SYLLABUS FOR PG ENTRANCE TEST-2020

CHEMISTRY

Part-A (40 Marks)

Coordination Compounds, Applications of Coordination Compounds, Organometallic Chemistry, Metal Carbonyls and Related Compounds, Boranes and Carboranes, Inorganic Reaction Mechanisms, Bioinorganic Chemistry, Hard and Soft Acids and Bases (HSAB). Carboxylic Acids and Derivatives, synthesis Based on Carbanions, Nitro Hydrocarbons, Amines, Cyanides and Isocyanides, Heterocyclic Compounds, Carbohydrates, Amino Acids and Proteins, Pericyclic Reactions, Synthetic Strategies, Asymmetric Synthesis. Electrochemistry and Emf, Chemical Kinetics, Thermodynamics. Photochemistry, Molecular Spectroscopy, Proton Magnetic Resonance Spectroscopy, Mass Spectroscopy.

Part-B (60 Marks)

S-Block Elements, P-Block Elements, Chemistry of Zero Group Elements, Chemistry of d-Block Elements, Chemistry of f-Block Elements, General Principles of Inorganic Qualitative Analysis, Symmetry of molecules, Non-Aqueous Solvents, Chemical Bonding, Molecular Orbital Theory, Theory of Quantitative Analysis, Theories of Bonding in Metals. Structural Theory in Organic Chemistry, Acyclic Hydrocarbons, alicyclic Hydrocarbons, aromatic Hydrocarbons, Arenes and Polynuclear Aromatic Hydrocarbons, Halogen Compounds, Alcohols, Phenols, Ethers and Epoxides, Carbonyl Compounds, Conformational Analysis, Stereochemistry of Carbon Compounds. Atomic Structure and Elementary Quantum Mechanics, Gaseous State, Liquid State, Solutions, Dilute Solutions and Colligative Properties, Solid State Chemistry, Phase Rule, Colloids and Surface Chemistry, adsorption, Material Science, Nano materials, Evaluation of Analytical Data.

BIOCHEMISTRY / BIOTECHNOLOGY /MICROBIOLOGY (CBBM)

Part-A (40 Marks) CHEMISTRY

Coordination Compounds, Applications of Coordination Compounds, Organ metallic Chemistry, Metal Carbonyls and Related Compounds, Boranes and Carboranes, Inorganic Reaction Mechanisms, Bioinorganic Chemistry, Hard and Soft Acids and Bases (HSAB). Carboxylic Acids and Derivatives, synthesis Based on Carbanions, Nitro Hydrocarbons, Amines, Cyanides and Isocyanides, Heterocyclic Compounds, Carbohydrates, Amino Acids and Proteins, Pericyclic Reactions, Synthetic Strategies, Asymmetric Synthesis. Electrochemistry and Emf, Chemical Kinetics, Thermodynamics. Photochemistry, Molecular Spectroscopy, Proton Magnetic Resonance Spectroscopy, Mass Spectroscopy.

S-Block Elements, P-Block Elements, Chemistry of Zero Group Elements, Chemistry of d-Block Elements, Chemistry of f-Block Elements, General Principles of Inorganic Qualitative Analysis, Symmetry of molecules, Non-Aqueous Solvents, Chemical Bonding, Molecular Orbital Theory, Theory of Quantitative Analysis, Theories of Bonding in Metals. Structural Theory in Organic Chemistry, Acyclic Hydrocarbons, alicyclic Hydrocarbons, aromatic Hydrocarbons, Arenes and Polynuclear Aromatic Hydrocarbons, Halogen Compounds, Alcohols, Phenols, Ethers and Epoxides, Carbonyl Compounds, Conformational Analysis, Stereochemistry of Carbon Compounds. Atomic Structure and Elementary Quantum Mechanics, Gaseous State, Liquid State, Solutions, Dilute Solutions and Colligative Properties, Solid State Chemistry, Phase Rule, Colloids and Surface Chemistry, adsorption, Material Science, Nano materials, Evaluation of Analytical Data.

