

**WEST BENGAL COUNCIL OF HIGHER SECONDARY EDUCATION**  
**SYLLABUS FOR CLASS XI AND XII**  
**SUBJECT : BIOLOGICAL SCIENCE ( BIOS )**

**CLASS - XI**

**SEMESTER – I**

**FULL MARKS : 35**

**CONTACT HOURS : 55 Hours**

**COURSE CODE: THEORY**

UNIT No.	TOPICS	CONTACT HOURS	MARKS
<b>UNIT I</b> (DIVERSITY OF LIVING ORGANISM)	<u>Chapter-1: The Living World</u> Biodiversity; need for classification; three domains of life; Taxonomy and Systematics; concept of species; and taxonomical hierarchy; binomial nomenclature; Tools for study of Biodiversity; Museums; Zoological and Botanical Gardens; Herbaria (Definition: World's largest herbarium, name of the herbarium in Bengal, Importance of herbarium)	2	19
	<u>Chapter-2: Biological Classification</u> Five Kingdoms of Classification; Salient features and classification of Monera; Protista and Fungi into major groups; Lichens, Viruses, Viroids and Prions.	5	
	<u>Chapter-3: Plant Kingdom</u> Classification of Plants into major Groups, Salient and distinguishing features and a few examples of Algae, Bryophyta, Pteridophyta, Gymnosperm.	5	
	<u>Chapter-4: Animal Kingdom</u> Salient features and classification of animals, non-chordates up to phyla level and chordates up to class level.	7	
<b>UNIT II</b> STRUCTURAL ORGANIZATIONS IN PLANTS AND ANIMALS)	<u>Chapter-5: Morphology of Flowering Plants</u> Morphology of different parts of flowering plants: root, stem, leaf, inflorescence, flower, fruit, and seed. Description of families : Malvaceae, Solanaceae, Brassicaceae, Compositae, Leguminosae (Dicots), Poaceae, Liliaceae (Monocots).	8	16
	<u>Chapter-6: Anatomy of Flowering Plants</u> Plant tissue systems including Mechanical tissue systems, anatomy and functions of tissue systems in dicots and monocots.	4	
	<u>Chapter-7: Structural Organization in Animals</u> Animal Tissue Systems: epithelial, connective, muscular and nervous systems (structure, organization and function); morphology, anatomy and functions of different systems; digestive, circulatory, respiratory, nervous, and reproductive systems of frog.	4	

UNIT No.	TOPICS	CONTACT HOURS	MARKS
UNIT III (CELL STRUCTURE AND FUNCTIONS)	<u>Chapter-8: Cell- The Unit of Life</u> 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; endo-membrane system, nucleus, endoplasmic reticulum, golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids, microbodies, cytoskeleton, cilia, flagella, centrioles (ultra-structure and function).	7	20
	<u>Chapter-9: Biomolecules</u> Chemical constituents of living cells: biomolecules; structure and function of proteins; carbohydrates; lipids; and nucleic acids; Enzyme — types; properties; enzyme action.	9	
	<u>Chapter-10: Cell Cycle and Cell Division</u> Cell cycle; mitosis; meiosis; and their significance.	4	

**CLASS - XI**

**SEMESTER – II**

**SUBJECT : BIOLOGICAL SCIENCE ( BIOS )**

**FULL MARKS : 35**

**CONTACT HOURS : 97 HOURS**

**COURSE CODE : THEORY**

UNIT No.	TOPICS	CONTACT HOURS	MARKS
UNIT IV (PLANT PHYSIOLOGY)	<u>Chapter-11: Photosynthesis in Higher Plants</u> Photosynthesis as a means of autotrophic nutrition; site of photosynthesis, pigments involved in photosynthesis (structure of chlorophyll; empirical formula of chlorophyll a, b, c, d, e, bacteriochlorophyll, carotene and xanthophyll); photochemical and biosynthetic phases of photosynthesis; cyclic and non-cyclic photophosphorylation; chemiosmotic hypothesis, photorespiration, C3 and C4 pathways, CAM Cycle (schematic pathway only), factors affecting photosynthesis.	14	34
	<u>Chapter-12: Respiration in Plants</u> 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.	14	
	<u>Chapter-13: Plant Growth and Development</u> 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; plant growth regulators — auxin, gibberellin, cytokinin, ethylene, ABA, Photoperiodism — Definition and different types.	6	

