
Week 1	Routing Algorithms: Flooding, Shortest Path Routing, Distance Vector Routing; Link State Routing.
Week 2	Hierarchical Routing; Congestion Control Algorithms; Internetworking.
Week 3	Network Security Issues: Security threats; Encryption Methods.
Week 4	Authentication; Symmetric – Key Algorithms; Public-Key Algorithms.
Week 5	Queries of Unit-4. Revision of Unit-4. Assignment Submission and Test of Unit-4.
Month : FEBRUARY	
Week	**Topic covered**
Week 1	Thorough Revision of Unit-3 including queries, problem solving and written tests.
Week 2	Thorough Revision of Unit-4 including queries, problem solving and written tests.

Lesson Plan
16, April 2021 to 30 July, 2021

Name of Assistant Professor	Mrs Shilpi
Class and Semester	BA/B.sc. I Semester-2
Subject	Mathematics
Paper	Number Theory and Trigonometry(1st Paper)
Week/ Month	Name of Topics
April	
3 Week of April	Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple)
4 Week of April	Primes, Fundamental Theorem of Arithemetic, Linear Congruences and its Properties, Test
May	
1 Week of May	Fermat's theorem and its Properties, Wilson's theorem and its converse
2 Week of May	Linear Diophanatine equations in two variables
3 Week of May	Complete residue system modulo m, Reduced residue system modulo m.
4 Week of May	Euler's ø function and its Properties, Euler's generalization of Fermat's theorem, Test
June	
1 Week of June	Chinese Remainder Theorem and its Application, Quadratic residues. Legendre symbolsLemma of Gauss; Gauss reciprocity law,Greatest integer function [x].
2 Week of June	The number of divisors and the sum of divisors of a natural number n (The functions d(n) and σ(n)).
3 Week of June	Moebius function and Moebius inversion formula, De Moivre's Theorem and its Applications, AssignmentsTest, Assignments
4 Week of June	Rectification, fundamental theorem about rectification, Length of the parametric curves, length of the polar curves, Intrinsic equation of a curve, Assignments
July	
1 Week of July	Expansion of Trignometrical functions. Direct circular and hyperbolic functions and their properties, Assignment
2 Week of July	Inverse circular and hyperbolic functions and their properties.
3 Week of July	Logarithm of a complex quantity.
4 Week of July	Gregory's series. Summation of Trigonometry series,Test.

SHILPI

Assistant Professor
Department of Mathematics
G.C., Meham

Govt. College Meham (Rohtak)
Lesson Plan

Name of the Faculty :   **Ms. Priyanka**
Discipline   :   **BA/BSc-1ˢᵗ**
Semester   :   **Semester-II**
Subject   :   **Ordinary Differential Equation (2ⁿᵈ Paper)**
Lesson Plan duration: **16ᵗʰ April, 2021 to 30ᵗʰ July, 2021**

Week/Month	Name of Topics
3 week of April	Geometrical meaning of a differential equation, Exact differential equations, integrating factors
4 week of April	First order higher degree equations solvable for x,y,p Lagrange's equations, Clairaut's equations, Equation reducible to Clairaut's form
1 week of May	Singular solutions, Orthogonal trajectories: in Cartesian coordinates and polar Coordinates, Self orthogonal family of curves
2 week of May	Linear differential equations with constant coefficients, Homogeneous linear ordinary differential equations,
3 week of May	Equations reducible to homogeneous linear ordinary differential Equations, Linear differential equations of second order: Reduction to normal form,
4 week of May	Transformation of the equation by changing the dependent variable/the independent variable (**SESSIONAL-I + Problems**)
1 week of June	Solution by operators of non-homogeneous linear differential Equations, Reduction of order of a differential equation
2 week of June	Method of variations of parameters. Method of undetermined coefficients
3 week of June	Ordinary simultaneous differential equations
4 week of June	Solution of simultaneous differential equations involving operators x (d/dx) or t(d/dt) etc (**SESSIONAL-II + Problems**)
1 week of July	Simultaneous equation of the form dx/P = dy/Q =dz/R. Total differential equations
2 week of July	Condition for Pdx + Qdy +Rdz = 0 to be exact. General method of Solving Pdx + Qdy + Rdz = 0 by taking one variable constant.
3 week of July	Method of auxiliary equations
4 week of July	Revision and Assignment

Priyanka

Assistant Professor
Department of Mathematics
Govt College Meham

LESSON PLAN
(April 16, 2021 to July 30, 2021)

