

2017

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. (a) The following *E. Coli* Hfr strains donate their markers to  $F^-$  cells in the order given :

<u>Hfr strain</u>	<u>Order of gene transfer</u>				
	<u>First</u>		<u>Last</u>		
1	f	h	e	t	a g
2	o	c	r	f	h e
3	u	j	n	o	c r
4	n	j	u	g	a t

(Turn Over)

Draw a map showing the relative order of these genes in the circular chromosome of the original F<sup>+</sup> strain from which all four Hfr strains were derived. Also indicate the sites of F plasmid integration and the orientations of the origins of transfer origin. 5½

- (b) All pur alleles results in defective enzymes P A complementation test among six mutant pur strains produce the following results where (+) indicate complementation and (-) indicate no complementation.

	1	2	3	4	5	6
1	-	-	-	-	+	-
2	-	-	-	-	+	+
3	-	-	-	-	-	-
4	-	-	-	-	-	+
5	+	+	-	-	-	+
6	-	+	-	+	+	-

- (i) Draw a complementation map and comment what kind of mutant might mutant 3 ?
- (ii) How many complementation groups are there ?  
(5+1)+1
2. (a) In a population out of 100 people 17 have A blood group, 17 have B, 2 have AB and 64 have O group. Calculate allele frequencies for three genes and make

a comment whether the population is under Hardy-Weinberg equilibrium. 5½

- (b) Distinguish between plasmids and episomes. 2½
- (c) Distinguish between intergenic and intragenic crossing over. How many cistrons are present in rII locus. 2+1

3. (a) Describe the structure of Tn3. What is hybrid dysgenesis ? 3+2

- (b) What are protein kinases ? In what way they may be involved in cell cycle ? 2+3

- (c) Explain the role of p<sup>53</sup> in the cellular response to DNA damage. 2½

4. Write short notes on (any five) of the following :

2½ × 5

- (a) Hfr strain ;
- (b) UV ray induced mutation ;
- (c) Philadelphia chromosome ;

- (d) c-Src ;  
 (e) Anaphase A and Anaphase B ;  
 (f) Importance of 16A region of polytene chromosome ;  
 (g) F-duction.

### Unit—II

#### [Molecular Biology]

5. (a) What is Kozak's rule ?  
 (b) Draw a common pattern found within the promoter of structural genes reorganised by RNA polymerase II  
 (c) Describe the role of TFIID in the formation of eukaryotic open complex in transcription machinery.  
 (d) Describe the structural significance of DNA Pol-I.

$$2+3\frac{1}{2}+3+4$$

6. (a) What is charging of tRNA ? Mention the steps. 4  
 (b) Discuss the role of  $\sigma$  factor in transcription. 3  
 (c) How are histone proteins classified ? What is the significance of H1 in supercoiling and condensation of chromatin ? 2+1

(Continued)

- (d) Write a short note on spliceosome.  $2\frac{1}{2}$

7. (a) Consider the following hypothetical case. The three loci : a regulator gene, an operator gene and a structural gene are arbitrarily given the designation d, e, f.

Find out the three above mentioned genes observing the table given and explain in favour of your answer.

Genotype	Noninduced	Induced
$d^-e^+f^+$	+	+
$d^+e^+f^-$	+	+
$d^+e^-f^-$	-	-
$d^+e^+f^-/d^-e^+f^-$	+	+
$d^+e^+f^+/d^-e^-f^-$	-	+
$d^+e^+f^-/d^-e^-f^+$	-	+
$d^-e^+f^-/d^+e^-f^-$	-	-

- (b) (i) Why the level of production of  $\beta$ -galactosidase diminishes with the addition of glucose in wild type *E.Coli* culture medium containing lactose ?  
 (ii) Why is  $lac^{-d}/lac^+$  partial diploid, lac enzymes produced constitutively even in presence of normal repressor ?  $7\frac{1}{2}+(2\frac{1}{2}+2\frac{1}{2})$

8. (a) What are split genes ?  
(b) What do you mean by self-splicing ?  
(c) What is meant by VNTR ?  
(d) Why c-DNA is used in commercial cloning of human insulin gene ?  
(e) Distinguish between the action of Topoisomerase—I and II.

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

