2017

M.Sc.

1st Semester Examination

ZOOLOGY

PAPER—ZOO-104

Subject Code—35

Full Marks : 40

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 Group-A & Group-B

Group—A

(Cytogenetics)

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

   (a) What role does Ras-GTP play in intracellular signalling that makes it a proto-oncogene ?

   (b) Name two tumor suppressor proteins promote apoptosis.

   (c) The human MN blood type antigens are determined by two co-dominant alleles L^M and L^N. The MN blood types

and corresponding genotypes of 398 Finns from a village are given below :

Phenotype	Genotype	Number
MM	$L^M L^M$	182
MN	$L^M L^N$	172
NN	$L^N L^N$	44

Calculate genotypic and allelic frequencies at the MN locus for the population.

(d) Hartnup disease is an autosomal-recessive disorder of intestinal and renal transport of amino acids. The fraquency of affected newborn infants is about 1 in 14000. Assuming random mating what is the frequency of heterozygotes ?

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

(a) Five genes in a bacteria strain are being studied. The accompanying table shows the results of contransduction experiments A+ means that the genes can be co-transduced a– means they can not be cotransduced. NT means not tested. What is the order of the genes.

	top	arg	suc	mot
tan	–	+	+	–
top		NT	+	+
arg			–	NT
suc				NT

(b) In an analysis of other rII mutants, complementation testing yielded the following :

MUTANTS	RESULTS
1, 2	+
1, 3	+
1, 4	–
1, 5	–

Predict results of testing 2 and 3, 2 and 4 and 3 and 4 together and what do you conclude about mutant 5.

(c) In a Pygmy group in Central Africa, the frequencies of alleles determining the ABO blood groups were estimated as 0.74 for I^O, 0.16 for I^A and 0.10 for I^B. Assuming random mating, what are the expected frequencies of ABO phenotypes ?

(d) What protein is the major player in activating a DNA damage checkpoint ? What happens to the protein when there is a DNA damage ?

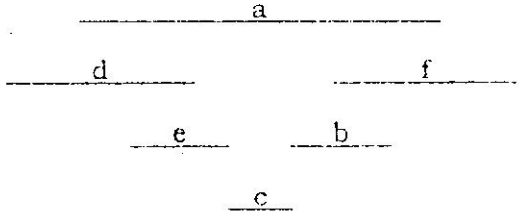
3. Answer any *one* question of the following : 1×8

(a) Four independent integrations of the F factor into the chromosome of an unusual strain of *E.Coli* yielded four different Hfr derivatives of the strain each with a different origin and possibly a different direction of transfer of markers. These were examined in interrupted-mating experiments and were found to transfer chromosomal genes at the times shown in accompanying table.

Draw a circular genetic map with position 0 (also 100) minutes at the top, showing the order of the chromosomal genes and the distance (in minutes) between adjacent genes. (The marker leu is near 2 minutes on the standed map).

	Genetic marker									
Hfr	his	lac	leu	lip	phes	pro	pyrD	terC	tonA	trp
W	–	20	–	11	–	–	3	–	–	–
X	–	–	18	–	–	–	31	–	20	25
Y	–	13	–	22	–	6	–	2	–	–
Z	19	–	–	–	12	4	–	8	–	–

(b) The accompanying map shows the genetic intervals defined by the endpoints of the deletion.



Seven rII mutants, t through *z*, thought to carry point mutations, are crossed to the six deletion mutants shown above and scored for the ability to produce

r^+ recombinants. The results are given in the accompanying table.

Deletion →	a	b	c	d	e	f
t	–	–	–	+	+	+
u	–	+	–	+	+	+
v	+	+	+	–	+	+
w	+	+	+	+	+	–
x	–	+	+	+	+	–
y	–	–	+	+	+	–
z	–	+	+	–	–	+

Point mutations ↑

Using the given deletion end points to define genetic intervals along the rII gene, position each point mutation within an interval. Refine the deletion end points if required.

Group—B

(Immunology)

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

(a) What are NK cells ? Mention its functions.

(b) Write the Principle of Immunohisto-Chemistry.

(c) What do you mean by 'titer' ?

(d) Mention the name of any four cytokines secreted by the macrophages.

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

(a) (i) What are Antigen Presenting Cells (APCs) ?

(ii) Write the functional significance of 'Psoriosin'. 3+1

(b) Differentiate Adjuvant and Hapten with example. Give an account of two important factors regulating Immunogenicity. 2+2

(c) Differentiate Helper T cells and cytotoxic T cells on the basis of their interaction with different MHC molecule.

(d) What are the general laws that govern MHC peptide interaction ?

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

(a) Write the principle of Sandwich ELISA. Describe in brief the procedure and application of Southern Blotting Hybridization (SBH). 1+5+2

(b) (i) Illustrate the mechanism of peptide assembly with class I MHC molecule with proper diagram.

(ii) State the function of invariant chain in MHC stabilization. 5+3

———