

Ramakrishna Mission Vidyalaya

P.O. – Narendrapur, Kolkata – 700103

Syllabus of Written Exam. for Assistant Teacher Recruitment-2023

LIFE SCIENCE

ZOOLOGY

Invertebrates:

1. Classification of major phyla upto subclasses with examples.
2. Structure and function of –Flagella, Cilia, Para podia, Ctenidium, Book lung, Nephridia, Flame cells, Malpighian tubes, Green gland.

Chordates:

1. Classification of Amphibians, reptilians and mammals upto order with examples.
2. Special features – Filter feeding in branchiostoma, Integumentary derivatives, Accessory respiratory organs, single and double circuit heart, aortic arches in vertebrates, origin and distribution of cranial nerves.

Cell Biology, Genetics & Molecular Biology:

1. Ultra structure and function of Plasma membrane, Mitochondria, Lysosome & Ribosome.
2. Chromosome structure.
3. Cell cycle
4. Properties of DNA and RNA, DNA as genetic material
5. Mechanism of Replication, Transcription & Translation.
6. Cell division: Mitosis & Meiosis
7. Mendelism & neo-Mendelism
8. Modes of inheritance of Autosomal and sex-linked genes in man: Thalassaemia and Hemophilia.
9. Mutation; Down syndrome & Klinefelter syndrome
10. Linkage and recombination
11. Sex determination in Drosophila and Man
12. Oncogene & Cancer

Developmental Biology:

1. Spermatogenesis & Oogenesis
2. Fertilization
3. Process of cleavage in frog and chick
4. Gastrulation in frog and chick
5. Placentation in mammals
6. Organizer concept.

Evolution, Adaptation & Distribution:

1. Chemical basis of origin of life.
2. Darwinism and synthetic theory of evolution.
3. Hardy – Weinberg Equilibrium in relation to natural selection.
4. Adaptation: Aquatic, Volant & Desert.
5. Zoogeographical realms and their subdivisions with their characteristic fauna

Ecology & Wildlife:

1. Energy flow through ecosystem
2. Population ecology : Properties and growth forms.
3. Community ecology; Niche concept, Resource partitioning and species diversity.
4. Biodiversity: As resource. Principles of conservation of Biodiversity (in situ & ex situ)
5. Conservation of wildlife: purpose & methods, concept of National Park. Sanctuary & Biosphere Reserve, Conservation of Tigers.

Parasitology, Histology & Endocrinology:

1. Life History, pathogenecity and clinical features of *Entamoeba histolytica*, *Ascaris*, *Fasciola hepatica*, *Plasmodium vivax*.
2. Immune response T & B lymphocytes, Antibody production in parasitic infection.
3. Histology of Pituitary, Thyroid and endocrine Pancreas and their hormonal functions in mammals.

Animal Physiology & Biochemistry:

1. Components of vertebrate blood, clotting & coagulation, ABO Blood group, Rh factor.
2. Physiology of nerve impulse & synaptic transmission.
3. Classification of Carbohydrates, Proteins and Lipids.
4. Enzymes: Classification, its properties and action
5. Vitamins – Chemical names, sources, deficiency, disorders for vitamins A, C and E

Economy Zoology:

1. Aquaculture: Induced breeding & Composite fish culture.
2. Sericulture: Silk varieties in India, mulberry silkworm culture, diseases of silkworm and their control.
3. Pest: Biology & Control, of Paddy pest.
4. Animal husbandry: Common poultry breeds (Fowl), rearing methods, diseases & control.

BOTANY

A. GENERAL BOTANY

Introduction: Concept of living object; Definition, basic structural organization of plant.

- Cell**
- (a) Minimum requirements of a "Cell to be cell"
 - (b) Prokaryotes and eukaryotes; Characteristics and differences with reference to the plant cell wall composition.
 - (c) Structure and functions of cellular organelles.
 - (d) Chromosome: Ultra-structures and chemical compositions.
 - (e) Cell division: Mitosis, Meiosis, their significance.