UNIT No.	TOPICS	CONTACT HOURS	MARKS
UNIT V (HUMAN PHYSIOLOGY)	<u>Chapter – 14: Digestion and Absorption</u> Introduction; Structure of human alimentary canal (drawing, labelling and function of different parts including dental arrangement and digestive glands); Role of digestive enzymes and the GI hormone in digestion; Peristalsis; Digestion, absorption and assimilation of protein, carbohydrate and fat; egestion; Nutritional and digestive disorders — PEM (protein energy malnutrition) indigestion, constipation, vomiting, jaundice, diarrhoea.	9	63
	<u>Chapter-15: Breathing and Exchange of Gases</u> Respiratory organs in animals (name 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.	9	
	<u>Chapter-16: Body Fluids and Circulation</u> 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.	9	
	<u>Chapter-17: Excretory Products and their Elimination</u> Modes of excretion — ammonotelism, ureotelism, uricotelism; human excretory system — structure and function; urine formation, osmoregulation; counter-current mechanism; regulation of kidney function — renin-angiotensin system, atrialnatriuretic factor, ADH and diabetes insipidus; role of other organs in excretion; disorders — uremia, renal failure, renal calculi, nephritis; dialysis and artificial kidney, kidney transplant.	7	
	<u>Chapter-18: Locomotion and Movement</u> Types of movement - ciliary, flagellar, muscular; skeletal muscle, contractile proteins and muscle contraction; skeletal system and its functions; joints; disorders of muscular and skeletal systems - myasthenia gravis, tetany, muscular dystrophy, arthritis, osteoporosis, gout.	8	
	<u>Chapter-19: Neural Control and Coordination</u> Mechanism of neural control and co-ordination; Neuron and nerves; Nervous system in humans - central nervous system; peripheral nervous system and visceral nervous system; Brain and its major parts- cerebral cortex, thalamus, hypothalamus and limbic system; mid-brain, pons, medulla, cerebellum and spinal cord (function only); Modes of distribution and function of P.N.S. and autonomic nervous system; Generation and conduction of nerve impulse; reflex action and reflex arc; Sense organs – Sensory perception, outline structure and function of eye and ear; Disorders — Parkinson’s and Alzheimer’s diseases.	12	
	<u>Chapter-20: Chemical Coordination and Integration</u> Endocrine glands and hormones; human endocrine system — hypothalamus, pituitary, pineal, thyroid, parathyroid, adrenal, pancreas, gonads; mechanism of hormone action (protein and steroid hormones); role of hormones as messengers and regulators, hypo- and hyperactivity and related disorders; dwarfism, acromegaly, cretinism, goitre, exophthalmic goitre, diabetes, Addison's disease.	9	

## CLASS: XI

SUBJECT : BIOLOGICAL SCIENCE ( BIOS )

COURSE CODE : PRACTICAL

FULL MARKS : 30

CONTACT HOURS: 30 HOURS

**Time allowed : 3 hours.**

**Max. Marks : 30**

EVALUATION SCHEME	MARKS
One major experiment Part A.(experiment no-1,3,7)	6
One minor experiment Part A.(experiment no-6,8,9,10,11)	5
Slide preparation Part A.(experiment no-2,4,5) (any one)	3
Spotting. Part – B ( three)	6(2x3)
Practical record+Viva voce	5(3+2)
Investigatory project viva voce	5(3+2)
Total: SEM-I = 14 PRACTICAL CLASSES + SEM-II = 22 PRACTICAL CLASSES ( 24HRS.)	30

### **A. List of Experiments**

1. Study and describe locally available common flowering plants from family Malvaceae, Solanaceae, Brassicaceae, Asteraceae, Leguminosae including dissection and display of floral whorls, Anther and Ovary to show number of chambers (Placentation). (Floral formula and floral diagrams.), Type of root. (Tap and adventitious.); Type of stem. (Herbaceous and woody); Leaf (Arrangement, shape, venation, simple and compound)
2. Preparation and study of TS of dicot and monocot roots and stems. (Primary.)
3. Study of osmosis by Potato Osmometer.
4. Study of plasmolysis in epidermal peels ( e.g. Rho/lily or fleshy scale leaves of onion bulb )
5. Study of distribution of stomata on the upper and lower surfaces of leaves.
6. Comparative study of the rates of transpiration in the upper and lower surfaces of leaves.
7. Test for the presence of sugar, starch, proteins and fats in suitable plant and animal materials.
8. Test for presence of urea in urine.
9. Test for presence of sugar in urine.
10. Test for presence of Albumin in urine.
11. Test for presence of Bile salts in urine.

