

**ALIGARH MUSLIM UNIVERSITY, ALIGARH**

**FACULTY OF SCIENCE / LIFE SCIENCES**

**SYLLABUS FOR**

**B.Sc. (Hons.) Science / Life Sciences**

**ENGLISH**

1. One unseen passage with a variety of questions
2. Vocabulary
3. Grammar
  - (i) Tenses, Clauses, gap-filling, error-correction of words and sentences.

**CHEMISTRY (CLASS XI – XII)**

**Class XI (Theory)**

**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 and empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

**Structure of Atom**

Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Thompson'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.

## **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.

## **Chemical Bonding and Molecular Structure**

Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, 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's law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro number, ideal gas equation. Deviation from ideal behaviour, liquefaction of gases, critical temperature Kinetic energy and molecular speeds (elementary idea).

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

## **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, Second law of thermodynamics, Gibbs energy change for spontaneous and non-spontaneous process, criteria for equilibrium.

## **Equilibrium**

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium – Le Chatelier's principle; ionic equilibrium – ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of polybasic acids, acid strength, concept of pH, Hydrolysis of salts (elementary idea),

buffer solutions, Henderson equation, 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 electron and change in oxidation numbers, applications of redox reactions.

## **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, use and structure; hydrogen as a fuel.

## **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 hydrogencarbonate, biological importance of sodium and potassium.

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

## **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, some important compounds; borax, boric acids, boron hydrides. Aluminium: uses, reactions with acids and alkalies.

Group 14 elements : General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous 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.

### **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, electrometric effect, resonance and hyper conjugation.

Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbonions; electrophiles and nucleophiles, types of organic reactions.

### **Hydrocarbons**

Classification of Hydrocarbons.

Aliphatic hydrocarbons:

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 mon-substituted benzene; carcinogenicity and toxicity.

### **Environmental Chemistry**

Environmental pollution – Air, water and soil pollution, chemical reactions in atmosphere, smogs, 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.

## **CLASS XII (Theory)**

### **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, calculations 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, semiconductors and insulators and n and p type semiconductors.

### **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.

### **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.

### **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.

### **Surface Chemistry**

Adsorption – physisorption and chemisorption; factors affecting adsorption of gases on solids; catalysis homogenous and heterogeneous, activity and selectivity: enzyme catalysis; colloidal state: distinction between true solutions, colloids and suspensions; lyophilic, lyophobic multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation; emulsions – types of emulsions.

### **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.

## **p-Block Elements**

Group 15 elements : General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; nitrogen – preparation, properties and uses; compounds of nitrogen : preparation and properties of ammonia and nitric acid, oxides of nitrogen (structure only); Phosphorous – allotropic forms; compounds of phosphorous : preparation and properties of phosphine, halides ( $\text{PCl}_3$ ,  $\text{PCl}_5$ ) and oxoacids (elementary idea only).

**Group 16 elements** : General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; dioxygen: preparation, properties and uses; classification of oxides; 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, compounds of xenon and their structure.

## **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  $\text{K}_2\text{Cr}_2\text{O}_7$  and  $\text{KMnO}_4$ .

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

**Actinoids** – Electronic configuration, oxidation states and comparison with lanthanoids.

## **Coordination Compounds**

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

## **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.

### **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 methanol and ethanol.

**Phenols** : Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reaction, uses of phenols.

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

### **Aldehydes, Ketones and Carboxylic Acids**

**Aldehydes and ketones:** Nomenclature, nature of carbonyl group, method 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.

### **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.

### **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.

**Hormones** – Elementary idea (excluding structure).

**Vitamins** – Classification and functions.

**Nucleic Acids** : DNA and RNA

## **Polymers**

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

## **Chemistry in Every Day Life**

1. **Chemicals in medicines** – analgesics, tranquilizers, antiseptic, 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.