Part-B (60 Marks) BIOCHEMISTRY

1. Elementary aspects of cell structure–function, tissues and body fluids.
2. Chemistry, physiological role and metabolism of biomolecules like carbohydrates, amino-acids, proteins, Lipids & nucleic acids.
3. Basic aspects of nutrition, endocrinology & Physiology, clinical biochemistry, enzymology, biological oxidations, photosynthesis.
4. Physiological role of vitamins and minerals.
5. Basic aspects of immunology.
6. Replication, transcription and protein synthesis.
7. Fundamental aspects of microbiology.
8. Elementary aspects of r-DNA technology and genetic engineering.
9. Principles, methodology and applications of various biochemical techniques used in biochemistry.

Part-B (60 Marks) BIOTECHNOLOGY

CELL BIOLOGY AND GENETICS Cell as basic unit of living organisms-bacterial, fungal, plant and animal cells,Structure of chromosome- morphology, components of chromosomes (histones and nonhistones),specialized chromosomes (Polytene, Lampbrush),Chromosomal aberrations - structural and numerical, Eukaryotic cell cycle – phases, Mitosis - Stages (spindle assembly)-significance, Meiosis- Stages (synaptonemal complex) - significance, Apoptosis. Mendel's experiments- factors contributing to success of Mendel's experiments, Law of segregation- Monohybrid Ratio; Law of independent assortment- Dihybrid Ratio, Trihybrid Ratio, X-Y chromosomes - Sex determination in Drosophila, Birds, Man, Bonellia; X-linked inheritance– Hemophilia and Color blindness; X-inactivation; Ylinked inheritance - Holandric genes, Linkage and recombination- Cytological proof of crossing over, phases of linkage, recombination frequency, gene mapping and map distance

NUCLEIC ACIDS AND BIOINFORMATICS DNA as the genetic material- Griffith's experiments on transformation in Streptococcus pneumonia, Hershey-Chase experiments, Avery, MacLeod and McCarty's experiments, RNA as genetic materialTobacco Mosaic Virus, Structure and forms of DNA (A, B and Z), Genome organization in prokaryotes, Genome organization in eukaryotes, C-value and C-value paradox, Reassociation kinetics-cot curve, Denaturation, Renaturation, Tm curve, Kinetic classes of DNA- unique sequences, moderately repeated and highly repeated sequences; tandem repeats (satellite, minisatellite and micro satellites), interspersed repeats (SINES-eg: Alu repeats, LINES); palindromic sequences and transposable genetic elements. DNA replication- enzymes; semi conservative DNA replication-Messelson and Stahl experiment; Linear, Circular, Rolling circle, Theta, D loop models, Mutation- spontaneous, induced (frame shift, transition, transversion), Physical and chemical mutagens, DNA damage- intrinsic and extrinsic factors, DNA repair- Direct, Excision and methyl mediated mismatch, recombinational and SOS repair, DNA recombination- homologous, site specific recombination and NHEJ (Non-Homologous End Joining).Bioinformatics-Storage of databases in DNA (GenBank, EMBL, DDBJ),Protein data banks (PDB, SWISS-PROT, UNIPROT, PIR) and their utilization, Data retrieval tools-BLAST, ENTREZ

BIOCHEMISTRY AND BIOSTATISTICS Biomolecules -Carbohydrates- importance, classification; structure and functions of monosaccharides (glucose & fructose), disaccharides (sucrose, lactose & maltose) and polysachharides (starch, glycogen & insulin), Amino acids-importance, classification, structure, physical and chemical properties of amino acids; peptide bond formation, Proteins- importance, structure of proteinsprimary, secondary, tertiary and quaternary, Lipids- importance, classification- simple lipids (triacylglycerides & waxes), complex lipids (phospholipids & glycolipids), derived lipids (steroids, terpenes & carotenoids) ,Fatty acids- importance, classification- saturated (palmitic acid, arachidic acid) and unsaturated fatty acids (oleic acid & linoleic acid), Enzymes- importance, classification

