## **RAMAKRISHNA MISSION VIDYAMANDIRA**

(Residential Autonomous College under University of Calcutta)

B.A./B.Sc. THIRD SEMESTER EXAMINATION, DECEMBER 2014

SECOND YEAR

Date : 17/12/2014 Time : 11 am - 3 pm MICROBIOLOGY (Honours) Paper : III

Full Marks : 75

## [Use a separate Answer Book for each group]

## <u>Group – A</u>

- 1. Answer the following questions :
  - a) Nature didn't provide any proofreading function in RNA polymerase though there remains possibility of misincorporation of wrong bases in nascent RNA during replication. Why? [2.5]
  - b) Why DNA polymerase cannot initiate replication of DNA without the help of RNA primers? How are RNA primers synthesized? [2.5]

## Answer **any three** questions from **<u>Q.No. 2 - 7</u>** :

2.	a)	How can you prove that the synthesis of daughter DNA on lagging strand template is discontinuous?	[2]
	b)	How does intrinsic terminator sequence in DNA facilitates the termination of transcription?	[3]
	c)	How was the genetic code cracked by triplet binding assay?	[3]
3.	a)	Name the different essential domains of non-ribosomal peptide synthetases and state their functions.	[2]
	b)	How does puromycin inhibit translation in <i>E. coli</i> ?	[3]
	c)	A different kind of sigma( $\sigma$ ) factor comes into play when the temperature is raised abruptly.	
		Why?	[2]
	d)	What is meant by derepression?	[1]
4.	a)	Mention the features of ori C of E. coli necessary for initiation of replication.	[2]
	b)	Briefly write the different kinds of proofreading mechanism to increase the fidelity of translation.	[4]
	c)	What is gratuitous inducer? Write the significance of its use to analyse the components of <i>lac</i>	. 11
		operon. [1	+1]
5.	a)	Briefly describe the rolling circle model of replication.	[2]
	b)	What will be the phenotypes of the following partial diploids.	[2]
		$I^+O^+Z^+ / F'I^-O^CZ^-$	
		$I^+O^CZ^+ / F'I^-O^+Z^-$	
	c)	Elucidate the role of sigma factor in transcription initiation.	[2]
	d)	With the help of a sketch elaborate the function of the anticodon loop of tRNA in translation.	[2]
6.	a)	How does rifampicin inhibit trancription?	[2]
	b)	What would happen if a DNA polymerase replicating the DNA strands encounter a RNA polymerase involved in transcription of the same DNA strands in prokaryoptes?	[2]
	c)	Why is it necessary to couple a pyrophosphate gene with the genes for subunits of DNA polymerase to facilitate replication?	[2]
	d)	What are the different types of post translational modification? Name them. What are ribozymes?[1	+1]
7.	a)	Why is the genetic code degenerate?	[2]
	b)	How does structural peculiarity of <i>trp</i> leader facilitate attenuation?	[2]
	c)	What is the biological significance of formylation during initiation of translation?	[2]
	d)	DNA polymerase has got two kinds of exonuclease activity. Why?	[2]

Answer **any two** questions from **<u><b>O.No. 8 - 11**</u> :

8.	a)	Distinguish between passive diffusion and facilitated diffusion.	[2]
	b)	List two major differences between cilia and flagella of eukaryotes and prokaryotes.	[2]
	c)	Write a note on phytochromes.	[2]
	d)	Liver cells contain many more mitochondria than adipose cells. Why?	[2]
9.	a)	State the endosymbiotic theory.	[3]
	b)	Two different species of bacteria have been isolated from very desparate environments : one, a hot spring with an average water temperature of ~40°C, the other a glacial lake with an average water temperature of ~4°C.	
		i) Which of the two bacterial species would be expected to have more unsaturated fatty acid in its membrane lipids?	[1]
		ii) Which would have longer – chain fatty acids?	[1]
		iii) At 27°C, which species would have a more fluid membrane?	[1]
		iv) Biological membranes acts as capacitor —elaborate the statement.	[2]
10.	a) b)	State two important criteria for permeability of materials across biomembranes. Describe the effect of each of the treatments below on the various types of membrane proteins. Would the treatment release peripheral protein from the membrane or integral protein or a peripheral protein covalently attached to a lipid anchor? [2 i) changes in pH	[2] 2+4]
		<ul> <li>i) changes in pri</li> <li>ii) changes in ionic strength</li> <li>iii) detergent</li> <li>iv) phospholipase C</li> <li>Justify your arguments briefly.</li> </ul>	
11.	a)	List three most important features of active transport across cell membranes.	1.5]
	b)	State two important criteria for permeability of materials across biomembranes.	[2]
	c)	What would be the effect of sodium dodecyl sulphate and phospholipase C on the integrity of the cell membrane?	[2]
	d)	The mitochondria of cell have been the store house of enzymes of the cell since evolution. Why?	1.5]
	e)	What would happen to a cell without centrosome?	[1]
		<u>Group – B</u>	
An	swer	any three questions from Q.No. 12 - 17:	
12.	a) b)	Briefly explain the transitional state model with respect to the [ES] complex. Describe the brief composition of an enzyme based on functional subunits.	[4] [2]
13.	a)	Elaborate the difference between enzyme activity and enzyme specific activity.	[4]
	b)	What is turnover number?	[2]
14	Fill	in the blanks :	ix11
11.	a)	Biotin coenzyme generally catalyze type of reactions.	~ <b>1</b> ]
	b)	The vitamin pantothenate is the precursor to type of coenzymes.	
	c)	Thiamine pyrophosphate coenzymes generally catalyze type of reactions.	
	d)	The vitamin folic acid deficiency in humans cause disease.	
	e)	The coenzyme lipoic acid generally catalyze type of reactions.	
	f)	The vitamin cobalamin $(B_{12})$ deficiency in humans cause disease.	
15	a)	Briefly define feedback inhibition with example.	[3]
•	b)	Why is Km changed but $V_{max}$ remains same in case of competitive inhibition of an enzymatic	r. 1
	,	reaction?	[3]

16.	a)	Why is aspartate transcarbamylase called an allosteric enzyme?	[3]					
	b)	Can the active site of an enzyme function as inhibitor binding site? Explain.	[2]					
	c)	Give example of an enzyme under the class transferases.	[1]					
17.	a)	What is irreversible inhibition? Give example. [1.5+	1.5]					
	b)	What are the significance of Km and Lineweaver-Burke plot? $[1.5+$	1.5]					
Answer <b>any two</b> questions from <b>O.No. 18 - 21</b> :								
18.	a)	Air above the fertile cultivated soil will contain more microorganisms than air above the poor soil						
		—Explain.	[2]					
	b)	Compare the structure and function of droplet proper with droplet nuclei.	[4]					
19.	a)	Write down the characters of an ideal indicator organism.	[3]					
	b)	What do you mean by false positive test during MPN procedure?	[3]					
20.	a)	What are the two basic methods of bioaerosol sampling?	[2]					
	b)	How are air current and temperature involved in the dispersion of bioaerosols?	[4]					
21.	a)	What is BOD?	[2]					
	b)	In a standard BOD <sub>5</sub> test using 300ml BOD bottle, initial DO is 8mg/ml and final DO after 5 days of incubation is 2mg/ml. If the sample volume is 30ml diluted upto 300ml, calculate the value of						
		BOD of the sample.	[2]					
	c)	Define sewage.	[2]					

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