

## **Syllabus for PhD Entrance Test in Microbiology**

### **History**

Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology, Development of the field of soil microbiology: Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A. Waksman Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner

### **Microscopy**

Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope

### **Systematics and bacteriology**

Aim and principles of classification, systematics and taxonomy, concept of species, taxa, strain; conventional, molecular and recent approaches to bacterial taxonomy,

### **Bacterial cell structure**

Cell size, shape and arrangement, glycocalyx, capsule, flagella, endospore, fimbriae and pili. Cell-wall: Composition and detailed structure of gram positive and gram-negative cell walls, lipopolysaccharide (LPS), Cell Membrane: Structure, function and chemical composition of bacterial membrane. Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids Endospore

### **Pure culture isolation**

Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria

### **Media**

Nutritional requirements in bacteria and nutritional categories; Culture media: components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media

### **Staining techniques**

Acid stains, basic stains, direct staining, negative staining, differential staining – Gram staining, acid-fast staining, structural staining – Cell wall, endospore, nuclear material, inclusion bodies, flagella

### **Sterilization techniques**

Physical and chemical methods, dry heat, moist heat, radiation, filtration, gaseous and liquid chemicals

**DNA structure and recombination**

Double helical structure, genetic recombination – transformation, transduction & conjugation