Name of Assistant Professor:-   **Ms. Sudesh Kumari**
Class & Section:-   **B.Sc II Mathematics (4th Semester)**
Paper:-   **Special Functions & Integral Transforms (2nd Paper)**
Subject:-   **Lesson Plan (April 16, 2021 to July 30, 2021)**

April	
Week 3	**Laplace Transforms** Definition, Results, Laplace Transformation of some Elementary Functions Linear Property of Laplace Transformation, Examples on Laplace Transformation
Week 4	First Shifting Property-Examples, Change of Scale Property, Piece-Wise Continuity of a Function in an Interval, Second Shifting Property –Examples *Test and Assignment
May	
Week 1	Laplace Transformation of Derivatives, Effect of Multiplication of f(t) by t^n in finding Laplace Transform, Effect of Division of f(t) by t in finding Laplace Transform
Week 2	Convolution Theorem-Examples, Laplace Transform of Periodic Function, Laplace Transform of Integrals—Examples
Week 3	**Inverse Laplace Transforms** Inverse Laplace Transforms-Examples, Inverse Laplace Transform of Derivatives-Examples, Inverse Laplace Transform of Integrals-Examples, Solution of Differential Equations by Laplace Transformation-Examples,
Week 4	**Infinite Fourier Transform** Infinite Fourier Transform,Fourier sine Transform,Fourier Cosine Transform, Properties of Fourier Transforms, Examples, Change of Scale Properties,Shifting Property *Test and Assignment
June	
Week 1	Modulation Property, Examples, Convolution Theorem, Fourier Transform of the Derivative, Relation between Fourier and Laplace Tranform Parseval's Identities, Examples, Finite Fourier sine and cosine Transform-Examples, Solution of Differtial Equation by Fourier Transforms-Examples
Week 2	**Power Series** Power Series, Analytic Functions,Ordinary and Singular Points of Differential Equations, Series Solutions of Differential Equations **Bessel's Equation** Bessel's Equation and Bessel's Function, Beta and Gamma Function, Bessel's Equation and its Solution, Bessel's Function, Deduction of Bessel's Function in the form of series
Week 3	Recurrence Relations for Bessel's Function, Orthogonality of Bessel's Function, Generating Function for $J_n(x)$, Representation of $J_n(x)$ in Integral
Week 4	*Test and Assignment
July	
Week 1	**Legendre's Equation** Solution of Legendre's Equation Legendre's Polynomial, Rodrigue's Formula Derivation of Legendre's Polynomial from Rodrigue's Formula
Week 2	Generating Function for $P_n(x)$, Examples on Legendre's Polynomial, Recurrence Relations, Examples on Orthogonality of Legendre Polynomial,
Week 3	**Hermite's Equation** Generating Function for Hermite's Polynomial, Recurrence Relations Examples on Recurrence Relations, Examples on Hermite's Polynomial,
Week 4	***Revision, Test and Assignments**

Lesson Plan
16 April, 2021 to 30 July, 2021

Name of Assistant Professor	Ms Priyanka
Class and Semester	BA/B.sc. III Semester-6
Subject	Mathematics
Paper	Real and Complex Analysis (1st paper)

Week/ Month	Name of Topics
April	
3 Week of April	Jacobians, Beta and Gama functions.
4 Week of April	Double and Triple integrals, Dirichlets integrals, Test
May	
1 Week of May	Change of order of integration in double integrals, Test and Revision of Jacobians and Double-Triple Integral
2 Week of May	Fourier's series: Fourier expansion of piecewise monotonic functions
3 Week of May	Properties of Fourier Co-efficients, Dirichlet's conditions,
4 Week of May	Parseval's identity for Fourier series, Revision of Fourier
June	
1 Week of June	Fourier series for even and odd functions, Half range series, Change of Intervals, Extended Complex Plane
2 Week of June	Stereographic projection of complex numbers, Continuity of complex functions, Differentiability of complex functions
3 Week of June	Analytic functions, Cauchy-Riemann Equations, Harmonic functions
4 Week of June	Mappings by Elementary functions: Translation, rotation, Magnification and Inversion, Test and Assignments.
July	
1 Week of July	Conformal Mappings, Mobius transformations, Assignments.
2 Week of July	Fixed pints, Cross ratio and Inverse Points, Test and assignments.
3 Week of July	Critical Mappings
4 Week of July	Revision and Class test

Priyanka

Assistant Professor
Department of Mathematics
G.C. Meham

Syllabi and Courses of reading for B.Sc. Part-I, Part-II and Part-III (Chemistry) w.e.f. 2016-2017, 2017-2018 and 2018-2019

B.Sc (Ist Semester)

