2018

M.Sc. 1st Seme. 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.

Group–A

(Cell Biology)

[Marks : 20]

1. Answer any *two* questions : 2×2

   (a) Hyperphosphorylation of MAP (microtubule associated protein) leads to neurodegenerative disease — Elaborate with example.

   (b) What do you mean by GPI anchored protein ?

   (c) State the role of Cdc 25 in cell cycle regulation.

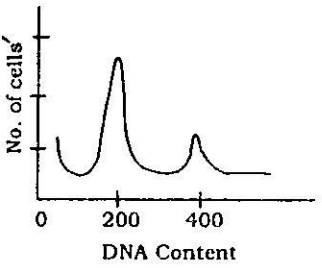
   (d) What is cadherin ?

2. Answer any *two* questions : 2×4

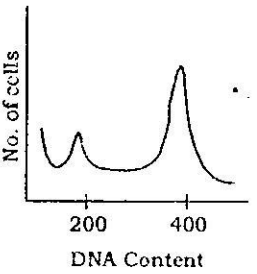
(a) What is pseudosubstrate domain of PKA ? Explain how binding of c AMP leads to activation of Protein kinase A. 1+3

(b) The following flow cytometry patterns were found during cell cycle assay by Propidium Iodide of caltured cancer cells.

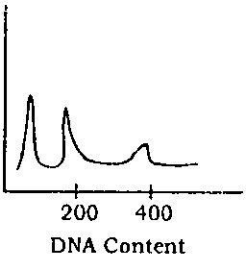
(i)



(ii)



(iii)



From the above patterns state which of the following statements are true or false.

(A) Pattern (i) – indicates G_1 Arrest : True / False

(B) Pattern (ii) – indicates Apoptosis : True / False

(C) Pattern (iii) – indicates G_2 Arrest : True / False

(D) Pattern (ii) – cells are synchronized : True / False

1×4

(c) Pancreatic cell binds with Acetylcholine through its respective receptor. Explain the cellular response under such condition.

(d) What are signal peptides ? Briefly state the experiment that discovered signal peptide. 1+3

3. Answer any *one* question : 1×8

(a) (i) Researchers introduced a mutant ras^D gene into fly embryo carrying a mutation in the *sevenless gene*. The ras^D gene leads to a constitutively active Ras. Explain the molecular mechanism and cellular consequences under such condition with proper diagram.

(ii) State the role of phosphoprotein phosphatase in cellular signalling. 6+2

(b) (i) Describe the topological structures of 2TM / 1P and 6TM / 1P of K^+ channel. How does signature sequence of selectivity filter contributes to the movement of K^+ ions through the channel.

(ii) What is polo Kinase ? State its role in cdk regulation. (2+3)+(1+2)

Group–B

(Cytogenetics)

[Marks : 20]

4. Answer any *two* questions : 2×2

(a) In cats all-white colour is dominant over not all-white. In a population of 100 cats. 19 are all-white cats. Assuming that population is in HWE, what is the frequency of all white allele in this population ?

(b) Which process of DNA transfer in bacteria require a virus ?

(i) Conjugation

(ii) Transduction

(iii) Transformation

(iv) All of the above.

(c) Conjugation between an F^+ and F^- cell usually results in

(i) two F^+ cells

(ii) two F^- cells

(iii) an F^+ and an F^- cell

(iv) an Hfr cell and an F^+ cell.

(d) In some cancer cells a specific gene has become duplicated many times. Is this gene likely to be an oncogene or a tumor suppressor gene ? Explain.

5. Answer any *two* questions : 2×4

(a) DNA from a strain of bacteria with genotype $a^+b^+c^+d^+e^+$ was isolated and used to transform a strain of bacteria that was $a^-\ b^-\ c^-\ d^-\ e^-$. The transformed cells were tested for the presence of tested genes. The following genes were contransformed :

a^+ and d^+, c^+ and d^+, b^+ and e^+, c^+ and e^+

Draw the map.

(b) A donor strain of bacteria with genotype $leu^+\ gal^-\ pro^+$ is infected with phages. The phage lysate from the bacterial cells is collected and used to infect a second strain of bacteria that are $leu^-\ gal^+\ pro^-$. The second strain is selected for leu^+, and the following contransduction data are obtained :

Donor	*Racipient*	*Selected gene*	*Cells with cotransduced gene (%)*
$leu^+\ gal^-\ pro^+$	$leu^-\ gal^+\ pro^-$	leu^+	47 pro^+
		leu^+	26 gal^-

Which genes are elosest, leu and gal or leu and pro ?

(c) Y3 phage infects *E. coli*. Eight mutant phages are isolated that fail to produce plaques when grown on *E. coli* strain K. To determine whether these mutations occur at same gene, one geneticist infects *E. coli* K cells with paired combinations of the mutants and looks to see

whether plaques are formed. He obtains the following results (A plus sign means plaques formed and a minus sign means no plaques formed)

Mutant	1	2	3	4	5	6	7	8
1								
2	+							
3	+	+						
4	+	–	+					
5	–	+	+	+				
6	–	+	+	+	–			
7	+	–	+	–	+	+		
8	–	+	+	+	–	–	+	

(i) To how many functional genes (cistron) do these mutations belong ?

(ii) Which mutations belong to the same functional gene ?

(d) Write a brief notes on the Ras signal-transduction pathway influencing cell-cyle.

6. Answer any *one* question : 1×8

(a) Jeffrey Milton and his colleagues found three genotypes (R^2R^2, R^2R^3 and R^3R^3) at a locus encoding the enzyme peroxidase in ponderosa pine trees growing at Glacier Lake, Colorado. The observed number of these genotypes were :