SYLLABUS FOR COMPUTER BASED RECRUITMENT TEST (CBRT)
FOR THE POST OF ASSISTANT PROFESSOR IN MICROBIOLOGY IN GOVERNMENT COLLEGE
UNDER
DIRECTORATE OF HIGHER EDUCATION
(Advt No. 2 Year 2020 and 06 Year 2022)

I. General English including Grammar **- 05 marks**

II. General Knowledge, Current Affairs and Events of National and International Importance **- 10 marks**

III. Logical Reasoning and Analytical Ability **- 10 marks**

IV. Core: **- 50 marks**

Carbohydrate catabolic pathways and microbial growth on C1 Compounds
EMP, HMP, ED, Phosphoketolase pathway, TCA cycle, methylglyoxal bypass. Anaplerotic sequences, catabolism of different carbohydrates, glycerol metabolism, regulation of carbohydrate metabolism, Pasteur effect. Substrate level phosphorylation. Microbial growth on C1 Compounds (Cyanide, Methane, Methanol, methylated amines and carbon monoxide).

Bacterial fermentations (biochemical aspects) and Biosynthesis
Alcohol, lactate, mixed acid, butyric acid, acetone-butanol, propionic acid, succinate, methane, and acetate fermentations. Fermentation of single nitrogenous compounds [amino acids] - alanine, glutamate and glycine. Biosynthesis of Purines, Pyrimidines and fatty acids.

Properties of Enzymes
Classification of enzymes into six major groups with suitable examples. Numerical classification of enzymes. Different structural conformations of enzyme proteins. Enzymes as biocatalysts, catalytic power, activation energy, substrate specificity, active site, theories of mechanisms of enzyme action. Mechanism of action of lysozyme, chymotrypsin and ribonuclease.

Industrial Food fermentations
Starter cultures their biochemical activities, production and preservation of the following fermented foods. a. Soy sauce fermentation by Moulds b. Fermented vegetables – Saurkraut c. Fermented Meat – Sausages d. Production and application of Bakers Yeast e. Application of microbial enzymes in food industry

Advanced Food Microbiology
Genetically modified foods. Biosensors in food, Applications of microbial enzymes in dairy industry [Protease, Lipases]. Utilization and disposal of dairy by-product - whey.

Classification and Morphology of Viruses
Cataloging the virus through virus classification schemes of ICTV / ICNV. Morphology and ultra-structure of viruses. Virus related agents, viroids and prions.

Viral Multiplication
Mechanism of virus adsorption and entry into the host cell including genome replication and mRNA production by animal viruses, mechanism of RNA synthesis, mechanism of DNA synthesis, transcription mechanism and post transcriptional processing, translation of viral proteins, assembly, exit and maturation of progeny virions, multiplication of bacteriophages.

Pathogenesis of Viruses
Host and virus factors involved in pathogenesis, patterns of infection, pathogenesis of animal viruses Adenovirus, Herpes virus, Hepatitis virus, Picorna virus, Poxvirus and Orthomyxovirus, pathogenesis of plant [TMV] and insect viruses [NPV]. Host cell transformation by viruses and oncogenesis of DNA and RNA viruses.

Antigens and Immunoglobulins
Concept of haptens, determinants, conditions of antigenicity, antigens and immunogenecity, superantigen. Immunoglobulins: Structure and properties of immunoglobulin classes. Theories of antibody formation, hybridoma technology for monoclonal antibodies and designer monoclonal antibodies. Multiple mylomas and structural basis of antibody diversity. Freund’s adjuvants and its significance.

Antigen – Antibody reactions

Antigen-Antibody reaction by precipitation, agglutination and complement fixation. Non-specific immune mechanism: - Surface defenses, tissue defenses, opsonization, inflamatory reaction, and hormone balance. Tissue metabolites with bactericidal properties (lysozyme, nuclein, histone, protamine, basic peptides of tissues – leukins, phagocytins, lecterins, haemocompounds)

Immunity and Immunoassays

Defense against bacteria, viruses, fungi and parasites. Immunodiagnostics and immunotherapy in virology – Serological methods for detection and quantitation of viruses including Hepatitis, Influenza, HIV and others. Immuno-assays: SRID, ELISA, ELISA-PCR, RIA, Western Blotting, Immunofluroscens and their application. Immune deficiencies and autoimmunity.

Biodiversity Introduction to microbial biodiversity – distribution, abundance, ecological niche. TypesBacterial, Archael and Eucaryal. Characteristics and classification of Archaebacteria. Thermophiles: Classification, hyperthermophilic habitats and ecological aspects. Extremely Thermophilic Archaebacteria, Thermophily, commercial aspects of thermophiles.

Applications of thermozymes. Methanogens: Classification, Habitats, applications.

Alkalophiles and Acidophiles Classification , alkaline environment , soda lakes and deserts , calcium alkalophily Applications . Acidophiles: Classification, life at low pH, acidotolerence, applications.

Halophiles and Barophiles Classification, Dead Sea, discovery basin, cell walls and membranes – Purple membrane, compatible solutes. Osmoadaptation / halotolerence. Applications of halophiles and their extremozymes. Barophiles: Classification, high-pressure habitats, life under pressure, barophily, death under pressure.

Bioreactors

Design of a basic fermenter, bioreactor configuration, design features, individual parts, baffles, impellers, foam separators, sparger, culture vessel, cooling and heating devices, probes for online monitoring, computer control of fermentation process, measurement and control of process. Reactors for specialized applications: Tube reactors, packed bed reactors, fluidized bed reactors, cyclone reactors, trickle flow reactors, their basic construction and types for distribution of gases.

Bioremediation of Xenobiotics

Microbiology of degradation of xenobiotics in the environment, ecological considerations, decay behaviour, biomagnification and degredative plasmids, hydrocarbons, substituted hydrocarbons, oil pollution, surfactants and pesticides. Genetically Modified Organisms released and its environmental impact assessment and ethical issues

Global environmental problems

Ozone depletion, UV-B, green house effect and acid rain, their impact and biotechnological approaches for management. . Containment of acid mine drainage applying biomining [with reference to copper extraction from low grade ores].

Note:

Duration for C.B.R.T : 90 Minutes

Maximum Marks for C.B.R.T : 75 Marks