



## West Bengal Council of Higher Secondary Education

Vidyasagar Bhavan

9/2, Block DJ, Sector-II, Salt Lake, Kolkata – 91

No : L/PR/99/2021

Date : 07/10/2021

### **NOTIFICATION**

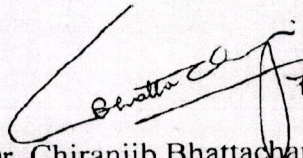
**Subject : Reduced Syllabus and Question Pattern for Science Subjects**

**Attention : All Heads of Higher Secondary Institutions , teachers , candidates  
for Class XI Annual Examination , 2022 and H.S Examination , 2022**

The Council has already notified about the Subject-wise Reduced Syllabus and Question pattern for Class XI Annual Examination 2022 and HS Examination 2022 vide Notification Memo No. L/Secy/25/2021 dated 06.08.2021.

For the benefit of the students , the Council is publishing the Reduced Syllabus and Question pattern for Science Subjects for Class XI Annual Examination 2022 and HS Examination 2022 . Please note that , the Notification published earlier regarding Science subjects showed only the discarded portions of the syllabus .

In order to avoid any confusion , all earlier Notifications uploaded in 2020 and 2021 regarding Reduced Syllabus or Question Pattern are being removed from our website.

  
[ Dr. Chiranjib Bhattacharya ]  
PRESIDENT  
(W. B. C. H. S. E.)



West Bengal Council of Higher Secondary Education.  
SULLABUS Session :-2021-2022  
CLASS-XI. Subject- PHYSICS (PHYS)  
Full Marks:-100. Theoretical marks:-70.

**Unit - 1. Physical world & Measurement.**

**Chapter-1: Physical World and Measurements.**

Measurement of small lengths:- Vernier constant and least count.  
Random errors:- Absolute error and proportional error. Significant figures.

**Unit- II. Kinematics**

**Chapter-2: Motion in a Straight Line.**

Reference frame.

Motion in a straight line:- Uniform accelerated motion, formula for uniformly acceleration motion, velocity- time and position- time graphs. Average speed and instantaneous velocity, elementary concepts of differentiation and integration for describing motion.

**Chapter- 3: Motion in a Plane.**

General vectors and notation, equality of vectors, addition and subtraction of vectors.

Unit vector, resolution of a vector in a plane- rectangular components. Position and displacement vectors in terms of unit vectors. Scalar and vector product of vectors.

Projectile motion and trajectory equation.

Uniform Circular motion:- Angular speed and velocity, centripetal acceleration, centrifugal force and their direction.

**Unit-III. Laws of motion.**

**Chapter-4: Laws of Motion.**

Force and Inertia, Newton's first law of motion; momentum. Newton's second law of motion; impulse. Newton's third law of motion. Law of conservation of linear momentum and its applications.

Static and kinetic friction, laws of friction.

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

**Unit-IV. Work, Energy &Power.**

**Chapter-5: 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 force; conservation of mechanical energy (kinetic and potential energies).

Motion in a vertical circle.

Elastic collision in one dimension.

**Unit-V. Motion of System of particles & Rigid Body.**

**Chapter-6: System of Particles and Rotational Motion.**

Position vector of Centre of mass, motion of centre of mass and momentum conservation.

Moment of force, torque, relation between torque and angular acceleration.

Moment of Inertia, radius of gyration, value of moments of inertia for simple geometrical objects (no derivation).

Equation in rotational motion. Comparison of linear and rotational motions..

Angular momentum, relation between torque and angular momentum, conservation of angular momentum with some examples.

**Unit-VI. Gravitation.**



#### **Chapter-7:- Gravitation.**

The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth.

Kepler's laws of planetary motion.

Gravitational potential energy and gravitational potential, escape velocity. Orbital velocity of a satellite, Geo-stationary satellites.

#### **Unit-VII. Properties of Bulk Matter.**

##### **Chapter-8:- Mechanical Properties of Solids.**

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

##### **Chapter -9: Mechanical Properties of Fluids.**

Pascal's law and its applications( hydraulic lift )

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

Surface energy and surface tension, angle of contact, capillary rise.

##### **Chapter-10: Thermal Properties of Matter.**

Thermal expansion of solids, liquids and gases, anomalous extension of water.

Calorimetry:- principle.

Change of state:- latent heat capacity.

Heat transfer- conduction, convection and radiation, thermal conductivity, qualitative ideas of blackbody radiation, Wien's displacement law, Stefan's Law.

#### **Unit- VIII. Behaviour of perfect Gas & Kinetic Theory of Gases.**

##### **Chapter-11: Kinetic Theory of gases.**

Equation of state of a perfect gas.

Assumptions; concept of pressure. Kinetic interpretation of temperature.

RMS speed of gas molecules; degrees of freedom, law of equipartition of energy(statement only); concept of mean free path.

#### **Unit-IX. Thermodynamics.**

##### **Chapter-12: Thermodynamics.**

Heat, work and internal energy. Work done in compressing a gas, First law of thermodynamics. Isothermal and adiabatic processes, two specific heats of gas and their relation. Second law of thermodynamics.

#### **Unit-X. Oscillations & Waves.**

##### **Chapter-13: Oscillations.**

Simple harmonic motion ( S.H.M ) and its equation; phase; oscillations of a loaded spring – restoring force and force constant, energy in S.H.M., kinetic and potential energies. simple pendulum -derivation of expression for its time period.

