

Upgraded Syllabus

PHYSICS – Std. XI & XII

Preamble

According to NCF 2005, the curriculum of the subject Physics is upgraded for higher secondary stage. This curriculum is comparable to the international standards which are useful for the students in Maharashtra State for different types of competitive examinations conducted in India. All the units of the subject from NCERT curriculum are divided into two years conveniently in Maharashtra State. Continuity in the curriculum is maintained in Std. XI & XII, which is not in NCERT curriculum. All the students appear for the competitive examinations only after +2 stages throughout India.

This syllabus has been designed in accordance with the guidelines shown in the final version of common core syllabii of COBSE, Delhi. Accordingly few additional sub units have been added.

Objectives –

1. Emphasis on basic conceptual understanding of the content.
2. Emphasis on use of SI units, symbols, nomenclature of physical quantities and formulations as per international standards.
3. Providing logical sequencing of units of the subject matter and proper placement of concepts with their linkage for better learning.
4. Reducing the curriculum load by eliminating overlapping of concepts/content within the discipline and other disciplines.
5. Promotion of process-skills, problem-solving abilities and applications of Physics concepts.
6. Strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject.
7. Expose the learners to different processes used in Physics-related industrial and technological applications.
8. Develop process-skills and experimental, observational, manipulative, decision making and investigatory skills in the learners.
9. Promote problem solving abilities and creative thinking in learners.
10. Develop conceptual competence in the learners and make them realize and appreciate the interface of Physics with other disciplines.

PHYSICS
(Upgraded Syllabus)
Std. XI

1. Measurements

Introduction, Need for measurement, Units for measurement, System of Units, S.I. Units, Fundamental and derived units, Dimensional analysis, Order of magnitude and significant figures, Accuracy and errors in measurement.

2. Scalars and Vectors

Addition and subtraction of vectors, Product of vectors.

3. Projectile motion

Uniformly accelerated motion along straight line, Non uniform motion, Position time graph and velocity-time graph, Equation of a projectile path, Time of flight, Horizontal range, Maximum height of a projectile, Relative velocity.

4. Force

Types of forces, General idea of gravitation, electromagnetic and nuclear forces, Law of conservation of momentum, Work done by a variable force. Work-energy theorem, Elastic and inelastic collisions **in one and two dimensions**, Inertial and non-inertial frames, Moment of force, Couple and properties of couple, Centre of mass, Centre of gravity, Conditions of equilibrium of a rigid body.

5. Friction in solids and liquids

Origin and nature of frictional forces, Laws of static friction, Laws of kinetic friction, Pressure due to fluid column, Pascal's Law and its applications, Effect of gravity on fluid pressure, Viscosity, Streamline flow, Turbulent flow, Viscous force, Newton's formula, Stokes' law, Equation for terminal velocity, Raynold's number, Bernoulli's principle and its applications.

6. Sound Waves

Waves and oscillations, Progressive waves, Characteristics of transverse waves, Characteristics of longitudinal waves, Sound as longitudinal wave motion, Relation between v , f and, λ Newton's formula for velocity of sound, Laplace's correction.

7. Thermal properties of matter

Temperature and heat, Measurement of temperature, Ideal-gas equation and absolute temperature, Thermal expansion, Specific heat capacity, Calorimetry, Change of state, Latent heat, Heat transfer.

8. Refraction of Light

Refraction of monochromatic light, Snell's law, Total internal reflection, Critical angle, Optical fibre, Dispersion of light, Prism formula, Angular dispersion and dispersive power, Rainbow, Scattering of light, Blue colour of sky, Colour of sun at sunrise and sunset. **Elementary idea of Raman effect.**

9. Ray optics

Reflection of light by spherical mirrors, Refraction at single curved surface, Lens maker's equation, Combination of thin lenses in contact, Concept of conjugate foci, **Correction of eye defects**, Magnifying power of simple microscope, Magnifying power of compound microscope, Magnifying power of telescope, Reflecting telescope - schematic diagram with explanation.

10. Electrostatics

Frictional electricity, Charges and their conservation, Coulomb's law and dielectric constant, Forces between multiple electric charges, Superposition principle of forces, Continuous distribution of charges, Concept of charge density, Electric field intensity, Potential energy, Electric potential due to point charge, Relation between electric field intensity and potential, Potential difference, Volt and electron volt, Electric dipole and dipole moment, Electric lines of force. Equipotential surfaces, P.E. of single charge and system of charges.

11. **Current electricity**

Ohm's law, Resistance, Specific resistance, Temperature dependence of resistance, Colour code of carbon resistor, **Series and parallel combination of resistors**, E.M.F. and internal resistance of cell, Work done by electric current, Power in electric circuit, Cells in series and in parallel, **Elementary idea of secondary cells.**

12. **Magnetic effect of electric current**

Oersted's experiment, Biot Savart's law, Right hand rule, Magnetic induction at the centre of circular coil carrying current, Magnetic induction at a point along the axis of a coil carrying current, Fleming's left hand rule, Force between two infinitely long current carrying parallel conductors, Definition of Ampere, Force acting on a conductor carrying current in magnetic field, Torque on a current loop in magnetic field.

13. **Magnetism**

Origin of magnetism due to moving charges, Equivalence between magnetic dipole and circular coil carrying current, Definition of magnetic dipole moment and its unit, Torque acting on a magnet in uniform magnetic induction, Bar magnet as an equivalent solenoid, Magnetic field lines, Magnetic induction due to bar magnet at a point along the axis and at a point along equator, Earth's magnetic field and magnetic elements, Electromagnets and factors affecting their strength.

14. **Electromagnetic waves**

Electromagnetic waves and their characteristics, Transverse nature of electromagnetic waves, Electromagnetic spectrum, Space communication, Propagation of electromagnetic waves in atmosphere.

Physics
List of Practicals
Std. XI

1. Use of Vernier Callipers.
2. Use of Screw gauge.
3. To determine radius of curvature of a given spherical surface by a spherometer.
4. To find the weight of a given body using parallelogram law of vectors.
5. To study the relationship between force of limiting friction and normal reaction and to find co-efficient of friction between a block and a horizontal surface.
6. To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.
7. To find the value of 'v' for different values of 'u' in case of a 'concave mirror and to find the focal length.
8. To find the focal length of a convex lens by plotting graphs between 'u' and 'v' or between '1/u' and '1/v'.
9. To find the focal length of a convex mirror, using a convex lens.
10. To find the focal length of a concave lens, using a convex lens.
11. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
12. To determine refractive index of a glass using a travelling microscope.
13. To find refractive index of a liquid by using (i) concave mirror, (ii) convex lens and plane mirror.
14. To determine specific heat capacity of a given (i) liquid (ii) solid, by method of mixtures.

Physics
List of Activities
Std. XI

1. To make a paper scale of given least count, e.g. 0.2 cm, 0.5 cm.
2. To determine mass of a given body using a meter scale by principle of moments.
3. To plot a graph for a given set of data, with proper choice of scales and error bars.

4. To measure the force of limiting friction for rolling of a roller on a horizontal plane.
 5. To study the variation in range of a jet of water with angle of projection.
 6. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
 7. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
 8. To study the nature and size of image formed by (i) convex lens (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
 9. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.
 10. To note the change in level of liquid in a container on heating and interpret the observations.
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PHYSICS
(Upgraded syllabus)
Std. XII

1. Circular motion

Angular displacement, Angular velocity and angular acceleration, Relation between linear velocity and angular velocity, Uniform circular motion, Radial acceleration, Centripetal and centrifugal forces, Banking of roads, Vertical circular motion due to earth's gravitation, Equation for velocity and energy at different positions of vertical circular motion. Kinematical equations for circular motion in analogy with linear motion.

2. Gravitation

Newton's law of gravitation, Projection of satellite, Periodic time, Statement of Kepler's laws of motion, Binding energy and escape velocity of a satellite, Weightlessness condition in orbit, Variation of 'g' due to altitude, latitude, depth and motion, Communication satellite and its uses.

3. Rotational motion

Definition of M.I., K.E. of rotating body, Rolling motion, Physical significance of M.I., Radius of gyration, Torque, Principle of parallel and perpendicular axes, M.I. of some regular shaped bodies about specific axes, Angular momentum and its conservation.

4. Oscillations

Explanation of periodic motion, S.H.M., Differential equation of linear S.H.M. Projection of U.C.M. on any diameter, Phase of S.H.M., K.E. and P.E. in S.H.M., Composition of two S.H.M.'s having same period and along same line, Simple pendulum, Damped S.H.M.

5. Elasticity

General explanation of elastic property, Plasticity, Deformation, Definition of stress and strain, Hooke's law, **Poisson's ratio**, **Elastic energy**, Elastic constants and their relation, Determination of 'Y', Behaviour of metal wire under increasing load, Applications of elastic behaviour of materials.

6. Surface tension

Surface tension on the basis of molecular theory, Surface energy, Surface tension, Angle of contact, Capillarity and capillary action, Effect of impurity and temperature on surface tension.

