Paper 02: Evolution and Preliminary Knowledge for Quantification in biology

Theory (Full Marks 50)

Module ZH201: Evolution (35)

1. Rise of evolutionary theories: the historical outline- conflict between creationists' idea and evolutionary theories, Lamark's theory, Theories proposed by Darwin and Wallace, modern form of Darwinian theory including modern synthehesis

2. H-W theorem and its significance in evolutionary theory, calculating gene frequencies for H-W and non-H-W populations (very simple problems only), Variations in natural populations.
3. Nature and actions of natural selection – evolution of industrial melanism in *Biston betularia* as example,
4. Genetic Drift, Gene Flow and Mutation Rate (only definitions and outlines of these processes, details of nature of actions by each, mathematical models not necessary)

5. Critical concepts (only preliminary and brief discussions)-
5.1 Application of the concept of adaptation- precise definition of adaptation in evolutionary sense, critique of `adaptationist program'
5.2 Trends in the evolution of modern horses- outlines only
5.3 Measurement of rates of evolution – with the example of equine teeth including allometry
5.4 Punctuationist vs. gradualist mode of evolutionary changes
5.5 Heterochrony – as a process of macroevolution, just definitions of the heterochronic processes and examples, including Neoteny and Progenesis
5.6 Process of speciation: concept of reproductively isolated species and models of speciation- Allopatric, Sympatric and Parapatric models
5.7 Recent knowledge about hominid evolution: a brief outline

Module ZH202: Preliminary knowledge for quantification in biology (15)

1. Logarithm, Matrices, Permutation and Combination, Probabilities (just preliminary concepts and very simple problems to be worked out)

2. Graphical representation of data- bar chart, histograms, scatter plots, pie charts; Discrete and Continuous variables-examples, Normal distribution (only primary characteristics and examples, detailed mathematical characterizations not required); Mean, Mode and Median, Standard deviation, Variance and Standard error; Simple Correlations; concept of Hypothesis Testing, Tests for goodness of fit- Chi-square, Student t-test for comparing means of two small samples from normal populations.