##### **Chapter-14: Waves**

Speed of wave motion:- Newton's law, Laplace's correction.

Displacement relation for a progressive waves, Principle of superposition of waves, reflection of waves, standing waves in string and organ pipes, fundamental mode and harmonics, beats. Doppler effect.



West Bengal Council of Higher Secondary Education.  
Questions Pattern and marks distribution. Class -XI. Subject:- Physics(PHYS).Session-2021-2022.

Sl. No.	Unit	Section-I	Section-I	Section-II	Section-II	Section-II	Total
		MCQ	Very Short Answer Questions.	Short Answer Questions. I	Short Answer Questions. II	Long Answer Questions. II	
		1 Mark.	1 Mark.	2 Marks	3 Marks	5 Marks.	
1	Physical World and Measurement.	1×1=1	00	2×1=2	00	00	03
2	Kinematics.	1×1=1	1×1=1	00	3×1=3	5×1=5	10
3	Laws of Motion.	1×2=2	00	2×1=2	3×2=6	00	10
4	Work, Energy and Power.	1×1=1	00	00	3×1=3	00	04
5	Motion of System of Particles and Rigid Body.	1×2=2	1×1=1	00	3×1=3	00	06
6	Gravitation.	1×1=1	00	00	3×2=6	00	07
7	Properties of Bulk Matter.	1×2=2	1×1=1	2×1=2	00	5×1=5	10
8	Behaviour of Perfect Gas and Kinetic Theory of Gases.	1×1=1	00	00	3×1=3	00	04
9	Thermodynamics	1×1=1	00	2×1=2	3×1=3	00	06
10	Oscillations and Waves.	1×2=2	1×1=1	2×1=2	00	5×1=5	10
	Total	14	04	10	27	15	70



**SUBJECT: CHEMISTRY**

SYLLABUS FOR SESSION: 2021 – 2022

CLASS – XI

THEORY – 70 MARKS

SL. NO.	UNIT	MARKS
1.	Some Basic concepts of chemistry	04
2.	Structure of Atom	06
3.	Classification of Elements and Periodicity in Properties	04
4.	Chemical Bonding and Molecular Structure	05
5.	State of Matter, Gases and Liquids	04
6.	Thermodynamics	06
7.	Equilibrium	06
8.	Redox Reactions	03
9.	Hydrogen	03
10.	S-Block Elements	05
11.	Some p-Block Elements	07
12.	Organic Chemistry: Some Basic Principles and Techniques	07
13.	Hydrocarbons	10
	Total	70



**Some Basic Concepts of Chemistry:** General Introduction: Importance and scope of Chemistry. Atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

**Structure of Atom:** 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's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.

**Classification of Elements and Periodicity in Properties:** 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, electro negativity, valency. Nomenclature of elements with atomic number greater than 100.

**Chemical Bonding and Molecular Structure:**

Valence electrons, ionic bond, covalent bond, 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.

**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 and deviation from ideal behaviour.

**Chemical Thermodynamics:** Concepts of System and types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics -internal energy and enthalpy, 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. Second law of Thermodynamics (brief introduction)

Introduction of entropy as a state function, Gibb's energy change for spontaneous and non-spontaneous processes.

Third law of thermodynamics (brief introduction).



**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 poly basic acids, acid strength, concept of pH, buffer solution, solubility product, common ion effect (with illustrative examples).

**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.

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

**s-Block Elements:** 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.

**Some p -Block Elements:** General 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.

Group 14 Elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first elements. Carbon-catenation, allotropic forms, physical and chemical properties.

**Organic Chemistry: Some basic Principles and Techniques:** General introduction, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electrometric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbonations, carbanions, electrophiles and nucleophiles, types of organic reactions.

**Hydrocarbons:** Classification of Hydrocarbons Aliphatic Hydrocarbons:

Alkanes - Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions.

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 monosubstituted benzene. Carcinogenicity and toxicity.



**Question Pattern for Class XI – 2022**

**Subject: CHEMISTRY**

Topic	MCQ (1 mark)	Very Short Answer Questions (1 mark)	Short Answer Questions (1 mark)	Short Answer Questions (2 Marks)	3 Mark Question	Total
Some Basic Concepts of Chemistry	1x1=1	1x1=1	1x2=2			04
Structure of Atom	1x1=1		1x2=2	1x3=3		06
Classification of Elements and Periodicity in Properties		1x1=1		1x3=3		04
Chemical Bonding and Molecular Structure	2x1=2			1x3=3		05
State of Matter, Gases and Liquids	1x1=1			1x3=3		04
Thermodynamics	2x1=2	1x1=1		1x3=3		06
Equilibrium	1x1=1				1x5=5	06
Redox Reactions				1x3=3		03
Hydrogen				1x3=3		03
s-Block Elements	2x1=2			1x3=3		05
Some p-Block Elements			1x2=2		1x5=5	07
Organic Chemistry: Some Basic Principles and Techniques	2x1=2		1x2=2	1x3=3		07
Hydrocarbons	2x1=2	1x1=1	1x2=2		1x5=5	10
Total	14	04	10	27	15	70



**MATHEMATICS**  
**CLASS-XI**

**UNIT -I SETS AND FUNCTIONS:**

**1.SETS :**

Sets and their representations .Empty set. Finite and Infinite sets. Equal sets.Subsets.Subsets of the Set of real number specially intervals(with notations). Power Set. Universal set. Venn diagram. Union and Intersection of 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. Functions as a special kind of relation from one set to another. Pictorial representation of a function, domain, co- domain & 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.

