

**Time: 2:30 hrs**

- Q 1. All Questions are Compulsory.  
 Q 2. Q 1. will consists of seven parts and each part will carry one Mark.  
 Q 3. Q 2. to Q 12 each will be of 3 Marks.  
 Q 4. Q 13 to Q 15 i.e. three questions each will be of 5 marks.  
 Q 5. There will be no overall choice. There will be an internal choice in any three questions of 3 marks each and two questions of 5 marks each (Total of 5 internal choices).  
 Q 6. Use of Calculator is not allowed.

Sr. No	Topic	Q. Carrying 1-Marks	Q. Carrying 3-Marks	Q. Carrying 5-Marks	Total Marks
1.	Sets	1	2	-	7
2.	Relations & Functions	2	2	-	8
3.	Trigonometric Functions	2	4	-	14
4.	Principle of Mathematical Induction	-	-	1	5
5.	Complex numbers & Quadratic Equations	1	2	1	12
6.	Linear Inequalities	1	1	1	09
	<b>Total</b>	<b>7</b>	<b>11</b>	<b>3</b>	<b>55</b>

**1. Sets:**

Sets and their representations. Empty set, Finite & Infinite sets, Equal sets. Subsets, Subsets of the set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set, Properties of complement sets.

**2. Relations & Functions:**

Ordered pairs, Cartesian product of sets. Number of elements in the Cartesian product of two finite sets. Cartesian product of the reals with itself (upto  $R \times R \times R$ ).

Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special kind of relation from one set to another. Pictorial representation of a function, domain, co-domain and range of a function. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum, difference, product and quotients of functions.

**3. Trigonometric Functions:**

Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity  $\sin^2x + \cos^2x = 1$ , for all x. Signs of trigonometric functions and sketch of their

graphs. Expressing  $\sin(x \pm y)$  and  $\cos(x \pm y)$  in terms of  $\sin x$ ,  $\sin y$ ,  $\cos x$  &  $\cos y$ . Deducing the identities like following:

$$\tan (x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \cdot \tan y}, \cot (x \pm y) = \frac{\cot x \cdot \cot y \mp 1}{\cot y \pm \cot x}$$

$$\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}, \cos x + \cos y = 2 \cos \frac{x+y}{2} \cdot \cos \frac{x-y}{2}$$

$$\sin x - \sin y = 2 \cos \frac{x+y}{2} \cdot \sin \frac{x-y}{2}, \cos x - \cos y = -2 \sin \frac{x+y}{2} \cdot \sin \frac{x-y}{2}$$

Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$  and  $\tan 3x$ . General solution of trigonometric equations of the type  $\sin \theta = \sin \alpha$ ,  $\cos \theta = \cos \alpha$  and  $\tan \theta = \tan \alpha$ . Proofs and simple applications of sine and cosine formulae.

#### 4. Principle of Mathematical Induction:

Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.

#### 5. Complex Numbers and Quadratic Equations:

Need for complex numbers, especially  $\sqrt{-1}$ , to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system. Square-root of a Complex number.

#### 6. Linear Inequalities:

Linear inequalities, Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables - graphically.

**CLASS XI**  
**Subject – Mathematics**  
**Semester – II(2012-13)**

**Theory Marks -85**  
**Internal Assessment - 35**  
**Total Marks - 120**

**Time: 3 hrs**

- Q 1. All Questions are Compulsory.  
 Q 2. Q 1. will consists of ten parts and each part will carry 1 Mark.  
 Q 3. Q 2. to Q 16 will carry 3 Marks each.  
 Q 4. Q 17 to Q 21 i.e. five questions each will be of 6 marks.  
 Q 5. There will be no overall choice. There will be an internal choice in any three questions of 3 marks each and any two questions of 6 marks each. (Total of 5 internal Choices)  
 Q 6. Use of Calculator is not allowed.

Sr. No	Topic	Q. Carrying 1-Marks	Q. Carrying 3-Marks	Q. Carrying 6-Marks	Total Marks
1.	Sequence & Series	2	2	*	08
2.	Permutations & Combinations	1	1	1	10
3.	Binomial Theorem	*	1	1	09
4.	Straight lines	1	2	*	07
5.	Conic Sections	1	1	1	10
6.	Three-dimensional Geometry	1	1	*	04
7.	Limits & Derivatives	2	2	1	14
8.	Mathematical Reasoning	1	2	*	07
9.	Statistics	*	1	1	09
10.	Probability	1	2	*	07
	<b>Total</b>	<b>10</b>	<b>15</b>	<b>5</b>	<b>85</b>

**1. Sequence and series:**

Sequence and Series , Arithmetic Progression (A.P), Arithmetic Mean (A.M) , Geometric Progression ( G.P), general term of a G.P, sum of n terms of a G.P . Arithmetic and Geometric series, infinite G.P. and its sum. Geometric mean (G .M), relation between A.M and G.M, Sum to n term of the special series  $\sum n$  ,  $\sum n^2$  and  $\sum n^3$  .

**2. Permutations & Combinations :**

Fundamental principle of counting, Factorial n(n!) Permutations and combinations, derivation of formulae and their connections, simple applications.

**3. Binomial Theorem :**

History, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle , general and middle term in binomial expansion, simple applications.

**4. Straight Lines :**

Brief recall of 2-D from earlier classes, Shifting of origin. Slope of a line and angle between two lines .Various forms of equations of a line: parallel to axes, point–slope form, slop–intercept

form, two–point form , intercept form and normal form ,General equation of a line. Equation of family of lines passing through the point of intersection of two lines. Distance of a point from a line.

#### **5. Conic Sections :**

Sections of a cone ; circles , ellipse , parabola, hyperbola , a point , a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equations of a circle;

#### **6. Introduction to Three-dimensional Geometry**

Coordinate axes and coordinate planes in three dimensions . Coordinates of a point .Distance between two points and section formula.

#### **7. Limits and Derivatives :**

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit.

$$\lim_{x \rightarrow 0} \frac{\log_e(1+x)}{x}, \lim_{x \rightarrow 0} \frac{e^x - 1}{x}$$

Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

#### **8. Mathematical Reasoning**

Mathematically acceptable statements. Connecting words/phrases—consolidating the understanding of “if and only if (necessary and sufficient) condition”, “ implies”, “ and/or”, “implied by”, “and”, “or”, “there exists” and their use through variety of examples related to real life and Mathematics , Validating the statements involving the connecting words- difference between contradiction, converse and contrapositive.

#### **9. Statistics:**

Measure of dispersion: mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

#### **10 Probability:**

Random experiments: outcomes, sample spaces( set representation).Events: Occurrence of events , ‘not’, ‘and’ & ‘or’ events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event , probability of ‘not’, ‘and’ & ‘or’ events.