7. Wave motion

Simple harmonic progressive waves, Reflection of transverse and longitudinal waves, Change of phase, Superposition of waves, Formation of beats, Doppler effect in sound.

8. Stationary waves

Study of vibrations in a finite medium, Formation of stationary waves on string, Study of vibrations of air columns, Free and Forced vibrations, Resonance.

9. Kinetic theory of gases and Radiation

Concept of an ideal gas, Assumptions of kinetic theory, Mean free path, Derivation for pressure of a gas, Degrees of freedom, Derivation of Boyle's law, **Thermodynamics- Thermal equilibrium and definition of temperature, 1st law of thermodynamics, 2nd law of thermodynamics, Heat engines and refrigerators, Qualitative idea of black body radiation, Wein's displacement law, Green house effect, Stefan's law**, Maxwell distribution, Law of equipartition of energy and application to Specific heat capacities of gases.

10. Wave theory of light

Wave theory of light, Huygens' Principle, Construction of plane and spherical wave front, Wave front and wave normal, Reflection at plane surface, Refraction at plane surface, Polarisation, Polaroids, Plane polarised light, Brewster's law, Doppler effect in light.

11. Interference and diffraction

Interference of light, Conditions for producing steady interference pattern, Young's experiment, Analytical treatment of interference bands, Measurement of wavelength by biprism experiment, Diffraction due to single slit, Rayleigh's criterion, Resolving power of a microscope and telescope, Difference between interference and diffraction.

12. Electrostatics

Gauss' theorem proof and applications, Mechanical force on unit area of a charged conductor, Energy density of a medium, Dielectrics and electric polarisation, Concept of condenser, Capacity of parallel plate condenser, Effect of dielectric on capacity, Energy of charged condenser, Condensers in series and parallel, van-de-Graaff generator.

13. Current electricity

Kirchhoff's law, Wheatstone's bridge, Meter bridge, Potentiometer.

14. **Magnetic effects of electric current**

Ampere's law and its applications, Moving coil galvanometer, Ammeter, Voltmeter, Sensitivity of moving coil galvanometer, Cyclotron.

15. **Magnetism**

Circular current loop as a magnetic dipole, Magnetic dipole moment of revolving electron, Magnetisation and magnetic intensity, Diamagnetism, Paramagnetism, Ferromagnetism on the basis of domain theory, Curie temperature.

16 **Electromagnetic inductions**

Laws of electromagnetic induction, proof of, $\epsilon = - \frac{d\Phi}{dt}$

Eddy currents, Self induction and mutual induction, Need for displacement current, Transformer, Coil rotating in uniform magnetic induction, Alternating currents, Reactance and impedance, LC oscillations (qualitative treatment only) Power in a.c circuit with resistance, inductance and capacitance, Resonant circuit, Wattless current, AC generator.

17 **Electrons and photons**

Photoelectric effect, Hertz and Lenard's observations, Einstein's equation, Particle nature of light.

18 **Atoms, Molecules and Nuclei**

Alpha particle scattering experiment, Rutherford's model of atom. Bohr's model, Hydrogen spectrum, **Composition and size of nucleus, Radioactivity, Decay law, mass-energy relation, mass defect, B.E. per nucleon and its variation with mass number, Nuclear fission and fusion**, de Broglie hypothesis, Matter waves – wave nature of particles, Wavelength of an electron, Davisson and Germer experiment, **Continuous and characteristics X-rays.**

19 **Semiconductors**

Energy bands in solids, Intrinsic and extrinsic semiconductors, P-type and N-type semiconductor, P-N junction diode, I-V characteristics in forward and reverse bias, Rectifiers, Zener diode as a voltage regulator, Photodiode, Solar cell, I-V characteristics of LED, Transistor

action and its characteristics, **Transistor as an amplifier (CE mode)**, Transistor as a switch,
Oscillators and Logic gates (**OR,AND,NOT,NAND,NOR**)

20 **Communication systems**

Elements of communication system, bandwidth of signals, bandwidth of transmission medium,
Need for modulation, Production and detection of an amplitude modulated wave, space
communication, Propagation of electromagnetic waves in atmosphere.

Physics
List of Practicals
Std. XII

1. To determine Young's modulus of elasticity of the material of a given wire.
2. To find the force constant and effective mass of helical spring by plotting T^2 - m graph using method of oscillations.
3. To determine the surface tension of water by capillary rise method.
4. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
5. To study the relation between frequency and length of a given wire under constant tension using sonometer.
6. To study the relation between the length of a given wire and tension for constant frequency using sonometer.
7. To find the speed of sound in air at room temperature using a resonance tube.
8. To find resistance of given wire using metre bridge and hence determine the specific resistance of its material.
9. To verify the laws of combination (series/parallel) of resistances using a metre bridge.
10. To compare the emf of two given cells using potentiometer.
11. To determine the internal resistance of given cell using potentiometer.
12. To determine resistance of galvanometer using metre bridge.
13. To draw the I-V characteristic curves of a p-n junction diode in forward bias and reverse bias.
14. To study the characteristics of a common-emitter npn or pnp transistor and to find out the values of current and voltage gains.
15. To draw the characteristic curve of a zener diode and to determine its reverse break down voltage.

Physics
List of Activities
Std. XII

1. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.
2. To study the effect of detergent on surface tension by observing capillary rise.
3. To study the factors affecting the rate of loss of heat of a liquid.
4. To study the effect of load on depression of a suitably clamped meter scale loaded (i) at its end (ii) in the middle.
5. To measure the resistance and impedance of an inductor with or without iron core.
6. To study the variation in potential drop with length of a wire for a steady current.
7. To draw the diagram of a given open circuit comprising at least a battery, resistor/ rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.
8. To study effect of intensity of light (by varying distance of the source) on an L.D.R.
9. To identify a diode, an LED, a transistor, and IC, a resistor and a capacitor from mixed collection of such items.
10. Use of multimeter to (i) identify base of transistor (ii) distinguish between npn and pnp type transistors, (iii) see the unidirectional flow of current in case of a diode and an LED (iv) check whether a given electronic component (e.g. diode, transistor or IC) is in working order.
11. To observe polarization of light using two polaroids.
12. To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.

CHEMISTRY
(Upgraded syllabus)
Std. XI & XII

Preamble

RATIONALE

According to NCF 2005, the new and updated curriculum is introduced at +2 stages. There is a need to provide the sufficient conceptual background of chemistry which will help the students to appear for different common entrance test at state level and national level. This new syllabus will make them competent to meet the challenges of academic and professional courses like medicine, engineering, technology, etc, after the +2 stage. The syllabus is comparable to the international level.

The syllabus contains areas like physical, organic, inorganic, industrial, analytical and polymer chemistry. The revised syllabus has taken care of new formulations and nomenclature of elements, compounds and IUPAC units of physical quantities. New nomenclature, symbols and formulations, fundamental concepts, modern techniques are given importance.

OBJECTIVES

The broad objectives of teaching Chemistry at Senior Secondary Stage are to help the learners :

- 1) To promote understanding of basic facts and concepts in chemistry while retaining the excitement of Chemistry.
- 2) To make students capable of studying chemistry in academic and professional courses (such as medicine, engineering, technology) at tertiary level.
- 3) To expose the students to various emerging new areas of chemistry and apprise them with their relevance in their future studies and their applications in various spheres of chemical sciences and technology.
- 4) To equip students to face various changes related to health, nutrition, environment, population, weather, industries and agriculture.
- 5) To develop problem solving skills in students.
- 6) To expose the students to different processes used in industries and their technological applications.
- 7) To apprise students with interface of chemistry with other disciplines of science such as Physics, Biology, Geology, Engineering, etc.

CHEMISTRY

Std. XI (Theory)

Unit 1: Some Basic Concepts of Chemistry

General Introduction: Importance and scope of chemistry. Historical approach to particulate nature of matter, laws of chemical combination, Dalton's atomic theory : concept of elements, atoms and molecules. Atomic and molecular masses mole concept and molar mass : Avogadro's law and Avogadro number, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

Unit 2 : States of Matter : Gases and Liquids

Three states of matter. Intermolecular interactions, type of bonding. Role of gas laws in elucidating the concept of the molecule, Boyle's law, Charles law, Gay Lussac's law. Ideal behaviour, empirical derivation of gas equation. Ideal gas equation. Deviation from ideal behaviour, liquefaction of gases. Critical temperature. Kinetic **energy and molecular speeds (elementary idea)** Liquid State – Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

Unit 3 : Structure of Atom

Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg's uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals – Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

Unit 4 : Periodic Table

Significance of classification, brief history of the development of periodic table, modern periodic law and present form of periodic table, periodic trends in properties of elements atomic radii, ionic radii. **Inert gas radii nomenclature of elements with atomic number greater than 100.** Enthalpy: Explanation and definition of term. Ionization enthalpy, electron gain enthalpy, electronegativity, valence.

Unit 5: Redox Reactions

Concept of oxidation and reduction, redox reactions, oxidation number, Balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number.

Unit 6: Chemical Equilibrium

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium, Le Chatelier's principle.

