

2022

Zoology

[P.G.]

(CBCS)

(M.Sc. First Semester End Examination-2022)

PAPER-104

Full Marks:40

Time: 02 Hrs

The figures in the right hand margin indicate marks

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

Illustrate the answers wherever necessary

[Use separate Answer Script for each Group]

Group A

Marks 20

(Cell Biology)

- 1. Answer any two questions of the following: 2x2= 4**
- a) What is GPCR desensitisation? 2
 - b) How does ATP enable transport proteins to move ions across a cell membrane? 2
 - c) State the role of cytosolic HSP to protein in mitochondrial transport. 2
 - d) Write the name of cyclin and CDKs in maintain through out the cell cycle according to stage specific. 2

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2. Answer any two questions of the following: $2 \times 4 = 8$
- a) State the difference between Voltage-gated ion channels and ligand-gated ion channels. 4
- b) Explain PI-3k Akt pathway in terms of tumor development. What is the role of FOXO protein in cell division. 4
- c) How Rb gene regulates cell cycle? Explain if with the help of diagram and flow chart.
- d) Explain how CDK activity is modulated by the following proteins:
- (i) Cyclin
 - (ii) CAK
 - (iii) Weel
 - (iv) ϕ^{21}
3. Answer any one question of the following: $1 \times 8 = 8$
- a) Which protein targeting common for mitochondria and chloroplast organelles? How are proteins trafficked to mitochondria? How transport into and out of the nucleus is regulated? 1+3+4
- b) The membrane potential in animal cells depend largely on resting K^+ channel. How do these channels contribute to the resting membrane potential? Why are these channels considered to be nongated channels? How do these cells achieve selectivity for K^+ versus Na^+ , Which is smaller than K^+ ? 2+2+4

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Group – B
Marks 20
(Cytogenetics)

4. Answer any two questions of the following: $2 \times 2 = 4$
- a) Differentiate between F^+ and Hfr. 2
- b) What role does Ras-GTP play in intracellular signalling that makes it a protooncogene?
- c) Write function of tumor suppresser gene. 2
- d) The human MN blood type antigens are determined by two codominant 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 genotype and allele frequencies at MN locus for the population.

5. Answer any two questions of the following: $2 \times 4 = 8$
- a) The rb gene encodes E2F inhibiting protein E2F, a transcription factor that activates genes involved in cell division. Mention in rb are associated with certain forms of cancer, such as

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retinoblastoma. Under each of the following conditions, would you expect cancer to occur.

- i) One copy of *rb* is defective, both copies of E2F normal.
 - ii) Both copies of *rb* is defective, both copies of E2F normal.
 - iii) Both copy of *rb* is defective, one copies of E2F normal.
 - iv) Both copies of *rb* and E2F are defective.
- b) In a pea garden total 36 plants are dwarf out of 100. Find out the all possible frequency.
- c) In a phase, a set of beletions is intercrossed in pairwise combinations. The following results are obtained (+ indicates wild type recombinant produced)

	1	2	3	4	5
1	-	+	-	+	-
2	+	-	+	+	-
3	-	+	-	-	-
4	+	+	-	-	+
5	-	-	-	+	-

Construct a deletion map from this table

- d) 4n E.Coli four Hfr strain donate the following genetic markers shown in the order donated:

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

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

6. Answer any one question of the following: 1x8 = 8

- a) In a Hardy Weinberg population following frequency of blood group in observed

$$O=0.36 \quad A=0.13 \quad B=0.28 \quad AB=0.33$$

Find out the allele frequency.

- b) Propose a genetic map that is consistant with Complementation data provided below, where $m_1 - m_7$ are different point mutations and Dfa-Dfe are deletions. A'+ indicates that complementation does not occur.

	m_1	M_2	M_3	M_4	M_5	M_6	M_7
Dfa	0	0	0	+	0	0	0
Dfb	0	+	+	0	+	0	0
Dfe	0	+	+	+	0	0	+
Dfd	0	0	+	0	0	0	0
Dfe	0	+	+	0	+	+	0