**CLASS – XII**  
**Subject -Mathematics**  
**Semester I (2012-13)**

Theory Marks-55  
Internal Assessment-25  
Total Marks-80

**Time: 2:30 hrs**

1. All Questions are Compulsory.
2. Q 1. will consists of seven parts and each part will carry 1 Mark.
3. Q 2. to Q 12 each will be of 3 Marks.
4. Q 13 to Q 15 i.e. three questions each will be of 5 marks.
5. There will be no overall choice. There will be an internal choice in any three questions of 3 marks each and two questions of 5 marks each(Total of 5 internal choices).
- Q 6. Use of Calculator is not allowed.

Sr. No	Topic	Q. Carrying 1-Marks	Q. Carrying 3-Marks	Q. Carrying 5-Marks	Total Marks
1.	Relations & Functions	1	2	-	07
2.	Inverse Trigonometric Functions	1	1	-	04
3.	Matrices and Determinants	3	3	1	17
4.	Continuity & Differentiability	1	3	1	15
5.	Applications of Derivatives	1	2	1	12
	<b>Total</b>	<b>7</b>	<b>11</b>	<b>3</b>	<b>55</b>

**1 Relations and Functions:**

Types of relations: Reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, composite functions, inverse of a function. Binary operations.

**2 Inverse Trigonometric Functions:**

Definition, Range, Domain, Principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

**3 Matrices:**

Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

**4 Determinants:**

Determinant of a square matrix (up to  $3 \times 3$  matrices), properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equation by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

## 5 Continuity and Differentiability:

Continuity and Differentiability, derivative of composite functions, chain rule, derivative of inverse trigonometric functions, derivative of implicit function. Concepts of exponential and logarithmic functions. Derivatives of  $\log_e^x$  and  $e^x$ . Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

## 6 Applications of Derivatives

Applications of derivatives: rate of change, increasing/decreasing functions, tangents and normal, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real life situations).

### CLASS – XII Subject -Mathematics Semester II(2012-13)

Theory Marks-85  
Internal Assessment-35  
Total Marks-120

Time:- 3 hrs

1. All questions are compulsory.
2. Q.1 will consist of ten parts and each part will carry 1-mark.
3. Q.2 to Q.16 will carry three marks each.
4. Q.17 to Q.21 i.e. five question each will be of six marks.
5. There will be no over all choice. There will be an internal choice in any three questions of three marks each and any two questions of 6 mark each.
6. Use of calculator is not allowed

S. No	Topic	Q.Carrying 1-Mark	Q.Carrying 3-Marks	Q.Carrying 6-Marks	Total Marks
1	Integrals	1	4	1	19
2	Applications of the Integrals	1	1	1	10
3	Differential Equations	3	3	-	12
4	Vectors	2	3	-	11
5	Three-dimensional Geometry	1	2	1	13
6	Linear Programming	1	-	1	07
7	Probability	1	2	1	13
	<b>Total</b>	<b>10</b>	<b>15</b>	<b>5</b>	<b>85</b>

### 1 Integrals:

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type:

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}, \int \frac{dx}{ax^2 + bx + c}$$
$$\int \frac{(px + q)}{ax^2 + bx + c} dx, \int \frac{(px + q)}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx \text{ and } \int \sqrt{x^2 - a^2} dx$$
$$\int \sqrt{ax^2 + bx + c} dx \text{ and } \int (px + q)\sqrt{ax^2 + bx + c} dx$$

to be evaluated.

Definite integrals as a limit of a sum. Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals. .

## 2 Applications of the Integrals:

Applications in finding the area under simple curves, especially lines, areas of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).

## 3 Differential Equations:

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

$$\frac{dy}{dx} + Py = Q$$

where P and Q are functions of x or constant.

$$\frac{dx}{dy} + Px = Q$$

where P and Q are functions of y or constant

## 4 Vectors:

Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors, scalar triple product.

## 5 Three-dimensional Geometry:

Direction cosines/ ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a point from a plane.

## 6 Linear Programming:

Introduction, definition of related terminology such as constraints, objectives function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints)

## 7 Probability:

Multiplication theorem on probability. Conditional probability, independent events, total probability, Baye's theorem, Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution.

**CLASS-XI  
CHEMISTRY  
SEMESTER-1**

TIME- 2½ Hours

Theory: 55 Marks  
I.A./CCE: 25 Marks  
Total: 80 Marks

**DISTRIBUTION OF MARKS**

Unit –I	Some Basic Concept of Chemistry	10
Unit-II	Structure of Atom	06
Unit-III	Classification of Elements and Periodicity in Properties	06
Unit-IV	Chemical Bonding and Molecular structure	07
Unit-V	Hydrogen	08
Unit-VI	S-Block Elements (Alkali and Alkaline Earth Metals)	08
Unit-VII	Organic Chemistry some Basic Principles and Techniques	10
	Total	<u>55</u>

**STRUCTURE OF QUESTION PAPER (THEORY)**

1. Question No. 1 to 9 will be of 1 mark each.
2. Question No. 10 to 17 will be of 2 marks each.
3. Question No. 18 to 22 will be of 3 marks each.
4. Question No. 23 to 25 will be of 5 marks each and there will be 100% internal choice.

**SYLLABUS (THEORY)**

**Unit:I 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: percentage composition, empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

**Unit II : Structure of Atom**

Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Thomson's model and its limitations, 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 uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p, and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli exclusion principle and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

**Unit III : Classification of Elements and Periodicity in Properties**

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

**Unit IV : Chemical Bonding and Molecular Structure**

Valence electrons, ionic bond, bond parameters, covalent bond. 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-V : 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, reactions, structure and use; hydrogen as a fuel.

## Unit-VI : 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 chloride sodium hydroxide and sodium hydrogen carbonate, biological importance of sodium and potassium.

CaO, CaCO<sub>3</sub> and industrial use of lime and limestone, biological importance of Mg and Ca.

## Unit-VII : Organic Chemistry Some Basic Principles and Techniques

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. 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, carboanion; electrophiles and nucleophiles, types of organic reactions

## SYLLABUS (PRACTICALS)

### A. Basic Laboratory Techniques

1. Cutting glass tube and glass rod
2. Bending a glass tube
3. Drawing out a glass jet
4. Boring a cork

### B. Experiments related to pH change

- (a) Anyone of the following experiments:
- Determination of pH of some solutions obtained from fruit juices, solution of known and varied concentrations of acids, bases and salts using pH paper or universal indicator.
  - Comparing the pH of 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 weak bases.

### D. Qualitative Analysis

Determination of one anion and one cation in a given salt

**Cations-** Pb<sup>2+</sup>, Cu<sup>2+</sup>, As<sup>3+</sup>, Al<sup>3+</sup>, Fe<sup>3+</sup>, Mn<sup>2+</sup>, Ni<sup>2+</sup>, Zn<sup>2+</sup>, Co<sup>2+</sup>, Ca<sup>2+</sup>, Sr<sup>2+</sup>, Ba<sup>2+</sup>, Mg<sup>2+</sup>, NH<sub>4</sub><sup>+</sup>

**Anions-** CO<sub>3</sub><sup>2-</sup>, S<sup>2-</sup>, SO<sub>3</sub><sup>2-</sup>, SO<sub>4</sub><sup>2-</sup>, NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup>, Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>, PO<sub>4</sub><sup>3-</sup>, C<sub>2</sub>O<sub>4</sub><sup>2-</sup>, CH<sub>3</sub>COO<sup>-</sup>

(Note: insoluble salts excluded)

### D. Detection of nitrogen, sulphur, chlorine in organic compounds.

## PROJECTS

- Investigation of foaming capacity of different washing soaps and the effect of addition of Sodium carbonate on them.
- Study of the acidity of different samples of the tea leaves.
- Determination of the rate of evaporation of different liquids.
- Study of the effect of acids and bases on the tensile strength of fibers.
- Analysis of fruit and vegetable juices for their acidity.