Ionic equilibrium: Ionization of acids and bases, strong and weak electrolytes, degree of ionization, **ionization of polybasic acids, acid strength**, concept of pH. Hydrolysis of salts (elementary idea). Buffer solutions, solubility product common ion effect (with illustrative examples.) **Handerson equation.**

Unit 7 : Surface Chemistry

Adsorption – physisorption and chemisorption; factors affecting adsorption of gases on solids; catalysis : homogenous 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. **Elementary idea of nanomaterials.**

Unit 8 : Nature of Chemical Bond

Valence electrons, ionic bond, **Born Haber cycle** : covalent bond parameters. Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), hydrogen bond.

Unit 9 : Hydrogen

Position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen; hydrides-ionic, covalent and interstitial; physical and chemical properties of water, heavy water. Hydrogen peroxide- preparation, properties and structure; hydrogen as a fuel. **Uses of hydrogen peroxide**

Unit 10: s-Block Elements (Alkali and Alkaline earth metals)

Group 1 and Group 2 elements:

General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens; uses. Preparation and properties of some important compounds: Sodium carbonate, sodium hydroxide and sodium hydrogen carbonate, biological importance of sodium and potassium. Calcium oxide and calcium carbonate (CaO) (CaCO_3) and industrial uses of lime and limestone, biological importance of Magnesium and Calcium.

Unit 11 : p-Block Elements

Group Introduction to p-Block Elements

Group 13 elements : General introduction, electronic configuration, occurrence. Variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group. Boron-physical and chemical properties, some important compounds: borax, boric acids, boron hydrides. Aluminium; uses, reactions with acids and alkalies.

Group 14 elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behavior of first element. Carbon – catenation, allotropic forms, physical and chemical properties; uses of some important Compounds; oxides. Important compounds of silicon and their uses: silicon tetrachloride, silicones, silicates and zeolites **and structure of silicates**

Unit 12: Basic Principles and Techniques in Organic Chemistry

General introduction, methods of qualitative and quantitative analysis, Classification and IUPAC nomenclature of organic compounds. Melting point and boiling point. Electronic displacements in a covalent bond; inductive effect, electromeric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond; free radicals, carbocations, carbanions; electrophiles and nucleophiles, types of organic reactions.

Unit 13 : Alkanes

Classification of hydrocarbons – Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

Unit 14 : Alkenes

Nomenclature, structure of double bond (ethane), geometrical isomerism, physical properties, methods of preparation. Chemical reactions; addition of hydrogen, halogen, water, hydrogen halides (Markovnikoff's addition and peroxide effect) ozonolysis, oxidation, mechanism of electrophilic addition.

Unit 15: Alkynes

Nomenclature, structure of triple bond (ethylene), physical properties. Methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of – hydrogen, halogens, hydrogen halides, water.

Unit 16 : Aromatic compounds

Introduction, IUPAC nomenclature; benzene; resonance aromaticity; chemical properties; mechanism of electrophilic substitution. – nitration, sulphonation, halogenation, Friedel Craft' alkylation and acylation; Carcinogenicity and toxicity.

UNIT-17: Environmental chemistry

Environmental pollution- air, water and soil pollution, chemical reactions in atmosphere, smog, major atmospheric pollutants, acid rain, ozone and its reactions, effects of depletion of ozone layer, green house effect and global warming. Pollution due to industrial wastes, green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.

Chemistry Practical Syllabus Std-XI

A. Basic Laboratory Techniques

1. Cutting glass tube and glass rod
2. Bending glass tube
3. Drawing out a glass jet
4. Study of burner
5. Operating pinch cork

B. Characterization and purification of chemical substances

1. Determination of melting point of an organic compound. (p-toludine, naphthalene, Oxalic acid, β -naphthol, resorcinol, benzoic acid.)
2. Determination of boiling point of an organic compound. (acetone, methyl acetate, acetic acid, xylene (o,m,p), water)
3. Crystallization of impure sample of anyone of the following compounds. Alum, copper sulphate, benzoic acid.

C. Surface Chemistry

- (a) Preparation of one lyophilic and one lyophobic sol: Lyophilic sol-starch and gum. Lyophobic sol–aluminium hydroxide, ferric hydroxide, arseneous sulphide.
- (b) Study of the role of emulsifying agents in stabilizing the emulsion of oil.

D. Chemical equilibrium

Any one of the following experiments:

- (a) Study the shift in equilibrium between ferric ions and thiocyanate ions by changing the concentration of either ion. (b) Study the shift in equilibrium between $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ and chloride ions by changing the concentration of either of the ions.

E. Experiments related to pH change

- (a) Any one of the following experiments:
- Determination of pH of some solutions obtained from fruit juices, varied concentrations of acids, bases and salts using pH paper or universal indicator.
 - Comparing the pH solutions of strong and weak acid of same concentration.
 - Study the pH change in the titration of a strong base using universal indicator.

(b) Study of pH change by common ion effect in case of weak acids and bases.

F. Quantitative estimation

- Using a chemical balance.
- Preparation of standard solution of oxalic acid.
- Determination of strength of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.
- Preparation of standard solution of sodium carbonate.
- Determination of strength of a given solution of hydrochloric acid by titrating It against standard sodium carbonate solution.

G. Qualitative analysis

Determination of one cation and one anion in a given salt:

Cations – Pb^{2+} , Cu^{2+} , Al^{3+} , Fe^{3+} , Mn^{2+} , Ni^{2+}
, Zn^{2+} , Co^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Mg^{2+} , NH_4^+

Anions – CO_3^{2-}

SO_3^{2-}

SO_4^{2-}

NO_2^-

NO_3^-

Cl^- , Br^- , I^- , PO_4^{3-}

$\text{C}_2\text{O}_4^{2-}$

CH_3COO^-

(Note: Insoluble salts excluded)

H. Detection of nitrogen, sulphur, chlorine bromine and iodine in an organic compound.

PROJECT

Scientific investigations involving laboratory testing and collecting information from other sources.

A few suggested Projects

- 1 Checking the bacterial contamination in drinking water by testing sulphide ion.**
- 2 Study of the methods of purification of water.**
- 3 Testing the hardness, presence of iron, fluoride, chloride etc. depending upon the regional variation in drinking water and the study of causes of presence of these ions above permissible limit (if any).**
- 4 Investigation of the foaming capacity of different washing soaps and the effect of addition of sodium carbonate on them.**
- 5 Study of the acidity of different samples of the tea leaves.**
- 6 Determination of the rate of evaporation of different liquids.**
- 7 Study of the effect of acids and bases on the tensile strength of fibers.**
- 8 Analysis of fruit and vegetable juices for their acidity.**

Note: Any other investigatory project can be chosen with the approval of the teacher.

CHEMISTRY

Std. XII (Theory)

Unit 1: Solid State

Classification of solids based on different forces; molecular, ionic, covalent and metallic solids, amorphous and 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, **Band theory of metals, conductors and semiconductors and insulators and n and p type semiconductors.**

Unit 2 : Solutions and colligative properties

Types of solutions, expression of concentration of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties –relative lowering of vapor pressure, **Raoult's law** elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass. **Van't Hoff factor and calculations involving it.**

Unit 3 : Chemical Thermodynamics and energetic

Concepts of system, types of systems, surroundings. Work, heat, energy, extensive and intensive properties, state functions. First law of thermodynamics – internal energy and enthalpy, Hess' law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation. Phase transition, ionization, and solution **and dilution**

Introduction of entropy as a state function, free energy change for spontaneous and non spontaneous processes, and equilibrium constant. **Second and third law of thermodynamics**

Unit 4: Electrochemistry

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 and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, fuel cells; corrosion. **Relation between Gibb's energy change and emf of a cell.**

Unit 5: Chemical Kinetics

Rate of reaction (average and instantaneous), factors affecting rate of reaction; concentration, temperature, catalyst; order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of

collision theory (elementary idea, no mathematical treatment). **Activation energy, Arrhenius equation.**

Unit 6 : General Principles and Processes of Isolation of Elements

Principles and methods of extraction – concentration, oxidation, reduction electrolytic method and refining; occurrence and principle of extraction of aluminium, copper, zinc and iron

Unit 7: p-Block Elements

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 ($\text{PCl}_3, \text{PCl}_5$) and 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; **Classification of oxides**, 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 (structures 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. Occurrence, trends in physical and chemical properties, uses.

Unit 8 : d and f Block Elements

d-Block Elements -

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 $K_2Cr_2O_7$ and $KMnO_4$.

f-Block Elements-

Lanthanoids – Electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction **and its consequences**. **Actinoids** – Electronic configuration, oxidation states.

Comparison with lanthanoids.

Unit 9: Coordination Compounds

Coordination compounds – Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding; **Werner's theory**, VBT, CFT. isomerism, (**Structural and stereo**) importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

Unit 10 : Halogen derivatives of alkanes (and arenes)

Haloalkanes : Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions. **Stability of carbocations, R-S and d-l configuration**

Haloarenes : Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only) **stability of carbocations, R-S and d-l configurations**. Uses and environmental effects of – dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

Unit 11 : Alcohols, Phenols and Ethers

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses of 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 12 : Aldehydes, Ketones and Carboxylic Acids

Aldehydes and Ketones : Nomenclature, nature of carbonyl group, methods of preparation.

Physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses.

Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

Unit 13: Organic Compounds Containing Nitrogen

Nitro compounds-General methods of preparation and chemical reactions

Amines : Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

Cyanides and Isocyanides: Will be mentioned at relevant places in context.

Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Unit 14: Biomolecules

Carbohydrates: Classification (aldoses and ketoses), monosaccharides **d-l configuration** (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen), importance.

Proteins: Elementary idea of α -amino acids, peptide, linkage, polypeptides, proteins; structure of amines-primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins; enzymes.

Lipids and Hormones (elementary idea) excluding structure, their classification and functions.

Vitamins: Classification and functions.

Nucleic Acids: DNA and RNA

Unit 15: Polymers

Classification - natural and synthetic, methods of polymerization (addition and condensation), copolymerization. Some important polymers; natural and synthetic like polythene, nylon, polyesters, bakelite, and rubber.**Biodegradable and non biodegradable polymers.**

Unit 16: Chemistry in Everyday life :

1. **Chemicals in medicines:** analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines (**elementary idea of antioxidants**)
2. **Chemicals in food:** Preservatives, artificial sweetening agents.
3. **Cleansing agents:** Soaps and detergents, cleansing action.

Chemistry Practical Syllabus

Std. XII

A. Chemical Kinetics (Any one of the following) :

- (a) Effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.
- (b) Study of reaction rate of any one of the following:
 - (i) Reaction of iodide ion with hydrogen peroxide at room temperature using different concentration of iodide ions.
 - (ii) Reaction between potassium iodate, KIO_3 and sodium sulphite (Na_2SO_3) using starch solution as indicator (clock reaction).
- (c) Acid hydrolysis of ethyl acetate.

B. Thermochemistry

Any one of the following experiments:

- i] Enthalpy of dissolution of copper sulphate or potassium nitrate.
- ii] Enthalpy of neutralization of strong acid (HCl) and strong base (NaOH).
- iii] Determination of enthalpy change during interaction (hydrogen bond formation) between acetone and chloroform.
- iv] Heat of displacement of Cu from CuSO_4 by Zn.

C. Electrochemistry

Variation of cell potential in $\text{Zn}|\text{Zn}^{2+}||\text{Cu}^{2+}|\text{Cu}$ with change in concentration of electrolytes (CuSO_4 or ZnSO_4) at room temperature (demonstration).

D. Chromatography (demonstration)

- (i) Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R_f values.
- (ii) Separation of constituents present in an inorganic mixture containing two cations only (constituents having large difference in R_f values to be provided).

E. Preparation of Inorganic Compounds

- (i) Preparation of double salt of ferrous ammonium sulphate or potash alum.
- (ii) Preparation of potassium ferric oxalate.

F. Preparation of Organic Compounds

- (i) p-Nitroacetanilide
- (ii) Aniline yellow or 2-Naphthol aniline dye.
- (iii) Iodoform
- (iv) Phthalic or succinic anhydride.
- (v) Di-benzal acetone

G. Tests for the functional groups present in organic compounds

Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (primary) groups.

H. Characteristic tests of carbohydrates, fats and proteins in pure samples and their detection in given food stuffs.

I. Determination of concentration/molarity of KMnO₄ solution by titrating it against a standard solution of:

- (i) Oxalic acid
- (ii) Ferrous ammonium sulphate

(Students will be required to prepare standard solutions by weighing themselves).

J. Qualitative analysis

- 1) Determination of two cations from a given mixture of salts.
- 2) Determination of two anions from a given mixture of salts.

Cations – Pb²⁺, Cu²⁺, As³⁺, Al³⁺, Fe³⁺, Mn²⁺, Zn²⁺, Co²⁺, Ni²⁺, Ca²⁺, Sr²⁺, Ba²⁺, Mg²⁺, NH₄⁺,

Anions – CO_3^{2-} ,

SO_3^{2-} ,

SO_4^{2-} ,

NO_2^-

NO_3^- , Cl^- , Br^- , I^- , PO_4^{3-}

$\text{C}_2\text{O}_4^{2-}$

CH_3COO^-

(Note : Insoluble salts excluded.)

PROJECT

Scientific investigations involving laboratory testing and collecting information

From other sources.

A few suggested Projects:

1 Study of presence of oxalate ions in guava fruit at different stages of ripening.

2 Study of quantity of casein present in different samples of milk.

3 Preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.

4 Study of the effect of potassium bisulphate as food preservative under various conditions (temperature, concentration, time etc).

5 Study of digestion of starch by salivary amylase and, effect of pH and temperature on it.

6 Comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice, etc.

7 Extraction of essential oils present in Saunf (aniseed), Ajwain (carum), Illaichi (cardamom).

8 Study of common food adulterants in fat, butter, sugar, turmeric powder, chilli powder and pepper.

Note : Any investigatory project, can be chosen with the approval of the teacher.

BIOLOGY- Std. XI & XII

Preamble

Higher secondary is the most crucial stage of education because at this juncture specialized disciplines of science are introduced. The present syllabus reinforces the concepts introduced in lower classes. Recently, the science of biology has undergone a paradigm shift that has transformed it from a collection of loosely related facts into a modern applied science.

Living organisms exhibit extremely complex functional system. Organisms seldom occur as isolated individuals. They are organized into populations and biological communities. Organisms, communities, ecosystems and environment constitute unique set of natural resources of great importance.

Knowledge of biology helps us to understand a common thread which holds all these components together. Understanding of biology will help in the sustainable development of the environment and will also ensure the existence of earth with all its amazing diversity.

This syllabus is designed to prepare students for various examinations conducted at state and national level. Hence it has been prepared in accordance with the guidelines shown in the final version of common core syllabi of COBSE, Delhi. Accordingly some additional topics from state Board syllabus have been deleted whereas the lacking topics have been added. The entire unit “Ecology and Environment” has now been added under Botany and Zoology sections.

Objectives:

The prescribed syllabus is expected to:

- Promote the inherent skill of observation.
- Assist to understand the underlying principles of biological sciences and thereby develop scientific attitude towards biological phenomena.
- Help students to understand the functioning of organisms.
- Make students aware of issues of global importance.
- Guide students to perform easy experiments for better understanding of biological principles and to develop experimental skills required in practical work.
- Create awareness about the contribution of biology to human welfare.

Std. – XI: Biology
(Upgraded syllabus)
Section I - Botany

Unit 1 Diversity in Living World:

Chapter 1- Diversity in organisms

1. Diversity in living organisms-Brief idea.
2. Systematic and binomial system of nomenclature - meaning of the terms taxonomy, systematics, classification and nomenclature, Need of classification. **Three domains of life, Concept of species.** Taxonomic hierarchy with examples. Binomial nomenclature explanation, significance and examples.
3. Classification of living organisms (five Kingdom classification) – Major groups and principles of classification for each Kingdom with examples.
4. Lichens - Meaning, characters, examples and importance.
5. Viruses and viroids - Definitions, characters, types with examples, Economic importance and list of viral diseases.

Chapter 2 - Kingdom Plantae

1. Salient features of major plant groups - Algae, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms (Dicotyledons and Monocotyledons). Three to five salient features and two examples of each category.
2. Botanical gardens and herbaria - Meaning, importance and list of gardens and herbaria in India.

Unit 2 Structure and function of cell

Chapter 3 - Biochemistry of cell:

1. Basic chemical constituents of living bodies.
2. Structure and function of carbohydrates, proteins, lipids and nucleic acids in brief.
3. Enzymes - Definition, **Types**, general properties, **Enzyme action** and factors affecting enzyme activity in brief.

Chapter 4 Cell Division

1. Cell cycle
2. Mitosis
3. Meiosis

Unit 3 Structural organization in plants:

Chapter 5 - Morphology of Plants

1. Morphology, anatomy and functions of different parts - Roots, stem, leaf, inflorescence, flower, fruit and seed. **(To be dealt along with the relevant practicals of the practical syllabus)**
2. Plant tissues.

Unit 4 Plant Physiology:

Chapter 6 - Plant Water Relation and Mineral Nutrition

1. Movement of water, food, nutrients and gases.- Absorption of water and minerals, **Apoplast and Symplast Pathways**. Active and passive absorption in brief.

2. Guttation

Ascent of sap, **root pressure concept** and cohesion - tension theory.

Translocation of sugars **through phloem** brief account.

Transpiration – structure of stomata, mechanism **of opening and closing of stomata, Role of K⁺ ions**

3. Role of water and minerals - macronutrients and micronutrients and their role. **Mineral deficiency symptoms, Mineral toxicity, Elementary idea of Hydroponics, Nitrogen Metabolism (nitrogen cycle, biological nitrogen fixation)**

Chapter 7 - Plant Growth and Development:

Seed dormancy.

Germination - Hypogeal, epigeal and viviparous.