**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 , for all  $x$ . Signs of trigonometric functions Expressing

$\sin(xy)$  in terms of  $\sin x$  , $\sin y$ ,  $\cos x$  &  $\cos y$ . Deducing the identities like it following:

$$\tan(x \pm y) = \frac{\sin(x \pm y)}{\cos(x \pm y)}, \sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}, \cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2}$$

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

Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$  and  $\tan 3x$ .

**UNIT-II:ALGEBRA**

**Complex Numbers and Quadratic Equations:**

Need for complex numbers, especially , to be motivated by inability to solve every quadratic equations. Brief descriptions of algebraic properties of complex numbers. Argand plane and polar representation of complex numbers .

Statement of fundamental theorem of algebra, solution of quadratic equation in the complex number system (with real coefficient)

**3. 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

**4.Permutations & Combinations:**

Fundamental principle of counting .Factorial  $n$  ( $n!$ ). Permutation and Combinations, derivation of formulae and their connections, simple applications.



## **5. Sequence and Series :**

Sequence and Series. Arithmetic progression(A.P.) Arithmetic mean(A.M.) Geometric progression(G.P.), General term of G.P., sum of  $n$  terms of a G.P., geometric mean(G.M.) relation between A.M. and G.M., infinite G.P. and its sum.

## **UNIT-III COORDINATE GEOMETRY**

### **1. Straight Lines:**

Brief recall of 2D from earlier classes, Slope of a line and angle between two lines. Various forms of equations of a line parallel to axes, point-slope form, slope-intercept form, two-point form, intercept form and normal form. General equation of a line. Distance of a point from a line.

### **2. Conic Section :**

Sections of a cone, circle, ellipse, parabola, hyperbola. Standard equation of a circle. Standard equations and simple properties of parabola, ellipse and hyperbola.

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

Co-ordinate Axes and co-ordinate in three dimensions coordinates of a point. Distance between two points and Section formula.

## **UNIT-IV : CALCULUS:**

### **1. Limits and Derivatives**

Derivative introduced as a rate of change both as that of distance function and geometrically. Intuitive idea of limit. 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. Limits of polynomials and rational functions and trigonometric functions.

## **UNIT-V Statistics & Probability**

### **STATISTICS :**

Measures of dispersion; mean deviation, variance and standard deviation of ungrouped/ grouped data

### **Probability :**

Random experiments outcomes, sample spaces(set representation). Events: occurrence of events 'not' 'and' 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.



Subject Name : Mathematics

Theory Marks : 80

Topic	MCQ (1 mark)	VSA (2 marks)	SA I (4 marks)	LA (5 marks)	Total
Sets , Relation & Functions, Trigonometric Functions	2X1=2	2X2=4	2X4=8	1X5=5	19
<u>Algebra</u> Comple No & Quadratic Eqn , Permutation & Combination , Sequence % Series , <u>Linear Inequalities</u>	3X1=3	2X2=4	2X4=8	2X5=10	25
Straight Lines , Conic Sections	2X1=2	1X2=2	2X4=8	1X5=5	17
Limits & Derivatives	1X1=1	1X2=2	2X4=8		11
Statistics , Probability	2X1=2	1X2=2	1X4=4		08
TOTAL:					80



West Bengal Council of Higher Secondary Education

SYLLABUS : SESSION-2021-2022

Subject- BIOLOGICAL SCIENCE (BIOS)

CLASS-XI

Full Marks-100. Theory-70

UNIT		Marks
1	DIVERSITY OF LIVING ORGANISMS	07
2	STRUCTURAL ORGANIZATION OF PLANTS	12
3	CELL:STRUTURE AND FUNCTION	15
4	PLANT PHYSIOLOGY	18
5	HUMAN PHYSIOLOGY	18

**UNIT-1: DIVERSITY OF LIVING ORGANISMS.**

1. Science of life:- 1.1 Definition and concept of biodiversity.
2. Taxonomy and Systematics:-2.1. Taxonomy and Systematics -Definition. 2.2. Taxonomic hierarchy-(Linnaeus) with Example. 2.3. Binomial nomenclature .
3. Classification of Living Organisms:- 3.1 Five kingdoms of life and the basis of classification of five kingdoms.3.2. Salient features and classification of Monera, Protoctista (Protista) , Fungi and Lichens into major groups. 3.3. Virus and Virioids-a brief general account. 3.4 Salient features and classification of plant into major group-Algae,Bryophyte Pteridophytes, Gymnosperms and Angiosperm (three to five salient and distinguishing features of each category and at least two examples of each category. 3.5 Angiosperm- classification upto class, characteristic features (three to five ) and examples. 3.6 Salient features and classification of Animals – major non chordata upto phyla and chordatas upto class level (three upto five salient features and at least two examples).

**UNIT-II. STRUCTURAL ORGANISATION IN PLANTS AND ANIMALS**

4. Structural Organisation in Plants :- 4.1 Tissues (Definition) 4.2 Tissues in plants -Meristematic and Permanent ( Structure and function) 4.3 Inflorescences (Major types- Racemose and Cymose ). 4.4 Morphology of flower (including aestivation and placentation ), fruit.
5. Structural Organisation in Animals:- 5.1 Tissues in animals ( structure, occurrence and function in brief ).