and nomenclature; Michaelis-Menton Equation, factors influencing the enzyme reactions; enzyme

inhibition (competitive, uncompetitive & mixed), Co-enzymes. Probability, probability distributionBinomial, Poisson and Normal distributions, Test of significance- Null hypothesis and Alternate hypothesis, Chi-square test- degrees of freedom and their applications to biology (goodness of fit), Analysis of variance (One-way ANOVA) and their applications to biology.

BIOENERGETICS AND BIOANALYTICAL TECHNIQUES Glycolysis, tricarboxylic acid (TCA) cycle, electron transport, oxidative phosphorylation, Gluconeogenesis and its significance ,Transamination and oxidative deamination reactions of amino acids and β-oxidation of fatty acids Colorimetry: Beer and Lambert's laws and UV- vis spectrophotometry ,Principle and applications of chromatography (paper, thin layer & HPLC), Electrophoresis (Agarose & SDS-PAGE), Principle and applications of centrifugation (preparative & analytical)

MICROBIOLOGY AND IMMUNOLOGY Historical development of microbiology and contributors of microbiology, Outlines of classification of microorganisms ,Structure and general characteristics of bacteria and virus ,Disease causing pathogens and symptoms (Eg: Mycobacterium, Hepatitis). Methods of sterilization- physical and chemical methods, Bacteriological media: LB media, EMB agar; Identification of bacteria by staining methods , Bacterial growth curve and factors affecting bacterial growth, Fungal media- PDA, Sabourauds agar. Types of immunity- innate and adaptive immunity, Cells of the immune system: T-cells (helper and cytotoxic cells), B-cells, Natural killer cells, Macrophages, Basophils and Dendritic cells, Primary organs of immune system- Thymus and Bone marrow, Secondary organs of immune system- Spleen and Lymph nodes Antigens-immunogenicity vs antigenecity, factors affecting antigenecity, epitopes, Haptens & types of adjuvants , Humoral and Cell mediated immunity, Structure of immunoglobulin; types and functions of immunoglobulins (IgG, IgA, IgM, IgE & IgD)

MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY Structure of prokaryotic gene (promoter, initiator & terminator regions),Structure and functions of RNA polymerase Transcription mechanism- initiation, elongation & proof reading, termination ,Genetic code- properties, deciphering of genetic code, wobble hypothesis, aminoacylation, Translation mechanism- initiation, elongation and termination, Operon concept, Lac operon. Gene expression and regulation in eukaryotes-Structure of eukaryotic gene (promoter, exons, introns, terminator, enhancer & silencer), Transcriptional machinery in eukaryotes (RNA polymerases), structures and transcriptional factors (basic, upstream &regulatory), Transcription- initiation (formation of transcriptome), elongation and termination, Post-transcriptional modifications- capping, polyadenylation, Splicing (self & protein mediated) and alternative splicing, Translation- initiation, elongation and termination. Enzymes useful in molecular cloning: Restriction endonuclease, DNA ligases, polynucleotide kinase, klenow

enzyme, DNA Polymerase- I, reverse transcriptase, alkaline phosphatase, terminal nucleotidyl transferase, Cloning Vectors: PBR 322, Bacteriophage, Cosmid, Phagemid, Shuttle vectors, Gene transfer techniques: Physical, Chemical and Biological methods, Polymerase Chain Reaction and its applications

MICROBIAL TECHNOLOGY Industrial biotechnology- scope and applications, Exploitation of microorganisms and their products, Principles of Fermentation technology, Types of fermentation, Microbial production of Organic acids (Lactic acid, citric acid), Amino acids (Glutamic acid, Aspartic acid, Lysine), Fermentation by microbes for food additives: dairy products (Cheese, Yogurt), beverages (Beer, Wine) and antibiotics (Streptomycin, Erythromycin), Therapeutic drugs: Recombinant vaccines, monoclonal antibodies, insulin, vitamins, Biofuel: Hydrogen, Alcohol, Methane.