**Note:** Any other investigatory project, which involves about 10 period of work can be chosen with the approval of the teacher.

TIME- 3 Hours  
TIME- 3 Hours

**SEMESTER-II (THEORY)** Theory : 65 Marks  
Practical : 25 Marks  
I.A./CCE : 30 Marks  
Total : 120 Marks

### DISTRIBUTION OF MARKS

Unit-I	Status of Matter: Gases and liquids	10
Unit-II	Thermodynamics	08
Unit-III	Equilibrium	10
Unit-IV	Redox Reaction	10
Unit-V	Some p- Block Elements general introduction to p-Block elements	10
Unit-VI	Hydrocarbons	10
Unit-VII	Environmental Chemistry	07
	Total	<u>65</u>

**NOTE:** Practical examination will be taken only once a year at the end of Semester II from the whole syllabus.

### STRUCTURE OF QUESTION PAPER (THEORY)

1. Question No. 1 to 10 will be of 1 mark each.
2. Question No. 11 to 20 will be of 2 marks each.
3. Question No. 21 to 25 will be of 3 marks each.
5. Question No. 26 to 29 will be of 5 marks each and there will be 100% internal choice.

### STRUCTURE OF QUESTION PAPER (PRACTICAL)

<b>Time: 3.00 hrs.</b>	<b>Marks: 25</b>
1. Volumetric Analysis	08
2. Salt Analysis	06
3. Content based experiment	06
4. Class record and Viva	05
Total Marks	<u>25</u>

### SYLLABUS (THEORY)

#### Unit-I States of Matter: Gases and Liquids

Three states of matter. Intermolecular interactions, types of bonding, melting and boiling points. Role of gas laws in elucidating the concept of the molecule, Boyle's law, Charles' law, Gay Lussac's law, Avogadro's law. Ideal behaviour, empirical derivation of gas equation, Avogadro's number. Ideal gas equation. Derivation from ideal behaviour, liquifaction of gases, critical temperature, kinetic energy and molecular speeds (elementary idea) derivation from ideal behaviour, liquification of gasses, critical temperature

Liquid State - Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

#### Unit-II Thermodynamics

Concepts of System, types of systems, surroundings. Work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics - internal energy and enthalpy heat capacity and specific heat measurement of  $\Delta U$  and  $\Delta H$ , Hess's law of constant heat summation, enthalpy of: bond dissociation, combustion, formation, atomization, sublimation. Phase transition, ionization, solution and dilution.

Introduction of entropy as a state function, Gibbs energy change for spontaneous and non-spontaneous processes, criteria for equilibrium.

Second law of thermodynamics, third law of thermodynamics (Brief introduction).

### Unit-III 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, Henderson Equation. Hydrolysis of salts (elementary idea). Buffer solutions, solubility product, common ion effect (with illustrative examples).

### Unit-IV 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, application of redox reaction .

### Unit-V Some p-Block Elements

General introduction to p-Block Elements

**Group 13 elements:** General introduction, electronic configurations, 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 acid, boron hydrides. Aluminium: reactions with acids and alkalis and uses.

**Group 14 elements :** General introduction, electronic configurations, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first element, Carbon - catenation, allotropic forms, physical and chemical properties; uses of some important compounds: oxides.

Important compounds of silicon and a few uses: silicon tetrachloride silicones, silicates and Zeolites, their uses.

### Unit-VI 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; greenhouse effect and global warming - pollution due to industrial wastes: green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.

### Unit-VII Hydrocarbons

#### Classification of hydrocarbons

#### Aliphatic Hydrocarbon

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

**Alkenes** - Nomenclature, structure of double bond (ethene) geometrical isomerism, physical properties, methods of preparation; chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

**Alkynes** - Nomenclature, structure of triple bond (ethyne), physical properties.

Methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of - hydrogen, halogens, hydrogen halides and water.

**Aromatic hydrocarbons:** Introduction, IUPAC nomenclature: Benzene; resonance aromaticity : chemical properties: mechanism of electrophilic substitution. - nitration sulphonation, halogenation, Friedel Craft's alkylation and acylation: directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.

### PRACTICAL SYLLABUS

#### A. Characterization and purification of chemical substances

1. Determination of melting point of an organic compound
2. Determination of boiling point of an organic compound

3. Crystallization of impure sample of anyone of the following: Alum, copper sulphate, Benzoic acid.

### **B. Chemical Equilibrium**

One of the following experiments:

- a) Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either ions.
- 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.

### **C. 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.

## **PROJECT**

### **Scientific Investigations involving A few suggested Projects**

- Checking the bacterial contamination in drinking water by testing sulphide ion. Study of the methods of p.
- 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).
- Study the method of purification of water.

# CLASS - XII CHEMISTRY

Time: 2:30 hrs.

SEMESTER-1

Theory : 55 Marks  
Int. Ass./CCE : 25 Marks  
Total : 80 Marks  
MARKS

Unit I	Solid State	8
Unit II	Solution	8
Unit III	Electrochemistry	8
Unit IV	Chemical Kinetics	8
Unit V	Surface Chemistry	8
Unit VI	General Principles and Processes of Isolation of Elements	5
Unit VII	p- Block elements	<u>10</u>
<b>Total</b>		<b>55</b>

## QUESTION PAPER

1. Question No. 1 to 9 will be of 1 mark each.
2. Question No. 10 to 17 will be of 2 marks each.
3. Question No. 18 to 22 will be of 3 marks each.
4. Question No. 23 to 25 will be of 5 marks each and there will be 100% internal choice.

## SYLLABUS THEORY

### Unit 1: Solid, State

Classification of solids based on different binding 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, Packing efficiency, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties, Band theory of metals, conductors, semi-conductors and insulators and n and p type semiconductors.

### Unit II : Solutions

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties - relative lowering of vapour pressure, Raoult's law, elevation of B.P., depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Vant Hoff factor.

### Unit III: 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 cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, relation between Gibbs energy change and EMF of a cell, fuel cells; corrosion.

### Unit IV: Chemical Kinetics

Rate of a reaction (average and instantaneous), factors affecting rates 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 V: Surface Chemistry

Absorption- 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.

### **Unit VI: General Principles and Processes of Isolation of Elements**

Principles and methods of extraction – concentration, oxidation, reduction electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and Iron.

### **Unit VII: p-Block Element**

**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 acids, 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; 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 (structures only).

**Group 18 elements** : General introduction, electronic configuration. Occurrence, trends in physical and chemical properties, uses.

