PG/IS/ZOO - 104/13

M.Sc. 1st Semester Examination, 2013

ZOOLOGY

PAPER – ZOO - 104(A & B)

Full Marks : 40

Time : 2 hours

Answer **all** question

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

GROUP – A

(*Immunology*)

[*Marks* : 20]

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

(*a*) "Haematopoietic Stem Cells (HSC) are designated as multipotent cells" – Explain.

(*b*) What are the gene products of class I, II and III MHC region of mouse H-2 complex ?

(*c*) What is sandwich ELISA ?

(*d*) Write the functional significance of the following :

(*i*) Psoriasin

(*ii*) Thymosin

(*iii*) Perforin

(*iv*) Fab.

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

(*a*) Distinguish between Immunogen and Hapten. Give an account of two important factors regulating immunogenicity. 3 + 1

(*b*) Describe the major differences between class I MHC peptide and class II MHC peptide interaction. 4

(*c*) Define Adjuvants with example. Add a note on ADCC. 1 + 3

(*Continued*)

(*d*) Define epitope and agretope. What are cytokines ? Mention the role of any two cytokines. 2 + 2

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

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

(*b*) (*i*) State the role of CLIP and proteasome complex in Antigen presentation. 2 + 2

(*ii*) Illustrate the mechanism of association of peptide with class I MHC molecule within ER with proper diagram. 4

GROUP – B

(*Cytogenetics*)

[*Marks* : 20]

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

(*a*) Two *X*-linked mutations in Drosophila, white ivory and white apricot, cause the eyes to be

ivory and apricot color respectively. When hemizygous white ivory makes are crossed with homozygous white apricot females, the female progeny(trans heterozygote) have light apricot colored eyes, whereas wild-type Drosophila have dark red eyes. Are the white ivory and white apricot mutations in the same gene or in different genes ?

(*b*)

Hfr 2	0	pro	thr	thi	gly	his	gal	pur	lac	F
Hfr 3	0	pur	lac	pro	thr	thi	gly	his	gal	F
AB312	0	thi	thr	pro	lac	pur	gal	his	gly	F

By observing these results from interrupted mating experiment, indicate that the chromosome is circular.

(*c*) Why V-oncs induce tumors whereas normal c-oncs do not ? V-oncs do not have introns whereas c-oncs have. Explain.

(*d*) Full color in domestic cats is dominant over dilute color. Out of 325 cats, 194 have full color and 131 have dilute colour. What is the

frequency of dilute allele if the population is in Hardy Weinberg Equilibrium ?

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

(*a*) Strain *A* met^- bio^- thr^+ leu^+ thi^+

$\otimes$

Strain *B* met^+ bio^+ thr^- leu^- thi^-

Medium supplemented	Genotype of surviving colonies	Allele frequencies at unselected locus +	−
Biotin	met^+ $bio^?$ thr^+ leu^+ thi^+	60	40
Threonine	met^+ bio^+ $thr^?$ leu^+ thi^+	37	9

Is there any linkage between loci ?
If yes, explain the arrangement of loci. 4

(*b*) Draw a complementation map for the following complementation matrix obtained from an experiment in bacteria using 7 mutants and state how many complementation groups are present. 4

	1	2	3	4	5	6	7
1	0	+	+	+	+	+	0
2		0	+	0	+	+	+
3			0	+	+	0	+
4				0	+	+	+
5					0	+	+
6						0	+
7							0

(*c*) How is E_2F and Rb related to cell cycle regulation ? Elucidate the mechanism. 4

(*d*) 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 it mating is random ? 4

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

(*a*) Interrupted mating expt performed with fire different Hfr strains.

Hfr A	bio 4′	glu 20′	his 27′	cys 37′	tyr 45′
Hfr B	xyl 6′	met 18′	tyr 24′	cys 32′	his42′
Hfr C	his 3′	cys 13′	tyr 21′	met 27′	xyl 39′
Hfr D	xyl 7′	thr 25′	lac 40′	bio 48′	glu 64′
Hfr E	his 4′	glu 11′	bio 27′	lac 35′	thr 50′

(*i*) Observing these time of entry of the wild type alleles indicate the location of each gene.

(*ii*) Indicate the site of integration of sex factor in five Hfr strains. 8

(*b*) Propose a genetic map that is consistent with the complementation data provided below where m1 - m7 are different point mutations and Dfa - Dfe are deletions.

+ indicates complementation
0 indicates non-complementation.

	m1	m2	m3	m4	m5	m6	m7
Dfa	0	0	0	+	0	0	0
Dfb	0	+	+	0	+	0	0

	m1	m2	m3	m4	m5	m6	m7
Df c	0	+	+	+	0	0	+
Df d	0	0	+	0	0	0	0
Df e	0	+	+	0	+	+	0

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