Definition and characteristics of growth.

Phases of growth, **Conditions of growth, Differentiation, de- differentiation, redifferentiation**

Sequence of developmental process in a plant cell

Growth regulators - auxins, gibberellins, cytokinines, ethylene and abscissic acid (role in brief)

Photoperiodism, **Photomorphogenesis including brief account of Phytochromes (Elementary idea)**

Vernalization.

Std. - XI
Section II – Zoology

Unit 1 Diversity in Living World:

Chapter 8 - Kingdom Animalia:

1. Salient features of major phyla under kingdom Animalia. Classification of following phyla with three to five salient features and two examples of each category: Porifera, Coelenterata, Platyhelminthes, Nematelminthes, Annelida, Arthropoda, Mollusca, Echinodermata and Hemichordata.

Classification of phylum chordata upto class level with three to five salient features and two examples of each category: Urochordata, Cephalochordata, Cyclostomata, Chondrichthyes, Osteichthyes, Amphibia, Reptilia, Aves and Mammalia.

2. Zoological parks and Museums - General idea with list.

Unit 2 Structure and function of cell:

Chapter 9 - Organization of Cell:

1. Cell theory - brief account
2. Prokaryotic and eukaryotic cell - structure and examples.
3. Plant cell and animal cell.
4. Nuclear organization - Nucleus, nucleolus and nucleoplasm.
5. Cell wall and cell membrane - (fluid mosaic model).
6. Cell organelles: Plastids, Mitochondria, Golgi complex, Lysosomes, Endoplasmic reticulum, Vacuoles, Ribosome and Centrioles (**ultrstructure and functions**).

Microbodies, cytoskeleton, cilia and flagella.

Unit 3 Structural organisation in Animals:

Chapter 10- Study of Animal Tissues

1. Animal tissues - types: a) Epithelial tissues - simple epithelium (squamous, cuboidal, columnar, Ciliated, glandular). - compound epithelium (stratified and transitional).
b) Connective tissue - (Areolar, Adipose, Tendons, Ligaments, Cartilage and Bone).

- c) Muscular tissue - (Smooth, striated and cardiac).
- d) Nervous tissue (Neurons, glial cells and types of neurons).

Chapter 11- Study of Animal Type:

- 1. Morphology, anatomy and functions of digestive, **circulatory, respiratory, nervous, and reproductive** systems of cockroach (**Brief account only**)

Unit 4 Human Physiology:

Chapter 12- Human Nutrition:

- 1. Digestion, absorption and nutritional disorders:
 - ii) Digestive system in brief
 - iv) Physiology of digestion, **gastrointestinal hormones, Peristalsis. Calorific value of proteins, carbohydrates and fats**
 - v) Absorption, assimilation **and egestion**
 - vi) Nutritional and digestive disorders – PEM, indigestion, constipation, Jaundice, **vomiting and diarrhoea**

Chapter 13- Human Respiration:

1 Breathing, respiration and common respiratory disorders:

Respiratory organs in animals (Recall only)

- i) Respiratory system in brief
- ii) Breathing- inspiration and expiration, **Regulation**
- iii) Exchange of gases, transport of CO₂ and O₂ and tissue respiration.

Regulation of Respiration, Respiratory volumes

- iv) Respiratory disorders- Asthma, **Emphysema** and occupational lung diseases.

Chapter 14- Human skeleton and Locomotion:

Brief account of human skeleton:

A] Axial Skeleton

B] Appendicular Skeleton

(Details to be dealt with the relevant practical)

Types of joints - synarthroses, amphiarthroses, and diarthroses.

Types of diarthroses - ball and socket, hinge, condyloid, pivot, saddle and gliding joints.

Types of Movement- Ciliary, Flagellar, Muscular

Mechanism of muscle movement: **Contractile proteins and Muscle contraction** Skeletal and muscular disorders – **Myasthenia gravis**, Osteoporosis, arthritis, muscular dystrophy tetany and **gout**.

Std. XI Biology Practicals Syllabus

(A) List of experiments:

1. Study of parts of compound microscope.
2. **Preparation of T. S. of dicot (sunflower) and monocot roots and stem** to study different plant tissues.
- 3 **Study and describe three locally available flowering plants from the families-Solanaceae, Fabaceae and Liliaceae with respect to types of root-(tap and adventitious), stem (herbaceous and woody), leaf (arrangement, shape, venation, simple and compound) and floral characters.**
4. Study of plasmolysis in epidermal peels.
- 5 **Study of osmosis by Potato osmometer**
6. Study of structure and distribution of stomata in upper and lower surface of leaf.
7. To test the presence of sugar, starch, proteins and fats from suitable plant and animal materials.
- 8) To study the digestion of starch by salivary amylase under different conditions of temperature and pH.

(B) Study/ Observation of the following (Spotting):

1. Study of specimens and identification with reasons:

Bacteria, Amoeba, Oscillatoria, Spirogyra, Rhizopus, yeast, Agaricus, Usnea, Riccia, Funaria, Nephrolepis, Cycas, sunflower and maize.

2. Comparative study of rates of transpiration in upper and lower surface of leaf.

3. Study of different modifications of root (fusiform root, parasitic root, epiphytic root and pneumatophores).

4. Study of different modifications of stem (stem tuber, runner, and tendril).

5. Study of different modification of leaf (leaflet and stipular tendril), leaf Spines, phyllode).

6. Study of imbibition of seeds/raisins.

7 Study and identification of different types of inflorescence.

8 Study of tissues and diversity in shapes and sizes of plant and animal cells- palisade cells, guard cells, parenchyma, collenchyma, sclerenchyma, xylem, phloem, squamous epithelium, muscle fibres, mammalian blood smear, through temporary or permanent slides.

9. Observation and comments on experimental set up on:

a) Phototropism

b) Suction due to transpiration.

c) Apical bud removal

10. Study of specimens and their identification with reasons – *Sycon, Hydra, Liverfluke, Ascaris, Leech, Earthworm, Prawn, Silkworm Honey bee , Snail, Star-fish, Balanoglossus, Shark, Rohu, Frog, Lizard, Pigeon and Rat.*

11. Study of human skeleton (except skull, hand bones and foot bones) and **different types of joints (synovial, cartilaginous and fibrous joint with one suitable example).**

12 Study of external morphology of earthworm, cockroach and frog through models.

13. Study of mitosis in onion roots tips and animal cells (**grasshopper**) from permanent slides.

Std. - XII Biology
(Upgraded syllabus)
Section I – BOTANY

Unit 1: Genetics and Evolution

Chapter 1 - Genetic Basis of Inheritance:

Mendelian inheritance. Deviations from Mendelian ratio (gene interaction- incomplete dominance, co-dominance, multiple alleles **and Inheritance of blood groups**), **Pleiotropy, Elementary idea of polygenic inheritance.**

Chapter 2 - Gene: its nature, expression and regulation:

Modern concept of gene in brief-cistron, muton and recon. **DNA as genetic material**, structure of DNA as given by Watson and Cricks model, **DNA Packaging**, semi conservative replication of eukaryotic DNA.

RNA: General structure types and functions.

Protein Synthesis; central dogma, Transcription; Translation-Genetic Code,

Gene Expression and Gene Regulation (The *Lac* operon as a typical model of gene regulation).

Unit 2: Biotechnology and its application

Chapter 3 - Biotechnology: Process and Application

Genetic engineering (Recombinant DNA technology):

Transposons, Plasmids, Bacteriophages; Producing Restriction Fragments,

Preparing and cloning a DNA Library, Gene Amplification (PCR).

Application of Biotechnology in Agriculture – BT crops

Biosafety Issues (Biopiracy and patents)

Unit 3: Biology and Human Welfare

Chapter 4 - Enhancement in Food Production:

Plant Breeding -

Tissue Culture: Concept of Cellular Totipotency,

Requirements of Tissue Culture (in brief), Callus Culture, Suspension Culture.

Single Cell Protein. **Biofortification**

Chapter 5 - Microbes in Human Welfare:

Microbes in Household food processing

Microbes in Industrial Production.

Microbes in Sewage Treatment.

Microbes in Biogas (energy) Production.

Microbes as Biocontrol Agents.

Microbes as Biofertilizers.

Unit 4: Plant Physiology

Chapter 6 - Photosynthesis:

Autotrophic nutrition

Site of Photosynthesis

Photosynthetic Pigments and their role.

Light-Dependent Reactions (Cyclic and non-cyclic photophosphorylation)

Light-Independent Reactions (C3 and C4 Pathways)

Chemiosmotic hypothesis, Photorespiration, Factors affecting Photosynthesis. Law of limiting factors.

Chapter 7 - Respiration:

ATP as currency of Energy

Mechanism of Aerobic (Glycolysis, **TCA Cycle and Electron Transport System**) and Anaerobic Respiration. **Fermentation**

Exchange of gases

Amphibolic pathway. Respiratory quotient of Nutrients.

Significance of Respiration.

Unit 5: Reproduction in Organisms

Chapter 8 - Reproduction in Plants:

Modes of Reproduction (Asexual and Sexual).

