2016

M.Sc. Part–I Examination

ZOOLOGY

PAPER—II (Group—A)

Full Marks : 50

Time : 2 Hours

The figures in the margin indicate full marks.

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

Illustrate the answers wherever necessary.

Group—A

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

Unit—I

[Cytogenetics]

1. (i) Bacteriophage P^{22} was used to perform three factor cross in *Salmonella* between Arg^- Leu^- His^- recipient bacterium and bacteriophage P^{22} grown on an Arg^+Leu^+ His^+ strain. 1000 Arg^+ transductants were selected and tested them on several selective media. By replicating the following results were obtained.

$Arg^+ Leu^- His^- = 585$

$Arg^+ Leu^- His^+ = 300$

$Arg^+ Leu^- His^+ = 114$

$Arg^+ Leu^+ His^- = 1$

(a) What is the order of these three workers? 5

(b) What are the co-transduction frequencies? 3

(ii) Differentiate between generalised & specialised transduction. 3

(iii) What is a helper phage? $1\frac{1}{2}$

2. (a) What is thymine dimer? 1

(b) Mention the role of base analogues in causing mutations. 3

(c) What is meant by degeneracy of codons? What is wobble hypothesis?

(d) What is Base excission repair? Mention basic steps. 4

(e) What are protoncogenes? $1\frac{1}{2}$

3. (a) In a randomly mating labouratory population of Drosophila, 4 percent of the flies have black bodies (black is the autosomal recessive b) and 96 percent have brown bodies (the normal color B). If this population is assumed to be in Hardy-Weinberg equilibrium, what are

the allelic frequencies of B and b and the genotypic frequencies of BB and Bb? $5\frac{1}{2}$

(b) The following map shows four deletions (1-4) involving the r II A cistron of phage T4!

1. ——
2. ————
3. ——————
4. ———

Five point multations (a-e) in r II A are tested against these four deletions mutants for their ability to give r^+ recombinants, with the following results:

	a	b	c	d	e
1	+	+	−	+	+
2	+	+	−	−	−
3	−	−	+	−	+
4	+	−	+	+	+

What is the order of the point mutants? 7

4. Write short note on (any *five*) of the following : $2\frac{1}{2} \times 5$

(a) AC-DS element;

(b) Cell cycle check points;

(c) Sexduction;

(d) V-src;

(e) Benzo-α pyrene ;

(f) Balbiani ring ;

(g) Endomitosis.

Unit—II

[Molecular Biology]

5. (a) How does a rho dependent terminator look like ? What role does rho thought to play in such a terminator ?

(b) What is meant by the term "Processive transcription" ? What part of the polymerase II structure ensures processivity ?

(c) Explain the fact that enhancer activity is tissue specific. $(2+2)+(2+2)+4\frac{1}{2}$

6. (a) What are replisomes ? 2

(b) Schematically represent the molecular events at OriC during initiation of DNA replication in prokaryotes. $5\frac{1}{2}$

(c) What is kinetic proof-reading ?

(d) Indicate whether the posttranscriptional modifications listed below occur in prokaryotes or in eukaryotes.

(i) 5′ Cap ; (ii) Polyadenylation ; (iii) splicing.

7. (a) The *ser* operon, which has sequences A, B, C, and D (which may be structural genes or regulatory elements), encodes enzymes E1 and E2. Mutations in sequences A, B, C and D have the following effects, where a plus sign (+) indicates that the enzyme is synthesized and a minus sign (–) denotes that the enzyme is not synthesized.

Mutation in sequence	*Ser absent*		*Set present*	
	E1	*E2*	*E1*	*E2*
none	+	+	–	–
A	–	+	–	–
B	+	+	+	+
C	+	–	–	–
D	–	–	–	–

(i) Is the ser operon inducible or repressible ?

(ii) Indicate (with explanation) which sequence (A, B, C or D) is part of the following components of the operon : regulator, promotor and strucutural genes for E1 and E2, respectively. 8

(b) What do you understand by degeneracy of genetic codes ? $2\frac{1}{2}$

(c) Indentify the polypeptide encoded by the DNA sequence below, in which the lower standard serves as the template for mRNA synthesis.

5′ CGACCTATGATCACCTGCTCCCCGAGTGCTGTTTAGGTG 3′

3′ GCTGGATACTAGTGGACGAGGGGCTCACGACAAATCCAC 5′

8. (a) Compare between cDNA and genomic DNA libraries. 3

(b) What are the essential features of a Cloning vector ? 3

(c) What is Shine-Dalgarno sequence ? 2

(d) Describe the roles that EF-Tu, EF-Ts, and EF-G play during bacterial translation. $4\frac{1}{2}$