PG/IIIS/ZOO-302/18

M.Sc. 3rd Semester Examination, 2018

ZOOLOGY

PAPER – ZOO-302(A & B)

Full Marks : 40

Time : 2 hour

The figures in the right-hand margin indicate marks

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

GROUP – A

(*Evolution and Adaptation*)

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

(*a*) What are the different approaches to inferring evolutionary relationships and constructing phylogenetic tree ?

(*b*) How many distinct rooted, bifureating phylogenetic trees could show the

evolutionary relationships among Chimpanzee, Gorilla and Human.

(*c*) Why the human and horse α globin genes are more similar than human α and β globin genes.

(*d*) In which why effective population size(Ne) can be reduced ?

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

(*a*) Two small separated human populations A and B have respective frequencies of phenyl thio carbamide tasters(caused by a dominant) of 0.85 and 0.25. If 5 percent of population B comes from population A each generation, what will be the frequency of the tasting gene in population B after 1 and 10 generation ?

(*b*) The following two genetically caused diseases are considered lethal since affected individuals do not reach reproductive age : retinoblastoma caused by a dominant gene; infantile amaurotic idiocy, caused by a recessive gene in homozygous condition.

(*i*) Assuming that both genes arise at mutation rates of 3×10^{-6}, what are their respective equilibrium frequencies ?

(*ii*) What frequency of homozygotes is expected for each gene ?

(*c*) Let us suppose that the starting allele frequencies of a population are $A = 0.5$ and $a = 0.5$ and fitness values of the three genotypes *AA*, *Aa* and *aa* are 1·0, 0·8 and 0·2 respectively. What will be the allele frequencies of *A* and *a* after one generation ?

(*d*) (*i*) Provide two activative states of oxygen.

(*ii*) Mention two degenerative disorders of man due to oxidative stress.

(*iii*) Name the site where environmental ROS affects.

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

(*a*) Alcohol is a common substance in rotting fruit, where fruit-fly larvae grow and

develop; larvae use the enzyme alcohol dehydrogenase (ADH) to detoxify the effects of alcohol. In some fruit-fly populations, two alleles are present at the locus that encodes ADH^F, which encodes a form of the enzyme that migrate rapidly (fast) on an electrophoretic gel ; and Adh^S, which encodes a form of the enzyme that migrates slowly on an electrophoretic gel. Female fruit flyes with different Adh genotypes produce the following numbers of off spring when alcohol is present.

Genotype	Mean number off springs
Adh^F/Adh^F	120
Adh^F/Adh^S	60
Adh^S/Adh^S	30

(*i*) Calculate the relative fitness of females having these genotypes;

(*ii*) What are the selection coefficient ?

(*iii*) It a population of fruit-fly has an initial frequency of Adh^F equals to 0.2, what

will the frequency be in the next generation ?

(*iv*) In a region where industrial pollution has been under control for a number of years, the fitness of Adh^F allele is 0.47 and Adh^S allele is 1. Calculate the change in allele frequency $\Delta p(Adh^F)$ after one generation of selection when $p = 0.40$. 4 + 2 + 2

(*b*) Consider the following five way multiple alignment of hypothetical homologous sequences Generate a distance matrix that describes the pairwise relationship of all the sequences presented. Use the UPGMA method to generate a tree that describes the relationship between these sequences : 8

	10	20	30	40	50
A :	GCCAACGTCC	ATACCACGTT	GTTTAGCACC	GGTTCTCGTC	CGATCACCGA
B:	....	....	..CA. A....	....	....
C:	. G.....	....	...ATA....	....	A. G.....
D:	. . T.....	...T.....C	. . CAT. T...	...C.....	A.....C. . A.
E:	. . TGGT....	...T.....	A. CAT. T..	...A.....	....

GROUP – B

(*Microbiology*)

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

   (*a*) What do you mean by H-O variation and S-R variation ?

   (*b*) State the Koch's postulates.

   (*c*) Comment on Actinomycetes.

   (*d*) Are "Plasmids and Episomes same entities" ?

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

   (*a*) Compare the advantages and disadvantages of solid and Liquid culture media. $2 + 2$

   (*b*) Elaborate the difference between Eubacteria and Archaebacteria. Mention the groups categorised under 8-kingdom system. Who proposed it ? $2 + 1 + 1$

   (*c*) Draw and describe the normal Growth curve of Bacteria. List the names of various culture methods used for microorganisms. $2 + 2$

(*d*) How are microcapsules different from capsules ? Describe the structure and function of mesosomes. 2 + 2

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

(*a*) (*i*) Draw and describe the fine structure of a Bacterial flagella.

(*ii*) What are the difference between quorum-sensing mechanisms of a gram-positive and gram-negative bacteria to ensure the Bioluminescence ? 4 + (2 + 2)

(*b*) (*i*) Describe the commonly used classification system for Fungi and viruses.

(*ii*) Classify bacteria on the basis of cellular morphology. Add a note on the various planes of division exhibited by cocci. (2 + 2) + (2 + 2)