**UNIT-III. STRUCTURE AND FUNCTION**

6. Cell:- 6.1 Cell envelope- cell membrane and cell wall ( ultrastructure and function ) 6.2 cell organelles-Ultrastructure and function: Mitochondria, golgi bodies, ribosomes, lysosomes and plastics.6.3 Ultra structure and function of cytoskeleton, centrioles.6.4. Nucleus – nuclear membrane,nucleoplasm,chromatin,nucleus (Ultrastructure and function).
7. Chemical constitutions of living cell:- 7.1 Biomolecules- structure and function of protein, carbohydrate, lipid and nucleic acid.7.2 Enzyme-types, properties and enzyme action ( lock and key, induced fit model and allosterism)



8. **Cell Division :-** 8.1 Introduction 8.2 Definition and types 8.3 cell cycle 8.4 Meiosis – Definition, types, process and significance.

#### **UNIT-IV. PLANT PHYSIOLOGY**

9. **Movement of water, Food, Nutrition and Gases** 9.1 Cell to cell transport- diffusion, facilitated diffusion, active transport. 9.2 Plant-water relation—inhibitions, water potential, osmosis and plasmolysis. 9.3 Transpiration and guttation, opening and closing of stomata. 9.4 Translocation – transport through xylem and phloem, Mass flow hypothesis.
10. **Plant Nutrition and Minerals** 10.1-Elementary idea of the Hydroponics 10.2 Nitrogen metabolism- nitrogen cycle, biological nitrogen fixation.
11. **Respiration :-** 11.1 Cellular respiration – glycolysis, T.C.A cycle and E.T.S ( aerobic) Definition, process and significance. 11.2 Energy relations – number of A.T.P. molecules generated in respiration. 11.3 Respiratory quotient of nutrients.
12. **Photosynthesis :-** 12.1 Photosynthetic pigments( elementary idea-structure not required) 12.2 Photochemical and biosynthetic phases of photosynthesis. 12.2 Cyclic and non cyclic photophosphorylation. 12.3 Photo respiration 12.4  $C_3$  and  $C_4$  pathways.
13. **Plant Growth and Development :-** 13.1 Condition of growth-( light, temperature, water, hormone, nutrients only) 13.2 Sequence of development process in a plant cell through charts. 13.3 Growth regulations – auxin, gibberellin cytokinin, ethylene, A.B.A. 13.4 seed germination 13.5 Seed dormancy 13.5 Photoperiodism- definition, types of plants on basis of the length of the photoperiod.

#### **UNIT-V. HUMAN PHYSIOLOGY.**

14. **Digestion and Absorption:-** 14.1 Structure (in brief) of human alimentary canal including dental arrangement and digestive glands. 14.2 Role of the digestive enzymes and the G-I Hormone in digestion . 14.3 Peristalsis 14.4 Digestion, absorption and assimilation of protein, carbohydrate and fat.
15. **Breathing and Respiration:-** 15.1 Respiratory system in human( outline) 15.2 Mechanism of breathing and it's regulation in human . 15.3 Exchange of gases, transport of gases and regulation of respiration. 15.4 Respiratory volumes.
16. **Body Fluids and Circulation:-** 16.1 Composition of Blood( Tabular form) 16.2 Blood groups, ABO Blood groups 16.3 Coagulation of blood 16.4 Structure of Human heart and blood vessels. 16.5 Cardiac cycle 16.6 Cardiac output (stroke volume and minute volume, determination of cardiac output-Fick's Principle) 16.6 E.C.G (brief idea, no analysis required)
17. **Excretory Products and their Elimination.-** 17.1 Modes of excretion -Ammonotelism Ureotelism, Uricotelism ( Definition and Examples) 17.2 Human excretory system- structure and function ( Histology of nephron) 17.3 Urine formation and Osmo-regulation. 17.4 Role of other organs in excretion- Liver, skin, lung and salivary gland.
18. **Locomotion and Movement:-** 18.1 Skeletal muscle -contractile proteins and muscle contraction. 18.2 Joints
19. **Neural control and coordination:-** 19.1 Central Nervous System, Peripheral Nervous system( P.N.S.) ,and visceral Nervous system. Brain and it's major parts-cerebral cortex, thalamus , hypothalamus and limbic system, mid brain, pons, medulla, cerebellum and Spinal cord (function only) , Mode of distribution and function of P.N.S and autonomic nervous system. 19.2 Reflex action and Reflex Arc.
20. **Chemical Coordination and Regulation.** 20.1 Human endocrine system-Hypothalamus, Pituitary , Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads ( location and function only) 20.2. Mechanism of hormone action ( elementary idea).