### **Practical Syllabus.**

#### **A. Surface Chemistry**

- (a) Preparation of one lyophilic and one lyophobic sol.  
Lyophilic sol - starch, egg albumin and gum.  
Lyophobic sol - aluminium hydroxide, ferric hydroxide, arsenious sulphide.
- (b) Dialysis of sol prepared in (a) above
- (c) Study of the role of emulsifying in stabilizing the emulsions of different oils.

#### **B. Chemical Kinetics**

- (a) Effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.
- (b) Study of reaction rates 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,  $\text{KIO}_3$ , and sodium sulphite : ( $\text{Na}_2 \text{SO}_3$ ) using starch solution as indicator (clock reaction).

#### **C. 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.

#### **D. Electrochemistry**

Variation of cell potential in  $\text{Zn}/\text{Zn}^{2+}/\text{Cu}^{2+}/\text{Cu}$  with change in concentration of electrolytes ( $\text{CuSO}_4$  or  $\text{ZnSO}_4$ ), at room temperature.

### E. Chromatography

- 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 wide difference in  $R_f$  values to be provided).

### F. Determination of concentration/molarity of $KMnO_4$ 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).

## SEMESTER-II

Time: 3.00 hrs.

Marks

Time: 3.00 hrs.

Marks

Theory: 65

Practical : 25

Internal Assessment/CCE: 30 Marks

Total : 120 Marks

### MARKS

Unit I	d & f Block elements	9
Unit II	Coordination Compounds	7
Unit III	Haloalkanes and Haloarenes	7
Unit IV	Alcohols phenols and Ethers	9
Unit V	Aldehydes, ketones and carboxylic acid	9
Unit VI	Organic Compounds Containing Nitrogen	7
Unit VII	Biomolecules	7
Unit VIII	Polymers	5
IX	Chemistry in Everyday life	5

---

**Total**

**65**

---

### STRUCTURE OF QUESTION PAPER

1. Question No. 1 to 10 will be of 1 mark each.
2. Question No. 11 to 20 will be of 2 marks each.
3. Question No. 21 to 25 will be of 3 marks each.
4. Question No. 26 to 29 will be of 5 marks each and there will be 100% internal choice..

### STRUCTURE OF QUESTION PAPER (PRACTICAL)

Volumetric Analysis	8
Mixture Analysis	6
Content based Experiment	6
Class record & viva	5
Total Marks	<hr/>
	25

**NOTE:** Practical examination will be taken only once a year at the end of Semester II from the whole syllabus.

### SYLLABUS THEORY

Unit-I d and f 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  $KMnO_4$ .

**Lanthanoids** - electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequences.

**Actenoids** - Electronic configuration, oxidation states and comparison with lanthanoids.

## Unit-II Coordination Compounds

Coordination compounds - introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding, werners theory, VBT, CFT; isomerism (Structural and Stereo), importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

## Unit-III Haloalkanes and Haloarenes.

### Haloalkanes:

Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, Optical rotation.

### Haloarenes:

Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only)

Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

## Unit -IV 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 with special reference to, 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-V Aldehydes, Ketones and Carboxylic Acids

**Aldehydes and Ketones:** Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, and 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-VI Organic compounds containing Nitrogen

**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-VII Biomolecules

**Carbohydrates** - Classification (aldoses and ketoses), monosaccharide (glucose and fructose), D-L Configuration oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); importance

**Proteins** - Elementary idea of amino acids, peptide bond, polypeptides proteins, primary structure, secondary structure, tertiary structure and quaternary structure (qualitative idea only), denaturation of proteins; enzymes.

**Harmones** - Elementary idea only (excluding Structure)

**Vitamins**- Classification and functions.

## Nucleic Acids: DNA & RNA

### Unit-VIII Polymers

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

### Unit-IX Chemistry in everyday life :

1. **Chemicals in medicines** analgesic, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

2. **Chemicals in food-** preservatives, artificial sweetening agents elementary idea of antioxidants.

3. **Cleansing agents** - soaps and detergents, cleansing action.

## PRACTICAL

### A. Preparation of Inorganic Compounds

i) Preparation of double salt of ferrous ammonium sulphate or potash alum.

ii) Preparation of potassium ferric oxalate.

### B. Preparation of Organic Compounds

Preparation of any two of the following compounds

i) Acetanilide

ii) Di-benzal acetone

iii) p-Nitroacetanilide,

iv) Aniline yellow or 2-Naphthol aniline dye.

### C. Test for the functional groups present in organic compounds:

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

### D. Characterizes test of carbohydrates, fats and proteins in pure form and detection of their presence in given food stuffs.

### E. Qualitative analysis

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

**Cations** -  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{As}^{3+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{NH}_4^+$

#### Anions

$\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{PO}_4^{3-}$ ,  $\text{C}_2\text{O}_4^{2-}$ ,  $\text{CH}_2\text{COO}^-$ ,  $\text{SO}_4^{2-}$ ,  
(Note: Insoluble salts excluded)

## PROJECT

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

### A few suggested Projects

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

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

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

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

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

Comparative study of the rate of fermentation of following material wheat flour, gram flour, Potato juice, carrot juice etc.

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

Study of common food adulterants in fat, oil, butter, sugar, turmeric powder, chili powder and pepper.

**Note:** Any investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.

**Class XI  
BIOLOGY  
SEMESTER-1**

TIME- 2½ Hours

Theory : 55 Marks  
I.A./CCE : 25 Marks  
Total : 80 Marks

**DISTRIBUTION OF MARKS**

Unit –I	Diversity in Living	25
Unit-II	Structural Organization in animals and Plants	30
	Total	<u>55</u>

**STRUCTURE OF QUESTION PAPER**

5. Question No. 1 to 9 will be of 1 mark each.
6. Question No. 10 to 17 will be of 2 marks each.
7. Question No. 18 to 22 will be of 3 marks each.
8. Question No. 23 to 25 will be of 5 marks each and there will be 100% internal choice.

**SYLLABUS (THEORY)**

**1. Diversity in Living World**

What is living?; Biodiversity; Need for classification; Three domain of life; Taxonomy & Systematic; Concept of species and taxonomical hierarchy; Binomial nomenclature; Tools for study of Taxonomy-Museums, Zoos, Herbaria, Botanical gardens.

Five Kingdom classification; Salient features and classification of Monera; Protista and Fungi into major groups; Lichens; Viruses and Viroids.

Salient features and classification of plants into major groups-Algae, Bryophytes, Pteridophytes, Gymnosperm and Angiosperm (three to five salient and distinguishing features and at least two examples of each category); Angiosperms-classification up to class, characteristics features and examples.

Salient features and classification of Animals-non chordate up to phyla level and chordate up to classes level (three to five salient features and at least two examples)

**2. Structural Organization in Animals and Plants**

Morphology and modifications; Tissues; Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence-cymose and racemose, flower, fruit and seed (To be dealt along with the relevant practical of the practical syllabus).