**B. Study and observe the following (Spotting)**

1. Parts of a compound microscope.
2. Specimens./Slides./Models. Identify with reasons.—Bacteria, Spirogyra, Rhizopus, mushroom, yeast, liverwort, moss, fern, pine cone: male and female, one monocotyledonous plant, one dicotyledonous plant, one lichen. Different types of inflorescence. (Racemose and Cymose)
3. Virtual specimens/Slides/Models. Identifying features of Amoeba, Hydra, Liver Fluke, Ascaris, Leech, Earthworm, Prawn, Silkworm, Honeybee, Snail, Starfish, Shark, Rohu, Frog, Lizard, Pigeon and Rabbit. Human blood, and Toad blood
4. Mitosis in onion root tip cells and animal cells (Grasshopper) from permanent slides.
5. Human skeleton and different types of joints with the help of Virtual image/Models only.

[Note: \*18 Hours reserved for Remedial classes, Tutorials and Home Assignments.]

# CLASS - XII

## SEMESTER – III

### SUBJECT : BIOLOGICAL SCIENCE ( BIOS )

FULL MARKS : 35

CONTACT HOURS : 90 Hours

#### COURSE CODE : THEORY

UNIT No.	TOPICS	CONTACT HOURS	MARKS
UNIT VI REPRODUCTION	<u>Chapter 1: Sexual Reproduction in flowering plants</u> Flower structure;Development of male and female Gametophytes; Pollination — Types, Agencies and examples; Out breeding 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; Seed dispersal and fruit formation and their significance.	15	33
	<u>Chapter 2: Human reproduction</u> Male and female reproductive systems; Anatomy and Histology of testis and ovary, Gametogenesis-Spermatogenesis and Oogenesis; Menstrual cycle; Fertilization,embryo development up to blastocyst, formation and implantation; Pregnancy and placenta formation and function;Parturition: mechanism and neuroendocrine system involved in this mechanism, Lactation.	15	
	<u>Chapter 3: Reproductive health</u> 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).	3	
UNIT-VII (GENETICS AND EVOLUTION)	<u>Chapter 4: Principles of Inheritance and variation.</u> 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; Chromosome theory of inheritance; Chromosomes and genes, sex determination in humans, birds and honeybees; Linkage and crossing over; Sex linked inheritance-hemophilia,colour blindness; Mendelian disorders in humans-Thalassemia; Pedigree Analysis; chromosomal disorders in humans; Down’s syndrome, Turner’s syndrome and Klinefelter’s syndrome.	20	57

UNIT No.	TOPICS	CONTACT HOURS	MARKS
	<p><u>Chapter 5: Molecular basis of inheritance</u>            Search for genetic material and DNA as genetic material(experiments on bacterial transformation by F. Griffith; Avery, MacLeod and McCarty; Experiment by Hershey and Chase; Structure of DNA and RNA, DNA packaging, DNA replication; Central Dogma; Genetic Code, Translation, gene expression and regulation-lac operon; Genome, Human and Rice genome projects; DNA fingerprinting.</p>	25	
	<p><u>Chapter 6: Evolution</u>            Origin of life;Biological evolution and evidences for biological evolution(Palaeontology, Embryology and molecular evidence); Darwin's contribution, modern synthetic theory; Mechanism of evolution – Variation (Mutation and Recombination) and Natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg Principle; Adaptive radiation; Human evolution.</p>	12	