Paper No.	Code No.	Nomenclature	Periods (40 min. each)	Max. Marks Written + I.A.	Time
I	CH-101	Inorganic Chemistry(Theory)	30	30+8	3 Hrs
II	CH-102	Physical Chemistry(Theory)	30	29+7	3 hrs.
III	CH-103	Organic Chemistry (Theory)	30	29+7	3 hrs
IV	CH-104	Practicals	90	40	3½ hrs

B.Sc (IInd Semester)

Paper No.	Code No.	Nomenclature	Periods (40 min. each)	Max. Marks Written + I.A.	Time
V	CH-201	Inorganic Chemistry (theory)	30	30+8	3 hrs.
VI	CH-202	Physical Chemistry (Theory)	30	29+7	3 hrs.
VII	CH-203	Organic Chemistry (theory)	30	29+7	3 hrs.
VIII	CH-204	Practicals	90	40	3½ hrs

B.Sc (IIIrd Semester)

Paper No.	Code No.	Nomenclature	Periods (40 min. each)	Max. Marks Written + I.A.	Time
IX	CH-301	Inorganic Chemistry (Theory)	30	29+7	3 hrs.
X	CH-302	Physical Chemistry (theory)	30	30+8	3 hrs.
XI	CH-303	Organic Chemistry (theory)	30	29+7	3 hrs.
XII	CH-304	Practicals	90	40	3½ hrs

B.Sc (IVth Semester)

Paper No.	Code No.	Nomenclature	Periods (40 min. each	Max. Marks Written + I.A.	Time
XIII	CH-401	Inorganic Chemistry (theory)	30	29+7	3 hrs.
XIV	CH-402	Physical Chemistry (theory)	30	30+8	3 hrs.
XV	CH-403	Organic Chemistry (theory)	30	29+7	3 hrs.
XVI	CH-404	Practicals	90	40	3½ hrs

B.Sc (Vth) Semester

Paper No.	Code No.	Nomenclature	Periods (40 min. each	Max. Marks Written + I.A.	Time
XVII	CH-501	Inorganic Chemistry (theory)	30	29+7	3 hrs.
XVIII	CH-502	Physical Chemistry (theory)	30	29+7	3 hrs.
XIX	CH-503	Organic Chemistry (theory)	30	30+8	3 hrs.
XX	CH-504	Practicals	90	40	3½ hrs

B.Sc (VIth Semester)

Paper No.	Code No.	Nomenclature	Periods (40 min. each	Max. Marks Written + I.A.	Time
XXI	CH-601	Inorganic Chemistry (theory)	30	29+7	3 hrs.
XXII	CH-602	Physical Chemistry (theory)	30	29+7	3 hrs.
XXIII	CH-603	Organic Chemistry (theory)	30	30+8	3 hrs.
XXIV	CH-604	Practicals	70	40	3½ hrs

B. Sc Ist Semester

Paper I (Theory) Inorganic Chemistry   **Max. Marks: 30**
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 questionscovering 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.

Section-A
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.

Section-B
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).

Section-C
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_{42} -, ClO_4-)Valence shell electron pair repulsion (VSEPR)5 theory to NH_3, H_3O_+, SF_4, CIF_3, ICI_2- and H_2O. MO theoryof heteronuclear (CO and NO) diatomic.molecules, , bond strength and bond energy, pe rcentage ionic character from dipole moment and electronegativity difference.

Section-D
Ionic Solids
Ionic structures (NaCl,CsCl, ZnS(Zinc Blende), CaF_2) radius ratio effect 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.
6

B. Sc Ist Semester

Paper II (Theory) Physical Chemistry　　　　**Marks: 29**
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 five short answer type questions covering the entire syllabus and will be of five 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.

Section – A
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 behaviour of real gases using Vander Waal's equation.

Secton-B
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.

Section-C
Liquid States
Structure of liquids. Properties of liquids – surface tension, viscosity vapour pressure and optical rotations and their determination.

Section-D
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 Semester

Paper II I (Theory) Organic Chemistry   **Max. Marks: 29**

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 five short answer type questions covering the entire syllabus and will be of five 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.

Section-A
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.

Section-B
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.

Section-C
.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.

Section-D

Alkanes and Cycloalkanes

IUPAC nomenclature of branched and unbranched alkanes , the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties. 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 Semester)

Paper IV (Practicals)   **Max. Marks: 40**

CH-104   **Time:** 3½ hrs

(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.