Animal tissues; Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (Brief account only)

**SYLLABUS (PRACTICALS)**

**A. List of Experiments**

1. Study and describe three locally available common flowering plants from each of the following families (Solanaceae, Fabaceae and Liliaceae) including dissection and display of floral whorls and anther and ovary to show number of chambers. Types of root (Tap and Adventitious); Stem (Herbaceous and woody); Leaf (arrangement, shape, venation, simple and compound).
2. Preparation and study of T.S. of dicot and monocot roots and stems (primary).
3. Study parts of a compound microscope.
4. Study of the specimens and identification with reasons-Bacteria, Oscillatoria, Spirogyra, Rhizopus, mushroom, Yeast, liverwort, moss,

fern, Pine, one monocotyledonous plant and one dicotyledonous plant and one lichen.

5. Study of specimens and identification with reasons-Amoeba, Hydra, Liver fluke, Ascaris, leech, earthworm prawn, silkworm, honeybee, snail, starfish, shark, Rohu, frog, lizard, pigeon and rabbit.
6. Study of tissues, and diversity in shapes and sizes of plant and animal cells (e.g. palisade cells, guard cells, parenchyma, collenyma, sclerenchyma, Xylem, Phloem, Squamous epithelium, muscle fibers and mammalian blood smear) through temporary/permanent slides.
7. Study of different modifications in root, stem and leaves.
8. Study and identification of different types of inflorescence.

## SEMESTER-II

Time: 3.00 hrs.

Time: 3.00 hrs.

Theory: 65 Marks

Practical:25 Marks

Internal Assessment/CCE: 30 Marks

Total : 120 Marks

### DISTRIBUTION OF MARKS

Unit-III	Cell Structure and Functions	20
Unit-IV	Plant Physiology	21
Unit-V	Human anatomy & Physiology	24
	Total	<u>65</u>

### STRUCTURE OF QUESTION PAPER (THEORY)

1. Question No. 1 to 10 will be of 1 mark each.
2. Question No. 11 to 20 will be of 2 marks each.
3. Question No. 21 to 25 will be of 3 marks each.
4. Question No. 26 to 29 will be of 5 marks each and there will be 100% internal choice.

### STRUCTURE OF QUESTION PAPER (PRACTICAL)

Time: 3.00 hrs.

Marks: 25

1.	Experiment and Spotting	15
2.	Record of one investigatory and Viva based on the project	05
3.	Class record and Viva based on experiments	05
	Total	<u>25</u>

**Note: Practical examination will be taken once a year at the end of Semester-II from the whole syllabus**

### SYLLABUS (THEORY)

#### 3. Cell Structure and Function

Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; Cell envelope, cell membrane, cell wall; Cell organelles-structure and function; Endomembrane system-endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, microbodies; Cytoskeleton, cilia, flagella, centrioles (ultra structure and function); Nucleus-nuclear membrane, chromatin, nucleolus.

Chemical constituents of living cells: Biomolecules- structure and function of proteins, carbohydrates, lipid, nucleic acid; Enzymes-types, properties, enzyme action.

Cell division: Cell cycle, mitosis, meiosis and their significance.

#### 4. Plant Physiology

Transport in plants: Movement of water, gases and nutrients; Cell to cell transport- Diffusion, facilitated diffusion, active transport; Plant- water relations-Imbibition, water potential, osmosis, plasmolysis; Long distance

transport of water- Absorption, apoplast, symplast, transpiration pull, rootpressure and guttation; Transpiration-Opening and Closing of stomata; Uptake and translocation of mineral nutrients- Transport of food; Phloem transport, Mass flow hypothesis; Diffusion of gases (brief mention).

Mineral nutrition: Essential minerals, macro and micronutrients and their role; Deficiency symptoms; Mineral toxicity; Elementary idea of Hydroponics as a method to study mineral nutrition; Nitrogen metabolism- Nitrogen cycle, biological nitrogen fixation.

Photosynthesis: Photosynthesis as a means of Autotrophic nutrition; Where does photosynthesis take place; How many pigments are involved in Photosynthesis (Elementary idea); Photochemical and biosynthetic phases of photosynthesis; Cyclic and non cyclic photophosphorylation; Chemiosmotic hypothesis; Photorespiration;  $C_3$  and  $C_4$  pathways; Factors affecting photosynthesis.

Respiration: Exchange of gases; Cellular respiration- glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); Energy relations- Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.

Plant growth and development: Seed germination; Phases of plant growth and plant growth rate; - Conditions of growth; Differentiation, dedifferentiation and redifferentiation, Sequence of developmental process in a plant cell; Growth regulators-auxin, gibberellin, cytokinin, ethylene, ABA; Seed dormancy; Vernalisation; Photoperiodism.

## 5. Human Physiology

Digestion and Absorption: Alimentary canal and Digestive glands; Role of digestive enzymes and gastrointestinal hormones; Peristalsis, Digestion, absorption and assimilation of proteins, carbohydrates and fats, Calorific value of proteins, carbohydrates and fats (for box item not to be evaluated); Egestion; Nutritional and digestive disorders - PEM, indigestion, constipation, vomiting, jaundice, diarrhea.

Breathing and Respiration: Respiratory organs in animals (Recall only); Respiratory system in humans; Mechanism of Breathing and its regulation in humans - Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes; Disorders related to respiration - Asthma, Emphysema, Occupational Respiratory disorders.

Body fluids and Circulation: Composition of blood, Blood groups, Coagulation of blood; Composition of Lymph and its function; Human circulatory system - Structure of human heart and blood vessels; Cardiac cycle, Cardiac output, ECG; Double circulation; Regulation of cardiac activity; Disorders of circulatory system - Hypertension, Coronary artery disease, Angina pectoris, heart failure.

Excretory products and their elimination: Modes of excretion - Ammonotelism, ureotelism; Uricotelism; Human excretory system - structure and function; Urine formation, Osmoregulation; Regulation of kidney-function - Renin-angiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus; Role of other organs in excretion; Disorders - Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.

Locomotion and Movement: Types of movement - ciliary, flagellar, muscular; Skeletal muscle - contractile proteins and muscle contraction; Skeletal system and its functions. (To be dealt with the relevant practical of Practical Syllabus); Joints; Disorders of muscular and skeletal system - Myasthenia gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.

Neural control and coordination: Neuron and nerves; Nervous system in humans - central nervous system, Peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse; Reflex action; Sense organs; Sensory Perception; Elementary structure and function of eye and ear.

Chemical coordination and regulation: Endocrine glands and hormones; Human endocrine system - Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action

(Elementary idea); Role of hormones as messengers and regulators, Hypo- and hyperactivity and related disorders. (Common disorders eg. Dwarfism, Acromegaly, Cretinism, goiter, exophthalmic goiter, diabetes, Addison's disease).

Imp: Diseases related to all the human physiology systems to be taught in brief.