B. PLANT ANATOMY

Plant Tissue – Definition, Classification, Distribution and Functions; Occurrence and Classification of Meristematic and Permanent tissues; Simple and Complex tissues. Primary structures of root, stem and leaf in angiospermic plants

C. ECOLOGY AND ENVIRONMENT

Divisions of ecology, ecological factors, plant succession, Adaptation of Hydrophytes, Xerophytes, Halophytes, General ideas about global warming and air pollution – a brief knowledge.

D. PLANT GROUPS

1. Salient features of Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.
2. ALGAE: Life cycle patterns with one example in each pattern. Economic importance (as food, fodder, agar, algin)
3. FUNGI: Structure of mycelium; nutrition; Asexual Spore forms; Economics importance (alcohol, Penicillin and edible mushroom)
4. BRYOPHYTES & PTERIDOPHYTES: Structural organization and function of archegonia and antheridia
5. GYMNOSPERMS & ANGIOSPERMS: Structural organization of male and female gametophytes.

E. PLANT PATHOLOGY: Necrosis, hypo plastic and hyper plastic symptoms of plant diseases. Disease control – a brief knowledge.

F. MORPHOLOGY: Inflorescence; pollination – types and contrivances: Placentation – types and example; Development of embryo-sac; Fertilization and post-fertilization changes.

G. TAXNOMY: Principles of artificial, natural and phylogenetic systems of classifications, Binomial nomenclature. Functions of Botanical Garden; Importance of Herbaria in Botanical Studies. Diagnostic characters and economic importance of the following families: Leguminosae (Fabaceae) , Solanaceae. Rubiaceae and Gramineae (Poaceae).

- H. PALEOBOTANY: Fossils – Types with examples; Applications of Paleobotany.
- I. PLANT PHYSIOLOGY:
- (a) Absorption: Water & Salt uptake by living cell
 - (b) Transpiration: Its role in ascent of sap
 - (c) Nutrition: Role of mineral elements in plants.
 - (d) Photosynthesis: Photosynthetic pigments, Hill reaction, Photo phosphorylation, Calvin cycle.
 - (e) Respiration: Glycolysis, Krebs' cycle and ATP synthesis.
 - (f) Hormones: Definition, site of synthesis and role of auxin & ethylene. Role of synthetic hormones in agriculture
- J. CYTOGENETICS & HEREDITY: Nature of gene; Linkage and Crossing-over; Mendelian Principles, Darwinism & Neo-Darwinism.
- K. MICROBIOLOGY: Virus – general properties, structure of Bacteriophage and TMV; Electron microscopic structure of a bacterial cell. Role of bacteria in nitrogen cycle and maintenance of soil fertility. (N_2 - fixation, nitrification, denitrification and ammonification).

PHYSIOLOGY

1. **Units of Human Systems:** Structure function relationship of cell and its organelles and different tissues.
2. **Biochemical and Biophysical Principles involved in Human systems:**
Definition and physiological significance of diffusion, osmosis, dialysis, ultra filtration, adsorption and absorption. Definition, classification and physiological importance of colloids. Definition of enzymes, co-enzymes and isozymes with examples. Factors influencing enzyme action.
3. (a) **Conservation of matter and energy in human systems:**
Structures in relation to functions of alimentary tract. Composition, functions and regulations of secretion of digestive juices including bile. Digestion and absorption of dietary carbohydrates, proteins and fats.

(b) **Nutrition:** Definition of balanced diet. ACU. Marasmus, Kwashiorkor, PCM, Dietary fibers, Vitamins: definition, classification, functions deficiency symptoms and daily requirements, Hypervitaminosis.
Minerals ---- Dietary sources and nutritional importance.
BMR : Definition and factors affecting. R. Q.: Definition, factors affecting and significance, Biological value of protein.
SDA: Definition and importance.

