Bihar Board Class 12th Syllabus

Mathematics

UNIT-I : RELATIONS AND FUNCTIONS	UNIT-II : ALGEBRA
1. Relations and Functions : Types of relations : Reflexive, Symmetric and Transitive, Equivalence relations, Composite functions, Inverse of a function, Binary Operations. 2. Inverse trigonometric Functions : (Periods-12) Elementary concepts and properties of inverse trigonometric functions, Definition, Range, domain, general and principle value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.	1. Matrices : Concept of a matrix, Notation, order, equality, types of matrices, zero matrix, transpose of a matrix, Symmetric and Skew-symmetric matrices. Addition, Multiplication and scalar multiplication of matrices, Addition, Multiplication and scalar multiplication of matrices and their simple properties, Non-commutativity of matrix-multiplication and concepts of zero-divisors in product of matrices. Concept of elementary row and column operations. Adjoint of a matrix and invertible matrices. Proof of uniuences of inverse, 2. Determinants : Determinant of a square matrix (upto 3 x 3 matrices), Properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle. Consistency, inconsistency and number of possible solutions of a system of linear equations in two or three variables (using matrix inversion method).
UNIT-III : CALCULUS	**UNIT-IV : VECTORS AND THREE-DIMENSIONAL GEOMETRY**
1. Differentiability : Derivative of a function at a point, Derivative of a composite function, Chain rule, Derivatives of implicit functions, inverse circular functions, exponential and logarithmic functions. Logarithmic differentiation. Derivative of functions expressed in parametic forms. Derivatives upto order three. Rolle's and Lagrange's mean value theorems / theorem (without proof) and their geometric interpretations. 2. Applications of Derivatives : dy / dx as a rate-measurer, geometric interpretation of dy/dy, increasing and decreasing functions, tangents and normals, approximation, signs of derivatives, maxima and 3. Indefinite Integrals 4. Definite integrals: Definite Integrals as limit of a sum and its simple properties. Fundamental theorem of	1. Vectors : Vectors and scalars, magnitude, and direction of a vector. Direction consines / ratios of a vector, types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, local and free vectors, components of a vector, addition of vectors, multiplication by scalars. Position vector of a point dividing a line segment in a given ratio. Scalar and vector product of two vectors with their geometrical meaning. Projection of a vector on a line. Scalar and vector triple product. 2. Introduction to Three-dimensional Geometry: Co-ordinate axes and co-ordinate planes in three dimensions. Co-ordinates of a point, Distance between two points and section formula. Direction cosines / ratios of a line joining two points. Cartesian equation of a line and plane. Angles between (a) two lines, (b) two planes, (c) aline and a plane. Distance of a point from a line. Collinearity

Calculus (without proof), Evaluation of definite integrals. Properties of definite integrals. 5. Application of the integrals: Application in finding the area enclosed by simple curves, especially lines, areas of circles / Parabolas / ellipses (in standard form), area between the two above said curves 6. Differential Equations: Definition, order degree. Formation of differential equation whose general solution is given, general and particular solutions of a differential equations. Solution of differential Equations by method of separtion of variables, homogenous differential equations of first order and first degree. Linear differential equation of order one (or the type: dy/ dx + p(x)y = q(x). Applications of differential equations to problem related to the environment and to Dynamics (simple cases only).	of three points. Coplanar and skew lines. Shortest distance between two lines. Condition of intersection of two lines and two planes and a Condition of coplanarityof two lines in vector and cartesian form length of perpendicular of a point from a plane by both vectors and cartesian method.
UNIT-V : LINEAR INEQUATIONS AND LINEAR PROGRAMMING	**UNIT-VI : PROBABILITY**
1. Linear inequations, Algebraic solutions of linear inequations in one variable and their representation on the number line. Graphical solutions of linear inequations in two variables. Solution of system of linear inequations in two variables (graphically). Introduction, definition of related terminology such as constraints, objective function, optimization, different types of linear programming problems (LPP), mathematical formulation of LPP, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal and feasible solutions (up to three non-trivial constraints)	1. Probability : Multiplication theorem on probability. Conditional probability, independent events, total probability, Bay'es theorem. Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution. Note : Attempt should be made to discuss real life problems as far as practicable. Techniques of matrices, calculus and linear programming should be used to solve such problems.

