

2013

**M.Sc. Part-I Examination****ZOOLOGY****PAPER—II**

Full Marks : 100

Time : 4 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.*

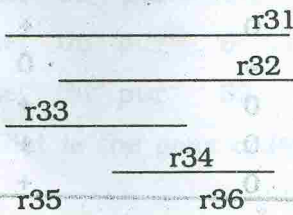
Answer any eight questions.

**Group—A**

Answer any four questions taking two from each unit.

**Unit—I****[Cytogenetics]**

1. Given the following deletion map with deletion r31, r32, r33, r34, r35, r36, place the point mutants on the map :



(Turn Over)

Delation Mutants + = recombinant produced  
0 = no recombinant produced

Point mutant	r31	r32	r33	r34	r35	r36
r41	0	0	0	0	+	0
r42	0	0	0	+	0	+
r43	0	0	+	+	+	0
r44	0	0	0	0	+	+
r45	0	+	0	+	+	+
r46	0	0	+	0	+	0

Show the dividing line between A cistron and the B cistron on your map from the following data + = growth on strain k12 ( $\lambda$ ), o = no growth on stain k12 ( $\lambda$ )

Complementation with

Mutant	rII A	rII B
r31	0	0
r32	0	0
r33	0	+
r34	0	0
r35	0	+
r36	0	0
r41	0	+
r42	0	+
r43	+	0
r44	0	+
r45	0	+
r46	0	+

12½

2. (a) In a transduction expt., the donor was  $c^+d^+e$  and the recipient was  $c d e$ . Selection was for  $c^+$ . The four classes of transductants from this experiment are shown in the following table.

Class	Genetic Composition	No. of Individual
1	$c^+ d^+ e^+$	57
2	$c^+ d^+ e$	76
3	$c^+ d e$	365
4	$c^+ d e^+$	2

(i) Determine the cotransduction frequency for  $c^+$  and  $d^+$ .

(ii) Determine the cotransduction frequency for  $c^+$  and  $e^+$ .

(iii) Which of the cotransduction frequencies calculated in (a) and (b) represents the greater actual distance between genes? Why?

(b) A cross is made between  $Hfr met^+ thi^+ pur^+ \otimes F^- met^- thi^- pur^-$ . Interrupted mating shows that  $met^+$  enters the recipient last. The following number of individuals are found with each genotype

$met^+ thi^+ pur^+$  280

$met^+ thi^+ pur^-$  0

$met^+ thi^- pur^+$  6

$met^+ thi^- pur^-$  52

What is the gene order?

7+5½



3. (a) In snail, multiple alleles at a single locus determine shell color. The allele for brown ( $C^B$ ) is dominant to the allele for pink ( $C^P$ ) and to the allele for yellow ( $C^Y$ ). The dominance hierarchy among these alleles  $C^B > C^P > C^Y$ . In one population, the following color phenotypes were recorded

Brown	236
Pink	231
Yellow	33

Assuming that this population is under Hardy Weinber equilibrium. Calculate the frequency of  $C^B$ ,  $C^P$ , and  $C^Y$ .

- (b) Red-green color blindness is caused by an X-linked recessive gene. About 64 women out of 10,000 are color blind. What proportion of men would be expected to show the trait if mating is random?

$$7+5\frac{1}{2}$$

4. The p53 protein can influence multiple pathways involved in tumor formation.

- (a) Explain how the function of p53 are regulated by phosphorylation?
- (b) Through what pathway does the phosphorylation of p53 influence phosphorylation of pRB to control cell cycle regulation?
- (c) What pathways can be activated by p53 in response to DNA damage?

$$5+5+2\frac{1}{2}$$

## Unit—II

## [Molecular Biology]

5. (a) What do you mean by polymerase switching & why is it necessary in enkaryotic DNA Replication?

- (b) How does sliding DNA clamp works in a fork? Describe stepwise with proper diagram.

$$6+6\frac{1}{2}$$

6. (a) Fox operon has sequence A, B, C and D that encodes enzyme A and enzyme B.

- = no synthesis  
+ = synthesis

Mutation sequence	Fox absent		Fox present	
	Enzyme 1	Enzyme 2	Enzyme 1	Enzyme 2
No mutation	-	-	+	+
A	-	-	-	+
B	-	-	-	-
C	-	-	+	-
D	+	+	+	+

- (i) Is the Fox operon inducible or repressible?
- (ii) Regulator gene —
- (iii) Promoter gene —
- (iv) Structural gene for enzyme 1 —
- (v) Structural gene for enzyme 2 —

- (b) In  $lac^{-d}/lac^{+}$  partial diploid, lac enzymes are produced constitutively even in presence of the normal repressor. Explain.

$10+2\frac{1}{2}$

7. (i) Which transcription factor is responsible for the release of RNA pol II from the promoter to start elongation & how does it work?
- (ii) Does the termination sequence of transcription differ in rho dependent and rho independent termination of transcription?
- (iii) What is the role of nus A protein?
- (iv) Which amino acid is bound to seryl - + RNA<sup>Leu</sup>?

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

8. (i) How does prespriming proteins interact with oriC in E-coli to form a replication bubble?
- (ii) Briefly describe the elongation stage of protein synthesis in prokaryotes sequentially with proper diagram.

$5+7\frac{1}{2}$

### Group—B

Answer any four questions taking two from each unit.

### Unit—I

### [Histology and Physiology]

1. (a) What is a fixative? Give example.
- (b) Classify fixatives with examples.
- (c) State the composition of 'Carney's fixative'.
- (d) How formaldehyde (HCHO) react with nucleic acids?
- (e) What is the difference between additive and non additive fixative?
2. (a) Mention the difference between Orthochromatic and Metachromatic dye.
- (b) Mention the process of staining of DNA and RNA.
- (c) Distinguish between :
- (i) Dye and stain.
- (ii) Haematoxylin and Haematein.
- (d) Write brief notes on :
- (i) Autolysis.
- (ii) Commercial importance of carmine.

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

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

