U.G. 6th Semester Examination - 2025

ZOOLOGY

[HONOURS]

Course Code : ZOOL-H-CC-T-14

(Evolutionary Biology)

Full Marks : 40 Time : $2\frac{1}{2}$ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer any **five** of the following: 2×5=10

a) What do you mean by plesiomorphy and symplesiomorphy?

b) What do you mean by bifurcating tree and multifurcating phylogenetic tree?

c) List the names of the several periods that fall under the Paleozoic era.

d) What is the difference between gene flow and genetic drift?

e) In terms of isolating mechanisms, what are habitat and temporal isolation?

f) What do you mean by population crash and flush?

g) What does positive and negative allometry mean?

h) Which time period is known as the "age of fish" and when do fishes first appear?

2. Answer any **two** of the following: 5×2=10

a) What do you mean by great apes and lesser apes? How are Hominin, Hominid and Hominoid different from one another? 2+3

b) i) Explain the importance and application of monophyly, paraphyly and polyphyly in the context of constructing a phylogeny.

ii) What are nodes? What is their functional significance? 3+2

c) What is neutral mutation? What are the Kimura's arguments on neutralism? 2+3

d) What is the significance of Hardy-Weinberg principle? In a population that is in Hardy-Weinberg equilibrium, the frequency of the recessive homozygote genotype of a certain trait is 0.09. Calculate the percentage of individuals' homogygous for the dominant allele. 2+3

3. Answer any **two** of the following: 10×2=20

a) What are the primary changes in the equine evolution? What is concomitant modification? What are the characteristics features of the first recorded fossil stage in the equine evolution? Describe the anatomical differences between Peking man and Lucy. 3+1+3+3

b) i) A population of rabbits may be brown (the dominant phenotype) or white (the recessive phenotype). Brown rabbits have the genotype BB or Bb. White rabbits have the genotype bb. The frequency of the BB genotype is 0.35. Based on this, calculate (1) frequency of heterozygous rabbits; (2) frequency of the B allele; and (3) frequency of the b allele. 6

ii) Explain briefly the concepts of Selection Coefficient and Heterozygous superiority. 4

c) What do you mean by distance-based method for construction of phylogenetic tree? Explain with example. What is operational taxonomic unit? Using maximum parsimony, construct a phylogenetic tree for the following four DNA sequences: ACT, ACA, GTT and GTA. Show your reasoning and explain the steps involved in finding the most parsimonious tree. 4+4+2

d) Explain how the genetic drift influences Hardy-Weinberg equilibrium. In the United States, approximately one child in 10,000 is born with PKU (phenylketonuria), a syndrome that affects individuals homozygous for the recessive allele (aa). Assume that the population is in Hardy-Weinberg equilibrium.

i) Calculate the frequency of this allele in the population.

ii) Calculate the frequency of the normal allele.

iii) Calculate the percentage of carriers of the trait within the population. 3+(2+2+3)
