

2018

M.Sc.

Part-II Examination

ZOOLOGY

PAPER—VII B

Full Marks : 50

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

Use separate Answer-scripts for each unit.

Group—B

Answer any *four* questions taking *two* from each unit.

Unit—I

(Microbiology)

1. (a) Illustrate 5-kingdom system of classification with detailed diagram.

(Turn Over)

(b) Name the updated volumes under Bergey's manual of systematic Bacteriology.

(c) Compare salient features of Fungi with those of algae.

(d) How does virus differ from a plasmid ?

5+2+4+1½

2. (a) What are the variety of inclusion granules present in bacterial cytoplasm ? State their utility.

(b) Describe the functions and origin of mesosomes.

(c) Broadly classify different types of culture media with examples each.

(d) How will you enumerate bacterial population present

in culture media ?

(1½+1)+2+5+3

3. (a) Which group of microorganisms are responsible for the earthy odour of soil ? Which chemical is released by them ? Define Microbivory with example.

(b) Draw a typical growth curve of bacteria. Explain the reasons for the decline of bacterial population. Define Generation Yime.

(c) Mention the morphological types of typical bacterial colonies. (1+1+1½)+(3+2+2)+2

4. (a) State the difference between Lithotrophic and Organotrophic bacteria. How can you distinguish between facultatory aerobic bacteria from anaerobic bacteria in culture ?

(b) Write short notes on any three :

(i) Mycoplasma,

(ii) H-O variation,

(iii) Flagella vs. Fimbrial,

(iv) Gram negative cell wall.

(2½+1)+(3×3)

Unit—II

(Environmental Physiology and Evolution)

5. (a) Why homologous genes have sequences that are similar but not identical ?

C/18/DDE/MSc/Part-II/ZOO/7B

(Turn Over)

- (b) Enlist the types of molecules having antioxidant properties.
- (c) Define ROS. How are they formed within human body? State their deleterious effects.
- (d) How many distinct rooted, bifurcating phylogenetic trees could show the evolutionary relationship among Chimpanzee, Gorilla and Human.

$$2\frac{1}{2} + 2 + (1\frac{1}{2} + 2 + 1\frac{1}{2}) + 3$$

6. (a) Two small separated human populations A and B have respective frequencies of phenyl thio carbamide taster (caused by dominant allele) 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 2 generation?
- (b) Why human and horse α globin genes are more similar than human α and human β -globin gene?
- (c) A certain stock of *Drosophila* shows a mutation rate for normal (w^+) to eosin (w^e) of 1.3×10^{-4} and a

reverse mutation rate $w^e \rightarrow w^+$ of 4.2×10^{-5} . What is the equilibrium value of w^e ? $6+3+3\frac{1}{2}$

7. (a) Construct a molecular phylogenetic tree using the table provided below. Number of dissimilar amino acids in the α globin of representative vertebrates among 141 amino acids.

	Mouse	Chicken	Newt	Carp	Shark
Human	16	35	62	68	79
Mouse		39	63	68	79
Chicken			63	72	83
Newt				74	84
Carp					85

Estimate the extent to which the amino acid sequence of these six organisms differ.

- (b) Write a brief note on principles of parsimony.

$$8+4\frac{1}{2}$$

8. 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 population, 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 flies with different Adh genotypes produce the following numbers of offsprings when alcohol is present :

Genotype	Mean number offsprings
Adh^F / Adh^F	120
Adh^F / Adh^S	60
Adh^S / Adh^S	30

- (a) Calculate the relative fitness of females having these genotypes.
- (b) What are the selection coefficient ?
- (c) If a population of fruit-fly has an initial frequency of Adh^F equals to 0.2 what will be frequency be in the next generation ?

- (d) 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 Adh^F after one generation of selection when $p = 0.40$. 2+2+3½+5
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