### **SYLLABUS (PRACTICALS)**

1. Study of osmosis by potato osmometer.
2. Study of plasmolysis in epidermal peels (e.g. Rhoec leaves).
3. Study of distribution of stomata in the upper and lower surface of leaves.
4. Comparative study of the rates of transpiration in the upper and lower surface of leaves.
5. Test for the presence of sugar, starch, protein and fats. To detect them in suitable plant and animal materials.
6. Separation of plant pigments through paper chromatography.
7. To study the rate of respiration in flower buds/leaf tissue and germinating seeds.
8. To test the presence of urea in urine.
9. To detect the presence of sugar in urine/blood sample
10. To detect the presence of albumin in urine.
11. To detect the presence of bile salts in urine.
12. Study of imbibition in seeds/raisins.
13. Observation and comments on the experimental set up for showing.
  - a. Anaerobic respiration
  - b. Phototropism
  - c. Apical bud removal
  - d. Suction due to transpiration
14. Study of human skeleton and different types of joints.
15. Study of external morphology of earthworm, cockroach and frog through models.
16. Study of mitosis in onion root tip cells and animals cells (grasshopper) from permanent slides.

**BIOLOGY**  
**SEMESTER-1**  
**Class XII**

Time: 2:30 hrs.

Theory : 55 Marks  
Internal Assessment/CCE : 25 Marks  
Total : 80 Marks

**DISTRIBUTION OF MARKS**

Unit –I	Sexual Reproduction	30
Unit-II	Genetics and Evolution	25
Total		55

**STRUCTURE OF QUESTION PAPER**

1. Question No. 1 to 9 will be of 1 mark each.
2. Question No. 10 to 17 will be of 2 marks each.
3. Question No. 18 to 22 will be of 3 marks each.
4. Question No. 23 to 25 will be of 5 marks each and there will be 100% internal choice.

**SYLLABUS**  
**THEORY**

**1. Reproduction:**

Reproduction in organisms: Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction– Asexual and sexual; Asexual reproduction; Modes- Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.

Sexual reproduction in flowering plants: Flower structure; Development of male and female gametophytes; Pollination- types, aggenices and examples; Outbreedings, devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events- Devlopment of endosperm and embryo, Development of seed and formation of fruit; Special modes- apomixis, parthenocrapy, Polyembryony; Significance of seed and fruit formation.

Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis- spermatogenesis & oogenesis; Menstrual Cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementray idea); Parturition (Elementary idea); Lactation (Elementary idea).

Reproductive health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control- Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies- IVF, ZIFT, GIFT (Elementary idea for general awareness)

**2. Genetics and Evolution:**

Heredity and variation: Mendelian Inheritance; Deviations from Mendelism- Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosomes theory of inheritance; Chromosomes and genes; Sex determination- In humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance- Haemophilia, Colour blindness; Mendelian disorders in humans- Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

Molecular Basis of Inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation- Lac Operon; Genome and human genome project; DNA finger printing.

Evolution: Origin of life; Biological evolution and evidences for biological evolution (Paleontological, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution-Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution.

## PRACTICAL

### Syllabus of semester -1

1. Study of pollen grains on a slide.
2. Study of flowers adapted to pollination by different agencies (wind, insect)
3. Study of pollen germination on a slide.
4. Study and identify stages of gamete development i.e. T.S of testis and T.S of ovary through permanent slides.
5. Study meiosis in Onion bud cell or grasshopper testis through permanent slides.
6. Study of T.S of blastula through permanent slide.
7. Study mendelian inheritance using seeds of different colour/size of any plant.
8. Study prepared pedigree charts of genetic traits such as rolling of tongue, blood groups, widow's peak, colour blindness.
9. Exercise on controlled pollination -Emasculation, tagging and bagging.
10. Study analogous and homologous organs in various plants and animals.

## SEMESTER-II

Time: 3.00 hrs.

Time: 3.00 hrs.

Theory: 65 Marks

Practical : 25 Marks

Internal Assessment/CCE: 30 Marks

Total : 120 Marks

### DISTRIBUTION OF MARKS

Unit-III	Biology and Human Welfare	23
Unit-IV	Biotechnology and its Application	19
Unit-V	Ecology and Environment	23
Total		65

### STRUCTURE OF QUESTION PAPER

1. Question No. 1 to 10 will be of 1 mark each.
2. Question No. 11 to 20 will be of 2 marks each.
3. Question No. 21 to 25 will be of 3 marks each.
4. Question No. 26 to 29 will be of 5 marks each and there will be 100% internal choice.

### STRUCTURE OF QUESTION PAPER (PRACTICAL)

Time: 3.00 hrs.

25 : Marks

1.	Experiment and Spotting	15
2.	Record of one investigatory and Viva based on the project	5
3.	Class record and Viva based on experiments	5
Total		25

**Note: Practical examination will be taken once a year at the end of Semester-II from the whole syllabus**

## SYLLABUS

### 3. Biology and Human Welfare:

Health and Disease: Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology-vaccines; Cancer, HIV and AIDs; Adolescence, drug and alcohol abuse.

Improvement in food production: Plant breeding, tissue culture, single cell protein, Biofortification; Apiculture and Animals husbandry.

Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

#### **4. Biotechnology and Its Applications:**

Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).

Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms- Bt crops; Transgenic Animals; Biosafety issues- Biopiracy and patents.

#### **5. Ecology and Environment:**

Organisms and environment: Habitat and niche; Population and ecological adaptations; Population interactions- mutualism, competition, predation, parasitism; Population attributes- growth, birth rate and death rate, age distribution.

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.

Biodiversity and its conservation: Concepts of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; 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; Agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warming; Ozon depletion; Deforestation; Any three case studies as success stories addressing environmental issues.

### **PRACTICAL**

#### **Syllabus of semester -2**

1. Collect and study soil from different sites and study them for texture and moisture content.
2. Study the pH and water holding capacity of soil correlate with the kinds of plants found in them.
3. Collect water from different water bodies around you and study them for pH clarity and presence of any living organisms.
4. Study the presence of any suspended particulate matter in air at the two widely different sites.
5. Study of plant population density by quadratic method.
6. Study of plant population frequency by quadrature method.
7. Study of plants and animals found in xerophytes conditions. Comment upon their adaptation ecosystem.
8. Study plants and animals found in aquatic conditions. Comment upon their adaptation ecosystem.
9. To identify common disease causing organisms like Ascaris, Endameba, Plasmodium, ringworm. Comment on symptoms of diseases that they cause through permanent slides or specious.

# CLASS - XI PHYSICS

TIME- 2½ Hours

SEMESTER-I

Theory : 55 Marks

I.A./CCE : 25 Marks

Total : 80 Marks

		Marks
UNIT-I	Physical World and Measurement	10
UNIT-II	Kinetics	15
UNIT-III	Laws of Motion	15
UNIT-IV	Work, Energy and Power	15
<b>Total</b>		<b>55</b>

## STRUCTURE OF QUESTION PAPER (THEORY)

- Question No. 1 to 9 will be of 1 mark each.
- Question No. 10 to 17 will be of 2 marks each.
- Question No. 18 to 22 will be of 3 marks each.
- Question No. 23 to 25 will be of 5 marks each and there will be 100% internal choice.