Physics

Unit-I : Electrostatics	**Unit-II : Current Electricity**
Electric charges and their conservation, Coulomb's law, Force between two points charges, forces between multiple charges, superposition principle and continuous charge distribution. Electric field, electric field due to a point charge, electric field	Electric current flow of electric charges in a metallic conductor, drift velocity and mobility, and their relation with electric current, Ohm's law, electrical resistance, V-I, Characteristic (linear and non-linear), electrical energy and power, electrical

lines, electric dipole, electric field due to a diapole, torque on a dipole in a uniform electric field. Electric flux, statement of Gauses's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite planesheet and uniformly charged thin spherical shell (field inside Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges, equi-potential surfaces, electrical potential energy of a system of two point charges and of electric Conductors and insulators, free charges and bound charges inside a conductor. Dielectric and electric polarisation capacitors and capacitance combination of capacitors in series and in parallel capicitance of a parallel plate capacitor with and without dielectric medium between plates, energy stored in a capacitor, Van	resistivity and conductivity, carbon resistors, colour code for carbon resistors, series & parallel combinations of resistors, temperature dependence of resistance, Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel. Krichoff's laws and simple applications, wheatstone bridge, meter bridge. Potentiometer-principle and applications to measure potential difference and for comparing emf of two cells, measurement of internal resistance of a cell.
Unit-III : Magnetic Effects of Current and Magnetism	**Unit-IV : Electromagnetic Induction and Alternating Current**
Concept of magnetic field, Oersted's experiment Biot-sevart law and its application to current carrying Ampere's law and its applications to infinitely long straight wire, straight and toroidal solenids, Force on a moving charge in uniform magnetic and the field, cyclotron. Force on a current carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductor - definition of ampere, Torque experiencd by a current loop in a uniform magnetic field, moving coil galvenometers, its current sensitivity and conversion to ammeter and voltmeter voltage current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (bar magnete) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field, bar magnet as an equivalent solenoid, magnetic field lines, Earth's magnetic field and magnetic elements. Para-dia & Ferro-magnetic substances, with examples. Electromagnets and factors affectings their strength, permanent magnets.	Electromagnetic induction, Faraday's law, induced emf and current, Lenz's law, Eddy currents, self and Need for displacement current. Alternating currents, peak and rms value of Ac/voltage, reactance and impedance, LC, oscillations (qualitative treatment only), LCR series circuit, resonance, power in AC Circuits, wattliess current. AC generator and transformer.
Unit-V : Electromagnetic Waves	**Unit-VI : Optics**
Electromagnetic waves and their characteristics (qualitative ideas only).	Reflection of light, spherical mirrors, mirror

Transverse nature of Electromagnetic spectrum / radio waves, micro waves, infrared , visible, ultraviolet, x-rays, gamma-rays) including elementary facts about their uses.	formula, Refraction of light, total internal reflection and its application, optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, Magnification, power of a lens, combination of thin lenses in contact. Refraction and dispersion of light through a prism, Scattering of light - blue colour of the sky and reddish appearance of the sun at sunrise and Optical instrument : Human eye, image formation and accomodation, correction of eye defects (Myopia, hypermetropia, presbyopia and astigmatism) using lenses, Microscopes and astronomical telescope (reflecting and refracting) and their magnifying powers. Wave Optics : Wavefront and Hyugen's principle, reflection and refraction of plane Wave at a plane, surface using wavefronts. Proof of laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light, Diffraction due to a single slit, width of centra maximum. Resolving powers of microscopes and astronomical telescope, polarisation, plane polarised light, Brcwster's law, uses of plane polarised light and
Unit-VII : Dual Nature of Matter and Radiation	**Unit-VII : Atoms and Nuclei**
Photoelectric effect, Hertz and Lenard's observations. Einstein's photoelectric equation, particle nature Matter waves – Wave nature of particles, de-Broglie relation, Davission - Germer experiment.	Alpha – Particle scattering experiments, Rutherford model of atom, Bohr model, energy levels, hydrogen Composition and size of nucleus, atomic masses, isotopes, isobars, isotones, Radioactivity – alpha, beta and gamma particle / rays and their properties, radioactive decay law. Mass energy relation, mass defect, binding energy per nucleon and its variation with mass number, nuclear fission and fusion.
Unit-IX : Electronic Devices	**Unit-X : Communication Systems**
Semiconductors, semiconductor diode – I. V. characteristics in forward ad reverse bias, diode as a rectifier, I-V characteristics of LED, photodiode, solar cell and Zener diode, Zener diode as a voltage regulator, Junction transistor, transistor action, characteristics of a transistor, transistor as an amplifier (common emitter configuration) and oscillator, Logic gates (OR, AND, NOT, NAND and NOR), Transistor as a Switch, Boolean	Elements of communication system (block diagram only), bandwidth of signals (speech, TV and digital data); bandwidth of transmission medium propagation of electromagnetic waves in the atmosphere, sky and space wave propagation, Need for modulation, production and detection of an amplitude-modulated wave. Satellite communication system and its uses : Elementary ideas of electronic gadget used in our daily life like - Mobile, tax, modem, computer and internet, remote sensing etc.