## **BIOLOGICAL SCIENCE Question Pattern ( Class XI )**

### **New Syllabus**

Sl.no.	Unit	Section I MCQ (1 mark)	Section II Very Short Answer Questions (1 mark)	Section II Short Answer Questions I (2 marks)	Section II Short Answer Questions II (3 marks)	Section II Long Answer Questions (5 marks)	TOTAL
1.	Diversity of Living Organisms	1X2=2	-	2X1=2	3X1=3	-	7
2.	Structural Organizations in Plants and Animals	1X3=3	1X1=1	2X1=2	3X2=6	-	12
3.	Cell structure and function	1X2=2	-	2X1=2	3X2=6	5X1=5	15
4.	Plant Physiology	1X4=4	1X1=1	2X1=2	3X2=6	5X1=5	18
5.	Human Physiology	1X3=3	1X2=2	2X1=2	3X2=6	5X1=5	18
		14	4	10	27	15	70

- Question paper will have two sections :  
Section I : for MCQ ( Question Nos : 1 to 14 )  
Section II will have four groups:  
VSA ( 1 mark ) – one sentence answer ( Question No : 1 to 4 )  
SA I ( 2 marks ) -- ( Question No : 5 to 9 )  
SA II ( 3 marks ) -- ( Question No : 10 to 18 )  
LA ( 5 marks ) -- ( Question No : 19 to 21 )
- There should be no fractions in the marks distribution.
- For SA I , marks may be divided into 1+1
- For SA II , marks may be divided into 2+1
- For LA , marks may be divided into 3+2 or 4+1 .
- Option Summary :

Section I	No Internal Option
Section II VSA	Internal Option for at least any two questions
Section II SA I	Internal Option for at least any three questions
Section II SA II	Internal Option for at least any five questions
Section II LA	Internal Option for at least any two questions



West Bengal Council of Higher Secondary Education.

SYLLABUS

SESSION:- 2021-2022.

CLASS-XII.

SUBJECT:- PHYSICS(PHYS)

MARKS:-100.

THEORETICAL MARKS :-70

**Unit-I. Electrostatics**

**Chapter-1: Electric charges and Coulomb's Law.**

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

**Chapter-2: Electric field and Gauss's Theorem.**

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

Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire and uniformly charged infinite plane sheet.

**Chapter-3: Electrostatic potential.**

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

**Chapter-4: Capacitors and Dielectrics.**

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, 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.

**Unit – II. Current Electricity.**

**Chapter-1:- Electric Current and Electric cell.**

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. Temperature dependence of resistance.

Internal resistance of a cell, potential difference and E.M.F. of a cell, combination of cells in series and in parallel.

**Chapter-2: Electric network rules and electrical measurements.**

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

Potentiometer; principle and its applications to measure potential difference and for comparing e.m.f. of two cells, measurement of internal resistance of a cell.

**Unit – III. Magnetic effect of current and Magnetism.**

**Chapter-1: Concept and laws of magnetic field.**

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.

**Chapter-2: Force on a Charge and current.**

Force on a moving charge in uniform magnetic and electric fields. 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 uniform magnetic field; moving coil galvanometer-its current sensitivity and conversion to ammeter and voltmeter.

**Chapter-3: Magnetic Dipole and Earth's Magnetism.**

Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Bar magnet as an equivalent solenoid, magnetic field lines; earth's magnetic field and magnetic elements.



## **Unit- IV. Electromagnetic Induction and Alternating Currents.**

### **Chapter-1: Electromagnetic Induction.**

Electromagnetic Induction; Faraday's law. Induced emf and current; Lenz's law, Eddy currents, Self and mutual inductance.

### **Chapter-2: Alternating Current.**

Alternating currents, peak and RMS value of alternating current/voltage; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits.

AC generator and transformer.

## **Unit-V. Electromagnetic waves.**

### **Chapter-1: Electromagnetic Waves.**

Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

## **Unit -VI. Optics :- Part A: Ray Optics and Optical Instrument.**

### **Chapter-1: Refraction of light.**

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. Refraction of light through a prism.

### **chapter-2: Optical Instruments.**

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

## **Part B:- Wave Optics:-**

### **Chapter-1:- Propagation principle of wavefront**

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 Huygen's principle.

### **Chapter-2: Interference of light.**

Interference, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light.

### **Chapter-3: Diffraction of light.**

Diffraction due to a single slit, width of central maximum.

## **Unit -VII. Dual Nature of Matter and Radiation.**

### **Chapter-1: Particles Nature of Radiation.**

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

### **Chapter-2: Wave Nature of Matter.**

Matter waves:-wave nature of particles, de Broglie relation.

## **Unit – VIII. Atoms and Nuclei**

### **chapter-1: Atoms**

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

### **Chapter-2:- Nuclei.**

Composition and size of nucleus, Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission and fusion.

## **Unit- IX. Electronic Devices.**

### **Chapter-1: Band theory of solids**

Energy bands in conductors, insulators and Semiconductors.

### **Chapter-2:- semiconductor Electronics.**

semiconductor diode, I-V characteristics of diode in forward and reverse bias, diode as a rectifier.

Special purpose p-n junction diodes; LED, photodiode, solar cell and their Characteristics.