Asexual reproduction; uniparental modes-vegetative propagation, micropropagation

Sexual Reproduction: **structure of flower** Development of male gametophyte,

Structure of anatropous ovule.

Development of female Gametophyte.

Pollination: Types and Agencies.

Outbreeding devices; pollen-pistil interaction.

Double Fertilization: Process and Significance.

Post-fertilization changes (development of endosperm and embryo, development of seed and formation of fruit)

Special modes-apomixis, parthenocarpy, polyembryony. Significance of seed and fruit formation.

Unit 6: Ecology and Environment:

Chapter 9: Organisms and Environment -I

Habitat and Niche

Ecosystems: Patterns, components, productivity and decomposition, energy flow; pyramids of number, biomass, energy; nutrient cycling (carbon and phosphorous).

Ecological succession, Ecological services-carbon fixation, pollination, oxygen release.

Environmental issues: agrochemicals and their effects, solid waste management, Green house effect and global warming, ozone depletion, deforestation, case studies (any two).

Std. - XII Biology **Section II - ZOOLOGY**

Unit 1: Genetics and Evolution

Chapter 10 - Origin and the Evolution of Life:

Origin of Life: Early Earth, Spontaneous, assembly of organic compounds,

Evolution: Darwin's contribution, Modern Synthetic Theory of evolution, Biological Evidences,

Mechanism of evolution; Gene flow and genetic drift; Hardy-Weinberg principle; Adaptive radiation. Origin and Evolution of Human being.

Chapter 11 - Chromosomal Basis of Inheritance:

The Chromosomal Theory.

Chromosomes.

Linkage and Crossing Over.

Sex-linked Inheritance (Haemophilia and colour blindness).

Sex Determination in Human being, **birds, honey bee.** **Mendelian disorders in humans-
Thalassemia. Chromosomal disorders in human: Down's syndrome, Turner's syndrome and
Klinefelter's syndrome.**

Unit 2: Biotechnology and its application

Chapter 12- Genetic Engineering and Genomics:

DNA Finger Printing.

Genomics and Human Genome Project.

Biotechnological Applications in Health:

Human insulin and vaccine production, Gene Therapy. **Transgenic animals.**

Unit 3: Biology and Human Welfare

Chapter 13- Human Health and Diseases:

Concepts of Immunology: Immunity Types, **Vaccines,**

Structure of Antibody, Antigen-Antibody

Complex, Antigens on blood cells.

Pathogens and Parasites (Amoebiasis, Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, Common cold and ring worm).

Adolescence, drug and alcohol abuse.

Cancer and AIDS.

Chapter 14- Animal Husbandry:

Management of Farms and Farm Animals.

Dairy.

Poultry.

Animal Breeding.

Bee-Keeping.

Fisheries.

Sericulture

Lac culture

Unit 4: Human Physiology

Chapter 15- Circulation:

Blood composition and coagulation, **Blood groups**

Structure and pumping action of Heart.

Blood Vessels.

Pulmonary and Systemic Circulation.

Heart beat and Pulse. Rhythmicity of Heart beat. **Cardiac output, Regulation of cardiac activity.**

Blood related disorders: Hypertension, coronary artery disease, angina pectoris, and heart failure.

ECG, Lymphatic System (Brief idea): **Composition of lymph and its functions.**

Chapter 16- Excretion and osmoregulation:

Modes of excretion-Ammonotelism, ureotelism, uricotelism.

Excretory System

Composition and formation of urine.

Role of Kidney in Osmoregulation. **Regulation of kidney function: renin-angiotensin, atrial natriuretic factor, ADH and Diabetes insipidus, role of other organs in excretion.**

Disorders; Kidney failure, Dialysis, Kidney stone (renal calculi). Transplantation. **Uraemia, nephritis.**

Chapter 17- Control and Co-ordination:

Nervous System:

Structure and functions of brain and

Spinal cord, brief idea about PNS and ANS.

Transmission of nerve impulse.

Reflex action.

Sensory receptors (eye and ear), **Sensory perception, general idea of other sense organs**

Endocrine System:

Endocrine glands.

Hormones and their functions. **Mechanism of hormone action**

Hormones as messengers and regulators.

Hormonal imbalance and diseases: **Common disorders (Dwarfism, Acromegaly, cretinism, goiter, exophthalmic goiter, Diabetes mellitus, Addison's disease)**

Unit 5: Reproduction in Organisms

Chapter 18- Human Reproduction:

Reproductive system in male and female.

Histology of testis and ovary.

Reproductive cycle.

Production of gametes, fertilization, implantation.

Embryo development up to three germinal layers.

Pregnancy, placenta, parturition and **lactation** (Elementary idea).

Reproductive health-birth control,

Contraception and sexually transmitted diseases. **MTP, Amniocentesis; Infertility and assisted reproductive technologies- IVF, ZIFT, GIFT** (elementary idea for general awareness).

Unit 6: Ecology and Environment

Chapter 19-Organisms and Environment-II

Population and ecological adaptations: population interactions-mutualism, competition, predation, parasitism, population attributes- growth, birth rate and death rate, age distribution.

Biodiversity and its conservation- Biodiversity- concept, patterns, importance, loss, Threats to and need for biodiversity conservation , Hotspots, endangered organisms,extinction,red data book , biosphere reserves, national parks and sanctuaries. Environmental issues: air pollution and its control, water pollution and its control and radioactive waste management. (Case studies any two)

Std. XII
(Upgraded)
Biology Practicals Syllabus

Experiments:

1. Dissect the given flower and display different whorls. Dissect anther and ovary to show number of chambers.
2. Study pollen germination on a slide.
3. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity of soil. Correlate with the kinds of plants found in them.
4. Study of plant population density and **frequency** by quadrat method.
5. **Prepare a temporary mount of onion root tip to study mitosis.**
6. Separation of plant pigments by paper chromatography
- 7 **To study the rate of respiration in flower buds/leaf tissue and germinating seeds.**
8. Study the presence of suspended particulate matter in air at the two widely different Sites.
9. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms..
10. To test the presence of urea and sugar in urine.
- 11 To test the presence of albumin and bile salts in urine.

Study/observation of the following (Spotting):

- 1 Study of flowers adapted to pollination by different agencies (wind, insect)
- 2 Study of pollen germination on stigma through a permanent slide.
- 3 To Study Mendelian inheritance using seeds of different colour/size of any plant.
- 4 Exercise on controlled pollination - Emasculation, tagging and bagging
- 5 Study meiosis in onion bud cell or grass hopper testis through permanent slide.
- 6 **Study plants found in xerophytic and aquatic conditions with respect to their morphological adaptations.(Two plants each)**

7 Study and identify stages of gamete development, T.S. of testis and T.S. ovary through permanent slides (from any mammal).

8. Study of V.S. of blastula through permanent slide.

9 To study prepared pedigree charts of genetic traits such as rolling of tongue, Blood groups, widow's peak, colour blindness.

10 To identify common disease causing organisms like *Plasmodium*, *Entamoeba*, *Ascaris* and ring worm through permanent slides or specimens. Comment on symptoms of diseases that they cause.

11 Study of animals found in xeric (desert) and aquatic conditions with respect to their morphological adaptations. (Two animals each)

Upgraded Syllabus
MATHEMATICS AND STATISTICS
(For Arts and Science)
Std. XI & XII

Introduction:

Mathematics is the language of all sciences and is perhaps the only subject which merits this distinction. Mathematics is the backbone of all sciences and it is an inseparable part of human life.

Higher Secondary is a launching stage from where students would go to either for academic education in Mathematics or professional courses like Engineering and Computer Technology, Physical and Biological Sciences. Hence to fulfill the needs of students, it is utmost important to make the study of Mathematics more meaningful by acquainting the student with many branches of mathematics. This will help them in developing Mathematical tools to be used in the professional education. Motivating topics from real life situations and other subject areas, major thrust is also on application of various concepts.

The proposed syllabus has been designed in accordance with National Curriculum Framework 2005 and as per guidelines given in Focus Group on Teaching of Mathematics 2005 which is to meet the emerging needs of all categories of students.

Objectives:

To enable the students -

- 1) To acquire knowledge and critical understanding, particularly by way of motivation and visualization of basic concepts, terms, principles, symbols and mastering the underlying processes and skills.
- 2) To apply the knowledge and skills in Mathematics and related problems from other subjects, by more than one method.
- 3) To develop positive attitude to think, analyze and articulate logically.
- 4) To develop interest in Mathematics by participating in various related competitions and self-learning.
- 5) To acquaint students with different aspects of Mathematics used in real life.
- 6) To develop an interest in students to study Mathematics as a discipline.
- 7) To develop awareness of the need for national integration, protection of an environment, removal of social barriers, elimination of sex biases and observance of small family norm.

8) To develop reverence and respect towards great mathematicians for their contribution to the field of Mathematics.

9) To develop interest in the subject by participating in related competitions.