## **PHYSICS**

1. Physical World and Measurement
2. Kinematics
3. Laws of Motion
4. Work, Energy & Power
5. Motion of System of Particles & Rigid Body
6. Gravitation
7. Properties of Bulk Matter
8. Thermodynamics
9. Behaviour for Perfect Gas & Kinetic Theory of gases
10. Oscillations & Waves
11. Electrostatics
12. Current Electricity
13. Magnetic effect of current & Magnetism
14. Electromagnetic Induction and Alternating current
15. Electromagnetic Waves
16. Optics
17. Dual Nature of Matter
18. Atoms and Nuclei
19. Electronic Devices
20. Communication System



## **MATHEMATICS**

1. Sets
2. Relations and Functions
3. Mathematical Induction
4. Complex Numbers
5. Linear Inequalities
6. Quadratic Equations
7. Sequences and Series
8. Trigonometric Functions
9. Cartesian System of Rectangular Coordinates
10. Straight Lines and Family of Straight Lines
11. Circles
12. Conic Section
13. Permutation and Combination
14. Binomial Theorem
15. Mathematical Reasoning
16. Statistics
17. Three Dimensional Geometry
18. Vectors
19. Matrices and Determinants
20. Probability
21. Function, Limits and Continuity
22. Differentiation
23. Application of Derivatives
24. Indefinite Integrals
25. Definite Integral
26. Differential Equations
27. Applications of Integrals
28. Linear Programming

## **BIOLOGY** **CLASS XI (THEORY)**

### **Botany**

#### **Diversity of Living Organisms**

##### **Chapter-1: The Living World**

What is living? Biodiversity; Need for classification; three domains of life; taxonomy and systematics; concept of species and taxonomical hierarchy; binomial nomenclature; tools for study of taxonomy-museums, zoological parks, herbaria, botanical gardens.

##### **Chapter-2: Biological Classification**

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

### **Chapter-3: Plant Kingdom**

Salient features and classification of plants into major groups - Algae, Bryophyta, Pteridophyta, Gymnospermae and Angiospermae (three to five salient and distinguishing features and at least two examples of each category); Angiosperms - classification upto class, characteristic features and examples.

### **Chapter-4: Animal Kingdom**

Salient features and classification of animals non-chordates up to phyla level and chordates up to class level (three to five salient features and at least two examples of each category).  
(No live animals or specimen should be displayed.)

## **Structural Organisation in Animals and Plants**

### **Chapter-5: Morphology of Flowering Plants**

Morphology and modifications: inflorescence, flower, fruit and seed

### **Chapter-6: Anatomy of Flowering Plants**

Anatomy and functions of different parts of flowering plants: root, stem, leaf, tissue (to be dealt along with the relevant experiment of the Practical Syllabus).

### **Chapter-7: Structural Organisation in Animals**

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

## **Cell: Structure and Function**

### **Chapter-8: Cell-The Unit of Life**

Cell theory and cell as the basic unit of life: Structure of prokaryotic and eukaryotic cells; 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 (ultrastructure and function); nucleus, nuclear membrane, chromatin, nucleolus.

### **Chapter-9: Biomolecules**

Chemical constituents of living cells: biomolecules, structure and function of proteins, carbohydrates, lipids, nucleic acids, enzymes, types, properties, enzyme action.

### **Chapter-10: Cell Cycle and Cell Division**

Cell cycle, mitosis, meiosis and their significance.

## **Plant Physiology**

### **Chapter-11: 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, root pressure and guttation; transpiration, opening and closing of stomata; Uptake and translocation of mineral nutrients - Transport of food, phloem transport, massflow hypothesis; diffusion of gases.

### **Chapter-12: 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.

### **Chapter-13: Photosynthesis in Higher Plants**

Photosynthesis as a mean of autotrophic nutrition; site of photosynthesis, pigments involved in photosynthesis (elementary idea); photochemical and biosynthetic phases of photosynthesis; cyclic and non

cyclic photophosphorylation; chemiosmotic hypothesis; photorespiration; C<sub>3</sub> and C<sub>4</sub> pathways; factors affecting photosynthesis.

#### **Chapter-14: Respiration in Plants**

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.

#### **Chapter-15: Plant - Growth and Development**

Seed germination; phases of plant growth and plant growth rate; conditions of growth; differentiation, dedifferentiation and redifferentiation; sequence of developmental processes in a plant cell; growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA; seed dormancy; vernalisation; photoperiodism.

### **Human Physiology**

#### **Chapter-16: 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 values of proteins, carbohydrates and fats; egestion; nutritional and digestive disorders - PEM, indigestion, constipation, vomiting, jaundice, diarrhoea.

#### **Chapter-17: Breathing and Exchange of Gases**

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 volume; disorders related to respiration - asthma, emphysema, occupational respiratory disorders.

#### **Chapter-18: 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.

#### **Chapter-19: 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.

#### **Chapter-20: Locomotion and Movement**

Types of movement - ciliary, flagellar, muscular; skeletal muscle- contractile proteins and muscle contraction; skeletal system and its functions; joints; disorders of muscular and skeletal system - myasthenia gravis, tetany, muscular dystrophy, arthritis, osteoporosis, gout.