**West Bengal Council of Higher Secondary Education**

**QUESTION STRUCTURE AND MARK DISTRIBUTION**

**Class – XII Subject-Physics (PHYS)**

**Session-2021-2022**

Sl No	Unit	Section I		Section II			Total Marks
		MCQ	Very Short Answer Question.	Short Answer Questions I	Short Answer Questions II	Long Answer Questions	
		1 mark	1 mark	2 marks	3 marks	5 mark	
1	Electrostatics	1X2=2	00	2×1=2	3×2=6	00	10
2	Current Electricity	1×1=1	00	2×1=2	00	5×1=5	08
3	Magnetic Effect of current and magnetism	1×1=1	1×1=1	00	3×1=3	5×1=5	10
4	Electromagnetic induction and Alternative current	1×1=1	00	2×1=2	3×1=3	00	06
5	Electromagnetic waves	1×1=1	00	2×1=2	00	00	03
6	Optics: Ray Optics and instruments.	1×2=2	00	00	3×2=6	00	8
	Optics: wave optics.	1×1=1	1×1=1	00	00	5×1=5	7
7	Dual Nature of radiation and matter	1×1=1	00	2×1=2	3×1=3	00	6
8	Atoms and Nuclei	1×2=2	1×1=1	00	3×1=3	00	6
9	Electronic Devices	1×2=2	1×1=1	00	3×1=3	00	6
Total.		14	4	10	27	15	70



SUBJECT: CHEMISTRY

SYLLABUS FOR SESSION: 2021 – 2022

CLASS – XII

THEORY – 70 MARKS

SL. NO.	UNIT	MARKS
1.	Solid State	4
2.	Solutions	6
3.	Electrochemistry	5
4.	Chemical Kinetics	10
5.	Surface Chemistry	7
6.	p-Block Elements	8
7.	d- and f-Block Elements	1
8.	Coordination Compounds	4
9.	Haloalkanes and haloarenes	4
10.	Alcohols, Phenols and Ethers	4
11.	Aldehydes, Ketones and Carboxylic Acids	10
12.	Organic Compounds Containing Nitrogen	4
13.	Biomolecules	3



**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, packing efficiency, calculation of density of unit Cell, Packing in solids, voids, number of atoms per unit cell in a cubic unit cell, point defects.

**Solutions:**

Types of Solutions, expression of concentration of solution of solids in liquids, solubility of gases in liquids in liquids, solid solutions, Raoult's law, colligative properties – relative lowering of vapour pressure, elevation of boiling point, depressing of freezing point, osmotic pressure, determination of molecular masses using colligative properties.

**Electrochemistry:**

Redox reactions, EMF of cell, standard and electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and EMF of a Cell, Conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's law, electrolysis and laws of electrolysis (elementary idea).

**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 reaction)

**Surface Chemistry:**

Adsorption – Physisorption and chemisorptions, factors affecting adsorption of gases on solids colloidal state, distinction between true solutions, multi molecular and macromolecular colloids; properties of colloids, Tyndall effect, Brownian movement, electrophoresis, coagulation.

**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.

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 : properties and uses : oxiacids 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, oxiacides of halogens (structure only).

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

#### **d- and f-Block Elements:**

General introduction, electronic configuration, occurrence and characteristic 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. Lanthanoids – electronic configuration, oxidation states and lanthanoid contraction and its consequences.

#### **Coordination Compounds:**

Coordination compounds – introduction , ligands, coordination number, colour, magnetic properties and shape, IUPAC nomenclature of mononuclear coordination compounds, bonding, Werner's theory, VBT and CFT.

#### **Haloalkanes and Haloarenes:**

Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, stability of carbonations R-S and d-l configurations.

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

#### **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

Phenols: Nomenclature, methods of Preparation, physical and chemical properties , acidic nature of phenol, electrophilic substitution reactions, uses of phenol.

Ethers: Nomenclature, methods of preparation, Physical and chemical properties uses.



**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.

**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.

**Bio Molecules:**

Carbohydrates – Classification (Alloses and ketose), monosaccharide's (glucose and fructose) D-L configuration

Proteins – Elementary idea of alpha amino acids, peptide bond, polypeptides, proteins, structure of proteins –Primary secondary, tertiary and quaternary structures (qualitative idea only), denaturation of proteins.

Nucleic Acids: DNA and RNA



Question Pattern for H.S. Examination – 2022

Subject: CHEMISTRY

Topic	MCQ (1 mark)	Very Short Answer Questions (1 mark)	Short Answer Questions (1 mark)	Short Answer Questions (2 Marks)	3 Mark Question	Total
Solid State	1x1=1			1x3=3		04
Solutions	1x1=1		1x2=2	1x3=3		06
Electro Chemistry	1x1=1	1x1=1		1x3=3		05
Chemical Kinetics	1x1=1	1x1=1		1x3=3	1x5=5	10
Surface Chemistry	1x1=1	1x1=1	1x2=2	1x3=3		07
P- Block Elements	1x1=1		1x2=2		1x5=5	08
d- and f-Block Elements	1x1=1					01
Co-ordination Compounds	1x1=1	1x1=1	1x2=2			04
Haloalkanes and Haloarenes	1x1=1			1x3=3		04
Alcohols, Phenol and Ethers	1x1=1			1x3=3		04
Aldehydes, Ketones and Carboxylic Acids	2x1=2			1x3=3	1x5=5	10
Organic Compounds Containing Nitrogen	1x1=1			1x3=3		04
Biomolecules	1x1=1		1x2=2			03
Total	14	04	10	27	15	70



# **MATHEMATICS**

## **Class 12**

### **Unit-1 : Relations and Function**

#### **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

#### **2. Inverse Trigonometric Functions**

Definition, range, domain, principal value branches

### **Unit-II: Algebra**

#### **1. Matrices:**

Concept, notation order equality, types of matrices, zero matrix, transpose of a matrix and 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 (Here all matrices will have real entries)

#### **2. Determinants:**

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

### **Unit-III : Calculus**

#### **1. Continuity and Differentiability:**

Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit functions, concept of exponential and logarithmic functions to the base  $e$ . Logarithmic functions as inverse of exponential functions.

