

APPENDIX – 1
WEST BENGAL JOINT ENTRANCE EXAMINATIONS BOARD
SYLLABUS FOR JEM - 2009

BIOLOGICAL SCIENCES

Unit of Life : Definition of life, Cell as the basic unit of life. Cell theory, Prokaryotic and Eukaryotic cell – structure and differences.

Ultrastructure and functions of cellular components : Cell wall, Plasma membrane, Plastid, Endoplasmic reticulum, Golgi bodies, Mitochondria, Ribosomes, Lysosomes, Nucleus, Centrosomes, Cilia, Flagella.

Microscopy : Components and principles of Simple and Compound Microscope;

Electron Microscope : Basic functional principles.

Physical and chemical principles involved in maintenance of life processes : Diffusion, Osmosis, Absorption, Osmoregulation.

Biomolecules : Classification and structural properties of carbohydrates, lipids, aminoacids, proteins and nucleic acids.

Carbohydrates : Monosaccharides, digosaccharides, and polysaccharides (starch, glycogen, cellulose).

Proteins : Simple (albumins, globulins, collagen) and conjugated proteins (only examples).

Nucleic acids : Structure of DNA, RNA, types of RNA.

Enzymes : Definition & properties, Examples; Mechanism of Action, Allosterism and Regulation.

Chromosomes and Cell Division : Morphology of chromosomes; Euchromatin and Heterochromatin. Nucleic acid as genetic material (Examples: Bacterial Transformation and Viral Transduction).

Brief idea of Polytene chromosomes: Cell cycle and phases (excluding control mechanism). Characters of malignant cell; Process & significance of Meiosis.

Genetics : Laws of Heredity : (Monohybrid and dihybrid crosses; Mendel's laws). Back cross, Test cross, Linkage, Crossing over, Sex linked inheritance – Colour blindness, Haemophilia.

Mutation – Definition and Types; Replication of DNA, Transcription and Translation (Brief idea).

Origin, Evolution and Diversity of Life : Haldane and Oparin's concept on origin of life. Modern concept of Natural selection, Biological Species concept.

Human evolution – an outline.

Taxonomy and Classification : Definition; Importance of Taxonomy, Binomial Nomenclature, Law of Priority (Homonym & Synonym).

Concept of Biodiversity : Definition of Biodiversity ; Genetic diversity; Species diversity and Ecosystem diversity. Five kingdom classification (only distinct characters). Salient features of major animal phyla with common examples, classification of Chordates (up to Sub Class) with distinctive characters only.

Population Biology : Concept of population growth (logistic and exponential) and population control.

Ecosystem : Concept of ecosystem and Biosphere, Wetland..

Brief idea of Ecological pyramids, Energy flow, Biogeochemical cycle (concept only).

Environmental pollution : Air, water and noise pollution – sources effects and probable control strategies; Biomagnification and Bioaccumulation. Cause of Dyslexia, Minamata and Etai etai diseases. Green house effect, BOD, COD, Acid rain and Ozone hole.

Virus and Bacteria : Morphological characteristics of Bacteriophage (T2), Plant virus (TMV); Animal virus (influenza), Bacterial cell (E. coli).

Staining : Gram staining for bacteria.

Biotechnological application of microbes : (a) Agricultural – *Rhizobium* and other Nitrogen fixing bacteria, Biofertilizers and Bio- pesticides ; (b) Industrial – Production of curd; tanning and brewery; synthesis of antibiotics, vitamin. (c) Cloning of microbial genes.

Tissue and tissue system : (a) Plant Tissues – Meristematic and permanent (types with characterization and function). (b) Animal Tissue – outline classification and examples.

Functions of life :

Photosynthesis :

Major photosynthetic pigments, outline concept of light and dark reaction phases, basic idea of bacterial photosynthesis, C₂, C₃, C₄ pathways, CAM (in brief), photorespiration.

Respiratory system :

- (a) Definition of respiration, Mechanisms of glycolysis, Krebs's cycle (Flow chart only; calculation for ATP, CO₂ & H₂O) ; Outline idea of Electron Transport system, Relationships of photosynthesis and respiration. (b) Respiratory system in human : Respiratory tract, Mechanism of breathing, Role of intercostal muscles and diaphragm;

Significance of physiological and anatomical dead space.

Tidal volume, inspiratory and expiratory reserve volumes, residual volume, vital capacity. Composition of inspired, expired and alveolar air. Common respiratory diseases – definition and causes – Asthma, Tuberculosis, Hypoxia, Anoxia, Apnoea, Dyspnoea.

Cardiovascular system & Blood :

Anatomy of Heart – junctional tissues of the heart; origin and propagation of cardiac impulse. Histological structures of arteries, veins and capillaries.

Cardiac cycle – Atrial and ventricular events only; cardiac cycle time, Heart sound.

Cardiac output – definition, Stroke and Minutes volume.

