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 :

r31

r32

r33

r34

r35 r36

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 (λ), o = no growth on stain k12 (λ)

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	+

$12\frac{1}{2}$

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?

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

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 Weinberz 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^{Leu}?

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

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?

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

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) Haematoxylon and Haematein.

(d) Write brief notes on :

(i) Autolysis.

(ii) Commercial importance of carmine.

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

3. Answer the following questions :

(a) Write briefly on isoreceptors.

(b) Give a short account of the characteristics of active transport. 4

(c) Soltatory conduction.

(d) Action potential in a nerve fibre.

(e) Structure of voltage gated Na-channel.

2+2+2+3+3

4. Write short notes on any *five* of the following : $2\frac{1}{2}\times5$

(i) Synapse.

(ii) Vitamin B-Complex.

(iii) Secondary Liquefaction.

(iv) Control of blood pressure.

(v) Nernst equation.

(vi) Peptide hormone and Steroid hormone.

(vii) Vital dyes.

(viii) Dye from animal origin.

(ix) Steps of synaptic transmission.

(x) Role of Na^+ in our body fluid.

Unit—II

[Biophysics and Biochemistry]

5. (a) Write briefly the role of diffusion in the transport of respiratory gases.

(b) State the laws of diffusion.

(c) Why do the plants stand erect on watering.

(d) What is Gibbs free energy ?

$5+2\frac{1}{2}+3+2$

6. (a) Mention briefly how carbohydrate and fatty acid can be synthesized from the members of TCA cycle.

(b) Write the steps of β-oxidation of saturated fatty acid in the mitochondrial matrix.

(c) Comment on the end products of peroxisomal β-oxidation of saturated fatty acid.

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

7. (a) What is Donnan Phenomenon ? How is it related to pH difference and potential difference across the membrane.

(b) Write briefly on deamination and transdemination.

$(2+4)+(5+1\frac{1}{2})$

8. (a) State the mechanism of origin of surface tention and what are the factors that affecting it?

(b) What is buffer? State the role of buffer in pH regulation in human body.

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