CONCEPTS AND MECHANISMS OF EVOLUTION

Paper 12

THEORY (48 Periods)

Unit 1: Introduction to Evolutionary Theories (4)
Lamarckism, Darwinism, Neo-Darwinism

Unit 2: History of Life (3)
Overview, Biogeny

Unit 3: Evidences of Evolution (6)
Fossils as direct evidences, Types of fossils, Incompleteness of fossil record, Phylogeny of horse as an example, Molecular evidences (Globin gene families and Molecular clock concept)

Unit 4: Sources and Processes of Evolutionary Change (15)
Causes of organic variations: An overview, Role of variations in evolution; Natural selection (Examples; Industrial melanism, Pesticide/Antibiotic resistance); Types of natural selection (Directional, Stabilizing, Disruptive); Principles of population genetics: Concept of gene pool, Gene frequencies – equilibrium frequency (Hardy-Weinberg equilibrium), Shift in gene frequency - Genetic drift, Mutation pressures and Gene flow

Unit 5: Products of Evolutionary Change (8)
Biological species concept (Advantages and Limitations); Sibling species, Polymorphic species, Polytypic species, Ring species; Isolating mechanisms; Modes of speciation (Allopatric, Sympatric); Macro-evolutionary Principles (example: Darwin's Finches); Convergence, Divergence, Parallelism

Unit 6: Extinction (6)
Background extinction, Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution

Unit 7: Origin and Evolution of Man (6)
Palaentological evidences; Note on molecular evidences

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PRACTICAL

1. Study of fossil evidences from plaster cast models and pictures.
2. Study of homology, analogy and homoplasy from suitable specimens.
3. Study of natural selection under different conditions, using simulation exercise.
4. Demonstration of role of natural selection and genetic drift in changing allele frequencies.
5. Construction of cladograms based on morphological characteristics.
6. Construction of phylogenetic tree with the bioinformatics tools (Clustal X and Phylip) and its interpretation.

ESSENTIAL READINGS

- Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
- Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). *Evolution*. Cold Spring, Harbour Laboratory Press.
- Hall, B. K. and Hallgrimsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers

SUGGESTED READINGS

- Pevsner, J. (2009). *Bioinformatics and Functional Genomics*. II Edition. Wiley-Blackwell.
- Campbell, N. A. and Reece J. B. (2011). *Biology*. IX Edition, Pearson, Benjamin, Cummings.
- Douglas, J. Futuyma (1997). *Evolutionary Biology*. Sinauer Associates.
- Minkoff, E. (1983). *Evolutionary Biology*. Addison-Wesley.