Part-B (60 Marks) MICROBIOLOGY

Scope and importance of Microbiology. Spontaneous generation-biogenesis theory; Germ theory of diseases; Recent developments of Microbiology. Principles of microscopy. Principles of staining. Culture media. Sterilization methods. Isolation of pure cultures, maintenance and preservation of microbial cultures. Morphology and ultra structure of typical eubacterial cell. Bacterial classification. Discovery and nature of viruses. TMV, HIV, T4 and lambda phages. Cultivation and assay of phages, plant and animal viruses. Nutritional types of bacteria. Bacterial growth. Respiration. Fermentation. Antibiotics. DNA and RNA structures and their role as genetic materials. Transcription and translation. Lac operon. Bacterial plasmids and transposons. DNA damage and repair mechanisms. Mutations. Gene transfer mechanisms in bacteria. Recombinant DNA technology. Types of immunity. Organs of immune system. Cells of immune system. Antigens. Antibodies. Antigenantibody reactions. Normal flora of human body. Infection, Disease, Defense mechanisms. Bacterial toxins, virulence and attenuation. Airborne diseases, Food water borne diseases and Blood borne diseases. General principles of diagnostic microbiology. Elements of chemotherapy-therapeutic drugs. Drug resistance. Microorganisms in relation to plant growth. Biological nitrogen fixation, Biofertilizers. Microorganisms of the environment (soil, water and air). Microbial interactions. Microbiology of potable and polluted waters. Microorganisms of food spoilage and their sources. General account of food .preservation. Microorganisms as food – SCP, edible mushrooms. Screening and isolation of industrially useful microbes, strain improvement and fermentation. Fermentor. Immobiolization Industrial production of Alcohols, Glutamic acid, Citric acid, vitamin B12, Enzymes, and Antibiotics. Biomolecules: Carbohydrates, aminoacids, proteins, Biochemical techniques.

COMPUTER SCIENCE

Computer Fundamentals: (20 Marks)

Introduction of Computers, Classification of Computers, Anatomy of a Computer, Memory Hierarchy, Introduction to OS, Operational Overview of a CPU. Program Fundamentals: Generation and Classification of Programming Languages, Compiling, Interpreting, Loading, Linking of a Program, Developing Program, Software Development. Algorithms: Definitions, Different Ways of Stating Algorithms (Step-form, Pseudo-code, Flowchart), Strategy for Designing Algorithms, Structured Programming Concept. Basics of C: Overview of C, Developing Programs in C, Parts of Simple C Program, Structure of a C Program, Comments, Program Statements, C Tokens, Keywords, Identifiers, Data Types, Variables, Constants, Operators and Expressions, Expression Evaluation–precedence and associatively, Type Conversions.

Input-Output: Non-formatted and Formatted Input and Output Functions, Escape Sequences, Control Statements: Selection Statements – if, if-else, nested if, nested if-else, comma operator, conditional operator, switch; Iterative Statements–while, for, do-while; Arrays and Strings: One-dimensional Arrays, Character Arrays, Functions from string.h, Multidimensional Arrays.

Functions: Concept of Function, Using Functions, Call-by-Value Vs Call-by-reference, Passing Arrays to Functions, Scope of Variables, Storage Classes, Inline Functions, and Recursion. Pointers: Introduction, Address of Operator (&), Pointer, Uses of Pointers, Arrays and Pointers, Pointers and Strings, Pointers to Pointers, Array of Pointers, Pointer to Array, Dynamic Memory Allocation.User-defined Data Types: Declaring a Structure (Union) and its members, Initialization Structure (Union), Accessing members of a Structure (Union), Array of Structures (Union), Structures verses Unions, Enumeration Types. File Management Functions.