#### **Chapter-21: 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; sensory perception; sense organs; elementary structure and functions of eye and ear.

#### **Chapter-22: Chemical Coordination and Integration**

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; dwarfism, acromegaly, cretinism, goiter, exophthalmic goiter, diabetes, Addison's disease.

**Note:** Diseases related to all the human physiological systems to be taught in brief.

## CLASS XII (THEORY)

### Reproduction

#### Chapter-1: Reproduction in Organisms

Reproduction, a characteristic feature of all organisms for continuation of species; modes of reproduction - asexual and sexual reproduction; asexual reproduction - binary fission, sporulation, budding, gemmule formation, fragmentation; vegetative propagation in plants.

#### Chapter-2: Sexual Reproduction in Flowering Plants

Flower structure; development of male and female gametophytes; pollination - types, agencies and examples; outbreeding devices; pollen-pistil interaction; double fertilization; post fertilization events - development of endosperm and embryo, development of seed and formation of fruit; special modes - apomixis, parthenocarpy, polyembryony; Significance of seed dispersal and fruit formation.

#### Chapter-3: Human Reproduction

Male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis - spermatogenesis and oogenesis; menstrual cycle; fertilisation, embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea).

#### Chapter-4: Reproductive Health

Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs); 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).

### Genetics and Evolution

#### Chapter-5: Principles of Inheritance and Variation

**Heredity and variation:** Mendelian inheritance; deviations from Mendelism - incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, chromosome theory of inheritance; chromosomes and genes; Sex determination - in humans, birds and 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.

#### Chapter-6: 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 and rice genome projects; DNA fingerprinting.

#### Chapter-7: Evolution

Origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences); 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.

### Biology and Human Welfare

#### Chapter-8: Human Health and Diseases

Pathogens; parasites causing human diseases (malaria, dengue, chickengunia, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse.

#### Chapter-9: Strategies for Enhancement in Food Production

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

#### **Chapter-10: Microbes in Human Welfare**

In household food processing, industrial production, sewage treatment, energy generation and microbes as biocontrol agents and biofertilizers. Antibiotics; production and judicious use.

### **Biotechnology and Its Applications**

#### **Chapter-11: Biotechnology - Principles and processes**

Genetic Engineering (Recombinant DNA Technology).

#### **Chapter-12: Biotechnology and its Application**

Application of biotechnology in health and agriculture: Human insulin and vaccine production, stem cell technology, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues, bio piracy and patents.

### **Ecology and Environment**

#### **Chapter-13: Organisms and Populations**

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.

#### **Chapter-14: Ecosystem**

Ecosystems: Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy; nutrient cycles (carbon and phosphorous); ecological succession; ecosystem services - carbon fixation, pollination, seed dispersal, oxygen release (in brief).

#### **Chapter-15: Biodiversity and its Conservation**

Concept of biodiversity; patterns of biodiversity; importance of biodiversity; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, national parks, sanctuaries and Ramsar sites.

#### **Chapter-16: 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 climate change; ozone layer depletion; deforestation; any one case study as success story addressing environmental issue(s).

### **Zoology**

1. Diversity of living organisms
2. Taxonomy, systematic and Binomial nomenclature
3. Five kingdom classification
4. Animal Tissues : types and structure
5. Anatomy and function of different systems of Earthworm, cockroach and frog
6. Biomolecules of the cell.
7. Human Digestive, Respiratory, Circulatory, Expiratory, Muscular, Skeletal and Nervous System, Endocrine system and diseases, Reproductive System
8. Development implantation, placentation and parturition
9. Reproductive health and sexually transmitted disease
10. Birth control, Amniocenteses, infertility, IVF
11. Sex determination, Linkage and crossing over, sex-linked inheritance
12. Multiple alleles and inheritance in blood groups, Chromosomes disorders
13. Genome, Human Genome Project and DNA Finger printing
14. Theories and mechanisms of evolution
15. Gene flow and genetics drift
16. Health and diseases, Concept of immunology, Vaccine, cancer, HIV & AIDS
17. Animal husbandry and agriculture

18. Principles and process of Biotechnology, Application of Biotechnology, Transgenic Animals
19. Population interactions
20. Growth, birth and death rates
21. Concept of biodiversity
22. Importance, loss and conservation of biodiversity
23. Biosphere Reserves, National Parks and Sancturries

**Note :**                **Morphology of earthworm and Frog were taught earlier but now not in Syllabus.**