

## **M.Sc. ENVIRONMENTAL SCIENCE ENTRANCE TEST SYLLABUS**

### **Unit – I**

Ecology & Environment: Definition, Scope-Branches of Ecology. Components of the Environment-Atmosphere, Lithosphere, Hydrosphere and Biosphere, Applications of Ecology, Concept of levels of organization and biosphere.

Abiotic factors-Nature of response of organisms to Abiotic factors; Laws of limiting factors and Tolerance.

Autoecology-Definition-Comparison of autoecology and synecology, Concept of species, speciation, characteristics of population.

### **Unit – II**

Basic components of an ecosystem-structure and functional aspects of an Ecosystem-Tropic structure-Ecological Niche-Ecological Dominance-Stability, Diversity rule. Homeostasis, aquatic Ecosystem-physico-chemical nature of lentic and lotic ecosystems. Types of aquatic ecosystem-structure and organization with examples of fresh water Ecosystem. Marine water ecosystem, estuarine water Ecosystem-Mangroves.

Terrestrial Ecosystem: Tundra forest, Grassland, Desert ecosystem. Energy flow in ecosystems-Laws of Thermodynamics. Productivity-Biomass production, primary productivity and net productivity. Food Chain – Types of food chain with examples, Foodweb, Ecological pyramid of biomes.

Number and energy-inverted ecological pyramids. Biogeochemical Cycles – Availability and rate of cycling of nutrients-gaseous and Sedimentary cycle.

### **Unit – III**

Fundamentals, Scope and relevance of Environmental Geology, Interaction of Lithosphere with Atmosphere, Biosphere and Hydrosphere. Earth's Materials: Minerals, rocks and soil. Economic importance of Mineral, Soil forming minerals and rocks. Soil conservation and erosion.

Study of Earth interior – Crust, Mantle and Core. Geomorphological studies: Nature and type of land-forms. Natural Hazards-Earthquake, Volcano, Landslides, Floods, Hydrologic cycle - Water quality Monitoring methods.

### **Unit – IV**

Scope of Environmental Chemistry-Definition, theory and concept of Environmental Chemistry. Air pollution – Definition, sources, types, Gaseous and particulate matter, smog, green house effect, acid rain and ozone depletion. Water pollution: definition, types, sources and classification of water pollution, ground water pollution, marine water pollution, minamata episode, *itai itai* episode, water pollution due to nutrients. Concept of DO, BOD, COD, their effect on flora and fauna.

Soil pollution: Definition, sources and types – classification of soil pollutants, effects of pollution on soil, health and productivity. Air and water quality standards, national and international criteria for the drinking water. Sampling, preservation, storage and processing of water samples, sewage – Municipal sewage, lake/pond, river water. Principles of potentiometry, Flame photometry, conductometry and colorimetry.

## **Unit – V**

Structure of microbial cells; Biodiversity, Cell constituents; Differences between eukaryotic and prokaryotic cells; Reproduction of bacteria. Biology of microbes, algae, protozoa and fungi; blue green Algae; mycobacteria, spirochetes and autotrophy,

Anaerobic Respiration; Nitrogen fixation. Role of Microorganisms in air, water and soil pollution – Microbes and human health hazards. Biological control – Microbial control of plant pests, pathogens and insects.

Bioremediation – Types of bioremediation, basics of bioremediation of surface soil and sludges, bioaccumulation, biomagnifications, biodegradation. Principles of staining techniques.

## **Unit – VI**

Waste management and Resource conservation: Importance of Microorganisms in industry, forestry and horticulture, secondary metabolic products and their applications. Cryopreservation and germplasm storage. Enzyme biotechnology, isolation, purification, immobilization and uses of enzymes, uses of microbes in industry and agriculture.

Biochemical wastes, Municipal solid wastes, plastic wastes. Conservation of minerals, Basics of Genetically engineered organisms in control of pollution and agriculture.

## **Unit – VII**

Sources of energy, fossil fuel, nuclear, wave, solar and geothermal energies. Noise-Oscillatory motion, wave phenomena, sound as a wave motion, sound Intensity, the human ear, noise insulation. Impact of noise on human beings.

Radioactivity-Sources, Types and Properties of Radiations. Interaction of radiation with matter. Ionization – direct and indirect ionization. Radiation exposure. Impact of radiation pollution on plants and animals.

### **Unit – VIII**

Natural waters, distribution of microorganisms in the aquatic environment. Water pollution: definition, types, sources, water-borne diseases-viral (jaundice), bacterial (cholera) and Determination of sanitary quality of water: SPC, Tests for coliform, MPN, membrane filter technique.

Water purification in municipal water supply. Sources of wastewater-domestic, agricultural and industrial. Physico- chemical and microbiological characteristics of wastewater. Wastewater treatment: municipal wastewater treatment – Primary. Secondary and Tertiary, Reclamation of wastewater. Solid waste recycling: Anaerobic digestion process, Biogas and composting.

### **Unit –IX**

Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people.

Mineral resources: Use and exploitation, environmental effects of extracting using mineral resources.

Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

Land resources: Land as a resource, land degradation, man induced landslides.

Wildlife Resources: Wildlife in India, IUCN categories, Hotspots

Forests and wildlife. *In situ* and *ex-situ* conservation.

Equitable use of resources for sustainable lifestyles.

Conventions related to global warming, climate change and ozone depletion

### **Unit –X**

Applications of Biotechnology in pollution management, Immunoassays, DNA-based methods, use of biosensors.

Biotechnological methods in abatement of CO<sub>2</sub> emission. Biotechnology and Biodegradation: Degradation of xenobiotic compounds-Simple, aromatic, chlorinated, poly aromatic, petroleum products, pesticides and surfactants.

Biohydrometallurgy and biomining: Bioleaching, biosorption, oil degradation, creation of superbug. Treatment of Industrial wastes: Dairy, pulp, dye, leather and pharmaceutical industries. Genetically engineered microbes for waste treatment.