RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2014

SECOND YEAR

Date : 23/05/2014 **MICROBIOLOGY (Honours)**

Time : 11 am – 2 pm Paper : IV Full Marks : 75

[Use a Separate Answer Books for each group]

Group – A

1. Answer **any one** question :

a) i) What will happen if the Cdc2(T_s) gene of *schizosaccharomyces pombe* is mutated? [2]

ii) Write down the role of Cdc 25C protein in $G_2 \rightarrow$M transition during cell cycle? [2]

iii) What are the checkpoints of the cell cycle? Mention the role of ATM in $G_1 \rightarrow$S transition. [1+3]

iv) Write the name of two motor proteins and state their roles in mitosis. [2]

b) i) Proteins are targeted to specific compartment by signal sequence— Comment with examples. [2]

ii) What are sec mutants? How do they help in understanding the secretary pathway in *Saccharomyces cerevisiae*? [1·5+2·5]

iii) Is it reasonable to expect that protein degradation can take place at any location in the cell? [2]

iv) Briefly discuss the mechanism of Type III secretion system found in bacteria. [2]

2. Answer **any two** questions :

a) i) Galactose is an important component of glycoprotein. Explain why withholding galactose from the diet of galactosemic patient has no effect on synthesis of glycoprotein? [2]

ii) What is futile cycle? [2]

iii) How does Pasteur effect differ from Crabtree effect? [2]

iv) Glycolysis is used for rapid ATP production —Comment on the staement. [3]

v) What is P/O ratio? [1]

b) i) Write short notes on (**any one**) :
Isocitrate Dehydrogenase, Stickland reaction [2]

ii) Acetyl CoA is Gluconeogenic in case of plants but not in case of mammals —Justify. [3]

iii) What is the biological basis of arsenite poisoning? [3]

iv) How does bacterial photosynthesis differ from eukaryotic photosynthesis? [2]

c) i) What is PMF? How is it related to pH? [3]

ii) How can inhibitors be used to determine the arrangement of complexes of the electron transport chain? [4]

iii) NADH is not permeable through mitochondrial membrane. Write briefly the mechanism by which cytosolic NADH is oxidized? [3]

d) i) G-6-P dehydrogenase deficiency offers selective advantage in case of malarial infection — Comment on this result. [2]

ii) In glycolysis, the interconversion of dihydroxyacetone phosphate and glyceraldehyde-3-phosphate is catalyzed by triose phosphate isomerase and the equillibrium favours the formation of dihydroxyacetone phosphate. How does glycolysis proceed? [2]

iii) Explain the effect of uncoupler of oxidative phosphorylation with example. How it help in generating body heat? [3]

iv) What is PSI and PSII. [3]

3. Answer **any one** question :

a) i) 'No net synthesis of amino acid takes place via transamination' —Justify with example. [3]

ii) Vitamin B_6 is an important requirement for amino acid metabolism —Justify [2]

b) i) State the subcellular sites of urea cycle. Show its links with TCA cycle. [1·5+1·5]

ii) Patients with Alkaptonuria excrete homogentisic acid in urine —Explain. [2]

4. Answer **any one** question :

a) While studying the intracellular dynamics of nucleic acid metabolic pathway, the following observations are made in different cells due to selective malfunction of catalytic steps. Please identify which steps has malfunctioned.

i) Accumulation of SAICAR intermediate in De Novo Purine biosynthesis. [1]

ii) Accumulation of IMP in De Novo Purine biosynthesis. [2]

iii) Gradual increase of NDP : dNDP ratio. [2]

iv) Accumulation of Guanosine in liver tissue in Purine degradation pathway. [1]

v) Accumulation of Uric acid in Uric acid degradation pathway. [2]

vi) Accumulation of β-aminoisobutyrate in Thymidylate degradation pathway. [2]

b) i) While studying fatty acid biosynthesis in vivo, it is found that there is an abnormal accumulation of NADPH in the cell. Please state which steps in the pathway has malfunctioned. [3]

ii) A cow regularly fed with an excess of 15 carbon synthetic fatty acid urinates regularly on a heap of cereal grain. After a month it was seen that the particular heap of cereal has not been infected with mold though all the heaps around it has. Can you speculate what is wrong with the metabolic pathway of the cow? [3]

iii) Mention the distinction between β -oxidation of saturated and unsaturated fatty acids. [4]

Group – B

5. Answer **any one** question :

a) i) How the osmotolerance of microbes can be utilized in food industry? [2½]

ii) What is cold sterilization? [1½]

iii) What is the active enzyme in rennet? Write down its function. [1+2]

iv) What are the different types of spoilage of meat during aerobic condition? [3]

b) i) The interaction between the starter cultures for yogurt production is symbiotic —Explain. [3]

ii) How shigellosis is caused? [2½]

iii) Write down the names of the four species of *Shigella*. [2]

iv) What are thermoduric bacteria? Give examples. [2½]

6. Answer **any two** questions :

a) i) Mention the physical conditions of soil congenial for microbial growth. [2]

ii) What is meant by rhizospheric effect? State the reasons behind the increased microbial activity in rhizosphere. [1+2]

iii) Write short notes on : [2½+2½]
Ammensalism, Methane production

b) i) State the methods that establish the nitrogen fixing power of a microorganism. [3]

ii) What is cross inoculation group? [1]

iii) Briefly discuss the role of leghaemoglobin in legume rhizobium symbiosis. [3]

iv) Compare nitrogen and carbon cycle. [3]

c) i) What is SOM? [2]

ii) What are meant by zymogenous and autochthonous bacteria? [2]

iii) What is biofertilizer? [2]

iv) Name the stages in the life cycle of rust fungus and mention the names of the host where these stages are completed. State the causes of annual recurrence of this disease. [4]

d) i) Elaborate the steps that are involved in the root infection and nodule formation in legumes by *Rhizobium sp*. [5]

ii) Write down the role of nitrogenase enzyme in the process of nitrogen fixation. [3]

iii) What are the roles of aerobic and anaerobic environment in the degradation of complex organic matter? [2]