(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

Distribution of marks

1. Volumetric Analysis   14 marks
2. Physical   12 marks
3. Copy   08 marks
4. Viva-Voce   06 marks

B. Sc IInd Semester

Paper V (Theory) Inorganic Chemistry   **Max. Marks: 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

Section-A
.Hydrogen Bonding & Vander Waals Forces
Hydrogen Bonding – Definition, Types, effects of hydrogen bonding on properties of substances, applicat ion 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.

Section-B
. **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.

SECTION – C
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 π– d π bonding (an idea), carbides, fluorocarbons, silicates structural aspects), silicons – general methods of preparations, properties and uses.

SECTION-D

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 H_2O_2 –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 strength .

B. Sc. IInd Semester

Paper VI (Theory) Physical Chemistry   **Marks: 29**

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 five short answer type questions covering the entire syllabus and will be of five 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 o f s ix marks each

Section – A

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.

Section – B

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 state theory of Bimolecular reactions.

Section-C

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)

Section-D

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 K_a of acids determination of solubility product of spa ringly soluble salts, conductometric titrations. Definition of pH and pK_a, Buffer solution, Buffer action, Henderson – Hazel equation, Buffer mechanism of buffer action.

B. Sc IInd Semester

Paper VII (Theory) Organic Chemistry   **Max. Marks: 29**

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 five short answer type questions covering the entire syllabus and will be of five 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 o f s ix marks each

Section-A

.Alkenes

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 of 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 $KMnO_4$,

Section-B

.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. 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.

Section-C

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 alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation of alkynes

Section-D

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 additionelimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

B.Sc IInd Semester

Paper VIII (Practicals)   Max. Marks: 40

CH-204   Time: 3½ hrs

Inorganic

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^{3-} and NO_3^-).

(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 available)

   iii) p-Bromoacetanilide from acetanilide

   iv) Dibenzalacetone from acetone and benzaldehyde

   v) Aspirin from salicylic acid

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

Distribution of marks

1. Paper Chromatography   10 marks
2. Organic Preparation   16 marks
3. Copy   08 marks
4. Viva-Voce   06 marks

B. Sc IIIrd Semester

Paper IX (Theory) Inorganic Chemistry   **Max. Marks: 29**

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 five short answer type questions covering the entire syllabus and will be of five 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 o f s ix marks each

Section-A
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 $Ni(CO)_4$

Section-B
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

Section-C
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

Section-D
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. IIIrd Semester

Paper X (Theory) Physical Chemistry   **Marks: 30**

CH-302   **Time: 3 Hrs**
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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 o f s ix marks each

SECTION – A

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 relationship. Joule's law – Joule – Thomson coefficient for ideal gass and real gas: and inversion temperature.

SECTION – B

Thermodynamics-II

Calculation of w.q. dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reve rsible process, Temperature dependence of enthalpy, Kirchoffs equation. Bond energies and applications o f bond energies.

SECTION – C

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.

SECTION – D

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. IIIrd Semester

Paper XI (Theory) Organic Chemistry   **Max. Marks: 29**

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 five short answer type questions covering the entire syllabus and will be of five 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 o f s ix marks each

Section-A

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

Section-B

.Phenols

Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.
23

Section-C

. 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□$_{max}$ of simple conjugated dienes and □,□ -unsaturated ketones. Applications o f UV Spectroscopy in structure elucidation of simple organic compounds.

Section-D

.**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 (IIIrd Semester)

Paper XII (Practical)   **Max. Marks: 40**

CH-304   **Time: 3½ hrs**

(Inorganic)

1**. Gravimetric Analysis**

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

(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, *α*-naphthol, *β*-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.	Gravimetric Analysis	10 marks
2.	Organic Analysis	16 marks
3.	Copy	08 marks
4.	Viva-voce	06 marks

B. Sc. IVth Semester

Paper XIII (Theory) Inorganic Chemistry   Max. Marks: 29

CH-401   Time: 3 Hrs.

Note: Examiner will set nine questions and the candidates will berequired to attempt five questions in all. Question number one will be compulsory containing five short answer type questions covering the entire syllabus and will be of five 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 o f s ix marks each

Section-A
Chemistry of   f – block elements
Lanthanides
Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

Section-B
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 trans ition elements .

Section-C
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.

Section-D
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. IVth Semester

Paper XIV (Theory) Physical Chemistry   **Marks: 30**

CH-402   **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.

Section-A

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 physica l change, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

Section-B
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.

Section-C
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 ($\Box$G, $\Box$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 se ries and its applications.

Section-D
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. IVth Semester

Paper XV (Theory) Organic Chemistry   **Marks: 29**

CH-403   **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 five short answer type questions covering the entire syllabus and will be of five 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 o f s ix marks each

Section-A
. Infrared (IR) absorption spectroscopy
Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic 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.