## SYLLABUS (THEORY)

### Unit I : Physical World and Measurement

Physics - scope and excitement; nature of physical laws; Physics, technology and society.

Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement, significant figures.

Dimensions of physical quantities, dimensional analysis and its applications.

### Unit II : Kinematics

Frame of reference. Motion in a straight line: Position-time graph, speed and velocity.

Uniform and non-uniform motion, average speed and instantaneous velocity.

Uniformly accelerated motion, velocity-time, position-time graphs, relations for uniformly accelerated motion (graphical treatment).

Elementary concepts of differentiation and integration for describing motion, Scalar and vector quantities: Position and displacement vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative velocity.

Unit vector: Resolution of a vector in a plane - rectangular components. Scalar and vector product of vectors. Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion. Uniform circular motion.

### Unit III : Laws of Motion

Intuitive concept of force. Inertia. Newton's first law of motion; momentum and Newton's second law of motion; impulse: Newton's third law of motion. Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces. Static and kinetic friction, laws of friction. rolling friction, lubrication.

Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road. vehicle on banked road).

### Unit IV: Work, Energy and Power

Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power.

Notion of potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-Conservative forces, motion in a vertical circle; elastic and inelastic collisions in one and two dimensions.

## PRACTICAL SYLLABUS

### Experiments

1. Use of Vernier Callipers
  - (i) To measure diameter of a small spherical/cylindrical body.
  - (ii) To measure internal diameter and depth of a given beaker/calorimeter and hence find its volume.
2. Use of screw gauge
  - (i) to measure diameter of a given wire,
  - (ii) to measure thickness of a given sheet
  - (ii) to measure volume of an irregular lamina
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. Using a simple pendulum, plot L-T and L-T<sub>2</sub> graphs. Hence find the effective length of second's pendulum using appropriate graph.
6. 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.
7. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination ( $\theta$ ) by plotting graph between force and  $\sin\theta$ .
8. To determine the mass of two different objects using a beam balance.

### Activities

1. To make a paper scale of given least count, e.g. 0.2cm, 0.5 cm.
2. To determine mass of a given body using a metre 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 study the conservation of energy of a ball rolling down on inclined plane (using a double inclined plane).
7. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.

**TIME- 3 Hours**  
**Time : 3 hours**

**SEMESTER-II**

**Theory: 65 Marks**  
**Practical: 25 Marks**  
**I.A./CCE: 30 Marks**  
**Total: 120 Marks**

		Marks
UNIT-I	Motion of system of Particles and Right Body	09
UNIT-II	Gravitation	09
UNIT-III	Properties of Bulk Matters	20
UNIT-IV	Thermodynamics	10
UNIT-V	Behavior of Perfect gas and Kinetic theory	07
UNIT-VI	Oscillation and Waves	10
Total		<b>65</b>

### STRUCTURE OF QUESTION PAPER (THEORY)

1. Question No. 1 to 10 will be of 1 mark each.
2. Question No. 11 to 20 will be of 2 marks each.
3. Question No. 21 to 25 will be of 3 marks each.
4. Question No. 26 to 29 will be of 5 marks each and there will be 100% internal choice.

## STRUCTURE OF PAPER (PRACTICAL)

Time : 3 hrs.

Total : 25 Marks

Two experiment	13
Record of Activities	3
Viva on Activities	3
Record of Experiments	3
Viva of Experiments	3
Total	<hr/> 25

**Note: Practical examination will be take only once a year at the end of semester II from the whole syllabus.**

## SYLLABUS (THEORY)

### Unit-I Motion of System of Particles and Rigid Body.

Centre of mass of a two-particle system, momentum conversation and centre of mass motion. Centre of mass of a rigid body; centre of mass of uniform rod.

Moment of a force, torque, angular momentum, conservation of angular momentum with some examples.

Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration.

Values of moments of inertia for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications.

### Unit-II Gravitation

Keplar's laws of planetary motion. The universal law of gravitation.

Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy; gravitational potential. Escape velocity, Orbital velocity of a satellite. Geo-stationary satellites.

### Unit-III Properties of Bulk Matter

Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear, modulus of rigidity, poisson's-ratio; elastic energy

Pressure due to a fluid column Pascal's law and its applications (hydraulic lift and hydraulic brakes). Effect of gravity on fluid pressure.

Viscosity, Stokes' law, terminal velocity, Reynold's number, streamline and turbulent flow. Critical velocity. Bernoulli's theorem and its applications.

Surface energy and surface tension, angle of contact, excess of pressure, application of surface tension ideas to drops, bubbles and capillary rise.

Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion, specific heat Capacity:  $C_p$ ,  $C_v$ -colorimetry; change of state-latent heat.

Heat transfer-conduction, convection radiation and thermal Conductivity, Qualitative idea of Blackbody radiation, Newton's law of cooling and Stefan's law, Wein's displacement law, Green House effect.

### Unit-IV Thermodynamics

Thermal equilibrium and definition of temperature (zeroth law of thermodynamics). Heat, work and internal energy. First law of thermodynamics. Isothermal and adiabatic processes.

Second law of thermodynamics: reversible and irreversible processes.

Heat engines and refrigerators.

### Unit-V Behaviour of Perfect Gas and Kinetic Theory

Equation of state of a perfect gas, work done on compressing a gas.

Kinetic theory of gases. Assumptions, concept of pressure. Kinetic energy and temperature;

rms, speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application to specific heat capacities of gases: concept of mean free path, Avogadro's number.

## Unit-VI Oscillations and Waves

Periodic motion - period, frequency, displacement as a function of time.

Periodic functions.

Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a spring-restoring force and force constant; energy in S.H.M.-kinetic and potential energies: simple pendulum-derivation of expression for its time period: free, forced and damped oscillations (qualitative ideas only), resonance.

Wave motion. Longitudinal and transverse waves, speed of wave motion. Displacement-relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect.

### PRACTICAL (SEMESTER-II)

#### Experiments

1. To determine Young's modulus of elasticity of the material of a given wire.
2. To find the force constant of a helical spring by plotting graph between load and extension.
3. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between P and V, and between P and  $1/V$ .
4. To determine the surface tension of water by capillary rise method.
5. To determine the coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.
6. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
7. To determine specific heat of a given (i) solid (ii) liquid, by method of mixtures.
8. (i) To study the relation between frequency and length of a given wire under constant tension using sonometer.  
(ii) To study the relation between the length of a given wire and tension for constant frequency using sonometer.
9. To find the speed of sound in air at room temperature using a resonance tube by two-resonance positions.

#### Activities

1. To observe change of state and plot a cooling curve for molten wax.
2. To observe and explain the effect of heating on a bi-metallic strip.
3. To note the change in level of liquid in a container on heating and interpret the observations.
4. To study the effect of detergent on surface tension of water by observing capillary rise.
5. To study the factors affecting the rate of loss of heat of a liquid.
6. To study the effect of load on depression of a suitably clamped metre scale loaded.  
(i) at its end (ii) in the middle.

# CLASS-XII

## PHYSICS

### SEMESTER-I

Time: 2:30 hrs.

