and synthetic polymers with their general methods of preparation.

Chemistry in action- (i) Dyes, (ii) Chemicals in medicines, (iii) Fertility contraceptives, material schemo- sterilints.

MATHEMATICS

Unit-A: Sets and functions   (5 Questions)
Sets-Sets and their representations. Different type of set. Empty set. Finite and Infinite sets. Equal sets. Subsets. Subsets of a set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement. Operation of set. Primary operation of sets represented by Venn diagrams. **Relations & functions-** Open sentence, ordered pairs. Cartesian product of two sets. Relation as a set of ordered points, Invers relation, Identity relation, Kinds of relation. Number of elements in the Cartesian product of two finite sets. Cartesian product of the set of reals with itself (upto R X R X R). Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Junctions, Function as a set of ordered pairs, function as a special type of relation. Pictorial representation of a function, domain, co-domain and range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum, exponential, logarithmic and greatest integer functions, with their graphs. Sum, difference, product and quotients of functions. Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, composite functions, inverse of a function. Binary operations.

Unit-B: Algebra   (5 Questions)
Principle of mathematical induction-Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications. **Complex numbers and quadratic equations -**Set of complex numbers, theorems on complex numbers, basic operations of set of complex numbers, some properties of conjugate complex numbers, Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve some of the quadratic equations. Algebraic properties of complex numbers. Argand plane and polar Representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations (with real coefficients) in the complex number system. Square root of a complex number, cube root of unit, quadratic equation. **Linear inequalities-** Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Graphical method of finding a solution of system of linear inequalities in two variables. **Permutations and combinations -**Fundamental principle of counting (multiplication & Addition). Factorial *n.* (n!) Permutations and combinations, Permutations of those objects in which not all district, Circular permutations, difference between clockwise and anticlockwise permutations. Derivation of formulae for and their connections, simple applications. **Binomial theorem-**History, statement and proof of the binomial theorem for positive integral indices.

Sequence progression and series - Sequence and Series. Arithmetic Progression (A. P.), Properties of A.P., Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P. and A.P., sum of *n* terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M. Sum of an infinite of G.P. Arithmetic Geometric series, sum to n terms of series of natural numbers, their squares and cubes, sum of series by difference method, Harmonic progression (H.P.) Hormonic mean (H.M.), relation between A.M., G.M. and H.M. **Logarithm-**Logarithm, fundamental lows and systems of logarithm, relation between Napierian & common logarithm, Characteristics and mantissa of the logarithm, Introduction and method to find antilogarithm.

Matrices-Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operation on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non- commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries) **Determinants-**Determinant of a square matrix (up to 3 x 3 matrices), properties of determinants, minors, co- factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Unit-C: Coordinate Geometry (5 Questions)
Straight Lines- Shifting of origin. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axis, point -slope form, slope- intercept form, two-point form, intercept form and normal form. General equation of a line. Straight line and linear equation in re, y, reduction of general equation of straight line in to standard forms, straight line passing through one point, two point. At last equation of line passing through a given point and making a certain angle with the given line. Equation of family of lines passing through the point of intersection of two lines angle between two lines. Distance of a point from a line. **Conic sections -**Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section, different forms of conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. **Introduction to three-dimensional geometry-** Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

Unit-D: Vectors and three-dimensional geometry (5 Questions)
Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors, scalar triple product of vectors. **Three - dimensional geometry-** Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a point from a plane.

Unit-E: Calculus (5 Questions)
Limits and derivatives- Derivative introduced as rate of change both as that of distance function and geometrically. Intuitive idea of limit. Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions. Theorems on limit, meaning of x→a. Definition of derivative relate it to scope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions. Geometrical detail of derivative of functions.

Continuity and differentiability -Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit functions. Concept of exponential and logarithmic functions. Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems

(without proof) and their geometric interpretation. **Applications of derivatives -**Applications of derivatives: rate of change of bodies, increasing/decreasing functions, tangents and normal, use of derivatives in approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations). **Integrals -** Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals. **Applications of the integrals-**Applications in finding the area under simple curves, especially lines, circles/ parabolas/ellipses (in standard form only), Area between any of the two above said curves (the region should be clearly identifiable). **Differential equations -**Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given.

Unit-F: Mathematical reasoning (5 questions)
Mathematically acceptable statements. Connecting words/ phrases - consolidating the understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "implied by", "and", "or", "there exists" and their use through variety of examples related to real life and Mathematics. Validating the statements involving the connecting words, difference among contradiction, converse and contrapositive. **Linear programming-**Introduction, related terminology such as constraints, objective function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Unit-G: Statistics and probability (5 Questions)
Statistics -Measures of dispersion: range, mean deviation (Quartile deviation and mean deviation-mean, median, mode) variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances. Probability - Random experiments; outcomes, sample spaces (set representation). Events- algebra of events. Occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with other theories addition and subtraction of probability of occurrence of at least one event. Probability of an event, probability of 'not', 'and' and 'or' events. Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean and variance of random variable. Repeated independent (Bernoulli) trials and Binomial distribution.

Unit-H: Trigonometric functions (5 Questions)
Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin 2x + \cos 2x = 1$, for all x. Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing $\sin(x \pm y)$ and $\cos(x \pm y)$ in terms of $\sin x$, $\sin y$, $\cos x$ & $\cos y$ and their simple applications. Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin g3x$, trigonometric equations of the type $\sin y = \sin a$, $cosy = cosa$ and $\tan y = \tan a$. **Inverse trigonometric functions -** Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

PHYSICS
Unit-A (10 Questions)
Physical world- Physics-scope and Expansion; nature of physical laws; Physics, technology