MATHEMATICS AND STATISTICS

(ARTS AND SCIENCE)

STD. XI - PART – I

1. **Measurement of Angles** : Need & concept, Revision of directed angle (+ve and –ve angles), zero angle, straight angle, angles in standard position, coterminal angles, angles in quadrant & quadrantal angles. Sexagesimal system, circular system, relation between degree measure and radian measure. **Theorem:** Radian is a constant angle. Length of an arc of a circle ($s = r \cdot \theta$, θ is in radians) (without proof). Area of the sector of a circle $A = \frac{1}{2} r^2 \cdot \theta$, θ is in radians (without proof).

2. **Trigonometric functions:** Need & concept, Trigonometric functions with the help of standard unit circle, signs of trigonometric functions in different quadrants, trigonometric functions of particular angles (0° , 30° , 45° , 60° , 90° , 180° , 270° , 360°), domain and range of trigonometric functions, periodicity of functions, fundamental identities, graphs of trigonometric functions, Graph of $Y = a \sin bx$, $y = a \cos bx$, trigonometric functions of negative angles.

3. **Trigonometric functions of compound angles** : Introduction, trigonometric functions of sum and difference, trigonometric functions of multiple angles (upto double and triple angles only), trigonometric functions of half angles.

4. **Factorization Formulae:** Introduction, Formulae for conversion of sum or difference into products, formulae for conversion of product into sum or difference, trigonometric functions of angles of a triangle.

5. **Locus** : Introduction, Definition and equation of locus, points of locus, shift of the origin.

6. **Straight Line** : Revision. Inclination of a line, slope of a line, equation of lines, parallel to coordinate axes, intercepts of a line, revision of different forms of equations of a line, slope point form, slope intercept form, two point form, double intercept form other forms of equations of a line, parametric form, normal form, general form, Theorem : A general linear equation $Ax + By + C = 0$, provided A and B are not both zero, simultaneously, always represents, straight line. Theorem 2 : Every straight line has an equation of the form $Ax + By + C = 0$, where A, B and C are constants (without proof), Reduction of general equation of a line into normal form,

intersection of two lines, parallel lines, perpendicular lines, identical lines, condition for concurrency of three lines, angle between lines, distance of a point from a line, distance between two parallel lines, equations of bisectors of angle between two lines, family of lines, equation of a straight line parallel to a given line, equation of a straight line perpendicular to a given line, equation of family of lines through the intersection of two lines.

7. Circle and Conics : Revision, standard equation, centre-radius form, diameter form, general equation, parameter equations of standard equation, Conics Napees – Intersection of Napees of a cone and Plane, introduction, focus-directrix property of parabola, ellipse, hyperbola, parabola, standard equation (different forms of parabola), parametric equations, ellipse, standard equation, hyperbola, standard equation, parametric equations. Application of conic section.

8. Vectors : Definition, magnitude of a vector, free and localized vectors, types of vectors, zero vector, unit vector, equal vector, negative of a vector, collinear vectors, coplanar vectors, coinitial vector, like and unlike vector, scalar multiple of a vector, triangle law, parallelogram law, polygon law, properties of addition of vectors, three dimensional co-ordinate geometry, co-ordinate axes & coordinate planes in space, co-ordinates of a point in space, distance between two points in a space, unit vectors along axes, position vector of a point in space, product of vectors, scalar product, definition, properties, vector product, definition, properties, simple application, workdone by force, resolved part of a force, moment of a force.

9. Linear Inequations : Linear in equations in one variable – solution of linear inequation in one variable & graphical solution, solutions of system of linear in equations in one variable, Linear in equations in two variable – solution of linear inequation in one variable & graphical solution, solution of linear in equations in two variable & graphical solution, solutions of system of linear inequations in two variables, Replacement of a set or domain of a set, Transposition.

10. Determinants : Revision, determinant of order three–definition, expansion, properties of determinants, minors & co-factors, applications of determinants condition of consistency, area of a triangle, Cramer’s rule for system of equations in three variables.

11. Matrices : Introduction, concepts, notations, order, types of matrices – zero matrix, row matrix, column matrix, square matrix, determinant of a square matrix, diagonal matrix, scalar matrix, identity matrix, triangular matrices, singular & non-singular matrices, transpose of a matrix, symmetric & skew symmetric matrices, operations on matrices – equality, addition, subtraction, multiplication of a matrix by a scalar, simple properties, multiplication of matrices – definition, properties of matrix multiplication, properties of transpose of a matrix -
 $(A')' = A$, $(KA)' = KA'$, $(AB)' = B'A'$.

PART – II

1. Sets, Relations and Functions : Set – Revision, subset, proper, improper, subset and their properties, union, intersection, disjoint sets, empty set, finite & infinite sets, equal sets, equivalent sets, universal set, Venn diagrams, complement of a set, difference of two sets, power set, Relations – ordered pairs, equality of ordered pairs, Cartesian product of two sets, No. of elements in the Cartesian product of two finite sets, Cartesian product of the reals with itself, definition of relation, pictorial diagrams, domain, codomain and range of a relation, types of relations, one-one, many-one, binary equivalence relation, functions – function as a special kind of relation, pictorial representation of a function, domain, codomain and range of a function, equal functions, types of functions, constant function, identity function, one-one function, onto function, into function, even & odd functions, polynomial function, rational function, modulus function, signum & greatest integer, exponential function, logarithmic function, functions with their graphs, sum, difference, product quotient of functions, scalar multiplication, composite function, inverse function, binary operations, real valued function of the real variable, domain and range of these functions.

2. Logarithms : Introduction, definition, properties, laws of logarithms, change of base, characteristics & mantissa – method of finding characteristics, method of finding mantissa, method of finding antilogarithm.

3. Complex Numbers : Introduction, need for complex numbers, definitions –(real parts, imaginary parts, complex conjugates, modulus, argument), algebra of complex numbers – equality, addition, subtraction, multiplication, division, powers and square root of a complex number – higher powers of i , Demoivre's formula – (without proof), square root of a complex number, properties of complex numbers – properties of addition of complex numbers, 1) Closure Property, 2) Commulative Law, 3) Associative law, 4) Existence of additive identity, 5) Existence of additive inverse. Properties of product of complex numbers – Existence of multiplicative identity – Existence of multiplicative inverse properties of conjugate & modulus of complex numbers, Argand Diagram – representation of a complex number as a pt. in plane, geometrical meaning of modulus and argument, polar representation of complex numbers, fundamental theorem of algebra, cube roots of unity – solution of quadratic equations in the complex number system, cube roots of unity.

4. Sequences & Series : Revision sequence, A.P., Sum of first n terms of A.P. properties of A. P. geometric progression – introduction, general term, sum of the first ‘n’ terms, n terms from the end of G.P. containing finitely many terms & sum to infinite terms properties of G.P., H.P. as a special type of A.P, Means – arithmetic mean, geometric means, harmonic mean, relation between A.M., G.M., H.M., Arithmetic-Geometric sequence, special series, sum of cube of first n natural, sum of cube of first n odd natural nos., exponential & logarithmic series.

5. Permutations & combinations : Introduction, fundamental principle of counting, factorial notation, permutations, when all r objects are distinct, when all r objects are not distinct, circular permutations, simple applications, combinations – definition, properties, relations between permutations and combinations, simple applications.

6. Mathematical Induction and Binomial Theorem : Principle of mathematical induction, simple applications, binomial theorem – binomial theorem for positive integers, general term, particular term, properties of binomial co-efficient with simple application, binomial theorem for any index (without proof), particular cases of binomial theorem, simple applications.

7. Limits : Introduction of concept, meaning of $x \rightarrow a$, the limit of a function, fundamental theorem on limits, algebra of limits – standard limits, with proof, limits at infinity – concepts, simple problems.

8. Differentiation : Definition of a derivative, derivative at a point, geometrical significance of derivative, physical significance (velocity as a rate of change of displacement), derivatives from first principle of trigonometric functions, logarithmic functions, algebraic functions, exponential functions, rules of differentiation – derivative of sum, difference, product and quotient.

9. Integration: Definition (of integration) as antiderivative, geometrical interpretation of indefinite integrals, algebra of integrals – integrals of some standard functions, rules of integration.

10. Statistics : Measures of dispersion – range, quartile & quartile deviation (for grouped and ungrouped data), comparison of two frequency distributions with same mean, mean deviation about mean, mean deviation about median (for grouped & ungrouped data), variance, standard deviation, effect of change of origin and scale on variance and standard deviation, combined variance and standard deviation, co-efficient of variation.

11. Probability: Revision, types of events – events and algebra of events, axiomatic definition of probability, mutually exclusive and exhaustive events, mutually exclusive events, addition theorem – for any two events A and B, Result on compatible events. Conditional probability – definition, multiplication theorem, independent events, Baye’s theorem, odds in favour and against.

