2016

M.Sc. 1st Semester Examination

ZOOLOGY

PAPER—ZOO-104

Full Marks : 40

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.

Use separate Answer-scripts for Group-A & Group-B

Group—A

(Cytogenetics)

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

(a) In E. coli, four Hfr strains donate the markers shown in the order given :

Strain 1	M	Z	X	W	C
Strain 2	L	A	N	C	W
Strain 3	A	L	B	R	U
Strain 4	Z	M	U	R	B

All of these Hfr strains are derived from the same F^+ strain. What is the order of these markers on the circular chromosome of the original F^+.

(b) About 70% of all white North American can taste the chemical phenylthiocarbamide and the remainder can not. The ability to taste is determined by the dominant allele T and the inability to taste is determined by the recessive allele t. If the population is assumed to be in Hardy-Weinberg Equilibrium, what are the genotypic and allelic frequencies in this population ?

(c) In what sense is pRB a negetive regulator of E2F transcription factor ?

(d) During the cell cycle, the p16 protein is an inhibitor of cyclin/CDK activity. Predict the phenotype of cells homozygous for a loss of function mutation in the gene that encode p16. Would this gene be classified as a protooncogene or a tumor suppressor gene ?

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

(a) In a HW equilibrium population, out of 100 people 17 have A type blood group, 17 have B type, 2 have AB type and 64 have O type. Calculate the allelic frequencies. 4

(b) The data in the following table obtained from a 3 point transduction test. A gene encode tryptophan synthetase, anth is linked unselected marker. What is the linear order of anth and three mutant alleles of A gene in the table ?

Cross	Donor markers	Recipient markers	anth allele in Recombinant	% anth$^+$
1.	anth$^+$ – A34	anth$^-$ – A223	72anth$^+$: 332 anth$^-$	18%
2.	anth$^+$ – A46	anth$^-$ – A223	196anth$^+$: 180 anth$^-$	52%
3.	anth$^+$ – A223	anth$^-$ – A34	380anth$^+$: 379 anth$^-$	50%
4.	anth$^+$ – A223	anth$^-$ – A46	60anth$^+$: 280 anth$^-$	20%

(c) Explain the role of p53 in the cellular response to DNA damage.

(d) All pur alleles result in defective enzyme P and map at one genetic locus. 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	–	+	–	+	+	–

Draw a complementation map and comment what kind of mutatnt might mutant 3 ?

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

(a) You cross a number of r II deletion mutations in all possible combinations in E. coli B and plate them on E. coli k 12(λ) to determine whether r^+ recombinants are formed. The formation of r^+ recombinants indicates that the mutations can recombine and so, if they are deletions, they must be non-overlapping. The results are given in the accompanying table, in which a through f indicate an rII mutation and + indicates the formation of r^+ recombinant progery in the cross.

Assemble a deletion map for these mutations using a line to indicate the DNA segment that is deleted in each mutant.

	a	b	c	d	e	f
a	–	–	–	–	–	–
b		–	–	+	+	–
c			–	+	–	+
d				–	–	+
e					–	+
f						–

(b) A cross is made between Hfr arg^+ bio^+ leu^+ X F^- art^- bio^- leu^-. Interrupted mating studies show that arg^+ enters the recipient last, so that arg^+ recombinants are selected

on a mdeium containing bio and leu only. These recombinants are tested for the presence of bio^+ and leu^+. The following number of individuals are found for each genotype :

$arg^+ bio^+ leu^+$	320
$arg^+ bio^+ leu^-$	8
$arg^+ bio^- leu^+$	0
$arg^+ bio^- leu^-$	48

(a) What is the gene order ?

(b) What are the map distances in recombination units ?

5+3

Group—B

(Immunology)

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

(a) Write the principle and application of Immunohisto-chemistry

(b) Mention the functional significance of the following :

(i) Psoriasin,

(ii) Thymosin,

(iii) Secondary lymphoid organ,

(iv) IgA.

(c) Define Agretope with diagram.

(d) Distinguish between Central tolerance and Peripheral tolerance.

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

(a) Distinguish between Necrosis and Apoptosis with proper diagram.

(b) Write the properties of T-cell epitope.

(c) What is Adjuvant ? Give exdample. Add a note on ADCC. 1+3

(d) State the characteristics of peptides that are presented through MHC class I molecule.

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

(a) What is Hybridization Probe ? Write the principle of Southern Blotting Hybridization. How it differs from Western Blotting Hybridization ? 1+1+6

(b) (i) Describe the structure of class II MHC molecule with suitable diagram.

(ii) Illustrate the cytosolic pathway for processing of antigen. 3+5

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