Programming in C++:(20 Marks)

Introduction to C++: Applications, Example Programs, Tokens, Data Types, Operators, Expressions, Control Structures, Arrays, Strings, Pointers, Searching and Sorting Arrays. Functions: Introduction, Prototype, Passing Data by Value, Reference Variables, Using Reference Variables as Parameters, Inline Functions, Default Arguments, Overloading Functions, Passing Arrays to Functions. Object Oriented Programming: Procedural and Object- Oriented Programming, Terminology, Benefits, OOP Languages. Classes: Introduction, Defining an Instance of a Class, Why Have Private Members? Separating Class Specification from Implementation, Inline Member Functions, Constructors, Passing Arguments to Constructors, Destructors, Overloading Constructors, Private Member

Functions, Friends of Classes, Copy Constructors, Operator Overloading. Inheritance: Introduction, Protected Members and Class Access, Base Class Access Specification, Constructors and Destructors in Base and Derived Classes, Polymorphism and Virtual Member Functions, Abstract Base Classes, Single Inheritance, Multiple Inheritance, Multi level, Multipath, Hybrid and Hierarchical Inheritance.

C++ Streams: Stream Classes, Unformatted I/O Operations, Formatted I/O Operations. Templates: Function Templates–Introduction, Overloading with Function Templates.

Data Structures:(20 Marks)

Fundamental Concepts: Introduction to Data Structures, Types of Data Structures, Introduction to Algorithm, Linear Data Structure Using Arrays: 1-D Arrays, 2-D Arrays, Pointer Arrays, Concept of Ordered List, Limitations of Arrays. Stacks: Concept, Primitive Operations, Abstract Data Type, Representation Stacks Using Arrays, Prefix, Infix, Postfix Notations for Arithmetic Expression, Applications of Stacks– Converting Infix Expression to Postfix Expression, Evaluating the Postfix Expression, Queues: Concept, Primitive Operations, Abstract Data Type, Representation Queues Using Arrays, Types of Queues-Circular Queue, Priority Queue, Sparse Matrix, Applications of Queues. Linked Lists: Introduction, Concept, Terminology, Primitive Operations-creating, inserting, deleting, traversing, Representation of Linked Lists, Linked List Abstract Data Type, Linked List Variants – Singly Linked List, Doubly Linked List, Linear and Circular Linked List, Representation Stacks and Queues Using Linked Singly Lists, Application of Linked List. Trees: Introduction, Representation of a General Tree, Binary Tree Introduction, Binary Tree Abstract Data Type, Implementation of Binary Trees, Binary Tree Traversals – Preorder, norder, Postorder Traversals, Applications of Binary Trees Briefly. Graphs: Introduction, Graph Abstract Data Type, Representations of Graphs, Graph Traversal – Depth-First Search, Breadth-First Search. Searching and Sorting: Sequential (Linear) Search, Binary Search, Linear Sort, Bubble Sort, Insertion Sort, Selection Sort.

Database Management Systems: (20Marks)

Introduction to Databases: Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment, Advantages and Disadvantages of DBMSs, The Three-Level Architecture, Database Languages, Data Models, Functions of a DBMS, Components of a DBMS. Relational Model: Introduction, Terminology, Integrity Constraints, Views.

SQL: Introduction, Data Manipulation–Simple Queries, Sorting Results, Using the SQL Aggregate Functions, Grouping Results, Sub-queries, Multi-table Queries, Combining Result Tables, Database Updates. SQL: The SQL Data Types, Integrity Enhancement Feature–Domain Constraints, Entity Integrity, Referential Integrity, General Constraints, Data Definition–Creating a Database, Creating a Table, Changing a Table Definition, Removing a Table.