Derivatives of logarithmic and exponential functions. Logarithmic, differentiation, derivative of function expressed in parametric forms. Second order derivatives

#### **2. Applications of derivatives:**

Applications of derivatives, increasing/ decreasing functions, tangents and normals, 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 a real time situation)

#### **3. 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 to be evaluated.

$\int \dots dx,$   
 $\int \dots dx$

Fundamental theorem of Calculus (without proof) Basic properties of definite integrals and evaluation of definite integrals.



evaluation of definite integrals.

#### **4. Applications of the Integrals:**

Applications in finding the area under simple curves especially lines ,areas of circles/ parabola/ ellipse (in standard form only)

#### **5 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 equation by method of separation of variables, homogenous differential equation of first order and first degree.

### **UNIT-IV : Vectors and Three-Dimensional Geometry**

#### **1.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 vectors by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar(dot) product of the vectors, projection of a vector on a line .Vector(cross) product of vectors.

#### **2. Thre-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 .Distance of a point from a plane.

### **UNIT-V : Linear Programming :**

#### **1. Linear Programming**

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

### **UNIT-VI: Probability:**

#### **1. Probability :**

Multiplication theorem on probability, Conditional probability, independent events, total probability, Baye's Theorem, Random variable and its probability distribution.



# Subject-wise Question Pattern for H.S.Examination-2022

Subject Name : MATH

Theory Marks : 80

Topic	MCQ (1 mark)	Very Short Answer Questions (2 mark)	Short Answer Questions (4 mark)	Long Answer Questions (5 Marks)	Total
Relations & Functions <i>Inv. Trigo Functions</i>	2x1=2	1x2=2	1x4=4	----	8
<u>ALGEBRA</u> • Matrices, <i>Determinants</i>	1x1=1	1x2=2	2x4=8	----	11
<u>CALCULUS</u> • Continuity • Differentiability • Application of Derivatives • Integrals(Definite & Indefinite) • Application of Integrals • Differential Equation	3x1=3	3x2=6	4x4=16	2x5=10	35
3D Geometry <i>Vector</i>	2x1=2	1x2=2	1x4=4	1x5=5	13
Linear Programming	----	----	----	1x5=5	5
Probability	2x1=2	1x2=2	1x4=4	----	8
Total	10	14	36	20	80



# **BIOLOGICAL SCIENCES (BIOS)**

**CLASS - XII**  
FULL MARKS- 100  
THEORY - 70 MARKS

Unit - I	REPRODUCTION IN ORGANISMS	14 MARKS
Unit - II	GENETICS AND EVOLUTION	18 MARKS
Unit - III	BIOLOGY AND HUMAN WELFARE	14 MARKS
Unit - IV	BIOTECHNOLOGY AND ITS APPLICATION	10 MARKS
Unit - V	ECOLOGY AND ENVIRONMENT	14 MARKS

## **Unit - I**

### **REPRODUCTION IN ORGANISMS**

#### **1 : Sexual Reproduction In flowering Plants**

- 1.1 Flower structure: Typical structure of a complete regular flower with diagram
- 1.2 Pollination: Definition, types-self Pollination ( autogamy and geitonogamy ) And cross pollination. (allogamy and xenogamy); agents of pollination- wind, water, animals, insects and birds- brief description with example. Significance.
- 1.3 Outbreeding devices
- 1.4 Double fertilization
- 1.5 Special modes – apomixes, Parthenogenesis, parthenocarpy and Polyembryony (brief account)
- 1.6 Significance of seed and fruit formation

#### **2 : Human Reproduction**

- 2.1 Introduction
- 2.2 Male Reproductive system (outline with diagram)
- 2.3 Female Reproductive system (outline with diagram)
- 2.4 Gametogenesis- Definition and type
- 2.5 Spermatogenesis (brief account)
- 2.6 Oogenesis (brief account)
- 2.7 Menstrual cycle
- 2.8 Fertilization and development of embryo upto blastocyst formation and implantation.
- 2.9 Pregnancy and Placenta formation (elementary idea)



- 2.10 Parturition (elementary idea)
- 1.11 Lactation (elementary idea)

### **3 : Reproductive Health**

- 3.1 Introduction: what is Reproductive health?
- 3.2 Need for reproductive health
- 3.3 Sexually Transmitted diseases (STD) And its prevention
- 3.4 Birth control- Needs and Methods:
  - i) Contraception
  - ii) Medical termination of pregnancy (MTP)
- 3.5 Amniocentesis: What it is and it's Significance
- 3.6 Infertility and assisted reproductive Technologies – IVF (in vitro fertilization), ZIFT (Zygote intrafallopian transfer), GIFT (Gamete intrafallopian transfer ) Elementary idea for general awareness.