Blood pressure : factors controlling & measurement.

Blood – Composition and functions of blood.

Blood coagulation and anticoagulants, Blood group and Rh factor, Blood Transfusion, Lymph and tissue fluid formation and functions, Portal circulation.

Nutrition and Digestive system : Basic constituents of food and their nutritional significance. Vitamins – dietary sources, functions and deficiency symptoms of water and fat soluble vitamins. Structure and functions of the alimentary canal and the digestive glands. Functions of the digestive juices (saliva, gastric juice, pancreatic juice, intestinal juice), Biles.

Digestion and absorption of carbohydrates, lipids and proteins. Diseases – Peptic and Gastric ulcers, Gastritis; fasting and obesity.

Metabolism : Definition; B.M.R. – Controlling factors; elementary idea of metabolic pathways; glycogenesis, glycogenolysis, gluconeogenesis, Oxidation of fatty acids, Ketone body formation and its significance.

Deamination, Transamination and Decarboxylation of aminoacids (definition only).

Excretory system : Histology and function of the nephron (brief idea)

Normal and abnormal constituents of urine.

Nervous and Muscular system : Brief outline of human brain structure.

Cranial nerves : Distribution and Function. Spinal cord – Structure and major functions, Reflex arc (types) and reflex action : Conditional and unconditional reflexes.

Autonomic : sympathetic and parasympathetic (definition only) nervous system.

Synapse : Structure and mechanism of synaptic transmission.

Different types of muscles and their structure, properties of muscles

(i)Excitability (ii)Contractility (iii)All or none law (iv)Refractory period (v)Summation of stimuli (vi)Tetanus (vii)Rigor mortis; Mechanism of muscle contraction.

Endocrine system and animal hormones :

Definition of endocrine glands and hormones, functions of hormones released from (i)pituitary (ii)thyroid (iii)pancreas (iv)adrenal (v)gastrointestinal gland, An outline mechanism of action of protein & steroid hormones.

Causes and symptoms of Acromegaly,Diabetis insipidus, Diabetis mellitus, Goiter, Cushing's disease.

Growth, Reproduction, and Ageing :

A. In Plants :

Different parts of a typical flower (China rose). Types of flower : regular and irregular, actinomorphic, zygomorphic. Aestivation in Musaceae & Malvaceae. Floral formula : Definition, symbols used in floral formulae in Musaceae (e.g. Banana) and Malvaceae (eg. China rose) ; Pollination – Definition, self and cross pollination; Merits and demerits of self and cross pollination. Fertilization – Process of double fertilization. Dispersal of fruits and seeds – Types with examples. Phases and factors of Growth, Differences between growth and development, Abscission senescence, ageing and growth of seedling and the role of gibberellic acid.

B. In Animals :

Primary and secondary sex organs and secondary sex characters – Testis – Histology, Functions of Testosterone. Spermatogenesis (outline). Ovary – Histology : Functions of estrogen and progesterone; Oogenesis (outline); structure of mature Graafian follicle .

Menstrual cycle (brief idea). Fertilization and Implantation.

Immunology : A brief idea of antigen and antibody. Elementary knowledge of inherited, acquired, humoral, cell mediated immunity. Active and passive immunity. Prevention of AIDS and Hepatitis B.

Medical, Agricultural and Economic zoology:

A. Outline idea of diseases, their causative organism, mode of infection, symptoms and preventive measures of :

- (i) Malaria
- (ii) Filariasis
- (iii) Ascariasis

Distinguishing features of Culex, Anopheles and Aedes

Life cycle and comparative study of Culex and Anopheles;

Causative agents of encephalitis and kalaazar and control of their vectors.

B. Characteristic features of major and minor carps and examples of exotic carps. Mechanism of induced breeding – hypophysation.

Composite culture of carps, common diseases of carp – Gillrot, fin rot and Dropsy.

Definition of pest, Damage symptoms and control of *Scirpophaga incertulus* and *Leptocorisa acuta*.

C. Poultry – Types of poultry birds ; high yielding varieties of poultry birds. Species of honey bees in India and different castes in a colony. Composition and uses of honey.

Chemical composition of silk, types of silk and silk worms.

Life cycles of mulberry silk worm. Structure of silk gland.

Symptoms of Flacherie, Muscardine, Grassarie and Pebrine.

Application of Biology :

Pesticides and Biological Pest Control – Benefit and hazards, Basic principles of *ex situ* and *in situ* conservation. Red Data Book, Green Data Book.

Role of phytohormones in horticulture and agriculture.

Hybridization in plants – Definition and techniques.

Idea about plant cell and tissue culture – Micropropagation.

Principles and application of transgenic plants and animal, Test tube baby.

Biomedical engineering :

Application - ECG & EEG

Imaging – USG, CT Scan, X-ray, MRI

Therapeutic - Pacemaker, Dialyzer.