Theory : 55 Marks  
Int. Ass./CCE : 25 Marks  
Marks

UNIT-I	(Electrostatics)	14
UNIT-II	(Current Electricity)	12
UNIT-III	(Magnetic Effects of current & Magnetism)	15
UNIT-IV	(Electromagnetic Induction of alternating current)	14
<hr/> <b>Total</b>		<b>55</b>

### STRUCTURE OF QUESTION PAPER

- Question No. 1 to 9 will be of 1 mark each.
- Question No. 10 to 17 will be of 2 marks each.
- Question No. 18 to 22 will be of 3 marks each.
- Question No. 23 to 25 will be of 5 marks each and there will be 100% internal choice.

### SYLLABUS THEORY

#### Unit 1 : Electrostatics

Electric Charges; Conservation of charge, Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution.

Electrical field, electric field due to a point charge, electric-field lines; electric dipole, electric field due to a dipole; torque on a dipole in uniform electric field.

Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (Field inside and outside).

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor, Van de Graaf generator.

#### Unit II: Current Electricity

Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current: Ohm's law, electrical resistance. V-I characteristics (linear and non linear), electrical energy and power, electrical resistivity and conductivity. Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance.

Internal resistance of a cell, potential difference and emf of cell, combination of cells in series and in parallel.

Kirchhoff's laws and simple applications. Wheatstone bridge, metre bridge.

Potentiometer-principle and its 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

Concept of magnetic field. Oersted's experiment;  
 Biot-savart law and its application to current carrying circular loop.  
 Ampere's law and its applications to infinitely long straight wire, straight and toroidal solenoids.  
 Force on a moving charge in uniform magnetic and electric fields. Cyclotron.  
 Force on a current-carrying conductor in a uniform magnetic field Force between two parallel current-carrying conductors, definition of ampere. Torque experienced by a current loop in magnetic field; moving coil galvanometers its current sensitivity and conversion to ammeter and voltmeter.  
 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 magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnetics as equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements Para-, dia-and ferro-magnetic substances with examples, Electromagnets and factors affecting their strengths. Permanent magnets.

#### **Unit IV: Electromagnetic Induction and Alternating Currents**

Electromagnetic induction, Faraday's laws, induced emf and current, Lenz's Law, Eddy currents: Self and mutual inductance.

Alternating current, peak and rms value of alternating current/voltage; reactance and impedances; LC oscillations, (qualitative treatment only), LCR series circuit, resonance; power in AC circuit, wattless current.

AC generator and transformer.

### **PRACTICALS SECTION-A**

#### **Experiments**

1. To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.
2. To find resistance of a given wire using metre bridge and hence determine the specific resistance of its material.
3. To verify the laws of combination (series/parallel) of resistance using a metre bridge.
4. To compare the emf of two given primary cells using potentiometer.
5. To determine the internal resistance of given primary cell using potentiometer.
6. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
7. To convert the given galvanometer of known resistance and figure of merit into an ammeter and voltmeter of desired range and to verify the same.
8. To find the frequency of the A.C. mains with a sonometer.

#### **Activities**

1. To measure the resistance and impedance of an inductor with or without iron core.
2. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
3. To assemble a household circuit comprising three, bulbs, three (on/off) switches, a – fuse and a power source.
4. To assemble the components of a given electrical circuit.
5. To study the variation in potential drop with length of a wire for a steady current.
6. To draw the diagram of a given open circuit comprising at least a battery, resistor rheostat, key ammeter and volt meter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.

Time: 3.00 hrs.  
Time: 3.00 hrs.

## SEMESTER-II (THEORY)

Theory: 65 Marks  
Practical: 25 Marks  
Int. Ass./CCE: 30 Marks  
Total : 120 Marks

		Marks
UNIT-V	(Electromagnetic waves)	05
UNIT-VI	(Optics)	23
UNIT-VII	(Dual nature of matter)	08
UNIT-VIII	(Atoms of nuclei)	10
UNIT-IX	(Electronic Devices)	13
UNIT-X	(Communication System)	06
Total		65

### STRUCTURE OF QUESTION PAPER

1. Question No. 1 to 10 will be of 1 mark each.
2. Question No. 11 to 20 will be of 2 marks each.
3. Question No. 21 to 25 will be of 3 marks each.
4. Question No. 26 to 29 will be of 5 marks each and there will be 100% internal choice.

### STRUCTURE OF QUESTION PAPER (PRACTICAL)

	Marks
Two Experiments	13
Record of Activities	3
Viva on Activities	3
Record of Experiments	3
Viva of Experiments	3
Total	25

**NOTE:** Practical examination will be taken once a year at the end of the semester II from the whole syllabus.

### SYLLABUS THEORY

#### Unit-I : Electromagnetic Waves

Need for displacement current, Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

Electromagnetic spectrum (Radio-waves, Microwaves, infra-red, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

#### Unit-II Optics

Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, 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. Combination of lens and mirror, 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 sunset.

**Optical instruments** :- Human eye, image formation and accommodation, correction of eye defects (myopia, hypermetropia) using lenses.

Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

**Waves optics** : wave front and Huygens' Principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygens' principle. Interference. Young's double hole experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, plane polarised light -Brewster's law, uses of plane polarised light and polaroids.

### **Unit-III Dual nature of Matter and Radiation**

Photoelectric effect, Hertz and Lenard's observations'; Einstein's photoelectric equation, particle nature of light.

Matter waves-wave nature of particles, de Broglie relation. Davission-Germer experiment.(experimental details should be omitted, only conclusions should be explained)

### **Unit-IV Atoms & Nuclei**

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum.

Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity- alpha, beta and gamma particles/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-V Electronic Devices**

Energy band in solids(qualitative ideas only, conductors, insulators) Semiconductors; semiconductor Diode-I-V characteristics in forward and 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.

### **Unit-VI Communication Systems**

Elements of a 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.

## **PRACTICALS**

### **Experiments**

1. To find the value of  $v$  for different values of  $u$  in case of a concave mirror and find their focal length.
2. To find the focal length of a convex lens by plotting graphs between  $u$  and  $v$  or between  $1/u$  and  $1/v$ .
3. To find the focal length of a convex mirror, using a convex lens.
4. To find the focal length of a concave lens, using a convex lens.
5. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
6. To draw the I-V characteristic curve of a p-n junction in forward bias and reverse bias.
7. To draw the characteristic curve of a zener diode and to determine the reverse breakdown voltage.
8. To study the characteristics of a common-emitter npn or pnp transistor and to find out the values of current and voltage gains.
9. To determine the reflective index of a glass slab using a traveling microscope.

10. To find refractive index of a liquid by using (i) Concave mirror. (ii) Convex lens and plane mirror.

### **Activities**

1. To study effect of intensity of light (by varying distance of the source) on an LDR
2. To identify a diode, an LED, a transistor and IC, a resistor and a capacitor from mixed collection of such items.
3. 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.
4. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
5. To observe polarization of light using two Polaroids.
6. To observe diffraction of light due to a thin slit.
7. To study the nature and size of the 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).
8. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.