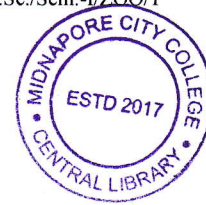


**PG CBCS**  
**M.Sc. Semester-I Examination, 2022**  
**Department of Zoology**  
**PAPER: ZOO 104**  
**(Cell biology and Cytogenetics)**

**Full Marks: 40****Time: 2 Hours****Write the answer for each unit in separate sheet****ZOO 104.1****CELL BIOLOGY****GROUP-A**

**1. Answer any TWO from the following questions: 2×2=4**

- a) What is meant by Lipid Raft?
- b) What do you mean by GPI anchored protein?
- c) State the role of Cdc 25 in cell cycle regulation.
- d) How does cAMP regulate the action of Protein kinase A (PKA)?

**GROUP-B**

**2. Answer any TWO from the following questions: 2×4=8**

- a) Why fluidity is important in membrane structure? Write a short note on fluid mosaic model of Plasma membrane. 1+3=4
- b) What are the main functions of Tight Junctions? Mention the roles of Rod Photoreceptors. 2+2
- c) What is the structure of microtubule? Mention its role in cell division. 2+2
- d) Explain how CDK activity is controlled or modulated by the following proteins: 4
  - i. Cyclin
  - ii. CAK
  - iii. Wee 1
  - iv. APC

**GROUP-C**

**3. Answer any ONE from the following questions: 1×8=8**

- a) What do you mean by G protein coupled receptors? How does GPCR activate G protein? 2+6
- b) What is active transport? Describe how the sodium-potassium pump functions. What is the electrochemical gradient? 1+5+2

**P.T.O.**



ZOO 104.2  
CYTOGENETICS

GROUP-A



(2)

4. Answer any TWO from the following questions:

2x2=4

- a) What is the implication of Cis-Trans complementation test?
- b) What is the gene frequency of  $L^M$  of a population consists of  $L^M L^M$ ,  $L^M L^N$ ,  $L^N L^M$ ,  $L^N L^N$ ?
- c) Write names of two tumor suppressor genes?
- d) What roles does Ras- GTP play in intracellular signaling that makes it a proto-oncogene?

GROUP-B

5. Answer any TWO from the following questions:

2x4=8

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

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

- b) Mention the order *cheA*, *cheB*, *eda* and *supD* from the following data

|                  |                   |
|------------------|-------------------|
| Markers          | % Co transduction |
| <i>cheA-eda</i>  | 15                |
| <i>cheA-supD</i> | 5                 |
| <i>cheB-eda</i>  | 28                |
| <i>cheB-supD</i> | 2.7               |
| <i>eda-supD</i>  | 0                 |

- c) In a Hardy-Weinberg equilibrium population, out of 100 people 17 have A type blood group, 17 have B type, 2 have AB type and 64 have O type. Calculate the allelic frequencies.
- d) All *puz/pur* alleles result in defective enzyme P and map at one genetic locus. A complementation test among six mutant *pur* strains produce the following results where + indicates complementation and - indicate no complementation

P.T.O.



(3)

6. Answer any ONE from the following questions:

1x8=8

- a) You cross a number of deletion mutations in all possible combinations in *E. coli* B and plate them on *E. coli* K 12 ( $\Delta$ ) to determine whether  $r^+$  recombinants are produced.  $r^+$  recombinants indicate that the mutations can recombine and so, if they are deletions they must be non-overlapping. The results are given in the accompanying table in which - indicate an  $r^+$  mutation and + indicate the formation of  $r^+$  recombinant progeny in the cross. Assemble a deletion map for these mutations using a line to indicate the DNA segment that is deleted in each segment.

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| a | b | c | d | e | f |
| - | - | - | - | - | - |
| b | - | - | + | + | - |
| c | - | - | + | - | + |
| d | - | + | - | - | + |
| e | - | - | - | - | + |
| f | - | - | - | - | - |

P.T.O.

(4)

- b) Using bacteriophage p 22 you performed a three factor cross in *Salmonella typhimurium*. The cross was between an  $\text{Arg}^- \text{Leu}^- \text{His}^-$  recipient bacterium and bacteriophage p 22 which was grown on an  $\text{Arg}^+ \text{Leu}^+ \text{His}^+$  strain. You selected for 1000  $\text{Arg}^+$  transductants and tested them on several selective media. By replica plating you obtained the following results:

 $\text{Arg}^+ \text{Leu}^- \text{His}^- = 585$  $\text{Arg}^+ \text{Leu}^- \text{His}^+ = 300$  $\text{Arg}^+ \text{Leu}^+ \text{His}^+ = 114$  $\text{Arg}^+ \text{Leu}^+ \text{His}^- = 1$ 

- i) What is the order of the three markers?  
ii) What are the co-transduction frequencies?



4 + 4

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