# CLASS - XII

## SEMESTER – IV

### SUBJECT : BIOLOGICAL SCIENCE ( BIOS )

FULL MARKS : 35

CONTACT HOURS : 58 Hours

#### COURSE CODE : THEORY

UNIT No.	TOPICS	CONTACT HOURS	MARKS
UNIT-VIII (BIOLOGY AND HUMAN WELFARE)	<u>Chapter 7: Human health and diseases</u> Basic concept of immunology.-Immune system, Antigen, Antibody, antigen-antibody reaction, Types of immunity - vaccine and vaccinations; Pathogens: Parasites causing human diseases: Malaria, Filariasis, Chikungunya, Dengue, Ascariasis, Typhoid, Pneumonia, Common Cold, Amoebiasis, Ringworm, SARS (COVID), Allergy and Autoimmune disorders –Symptoms of disease, Name of causative agents, Mode of transmission. Preventive measures. Cancer, HIV and AIDS — Symptoms of diseases; Causative agents, Mode of transmissions, Preventive measures. Adolescence: Drug and alcohol abuse.	13	20
	<u>Chapter 8.Improvement In food production</u> Plant breeding, Tissue culture, Single cell Protein.	2	
	<u>Chapter 9: Microbes in Human Welfare</u> Microbes in food processing, Industrial production, Sewage treatment, Energy generation, Microbes as bio-control agents and biofertilizers, Antibiotics: Production and judicious use.	5	
UNIT –IX (BIOTECHNOLOGY AND ITS APPLICATION)	<u>Chapter 10: Biotechnology and its applications</u> Principle, Process of genetic engineering. (Recombinant DNA technology), Application of biotechnology in health and agriculture, Human Insulin and vaccine production, Stem cell therapy, Gene therapy; Genetically modified organisms: Bt Crops; Transgenic animals. Biosafety issues, Biopiracy and patents.	15	15
UNIT- X (ECOLOGY AND ENVIRONMENT)	<u>Chapter 11: Organisms and Populations</u> Meaning of Environment. Habitat and niche, Population interactions – Mutualism; Competition; Predation; Parasitism. Population attributes – Growth, birth rate and death rate, age distribution.	10	23
	<u>Chapter 12: Ecosystem.</u> Ecosystem and its pattern; Components of ecosystem. Productivity and Decomposition. Energy flow, Pyramids of number, Biomass and energy, Ecological succession.	5	
	<u>Chapter 13: Biodiversity and its conservation</u> Biodiversity — concept, Patterns, Importance; Loss of biodiversity; Biodiversity conservation; Hotspots, Endangered organisms, Extinction, Red Data book. Sacred Groves, Biosphere reserves, National Parks, Wildlife Sanctuaries and Ramsar sites.	4	



UNIT No.	TOPICS	CONTACT HOURS	MARKS
	Chapter 14: Environmental issues Solid waste management; Radioactive waste management; Success stories addressing environmental issues-Chipko movement, Dasholi Gram Swarajya Mandal movement (DGSM) Silent Valley movement, Amrita Devi Bishnoi (Jaipur) Movement.	4	

## CLASS : XII

### SUBJECT : BIOLOGICAL SCIENCE ( BIOS )

#### COURSE CODE : PRACTICAL

**FULL MARKS : 30**

**CONTACT HOURS : 30 HOURS**

**Time allowed : 3 hours.**

**Max. Marks : 30**

EVALUATION SCHEME.	MARKS
One major experiment. 5.	6
One minor experiment. 2 and 3.	5
Slide preparation. 1 and 4. (Any one)	3
Spotting. (three)	6(2x3)
Practical record+Viva voce	5(3+2)
Investigatory project viva voce	5(3+2)
Total : SEM-I= 12 PRACTICAL CLASSES + SEM-II = 10 PRACTICAL CLASSES ( 14.66 HRS).	30

#### **A. List of experiments.**

1. Prepare a temporary mount to observe pollen germination.
2. Study the plant population density by quadrat method.
3. Study the plant population frequency by quadrat method.
4. Prepare a temporary mount on onion root tip to study mitosis.
5. Isolate DNA from available plant material, such as Spinach, Green pea seeds, Papaya or any other suitable materials.

#### **B. Study and observe the following. (Spotting)**

1. Flowers adapted to pollination by different agencies (Wind, Insects, Birds, etc.).
2. Pollen germination on stigma through a permanent slide.
3. Identification of stages of gamete development i.e., T.S. of Mammalian Testis and TS of Mammalian Ovary through permanent slides.

4. Meiosis in Onion Bud cell or Grasshopper testis through permanent slides.
5. TS of Blastula through permanent slides (Mammalian.)
6. Prepare pedigree charts of any one of the genetic traits, such as rolling of tongue, blood groups, ear lobes, Widow's peak and colour blindness.
7. Common disease causing organisms like *Ascaris*, *Entamoeba*, *Plasmodium* , any fungus causing ringworm through Permanent slides/Models or virtual images or specimens, Comment on symptoms of diseases that they cause
8. Models, specimen showing symbiotic association in root nodules of leguminous plants, *Cuscuta* on host, Lichens.
9. Flash card models showing examples of homologous and analogous organs.

[Note:\*22 **Hours** reserved for Remedial classes, Tutorials and Home Assignments.]