Entity–Relationship Modeling: Entity Types, Relationship Types, Attributes, Keys, Strong and Weak Entity Types, Attributes on Relationships, Constraints, Problems with ER Models Enhanced Entity, Degree of Relationships

Logical Database Design and the Relatinal Model :Anomalies , Partial Functional Dependency, Transitive Functional Dependency, Multi Valued Dependency. Normalization: The Purpose of Normalization, How Normalization Database Design, Data Redundancy and Update Anomalies, Functional Dependencies in brief, The Process of Normalization,1NF, 2NF, 3NF, The Database Design Methodology for Relational Databases.

Programming in Java:(20 Marks)

Introduction: Java Essentials, JVM, Java Features, Creation and Execution of Programs, Data Types, Type Conversion, Casting, Conditional Statements, Loops, Branching Mechanism, Classes, Objects, Class Declaration, Creating Objects, Method Declaration and Invocation, Method Overloading, Constructors–Parameterized Constructors, Constructor Overloading, Class Variables & Methods-static Keyword, this Keyword, One-Dimensional Arrays, Two-Dimensional Arrays, Command-Line Arguments, Inheritance: Introduction, Types of Inheritance, extends Keyword, Examples, Method Overriding, super, final Keywords, Abstract classes, Interfaces, Abstract Classes Verses Interfaces. Packages–Creating and Using Packages, Access Protection, Wrapper Classes, String Class, StringBuffer Class. Exception: Introduction, Types, Exception Handling Techniques. Multithreading: Introduction, Main Thread, Creation of New Threads – By Inheriting the Thread Class or Implementing the Runnable Interface, Thread Lifecycle, Thread Priority, Synchronization. Applets: Introduction, Example, Life Cycle, Applet Class, Common Methods Used in Displaying the Output.

MATHEMATICS

DIFFERENTIAL CALCULUS: Successive Differentiation - Expansions of Functions- Mean value theorems. Indeterminate forms - Curvature and Evolutes. Partial differentiation - Homogeneous functions - Total derivative. Maxima and Minima of functions of two variables – Lagrange's Method of multipliers – Asymptotes - Envelopes.

DIFFERENTIAL EQUATIONS: Differential Equations of first order and first degree: Exact differential equations – Integrating Factors – Change in variables – Total Differential Equations – Simultaneous Total Differential equations – Equations of the form dx/P=dy/Q=dz/R

Higher order linear differential equations: Solution of homogeneous linear differential equations with constant coefficients - Solution of non-homogeneous differential equations P(D)y = Q(x) with constant coefficients by means of polynomial operators when Q (x) =be ax ,b Sinax /b Cos ax, bx k ,Ve ax .

Partial Differential equations: Formation and solution- Equations easily integrable - Linear equations of first order - Non linear equations of first order - Charpit's method - Homogeneous linear partial differential equations with constant coefficient - Non homogeneous linear partial differential equations - Separation of variables.

REAL ANALYSIS: Sequences: Limits of Sequences - Limit Theorems for Sequences - Monotone Sequences and Cauchy Sequences. Subsequences - Lim sup's and Lim inf's - Series - Alternating Series and Integral Tests,Power Series,. Integration: The Riemann Integral - Properties of Riemann Integral - Fundamental Theorem of Calculus.

ALGEBRA: Groups: Definition and Examples of Groups- Elementary Properties of Groups - Finite Groups; Subgroups -Subgroup Tests - Examples of Subgroups, Cyclic Groups:Properties of Cyclic Groups –

Permutation Groups: Definition and Notation - Properties of Permutations. Cosets and Lagrange's Theorem Properties of Cosets

Introduction to Rings: Definition - Examples of Rings - Properties of Rings – Subrings, Integral Domains:,fields-examples

LINEAR ALGEBRA: Vector Spaces: Vector Spaces and Subspaces, Linear Transformations,LID,LD sets, Bases.The Dimension of a Vector Space. Rank and Nullty, Eigen values and Eigenvectors - The Characteristic Equation. Inner product spaces- Inner Product, Length, and Orthogonality - Orthogonal Sets,orthonormal set.