List of Practicals: XI

1. Problems on locus.
 2. Family of lines.
 3. Applications of Conics I.
 4. Applications of Conics II.
 5. Applications of vectors (Dot and cross product).
 6. Linear inequation.
 7. Applications of determinants.
 8. Algebra of matrices.
 9. Tracing of graphs of functions.
 10. Numerical problems using laws of logarithms.
 11. Power and square root of a complex number, cube root of unity.
 12. Examples on special series.
 13. Permutations and combinations.
 14. Mathematical induction.
 15. Binomial theorem.
 16. Limits.
 17. Differentiation.
 18. Integration.
 19. Measures of dispersion.
 20. Probability.
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MATHEMATICS AND STATISTICS

STD. XII

PART – I

1. Mathematical Logic : Statements - Introduction, sentences and statement, truth value of statement, open sentences and truth sets, compound statement, quantifier and quantified statements, logical connective-conjunction, disjunction, negation, implication/ conditional, biconditional, there exists, truth tables of compound statements, examples related to real life and mathematics, statement patterns and logical equivalence-tautology, contradiction, contingency, logical equivalence, logical equivalence, duality, negation of compound statement, contrapositive, converse, inverse, algebra of statements-idempotent law, associative law, commutative law, distributive law, identity law, complement law, involution law, demorgan's laws, difference between converse, contrapositive, contradiction, application-introduction to switching circuits (simple examples).

2. Matrices : Elementary transformation of a matrix-revision of cofactor and minor, elementary row transformation, elementary column transformation, inverse of a matrix-existence and uniqueness of inverse of a matrix, inverse by elementary transformation, adjoint method, application-solution of system of linear equations by – reduction method, inversion method.

3. Trigonometric functions : Trigonometric equations-general solution of trigonometric equation of the type, solution of Trigonometric equations, $\sin\theta = 0$, $\cos\theta = 0$, $\tan\theta = 0$, $\sin\theta = \sin \alpha$, $\cos\theta = \cos \alpha$, $\tan\theta = \tan \alpha$, $\sin^2\theta = \sin^2 \alpha$, $\cos^2\theta = \cos^2 \alpha$, $\tan^2\theta = \tan^2 \alpha$, $a \cos \theta + b \sin \theta = c$ solution of a triangle-polar coordinates, sine rule, cosine rule, projection rule, area of a triangle, application, Hero's formula, Napier Analogues, inverse trigonometric functions-definitions, domain, range, principle values, graphs of inverse trigonometric function, properties of inverse functions.

4. Pair of straight lines : Pair of lines passing through origin-combined equation, homogenous equation, theorem-the joint equation of a pair of lines passing through origin and its converse, angle between the lines represented by $ax^2+2hxy+by^2=0$, condition for parallel lines, condition for perpendicular lines, pair of lines not passing through origin-combined equation of any two lines, condition that the equation $ax^2+2hxy+by^2+2gx+2fy+c=0$ should represent a pair of lines (without proof), acute angle between the lines (without proof), condition of parallel and perpendicular lines, point of intersection of two lines.

5. Circle : Tangent of a circle-equation of a tangent at a point to 1) standard circle,2) general circle, condition of tangency only for line $y = mx + c$ to the circle $x^2 + y^2 = a^2$, tangents to a circle from a point outside the circle, director circle, length of tangent segments, normal to a circle-equation of normal at a point.

6. Conics : Tangents and normals-equations of tangent and normal at a point for parabola, ellipse, hyperbola, condition of tangency for parabola, ellipse, hyperbola, tangents in terms of slope for parabola, ellipse, hyperbola, tangents from a point outside conics, locus of points from which two tangents are mutually perpendicular, properties of tangents and normals to conics (without proof).

7. Vectors : Revision, Collinearity and coplanarity of vectors-linear combination of vectors, condition of collinearity of two vectors, conditions of coplanarity of three vectors, section formula-section formula for internal and external division, midpoint formula, centroid formula, scalar triple product-definition, formula, properties, geometrical interpretation of scalar triple product, application of vectors to geometry-medians of a triangle are concurrent, altitudes of a triangle are concurrent, angle bisectors of triangle are concurrent, diagonals of a parallelogram bisect each other and converse, median of trapezium is parallel to the parallel sides and its length is half the sum of parallel sides, angle subtended on a semicircle is right angle.

8. Three dimensional geometry : Direction cosines and direction ratios-direction angles, direction cosines, direction ratios, relation between direction ratio and direction cosines, angle between two lines, condition of perpendicular lines.

9. Line : Equation of line passing through given point and parallel to given vector, equation of line passing through two given points, dist. of a point from a line, distance between two skew lines, distance between two parallel lines (vector approach).

10. Plane : Equation of plane in normal form, equation of plane passing through the given point and perpendicular to given vector, equation of plane passing through the given point and parallel to two given vectors, equation of plane passing through three non-collinear points, equation of plane passing through the intersection of two given planes, angle between two planes, angle between line and plane, condition for the coplanarity of two lines, distance of a point from a plane (vector approach).

11. Linear programming problems: Introduction of L.P.P. definition of constraints, objective function, optimization, constraint equations, non-negativity restrictions, feasible and infeasible

region, feasible solutions, Mathematical formulation-mathematical formulation of L.P.P. different types of L.P.P. problems, graphical solutions for problem in two variables, optimum feasible solution.

STD. XII - PART – II

1. Continuity : Continuity of a function at a point-left hand limit, right hand limit, definition of a continuity of a function at a point, discontinuity of a function, types of discontinuity, algebra of continuous functions, continuity in interval-definition, continuity of some standard functions-polynomial, rational, trigonometric, exponential and logarithmic function.

2. Differentiation : Revision- revision of derivative, relationship between continuity and differentiability-left hand derivative and right hand derivative (need and concept), every differentiable function is continuous but converse is not true, Derivative of composite function-chain rule, derivative of inverse function derivative of inverse trigonometric function, Derivative of implicit function definition and examples, derivative of parametric function – definition of parametric function , exponential and logarithmic function-derivative of functions which are expressed in one of the following form a) product of functions, b) quotient of functions, c) higher order derivative-second order derivative d) $[f(x)]^{(g(x))}$

3. Application of derivative : Geometrical application-tangent and normal at a point, Rolle's theorem, and Mean value theorem and their geometrical interpretation (without proof), derivative as rate measure-introduction, increasing and decreasing function, approximation (without proof), Maxima and minima-introduction of extreme and extreme values, maxima and minima in a closed interval, first derivative test, second derivative test.

4. Integration : Indefinite integrals-methods of integration, substitution method, integrals of the type, integration by parts-integration by parts, integrals of type (reduction formulae are not expected), integration by partial fraction-factors involving repeated and non-repeated linear factors, non-repeated quadratic factors, definite integral-definite integral as a limit of sum, fundamental theorem of integral calculus (without proof), evaluation of definite integral 1) by substitution, 2) integration by parts, properties of definite integrals properties of definite integrals.

5. Applications of definite integral: Area under the curve - area bounded by curve and axis (simple problems), area bounded by two curves, volume of solid of revolution-volume of solid obtained by revolving the area under the curve about the axis (simple problems).

6. Differential equation : Definition-differential equation, order, degree, general solution, particular solution of differential equation, formation of differential equation-formation of differential equation by eliminating arbitrary constants (at most two constants), solution of first order and first degree differential equation-variable separable method, homogenous differential equation (equation reducible to homogenous form are not expected), Linear differential equation, applications-population growth, bacterial colony growth, surface area, Newton's laws of cooling, radioactive decay.

7. Statistics: Bivariate frequency distribution - bivariate data, tabulation of bivariate data, scatter diagram, covariance of or ungrouped data, covariance for bivariate frequency distribution, Karl Pearson's co-efficient of correlation.

8. Probability distribution : Probability distribution of a random variable-definition of a random variable, discrete and continuous random variable, probability mass function (p.m.f.), probability distribution of a discrete random variable, cumulative probability distribution of a discrete random variable, expected value, variance and standard deviation of a discrete random variable, probability density function (p.d.f.), distribution function of a continuous random variable.

9. Bernoulli trials and Binomial distribution : Definition of Bernoulli trial, conditions for Binomial distribution, binomial distribution (p.m.f.), mean, variance and standard deviation, calculation of probabilities (without proof), Normal distribution - p.d.f. mean, variance and standard deviation, standard normal variable, simple problems (without proof).

List of Practicals : XII

1. Applications of logic.
2. Inverse of a matrix by adjoint method and hence solution of system of linear equations.
3. Inverse of a matrix by elementary transformation and hence solution of system of linear equation.
4. Solutions of a triangle.

5. Tracing of tangents and normals for circles and parabola.
 6. Tracing of tangents and normals for ellipse and hyperbola.
 7. Applications of scalar triple product of vectors.
 8. Three dimensional geometry - line.
 9. Three dimensional geometry - plane.
 10. Formations and solutions of LPP.
 11. Applications of derivatives (Geometric applications).
 12. Applications of derivatives – Rate, measure.
 13. Applications of derivatives - Maxima and minima
 14. Applications of definite integrals - Limit of sum.
 15. Applications of definite integrals - Area.
 16. Applications of definite integrals - volume.
 17. Applications of differential equations.
 18. Bivariate frequency distribution.
 19. Expected value, variance and S.D of random variable.
 20. Binomial distribution.
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