Section-B
. 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.

Section-C
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.

Section-D

. 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, $LiAlH_4$ and $NaBH_4$ reductions.

B.Sc. (IVth Semester)

Paper XVI (Practical)	**Max. Marks: 40**
CH-404	**Time: 3½ hrs**

Inorganic

Colorimetry:

To verify Beer - Lambert law for $KMnO_4/K_2Cr_2O_7$ and determine the concentration of the given $KMnO_4/K_2Cr_2O_7$ solution.

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

(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 ΔH 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.

Distribution of marks

1. Colorimetry	12 marks
2. Physical	14 marks
3. Copy	08 marks
4. Viva-Voce	06 marks

B. Sc Vth Semester

Paper XVII (Theory) Inorganic Chemistry   **Max. Marks: 29**

CH-501   **Time: 3Hrs .**

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 five short answer type questions covering the entire syllabus and will be of five 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 o f s ix marks each

SECTION–A
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.

SECTION–B
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).

SECTION-C
Magnetic Properties of Transition Metal Complexe
Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of $\square_s$ and $\square_{eff}$ values, orbital contribution to magnetic moments, application of magnetic moment data for 3dmetal complexes.
3
SECTION-D
Electron Spectra of Transition Metal Complexes
Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d_1 and d_9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

B. Sc. Vth Semester

Paper XVIII (Theory) Physical Chemistry   **Marks: 29**

CH-502   **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 five short answer type questions covering the entire syllabus and will be of five 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 o f s ix marks each

Section-A
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 partic le in one dimensional box, Pictorial representation and its significance.

Section-B
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.

Section-C
Spectroscopy-I
Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Bornoppenheimer approximation, Degrees of freedom.

Rotational Spectrum
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.

Section-D
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 Vth Semester

Paper XIX (Theory) Organic Chemistry   **Marks: 30**

CH-503   **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.

Section-A
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.

Section-B
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.

SECTION – C

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 ofmutarotation. Structures of ribose and deoxyribose.

SECTION – D

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 (Vth Semester)

Paper XX (Practical)	**Max. Marks: 40**
CH-504	**Time: 3½ hrs**

(Inorganic)
Salt Analysis

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-}

(Organic)

1.   Laboratory Techniques

(a)   Steam distillation   (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.   Thin Layer Chromatography

Determination of R_f values and identification of organic compounds

(a)   Separation of green leaf pigments (spinach leaves may be used)

(b)   Separation of a mixture of colored organic compounds using common organic solvents.

Distribution of marks

1. Salt Analysis   16 marks

2. Organic   10 marks

3. Copy   08 marks

4. Viva-Voce   06 marks

B. Sc. VIth Semester

Paper XXI (Theory) Inorganic Chemistry   **Max. Marks: 29**

CH-601   **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 five short answer type questions covering the entire syllabus and will be of five 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 o f six marks each

Section-A
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.

Section-B
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

Section—C
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 Ca_{2+}. Nitrogen fixation.

Section—D
Sil icones and Phosphazenes
Silicones and phosphazenes, their preparation, properties,structure and uses

B. Sc. VIth Semester

Paper XXII (Theory) Physical Chemistry   **Marks: 29**

CH-602   **Time: 3 Hrs**
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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 five short answer type questions covering the entire syllabus and will be of five 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.

Section-A
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.

Section-B
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 depicting 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).

Section-C
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.

Section-D

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 VIth Semester

Paper XXIII (Theory) Organic Chemistry   **Marks: 30**

CH-603   **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.

SECTION – A

Heterocyclic Compounds-I

Introduction: Molecular orbital p icture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole

SECTION – B

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.

SECTION – C

1. Organic Synthesis *via* Enolates

Acidity of $\square$ -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. Polyeste rs ,polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy re sins and polyurethanes.

Natural and synthetic rubbers.

Section – D

Amino Acids, Peptides& Proteins

Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of $\square$ -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 (VIth Semester)

Paper XXIV (Practical)   **Max. Marks: 40**

CH-604   **Time: 3½ hrs**

(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) 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.

(Organic)

Synthesis of the following organic compounds:

(a)   To prepare o-chlorobenzoic acid from anthranilic acid.

(b)   To prepare p-bromoaniline from p-bromoacetanilide.

(c)   To prepare m-nitroaniline from m-dinitrobenzene.

(d)   To prepare S-Benzyl-iso-thiouronium chloride from thiourea.

Distribution of marks

1.	Physical	12 marks
2.	Organic Preparation	14 marks
3.	Copy	08 marks
4.	Viva-Voce	06 marks