**SCHEME OF EXAM AND SYLLABUS FOR ENTRANCE TEST FOR ADMISSION TO**

**M.Sc. (ENVIRONMENTAL SCIENCE)- 2019-20**

**INSTITUTE OF ENVIRONMENTAL STUDIES, K.U.K.**

**Time: One Hour Max Marks: 100**

1. **50 questions will be set covering the entire syllabus.**
2. **All questions will carry equal marks.**

**3. There will be No Negative marking.**

**Unit-I** (20 Marks)

**Environment Factors**: Abiotic factors- light, temperature, humidity, topography, edaphic factors, biotic factors- microorganisms, plants, man, and other animals; Biogeochemical cycles – Carbon, Nitrogen, phosphorus and hydrological cycles.

Structure and composition of atmosphere, hydrosphere, lithosphere, biosphere, heat budget and energy transfer of earth. Interaction between atmosphere, hydrosphere, lithosphere and biosphere, Enthalpy: laws of thermodynamics, heat transfer processes.

**Natural resources**: Land resources: land degradation, soil erosion and desertification: Water resources: water use and availability, overutilization of surface and ground water.; Energy resource: Renewable and non-renewable energy resource, use of alternate energy resources, growing energy needs; Mineral resource: mineral as a resource, environmental impacts of mining and exploitation, restoration of mines and wastelands; Forest resource: forest as a resource, use and overexploitation; Food resource: world food problems, changes caused by modern agriculture Biogeography – Phytogeography regions of India, vegetation and its types of India; Biomes – Major biomes of world, characteristic features of terrestrial, freshwater and marine ecosystem, forest, grassland, lakes, rivers and marine ecosystem of India.

**Study of geological hazards and disaster management** - floods, earthquakes, cyclone, landslides, tsunamis, drought

**UNIT-II** (20 Marks)

**Ecology** - Definition, scope and importance, level of organization; Population ecology - Basic concepts, characteristics- density, mortality, natality, age structure, population growth curves, niche and habitat ;Community**-** Concept, characteristics (analytic and synthetic characters of plant community), methods of analysis, concept of keystone species, ecotypes, ecotones and ecads; Ecosystem – Concept, Components of ecosystems, functions (food chain, food webs, ecological pyramids and energy flows) energy efficiency; Ecological Succession – Concept and types of succession, climax and stability.

**Biodiversity:** concept, importance and conservation needs, classification, nomenclature; Species diversity: Principles of classification, concept of speciation, species extinction, micro-organisms organization and function of different species cell; Conservation of biodiversity: Causes of decline of biodiversity, approaches of conservation (ex-situ, in-situ conservation), hotspots of biodiversity, hotspots of India.

**Plant Physiology**: Plant water relation, mineral nutrition, photosynthesis, photorespiration, Celvin cycle, C4 pathway, CAM plants, growth and development, phytoharmones, phytochromes.

**Environmental Microbiology**: diversity of microbes, bacteria, cyanobacteria, algae, fungi, viruses, types and role of plants and microbes for in situ and ex situ remediation, bioindicators, biofertilizers, biofuels and biosensors.

**UNIT-III** (20 Marks) **Environmental chemistry**: equilibrium, chemical potential, stoichiometry, Gibbs energy, acid base reaction, solubility, carbonate system, radionuclides, chemical speciation. Composition of air: particles, ions and radicals in the atmosphere. Ozone and ozone chemistry, water chemistry: concept of DO, BOD and COD, sedimentation, coagulation, flocculation, filtration, pH and redox potential. Water treatment: primary, secondary and tertiary methods. Soil chemistry: inorganic and organic components of soil. **Pollution:** types, point and non-point sources of pollution, primary and secondary pollutants. Causes, impacts and control measures of water pollution, air pollution, soil pollution, marine pollution, noise pollution and thermal pollution. Greenhouse effect: global warming and climate change, acid rain, photochemical smog and ozone layer depletion. Air quality standards, water quality standards and noise pollution standards. **Waste Management**:-Causes, types, sources, effects and management of solid wastes, industrial wastes, hazardous waste, plastic waste and e-waste. Nuclear hazards, radioactivity in environment, properties of solid waste. Disposal methods: open dumping, sanitary land filling, secure land filling, incineration, composting, vermi-composting, deep-well injection of wastes. Fly ash: sources, composition and utilization.

**Unit IV** (20 Marks)

**Environmental Analysis:** Analytical Techniques of Air, Water, Soil, Vegetation and Microbes; Air: Methods of estimation of SOx, NOx, particulate matter; Water: Methods of estimation of Physico-chemical and biological parameters; Soil:Methods of estimation of Physico-chemical parameters; Vegetation: Methods of estimation of biomass and species diversity; Microbes:Analytical Methods of estimation of microbial population and diversity **Instrumentation:** Principles of Spectrophotometry (UV-Visible, AAS), Chromatography (TLC, GLC, Paper, HPLC), Titrimetry, Colorimetric, Gravimetric, Analytical . **Statistics:** Mean, Median, Mode, Standard deviation, variance, skewness, kurtosis, Correlation, Regression, Probability, t-test, Chi-square test **Cell biology and Genetics**- structure and function of cell (plants and animals), ultrastructure of different cell organelle of animals and plants cells, mechanism of active and passive transport, endocytosis and exocytosis; Elements of heredity and variations, genetic inheritance, linkage and recombination, sex determination, sex linked inheritance, extra chromosomal and cytoplasmic inheritance, multiple allelism, genetic material, genetic variation, gene expression, human genetics, applied genetics.Evolution: theories of organic evolution, micro-evolution and concept of species, concept of micro-mega evolution

**Unit V** (20 Marks)

**Environmental legislations in India**-Air (Prevention and Control of Pollution) Act, 1981; Water( Prevention and Control of Pollution) Act, 1974; Environmental Protection Act,1986; Wild Life Protection Act,1972. Motor Vehicle ACT-1988; National Green Tribunal Act, 2010; National Environmental Policy. International Conventions- Kyoto Protocol, Montreal Protocol, Convention on Biological Diversity (CBD), IUCN; Red data book; CITES; Issues related to water resource projects- Narmada Dam, Tehri Dam, Cauvery and Mahanadi, Rehabilitation of people affected form Dam construction; Water Conservation- Water shed development; rain water harvesting, ground water recharge; Namami Ganga and Yamuna Action Plan, restoration of lakes, rivers.

 **Environmental Health** -toxicity of arsenic, mercury, lead pesticides, PAN VOC, carcinogenicity; Symptoms, Epidemiology and control of vector and water bone diseases: Amoecbiasis, trypanosomiasis, leishmaniasis, schistosomiasis, filariasis, chlorea, diarrhea, control of malaria, tuberculosis, AIDS, dengue. **Environmental education and awareness**; Environmental ethics; Population growth, variation among nations; population explosion;

 **Sustainable development**; Sustainable habitat: Green building, National Mission on sustainable habitat, National mission sustainable agriculture