Chemistry

UNIT-I : Solid State	UNIT-II : Solutions
Classification of solids based on different binding forces : Molecular, ionic, covalent and metallic solids, amorphous an crystalline solids (elementary idea) unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties.	Types of solutions, expression of concentration of solutions of solids in liquids, colligative properties – relative lowering of vapour pressure, elevation of Boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass.
UNIT-III : Electrochemistry	**UNIT-IV : Chemical Kinetics**
Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's law, electrolysis and laws of electrolysis (elementary idea), dry cell, electrolytic cells and Galvanic cells, lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, and fuel cells corrosion.	Rate of a reaction (average and instantaneous), factors affecting rates of reaction, concentration, temperature, catalyst, order and molecularity of a reaction, rate laws and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concepts of collision theory (elementary idea, no mathematical treatment).
UNIT-V : Surface Chemistry	**UNIT-VI: General principles and process of**
Adsorption – Physiosorption and chemisorption; factor affecting adsorption of gases on solids; catalysis, homogeneous and heterogeneous, activity and selectivity, enzyme catalysis, colloidal state : distinction between true solutions, colloids and suspensions, lyophilic, lyophobic, multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation, emulsion – types of emulsions.	Isolation of elements Principles and methods of extraction – concentration, oxidation, reduction, electrolytic Occurence and principles of extraction of aluminium, copper, zinc and iron.
UNIT-VII : Group I & II elements	**UNIT-VIII : P-block elements**
Abnormal properties of first element of group-13 and group-14 elements, Diagonal relationship and different properties of groups I & group-II elements like chemical reactivities, atomic and Ionic radii, enthalpi of ionization etc.	Group 15 elements : General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties, nitrogen-preparation, properties and uses, compounds of nitrogen, preparation and properties of ammonia and nitric acid, oxides of nitrogen (structure only), Phosphorous – allotropic forms, compounds of phosphorous, preparation and properties of phosphine, halides of phosphorous (PCl3 oxoacids (elementary idea only). Group 16 elements : General introduction, electronic configuration,

	oxidation states, occurrence, trends in physical and chemical properties; dioxygen, preparation, properties and uses simple oxides, ozone sulphur – allotropic forms; compounds of sulphur; preparation, properties and uses of sulphur dioxide, sulphuric acid; industrial process of manufacture; properties and uses, oxoacids of sulphur (structure only). Group 17 elements : General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens; preparation, properties and uses of chlorine and hydrochloric acid, interhalogen compounds, oxoacids of halogens (structure only). Group 18 elements : General introduction, electronic configuration, occurrance, trends in physical and chemical properties, uses.
UNIT-IX : d– and f– block elements	**UNIT-X : Co-ordination Compounds**
General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation. Preparation and properties of K2 Lanthanides : Electronic configuration, oxidation states, chemical reactivity and lanthanide Actinides : Electronic configuration, oxidation states.	Coordination compounds – Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding, isomerism, importance of coordination (in qualitative analysis, extraction of metals and biological systems).
UNIT-XI : Haloalkanes and Haloarenes	**UNIT-XII : Alcohals, Phenols and Ethers**
Haloalkanes : Nomenclature, nature of C-X bonds, methods of preparation, prophysical and chemical properties, mechanism of substitution reactions. Haloarenes : Nature of C-X bond, methods of preparation, substitution reactions (directive influence of halogen for mono substitute compounds only) uses and environmental effects of dichloromethane, trichloro methane, tetra chloromethane, iodoform, freons, DDT.	Alcohol : Nomenclature, methods of preparation, physical and chemical properties (of primary alcohol only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses, some important compounds – methanol and ethanol. Phenols : Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols. Ethers : Nomenclature, methods of preparation, physical and chemical properties, uses.
UNIT-XIII : Aldehydes, Ketones and Carboxylic Acids	**UNIT-XIV : Organic compounds containing Nitrogen**
Aldehydes and Ketones : Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, and mechanism of nucleophilic	Amines cynaides and Isocynaides: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of

