



M.Sc. – Semester I Microbiology and Biotechnology

PAPER: (MB/BT) **405: EVOLUTION**

[CSIR – UGC – NET - TOPIC: 11]

Total Credits – 3

Total Hours – 45

Objectives:

- To understand the interactions of organisms and their environments as well as consequences of these interactions for population, community, and ecosystem dynamics.

Unit – 1: Evolution and behaviour

Emergence of evolutionary thoughts Lamarck; Darwin–concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; Spontaneity of mutations; the evolutionary synthesis.

Origin of cells and unicellular evolution: Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers; Concept of Oparin and Haldane; Experiment of Miller (1953); The first cell; Evolution of prokaryotes; Origin of eukaryotic cells; Evolution of unicellular eukaryotes; Anaerobic metabolism, photosynthesis and aerobic metabolism.

Unit – 2: History of palaeontology, evolution and molecular evolution

Paleontology and Evolutionary History: The evolutionary time scale; Eras, periods and epoch; Major events in the evolutionary time scale; Origins of unicellular and multi cellular organisms; Major groups of plants and animals; Stages in primate evolution including Homo.

Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks; Molecular tools in phylogeny, classification and identification; Protein and nucleotide sequence analysis; origin of new genes and proteins; Gene duplication and divergence.

Unit – 3: Mechanisms of population genetics and evolution

The mechanisms: population genetics – Populations, Gene pool, Gene frequency; Hardy Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution.

Brain, Behavior and Evolution: Approaches and methods in study of behavior; Proximate and ultimate causation; Altruism and evolution-Group selection, Kin selection, Reciprocal altruism; Neural basis of learning, memory, cognition, sleep and arousal; Biological clocks; Development of behavior; Social communication; Social dominance; Use of space and territoriality; Mating systems, Parental investment and Reproductive success; Parental care; Aggressive behavior; Habitat selection and optimality in foraging; Migration, orientation and navigation; Domestication and behavioral changes.

References:

1. Life Science: Fundamentals and Practice Part 2 Pranav Kumar and Usha Mina Pathfinder Publication 7th Edition.
2. Organic Evolution (Evolutionary Biology) – Veer Bala Rastogi, Publisher Scientific International, 2018, Thirteen Edition.
3. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology-PS Verma and VK Agrawal, Publisher S.Chand, 2005, Fourteenth Edition.
4. Evolution by Futuyama, Publisher Sinauer Associates, 2005, Third Edition.