NUMERICAL ANALYSIS: Trapezoidal rule,Simson's 1/3rd rule,Simson's 3/8th rule,relation between operator,Finding Polynimal by using Lagranges interpolation formula and Newton divided difference formula.

Texts:

1. Shanti Narayan and Mittal, Differential Calculus
2. Zafar Ahsan, Differential Equations and Their Applications
3. Kenneth A Ross, Elementary Analysis-The Theory of Calculus
4. Joseph A Gallian, Contemporary Abstract algebra (9th edition)
5. David C Lay, Linear Algebra and its Applications 4e
6. Richard L. Burden and J. Douglas Faires, Numerical Analysis (9e)

PHYSICS

Mechanics

1. Vector Analysis: Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field and related problems. Vector integration, line, surface and volume integrals. Stokes, Gauss and Greens theorems-simple applications:
2. Mechanics of Particles: Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section,
3. Mechanics of rigid bodies: Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope,
4. Central Forces: Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.
5. Special theory of relativity: Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

Waves and Oscillations

1. Fundamentals of vibrations: Simple harmonic oscillator, and solution of the differential equation– Physical characteristics of SHM, torsion pendulum, - measurements of rigidity modulus, compound pendulum, measurement of 'g', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures
2. Damped and forced oscillations: Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with undamped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance. Coupled Oscillators.

3. Vibrating Strings: Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance
4. Vibrations of bars: Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the mid point iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

Thermodynamics

1. Kinetic theory of gases: Introduction-Deduction of Maxwell‟s law of distribution of molecular speeds, Transport Phenomena-Viscosity of gases-thermal conductivity-diffusion of gases.
2. Thermodynamics: Basics of thermodynamics-Kelvin‟s and Claussius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature- Entropy (T-S) diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.
3. Thermodynamic potentials and Maxwell’s equations: hermodynamic potentials-Derivation of Maxwell‟s thermodynamic relations-Clausius-Clayperon‟s equation-Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas.Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal‟s gas.
4. Low temperature Physics: Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza‟s method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour compression type. CPGET-2019 Syllabus
5. Quantum theory of radiation: Black body-Ferry‟s black body – distribution of energy in the spectrum of Black body – Wein‟s displacement law, Wein‟s law, Rayleigh-Jean‟s law – Quantum theory of radiation - Planck‟s law – deduction of Wein‟s distribution law, Rayleigh-Jeans law, Stefan‟s law from Planck‟s law. Measurement of radiation using pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.
6. Statistical Mechanics: Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles ,classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann‟s distribution law - Molecular energies in an ideal gas- Maxwell-Boltzmann‟s velocity distribution law, Bose-Einstein Distribution law, Fermi- Dirac Distribution law, comparison of three distribution laws, Application of B-E distribution to Photons-planks radiation formula, Application of Fermi-Dirac statistics to white dwarfs and Neutron stars.

OPTICS

1. Interference: Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light Interference by division of wave front: Fresnel‟s biprism – determination of wave length of light. Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd‟s mirror experiment. Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton‟s rings in reflected light with and without contact between lens and glass plate, Newton‟s rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium D1,D2 lines and thickness of a thin transparent plate.
2. Diffraction: Introduction – Distinction between Fresnel and Fraunhoffer diffraction Fraunhoffer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhoffer diffraction due to double slit – Fraunhoffer diffraction pattern with N slits (diffraction grating) Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating. Fresnel diffraction-Fresnel‟s half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – difference between interference and diffraction.
3. Polarization: Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewsters law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen‟s explanation) – Quarter wave plate, Half wave plate – Babinet‟s compensator – Optical activity, analysis of light by Laurent‟s half shade polarimeter.
4. Aberrations and Fiber Optics: Introduction – Monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism and curvature of field, distortion. Chromatic aberration – the achromatic doublet – Removal of chromatic aberration of a separated doublet. Fiber Optics : Introduction – Optical fibers – Principles of fiber communication – Step and graded index fibers – Rays and modes in an optical fiber – Fiber material – Types of optical fibers and advantages of fiber communication.

