

## CSIR-CDRI, Lucknow

Syllabus for Written Test, Post Code **TA-09**, Technical Assistant, Microbiology, Parasitology and virology

### Essential Qualifications:

1st class **B.Sc. (Sci)** with one-year full time professional qualification in the techniques of microbiology / pathology / biomedical science / Medical laboratory technology

### OR

one year working experience in containment facility / BSL-3 facility / handling of microbial cultures, tissue cultures and recombinant DNA techniques from a recognized institute / organization

### Desirable Qualifications/Experiences:

One-year experience in wet lab of biomedical research in the area of microbiology / parasitology / virology. Hands-on experience of working in the BSL-3 facility.

### Job Specifications:

To assist the scientists in their research activities in the disease areas of microbial infections, malaria and other parasitic diseases and virology area. To work in biosafety facility, handling of microbial cultures and tissue cultures using different molecular biology techniques.

### **(Biological Science)**

**Animal Diversity:** Salient features and basis of classification, morphology and specific organizational systems and their structure and function. Hemichordata to chordata: general characters and classification up to orders, prototype organisms, structure and function of various body systems. Comparative anatomy of integumentary system from fishes to mammals along with digestive, respiratory and urogenital systems.

**Health and Hygiene:** Introduction and determinants and factors affecting health and hygiene. Pollution and associated hazards; water and air borne diseases. Prevention of diseases through health education and environmental improvements, Micro and macro nutrients, balanced diet and malnutrition, Diseases caused by deficiency of proteins, vitamins and minerals, Infectious agents (various types of microbes) responsible for diseases in humans. Communicable and non-communicable diseases and their preventive measures.

**Developmental Biology:** Metamorphosis, basics of embryonic development, gametogenesis, spermatogenesis, oogenesis, fertilization and post-fertilization, planes and patterns of cleavage, placenta, teratogenesis.

**Wildlife Conservation:** An introduction to wildlife conservation and management in India, protected areas, wildlife sanctuaries, national parks, biosphere reserves, conservation reserves and community reserves, Management practices in protected areas of India and concepts of zoning in protected areas

**Cell Biology:** Structure of prokaryotic and eukaryotic cells, techniques of cell biology, structure and function of extracellular matrix, cell wall and cell membranes, cell adhesion, membrane transport and vesicular transport, Structure and function of cellular organelles, cell receptors, cell signalling, signal transduction, chromosomes, chromatin and nucleosome. Mitosis and meiosis, molecular basis of cell cycle, numerical and structural variations in chromosomes and their significance, study of polytene, lampbrush and B-chromosomes—structure, behaviour and significance.

**Genetics, Molecular Biology and Evolution:** Mendelian genetics, extensions, modifications and exceptions, Structure and synthesis of nucleic acids and proteins, Chromosome, DNA, RNA, replication, transcription, translation, proteins synthesis, Genetic code and regulation of gene expression, Multigene families, rDNA technology, gene versus allele concepts, Quantitative genetics and multiple factors, Linkage and crossing over, Methods of gene mapping, Sex chromosomes and sex-linked inheritance, Sex determination and molecular basis of sex differentiation, Extranuclear/cytoplasmic inheritance, Mutation (biochemical and molecular basis), Cytoplasmic genes and genetics of male sterility. Organic Evolution: Introduction, evidences, mechanisms and theories of organic evolution, Origin of life, Origin and evolution of human, role of RNA in origin and evolution.

**Animal Physiology and Biochemistry:** Introduction to nutrition, digestion, circulation, respiration, muscle contraction, thermoregulation, nervous integration, sense organs, endocrine system, excretion, osmoregulation and reproduction, metabolism and biosynthesis of carbohydrates, proteins, fats and nucleic acids. Endocrine systems, Chemical messengers, General mechanism of hormone action, Endocrine glands, secretions and disorders.

**Toxicology:** Exposure to toxicants: routes/methods of exposure, frequency and duration of exposure, human exposure, dose-response relationship. Concept, significance, basic mechanisms of selective toxicity, bioassay, acute toxicity tests, chronic toxicity tests, Concept of maximum acceptable toxicant concentration and safe concentration. Bio-accumulation and bio-concentration of xenobiotics, local and systemic effects, immediate and delayed effects, reversible and irreversible effects, biochemical and physiological effects of xenobiotics. Nanotoxicology (concept of bio-concentration, bioaccumulation and biomagnifications). Bio-concentration factor, process of bio-accumulation in the biological system, concept of biotransformation and metabolism.

**Microbiology and Pathology:** Viruses, bacteria, and other microbes, structure and reproduction, Infection and phytoimmunology, applications of microbiology in industry (agriculture, chemical and medicine) and pollution control, important diseases caused by

viruses, bacteria, mycoplasma, fungi and nematodes, modes of infection and dissemination. Molecular basis of infection and disease resistance/defense. Physiology of parasitism and control measures, fungal toxins. Parasites causing diseases in humans and their life cycles, vector born diseases, viral infections and their replication cycles inside host.

**Economic Botany:** Origin of cultivated plants, Plants as sources for food, fodder, fibres, spices, beverages, drugs, narcotics, insecticides, timber, gums, resins and dyes, Latex, cellulose starch and their products, morphogenesis and tissue Culture, totipotency, polarity, symmetry and differentiation cell, tissue, organ and protoplast culture, Somatic hybrids and cybrids

**Bioinformatics and Biostatistics:** Introduction, history and scope of bioinformatics in computational biology and omics technology. Tools and theories involved in the analysis of gene expression, polymorphism and sequence alignment. Tools used in basic biostatistics and analysis of probability, distribution (normal, binomial and poisson distributions), correlation, regression and their significance, Standard deviation and coefficient of variation. Tests of significance (Z-test, t-test and chi-square test).

**Biotechniques:** Major tools and techniques involved in microscopy, different types of microscopes and their usage, biochemistry, physiology, immunology, cell culture and handling of laboratory animals. Routine laboratory techniques like, microbial and blood culture, cytological staining, isolation of DNA, RNA and Protein and their quantification, buffers, pH and pK, plasmid DNA isolation and gel electrophoresis. Transfer of DNA, RNA and proteins, PCR, RT-PCR, western blotting and immunostaining.