addition, reactivity of alpha hydrogen in aldehyde, uses. Carboxylic Acid : Nomenclature, acidic nature, methods of preparation, physical and chemical properties, uses.	primary, secondary and tertiary amines. Diazonium Salts : Preparation, chemical reactions and importance in synthetic organic chemistry.
UNIT-XV : Biomolecules	**UNIT-XVI : Polymers**
Carbohydrates : Classification (aldoses and ketoses), mono sacharides (glucose and fructose), oligosacharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogens), importance. Proteins : Elementary idea of amino acids, peptide bonds, polypeptides, proteins, primary structure, secondary structure, tertiary structure and quaternary structure (qualitative idea only), denaturation of proteins, enzymes. Vitmains : Classification and functions : Nucleic acid : DNA and RNA	Classification : natural and synthetic, methods of polymerization (addition and condensation), copolymerization. Some important polymers; natural and synthetic like polythene, nylon, polyesters, bakelite, rubber.
UNIT-XVII : Chemistry in everyday life	
1. Chemical in medicines – Analgesics, tranquilizers, antiseptic, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines. 2. Chemicals in food – Preservatives, artificial sweetening agents. 3. Cleansing agents – Soaps and detergents, cleansing action.	

Biology

UNIT-I : REPRODUCTION AND DEVELOPMENT	**UNIT-II : GENETICS AND ORGANIC EVOLUTION**
l Reproduction in Plants – Types of reproduction, reproductive part of flower, gametogenesis, pollination and fertilization; Development of seeds and fruits. l Reproduction and development in Human – Reproductive system in male and female; Role of sex-hormones in the development of sexual characters, menstrual cycle, production of gametes (gametogenesis), fertilization, implantation, embryo development, pregnancy and parturation, Test-tube baby (IVF). l Reproduction Health – Birth control, contraception and sexually transmitted diseases (STDs).	l Introduction l Mendelism – Mendel's experiments of monohybrid and dihybrid cross, Mendel's law of inheritance. l Gene interaction – Incomplete dominance, co-dominance, multiple alleles (blood groupings), Epistasis. l Chromosome theory of inheritance, linkage and crossing over, cytoplasmic inheritance. Sex-determination in human beings : XX, Xy, Sex-linked inheritance and congenital diseases ex. Haemophilia, colour blindness, Sickle celled anaemia. l Elementary idea of Gene, chromatin fibre and chromosome. l DNA – replication, Genetic code, transcription and translation.

	l Gene expression and regulation l Mechanism of variation – at chromosome level (chromosomal abberation and it gene level (mutation). l Theories and evidences of organic evolution, Lamarckism, Darwinism and Neo- Darwinism.
UNIT-III : BIOTECHNOLOGYAND ITS APPLICATIONS	**UNIT-IV : APPLIED BIOLOGY AND HUMAN WELFARE**
l Elementary idea of components of Biotechnology. l Tools and techniques. l Recombinant DNA technology, Genetically modified (GM) organism– Application in health, Agriculture and Industries. l Insulin and BT-Cotton. l DNA finger printing	l Introduction l Elementary idea of animal husbandry, poulty, fisheries, silviculture (litchi, mango), Horticulture, Apiculture, Sericulture, Cultivation of Makhana and Medicinal plants. l Improvement in agriculture, food production and food processing, food processing and micro organisms. l Basic concepts of plant breeding and tissue culture. l Microbes in sewage treatment and energy generation. l Basic concept of Immunology, vaccines. l Parasites and pathogens. l Cancer and AIDS l Adolescence and drug / alcohol abuse.
UNIT-V : MAN AND ENVIRONMENT	
l Effect of increasing population on Ecosystem. l Conservation of biological resources – Wildlife and forest conservation. Importance of forests, hazards of deforestation, afforestation, Indian forests; causes for extinction of some wild life. Concept of endangered species, Measures and steps for conservation of endangered species. Environmental Issues – l Environmental pollution; Air pollution, water pollution, soil pollution, noise pollution, radiation pollution, their effects and methods of control. l Environmental laws.	