PG/IIIS/ZOO/302.1 & 302.2/22
(CCAE)

M.Sc. 3rd Semester Examination, 2022

ZOOLOGY

(*Molecular Evolution/Microbiology*)

PAPER – ZOO-302.1 & 302.2(CCAE)

Full Marks : 40

Time : 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

PAPER – ZOO-302.1

(*Molecular Evolution*)

1. Answer any *two* of the following questions : 2 × 2

   (*a*) Differentiate ortholog sequence from paralog sequence citing examples.

(*b*) How many distinct rooted, biturcating phylogenetic trees could show the evolutionary relationship among Chimpanzee, Gorilla and Human ?

(*c*) Consider a population of sheep to be in Hardy-Weinberg equilibrium. The allele for black wool (w) has an allele frequency of 0.81 while the allele for white wool (W) has an allele frequency of 0.19. Then is the percentage of heterozygous individuals in the population.

(*d*) Which statement describes the Hardy-Weinberg law the best ?

(*i*) It is impossible to predict expected allele frequencies mathematically.

(*ii*) In large populations, dominant alleles become more prevalent.

(*iii*) Allele frequency changes over a period of time in a large population.

(*iv*) Mechanism of inheritance in a large population does not change allele frequency.

2. Answer any *two* questions of the following : 4×2

(*a*) State the significance of gene duplication in β-globin gene evolution.

(*b*) In the distance matrix shown here, which pair of taxa should be joined first and what is the resulting UPGMA distance matrix.

	B	C	D	E	F	G
A	8	15	19	24	30	35
B		20	18	16	22	28
C			7	5	4	3
D				6	4	5
E					7	6
F						5

(*c*) Consider a recessive gene for which the mutation rate is 10^{-6} and s is 0.1. What will be the equilibrium frequency of the gene.

(*d*) In an industrialized region 200 Dark moth (D) and 100 light (d) moth are released with a

frequency of $D = 0.7$ and $d = 0.3$. When recaptured, only 180 Dark moth and 20 light moth obtained ? Calculate the selection coefficient and frequency of 'd' allele after one generation.

3. Answer any *one* question of the following : 8×1

(*a*) A population of 80 white rats lives on city population and the frequency of the G6PD allele among these rats 0.70. Another population of rats found nearby village, the frequency of G6PD allele is 0.5. During severe drought 20 of the rats from village population migrate to the city population and join the city population. What will be the allele frequency of G6PD in city population after migration.

(*b*) In a homologous region containing 15000bp the following number of sequence differences are found

	Chimpanze	Gorilla	Orangutan	Rh Monkey
Human	145	151	398	851
Chimpanzee		197	294	855
Gorilla			304	840
Orangutan				810

Construct a gene tree using UPGMA method.

PAPER – ZOO-302.2

(*Microbiology*)

4. Answer any *two* questions form the following : 2×2

(*a*) Differentiate Capnophils from Micro-aerophils.

(*b*) What is the difference between inoculation and incubation ?

(*c*) What is selective media ? Give example.

(*d*) What *is agar ? State* its uses.

5. Answer any *two* questions from the following : 4×2

(*a*) What are the roles of various microbes in a soil habitat ?

(*b*) Draw the ultrastructure of a flagellum and state the primary functions of flagella.

(*c*) Distinguish between endotoxin and exotoxin.

(*d*) What is quorun sensing ? Mention its significance.

6. Answer any *one* question from the following : 8×1

(*a*) (*i*) How is Begey's manual of Systematic Bacteriology different from that of Determinative Bacteriology ?

(*ii*) Illustrate the various bacterial colony morphology patterns observed in solid culture. $4 + 4$

(*b*) (*i*) Draw and describe the phases of bacterial growth curve.

(*ii*) Write the role of microbes in nitrogen cycle. 4 + 4