4. **Blood ---** Composition and functions. Origin and functions of plasma proteins. Plasmapheresis. Bone marrow. Formed elements of blood --- their formation and functions. Haemoglobin: Different types of compounds and derivatives. Blood volume and its regulation.
Coagulation of Blood: Mechanism and factors influencing, anticoagulants, and disorders of coagulation. Blood groups – ABO and Rh, Thalassemia. TC, DC, Haemoglobin estimation, Bleeding and clotting time. Anaemia – definition and types, Leukocytosis, Leukopenia, leukemia, leukemia, purpura – definitions.
 5. **Cardiovascular System:** (a) Heart – Properties of cardiac muscle, Origin and propagation of cardiac impulse, various events (atrial and ventricular) of cardiac cycle, heart sounds, heart rate, cardiac output and factors affecting its regulation.
 6. **Respiratory System:** Anatomy and histology of respiratory passage and organs. Role of respiratory muscles in respiration. Artificial respiration. Significance of anatomical and physiological dead space. Lung volumes and capacity. Exchange of respiratory gases between (i) lung and blood, and (ii) blood and tissues. Transport of O₂ and CO₂ in blood. Neural and chemical regulation of respiration. Hypoxia.
 7. **Renal Physiology:**
Structure – function relationship of kidney. Mechanism of formation of urine and physiology of micturition. Acid-base regulation by the kidney. Non-excretory functions of kidney.
 8. **Nerve-Muscle Physiology:**
Structures of different types of muscles. Muscular contraction and relaxation, Isotonic and isometric contractions. Properties of muscles.
Structure and classification of nerves. Origin and propagation of nerve impulse. Velocity of impulse in different types of nerve fibres. Properties of nerve fibre.
Synapses: Structures, different types and mechanism of synaptic transmission.
Myoneural junction: Structure and mechanism of impulse transmission.
Degeneration and regeneration of nerve fibre.
 9. **Nervous System and Sensory Physiology:**

Reflex action --- Definition, reflex arc, classification, properties. Functions of spinal cord. Outline of functions of brain stem. A brief idea of structure, connections and functions of cerebellum. Functions of thalamus and hypothalamus. Cerebral cortex – Histological structures and localization of functions. Cerebrospinal fluid (CSF) – Composition, formation, circulation and functions.
Functions of sympathetic and parasympathetic nervous system.
Classification of general and special senses and their receptors.
Weber-Fechner law. Basic concept of receptor adaptation.
Olfaction and gustation – Structure of sensory organ, neural pathway of smell and taste sensation, mechanism of taste sensation, after taste. Olfactory adaptation.
Audition – Structure of ear, auditory pathway, mechanism of hearing, pitch perception and perception of loudness.
Vision – Structure of the eyes, histology of retina, visual pathway, chemical changes of retina on exposure to light; mechanism and pathway of accommodation, error
-

refraction, after image, light and dark adaptation elementary idea of colour vision and colour blindness.

10. Skin and Regulation of Body Temperature:

Structure and functions of skin. Insensible and sensible perspiration. Physiology of sweat secretion and its regulation. Regulation of body temperature.

11. Endocrine system:

Anatomy of endocrine system. Classification of Hormones. Basic concept of regulation of hormone actions. Elementary idea of hormone action. Histological structure, hormones and functions pituitary, thyroid, parathyroid, adrenal and pancreas. Hypothalamic control of anterior and posterior pituitary. Hypo and hyperactive states of pituitary gland, thyroid and adrenal cortex.

Brief idea of the origin and functions of rennin-angiogenesis, prostaglandins, erythropoietin and melatonin. Elementary idea of gastrointestinal hormones.

12. Reproductive Physiology:

Primary and accessory sex organs and secondary sex characters.

Testis – Histology, spermatogenesis, testicular hormones and their functions.

Ovary – Histology, Oogenesis, ovarian hormones and their functions.

Oestrus and menstrual cycles and their hormonal control.

Development of mammary gland and lactation.