2011

M.Sc.

1st Semester Examination

ZOOLOGY

PAPER—ZOO-104

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.

Write the answers to questions of each Group in seperate booklets.

Group—A

(Immunology)

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

   (a) "Haematopoietic stem cells (HSC) are designated as multipotent cell" — Explain.

   (b) Write the functional significance of the following :

      (i) Fab ;

      (ii) Hinge region ;

(iii) Psoriasin ;

(iv) Adjuvants. $\frac{1}{2} \times 4$

(c) Differentiate between carrier and hapten.

(d) What is Sandwich ELISA ?

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

(a) Define antibody. Describe briefly the structure of immunoglobulin molecule. 1+3

(b) Describe the role of macrophage in cell mediated Immunity (CMI). 4

(c) Write note on ADCC. 4

(d) Briefly describe how B cell epitopes are different from T cell epitopes ? 4

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

(a) Write the principle of Southern Blotting Hybridization. Describe briefly the steps and application of Southern Blotting Hybridization. 1+5+2

(b) Enumerate the mechanism of antigen processing by endocytic pathway. Mention the importance of antigen presentation. 7+1

Group—B

(Cytogenetics)

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

   (a) 70% North American can taste phenyl thiocarbamide which is dominated by allele (T). If the population is HWE, what are the genotypic frequencies.

   (b) In an Hfr × F⁻ cross, leu⁺ enters first. What is the order of other markers if 27% are ile⁺, 13% mal⁺, 82% thr⁺ and 1% trp⁺ are obtained ?

   (c) What is the relationship between neoplasmic growth and somatic mutation ?

   (d) How does p21 gene arrest G_1 phase ?

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

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

Strain 1 :	Q	W	D	M	T
Strain 2 :	A	X	P	T	M
Strain 3 :	B	N	C	A	X
Strain 4 :	B	Q	W	D	M

(Turn Over)

(b) In an island population, the following data were obtained regarding the numbers of people with each of the four blood types :

Type	O	721
Type	A	932
Type	B	235
Type	AB	112

Is this population in Hardy–Weinberg equilibrium? Explain your answer.

(c) How cancer is promoted by an oncogene by keeping a cell growth signalling pathway in a permanent 'on' position?

(d) In a large herd of 5468 sheep, 76 animals have yellow fat, compared to the rest of the members of the herd, which have white fat. Yellow fat is inherited as a recessive trait. It is assumed that this herd is in Hardy-Weinberg equilibrium.

    (i) What are frequencies of the white and yellow fat alleles in this population?

    (ii) Approximately how many sheep with white fat are heterozygous carriers of the yellow allele?

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

   (a) Five Hfr strains A–E are derived from a single F^+ strain of E.Coli. The following chart shows the entry times of the first five markers into an F^- strain when

each is used in an interrupted conjugation expt :

A	B	C	D	E
mal$^+$(1)	ade$^+$(13)	pro$^+$(3)	pro$^+$(10)	his$^+$(7)
str^s(11)	his$^+$(28)	met$^+$(29)	gal$^+$(16)	gal$^+$(17)
ser$^+$(16)	gal$^+$(38)	xyl$^+$(32)	his$^+$(26)	pro$^+$(23)
ade$^+$(36)	pro$^+$(44)	mal$^+$(37)	ade$^+$(41)	met$^+$(49)
his$^+$(51)	met$^+$(70)	str$^+$(47)	ser$^+$(61)	xyl$^+$(52)

(i) Draw a map of the F$^+$ strain, indicating the positions of all genes and their distances apart in minutes.

(ii) Show the insertion point and orientation of the F plasmid in each Hfr strain.

Or

(b) (i) The following deletion map shows four deletions (1–4) involving the rII A cistron of phage T4.
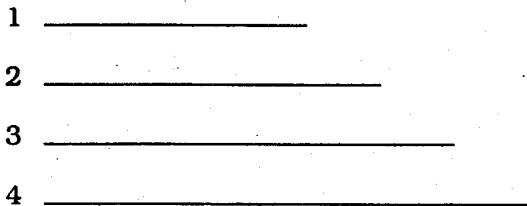
Five point mutations (a – e) are tested against F these four deletion mutants for their ability to give wild-type (r$^+$) recombinants; the results are

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

What is the order of the point mutation?

(ii) In a transduction expt, the donor was $c^+ d^+ e^+$ and the recipient was c d e. Selection was for c^+.

Class	Genetic Composition	Number of Individuals
1	$c^+d^+e^+$	57
2	c^+d^+e	76
3	$c^+d\ e$	365
4	$c^+d\ e^+$	2
		500

Determine the cotransduction frequency for c^+ and d^+. Determine the cotransduction frequency for c^+ and e^+.

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