Electromagnetism, Electrostatics:

Electric Field:- Concept of electric field lines and electric flux, Gauss‟s law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field E, irrotational field. Electric Potential:- Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

Magnetostatics

Concept of magnetic field B and magnetic flux, Biot-Savart‟s law, B due to a straight current carrying conductor. Force on a point charge in a magnetic field. Properties of B, curl and divergence of B, solenoidal field. Integral form of Ampere‟s law, applications of Ampere‟s law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance. Magnetic force between two current carrying conductors. Magnetic field intensity. Ballistic Galvanometer:- Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

Electromagnetic Induction

Faraday‟s laws of induction (differential and integral form), Lenz‟s law, self and mutual Induction. Continuity equation, modification of Ampere‟s law, displacement current, Maxwellequations

Electromagnetic waves

Maxwell‟s equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium, polarization, reflection and transmission. Polarization of EM waves, Brewster‟s angle, description of linear, circular and elliptical polarization.

MODERN PHYSICS

Atomic Spectra and Models Inadequacy of classical physics: Brief Review of Black body Radiation , Photoelectric effect, Compton effect, dual nature of radiation, wave nature of particles. Atomic spectra, Line spectra of hydrogen atom, Ritz Rydberg combination principle. Alpha Particle Scattering, Rutherford Scattering Formula, Rutherford Model of atom and its limitations, Bohr‟s model of H atom, explanation of atomic spectra, correction for finite mass of the nucleus, Bohr correspondence principle, limitations of Bohr model, discrete energy exchange by atom, Frank Hertz Expt. Sommerfeld's Modification of Bohr‟s Theory. Wave Particle Duality de Broglie hypothesis, Experimental confirmation of matter wave, Davisson Germer Experiment, velocity of de Broglie wave, wave particle duality, Complementarity. Superposition of two waves, phase velocity and group velocity , wave packets ,Gaussian Wave Packet , spatial distribution of wave packet, Localization of wave packet in time. Time development of a wave Packet; Wave Particle Duality, Complementarity . Heisenberg Uncertainty Principle, Illustration of the Principle through thought Experiments of Gamma ray microscope and electron diffraction through a slit. Time independent and time dependent Schrodinger wave equation. Estimation of ground state energy of harmonic oscillator and hydrogen atom, non-existence of electron in the nucleus. Uncertainty and Complementarities. Nuclear Physics Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, Liquid Drop model: semi-empirical mass formula and binding energy, Nuclear Shell Model and magic

numbers. Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron- positron pair creation by gamma photons in the vicinity of a nucleus. Fission and fusion- mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussions), Classification of Elementary Particles.

MBA & MCA ENTRANCE SYLLABUS & EXAM PATTERN

Syllabus:

- Data Sufficiency.
- Problem Solving.
- Mathematical Ability.
- Arithmetical Ability.
- Statistical Ability.
- Communication Ability.

Exam Pattern:

- Total Questions: 200.
- The medium of Test: English.
- Exam Duration: 2.5 hours.

Section	Subject	Number of Questions
Section- A	Analytical Ability	75 Questions
Section-B	Mathematical Ability	75 Questions
Section-C	Communication Ability	50 Questions

ENGLISH

Part A-40 Marks

Spelling & Punctuation

Vocabulary: Antonyms – Synonyms - One word substitutes - Words often confused – Idiomatic expressions

Grammar: Tenses - Propositions - Concord - Auxiliary verbs - Active passive Voice

Correction of sentences: Identify the error - Identify the correct sentence

Exercises in Jumbling: Jumbled words to be arranged in the right order to form a sentence - Paragraph sequencing.

Part B-60 Marks

History of English Literature
Literary Terms
Literary Forms
Literary Movements
Books & Authors (canonical texts)
Comprehension (Prose)
Comprehension (Poetry)