## **Unit – II**

## **GENETICS AND EVOLUTION**

### **4. Heredity and Variation**

- 4.1 Introduction
- 4.2 Mendelian Inheritance (laws only)
- 4.3 Deviations from Mendelism
  - i) incomplete dominance
  - ii) Co-dominance
  - iii) multiple alleles and Inheritance of Blood groups (ABO & Rh)
  - iv) Pleiotroph
- 4.4 Polygenic inheritance ( elementary )
- 4.5 Chromosome theory of inheritance
- 4.6 Chromosome and genes
- 4.7 Sex determination in – Human, bird and honey bee
- 4.8 Linkage and crossing over
- 4.9 Sex –linked inheritance – haemophillia and colour blindness
- 4.10 Mendelian disorder in human: Chromosomal disorders:
  - i) Autosomal – thalassemia
  - ii) Sex-linked-Down's Syndrome, Turner's Syndrome and Klinefelter's Syndrome (cause & symptoms only , Process of inheritance is not required)



## **5 : Molecular Basic of Inheritance**

- 5.1 Search for genetic material
- 5.2 DNA as genetic material:  
(experiments on Bacterial transformation by F. Griffith; Avery ,McLeod and Harshey & Chase)
- 5.3 Structure of DNA
- 5.4 Structure of RNA
- 5.5 Types of RNA –mRNA; rRNA & tRNA
- 5.6 DNA Packaging
- 5.7 Central dogma (elementary),  
DNA replication , transcription.  
Genetic code and translation .
- 5.8 Regulation of Gene expression  
(elementary) Lac Operon
- 5.9 Genome and Human genome project
- 5.10 DNA finger printing

## **6 : Evolution**

- 6.1 Introduction
- 6.2 Biological Evolution
  - a) What is biological Evolution?
  - b) Evidence for Biological Evolution
    - i) Paleontological
    - ii) From comparative anatomy
    - iii) Embryological
    - iv) Molecular
- 6.3 Theories of organic evolution  
Introduction – Darwin's contribution-  
Modern Synthetic Theory –  
Hardy Weinberg's Principle

## **Unit – III**

## **BIOLOGY AND HUMAN WELFARE**

### **7 : Health and Diseases**

- 7.1 Basic concept of immunology – vaccines  
Introduction – immune system – Antigen,  
Antibody , Antigen-Antibody reaction – Types  
of immunity – vaccines and vaccination
- 7.2 Pathogens, parasites causing human  
Diseases-Malaria, Filariasis, Ascariasis,  
Typhoid, Pneumonia, common cold ,  
Amoebiosis and ring worm .(symptoms of  
Disease, Name of causative agent ,mode of  
Transmission ,preventive measures)



- 7.3 Cancer ,HIV and AIDS-Symptoms of disease , causative agent , mode of transmission preventive measures
- 7.4 Adolescence : drug and alcohol abuse

### **8 : Microbes In Human welfare**

- 8.1 In household food processing
- 8.2 Industrial production
- 8.3 Sewage treatment
- 8.4 Energy generation
- 8.5 Bio control agents and bio fertilizers

## **Unit – IV**

### **BIOTECHNOLOGY AND ITS APPLICATION**

#### **9 : Biotechnology and its Application**

- 9.1 Introduction
- 9.2 Principle
- 9.3 Process –Genetic Engineering ( Recombinant DNA technology )
- 9.4 Application of Biotechnology in health and agriculture – introduction
- 9.5 Human insulin and vaccine production- gene therapy
- 9.6 Genetically modified organisms - BT crops (What is G.M.O ? example- cotton ). Transgenic animals.
- 9.7 Bio safety issues
- 9.8 Bio piracy and patents

## **Unit – V**

### **ECOLOGY AND ENVIRONMENT**

#### **10 : Ecology Environment & Population**

- 10.1 Meaning of ecology. Environment , Habitat and niche.
- 10.2 Organisms and environment
  - i) Introduction –biome concept and distribution
  - ii) Major abiotic factors – water ,light temperature and soil
  - iii) Responses to abiotic factors
  - iv) Adaptations
- 10.3 Population and ecological adaptations-
  - i) Population interactions – mutualism



**BIOLOGICAL SCIENCES (BIOS)****Class - XII****( New Syllabus )****QUESTION PATTERN****( THEORY )**• **Marks Distribution :**

Sl. No.	Unit	(1 mark) Sec-I MCQ	(1 mark) Sec-II VSA	(2 marks) Sec-II SA-I	(3 marks) Sec-II SA-II	(5 marks) Sec-II LA	Total
1.	Reproduction	3(3)	1(1)	2(1)	3(1)	5(1)	14
2.	Genetics & Evolution	4(4)	1(1)	2(1)	6(2)	5(1)	18
3.	Biology in Human Welfare	2(2)	1(1)	2(1)	9(3)	—	14
4.	Bio-Technology	2(2)	—	2(1)	6(2)	—	10
5.	Ecology & Environment	3(3)	1(1)	2(1)	3(1)	5(1)	14
		14(14)	4(4)	10(5)	27(9)	15(3)	70

• **Question Paper will have two Sections :**

Section-I : For MCQ (Question Nos. 1 to 14)

Section-II will have four groups :

VSA (1 mark) — one sentence answer (Question Nos. 1-4)

SA-I (2 marks) — (Question Nos. 5-9)

SA-II (3 marks) — (Question Nos. 10-18)

LA (5 marks) — (Question Nos. 19-21)

• **There should be no fractions in the marks distribution.**

• For SA-I, marks may be divided into 1 + 1

• For SA-II, marks may be divided into 2 + 1

• For LA, marks may be divided into 3 + 2 or 4 + 1.

• **Option Summary :**

Section-I	No internal option
Section-II VSA	Internal options for at least any 2 questions
Section-II SA-I	Internal options for at least any 3 questions
Section-II SA-II	Internal options for at least any 5 questions
Section-II LA	Internal options for at least any 2 questions