

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2017

SECOND YEAR [BATCH 2015-18]

MICROBIOLOGY (Honours)

Date : 18 /05/2017

Time : 11 am – 3 pm

Paper : IV

Full Marks : 100

[Use a separate Answer Book for each group]

Group – A

Answer **any three** questions

[3×10]

1. a) Mention the role of “Bip protein” in translocation of secretory proteins. 2
b) Briefly describe “type-III secretion system” found in bacteria. Explain with proper diagram. 4
c) Mention the signaling process involved during yeast cell mating. 2
d) Which genes are responsible for mating type switching in yeast? 2
2. a) Mention the characteristic features of an apoptotic cell. State the significance of apoptosis in living system with suitable examples. 4
b) Protein misfolding is the molecular basis of a wide range of human diseases – comment with example. 2
c) Glycosylation plays a key role in protein targeting – briefly elaborate the process. 2
d) Prokaryotes lack proteasome but they contain a variety of self-compartmentalized proteases – comment giving examples. 2
3. a) Outline the pathways that contribute to ‘proteostasis’. 2
b) Proteins are targeted to specific compartments by signal sequence – comment with examples. 2
c) Mention the differences between embryonic and adult stem cells. Briefly explain how stem cells are used in the therapy of genetic diseases. 4
d) What are degranulatory cells? 2
4. a) What are activated lymphocytes? What are the differences between activated and resting lymphocytes? 3
b) What are histamines? How does it help in innate immunity? 1+3
c) Justify the statements whether true or false: 1X3
 - i) In order for B cells to mature into plasma cells they need “help” from T cells.
 - ii) Removal of Bursa of Fabricius from a chicken results in low level of serum antibody.
 - iii) Antibodies generally do not react with self molecules because genes that code for self antibodies are inherited.
5. a) How does skin help in body immunity? 2
b) What are PAMPs? How do they contribute to immunity? 2+2
c) How does interferon contribute to immunity? 2
d) Mention the contribution of lysozyme in innate immunity. 2
6. a) Cyclin-dependent kinases are often described as the “engines” of the cell cycle. Why are these enzymes so described? 2
b) “cdc” mutants of *Saccharomyces* are lethal. How were they discovered then? 2
c) State the roles of APC^{Cdc20} and APC^{Cdh1} in anaphase separation of daughter chromatids during mitosis. 3
d) The protein p⁵³ is very short-lived. Under which condition its longevity is increased and for why? – Show this schematically. 3

Group – B

Answer **any three** questions

[3×10]

7. a) How is bacterial photosynthesis different from eukaryotic photosynthesis? 1½
 b) What is malate-Asp shuttle? 2½
 c) Describe the mechanism of action of $F_1 F_0$ ATPase? 3
 d) Write the regulation of TCA cycle in a cell. 3
8. a) 'No net synthesis of amino acid takes place via transamination' – justify with examples. 2
 b) What is the role of PLP in amino acid metabolism? 2
 c) Urea cycle is energetically expensive — explain. 2
 d) What is enzymatic decarboxylation of amino acid? 2
 e) Define glucogenic and ketogenic amino acid with example. 2
9. Fill in the boxes with question marks in details: 10

Reaction catalyzed	Enzyme	Cofactor needed
Ribose-5-Phosphate to 5-Phosphoribosyl 1-Pyrophosphate	?	?
?	FGAM synthetase	?
?	Ribonucleotide reductase	?
Glutamine to Carbamoyl Phosphate	?	?
?	Serine hydroxymethyl transferase	?

10. a) Naturally occurring fatty acids are cis configured but enzymes are trans specific. How does cell manage to solve this problem? 3
 b) How does Carnitine help in fatty acid metabolism? 3
 c) "Accumulation of unsaturated fatty acid is dangerous for health" – mention true or false and justify. 2
 d) What is fatty acid charging? Explain with reaction. 1+1
11. a) Mg^{2+} is required for the enzyme hexokinase in presence of ATP. Explain how Mg^{2+} acts on this reaction? 2
 b) How does galactose enter into the glycolysis? 3
 c) How does Pasteur effect differ from Crab tree effect? 2
 d) A person is lacking of galactose-1-phosphate uridylyl transferase. What kind of problem might he face? Explain. 3
12. a) What is the biological basis of arsenite poisoning? 2
 b) How will you convert alanine to acetate? 2
 c) What is reductive pentose phosphate pathway? 1
 d) What are the differences between homofermentative and heterofermentative process? Give examples? 3
 e) Redox loop mechanism contradict exit level of proton from matrix to intermembrane space – justify. 2

Group – C

Answer **any four** questions

[4×10]

13. a) Why does milk favour growth of microorganisms? 2
b) What do you mean by lactose-intolerance? Which bacterium can alleviate this problem and how? 2+1+2
c) What happens during ripening of meat and how is it performed? 1+2
14. a) Quick freezing is preferable than slow freezing — Justify. 3
b) Name any two chemical food preservatives and their mode of action. 1+3
c) Write down the pathogenesis and symptoms of salmonellosis. 2+1
15. a) Briefly discuss how physical and chemical composition of soil influences the magnitude and diversity of microbial flora. 2+2
b) In which step of terrestrial nitrogen cycle autotrophs are involved? Give two examples of microbes that are involved. 2+1
c) Describe the terrestrial sulphur cycle with diagram. 3
16. a) Write down the source and the function of the following substances in the process of nodulation – luteolin and genistein, Nod factors, leghaemoglobin, nodulin. 4
b) What is meant by hypersensitive response in relation to defence strategy in plants? 2
c) Write the important features of zymogenous bacteria of soil. 2
d) What is meant by high temperature composting? 2
17. a) Distinguish between mutualism and cooperation in relation to microbial ecology. 2+2
b) What are phytoanticipins and phytoalexins? State their roles in pathogenesis. 4
c) How do dinitrogenase and dinitrogenase reductase play a crucial role in nitrogen fixation? 2
18. a) What is meant by cross inoculation group in relation to symbiotic nitrogen fixation? 2
b) What is meant by non-host resistance in plant pathology? 2
c) (i) What is ‘ammonia switch off’ effect? 2
(ii) What is humus? 1
d) What do you mean by environmental genomics? State its importance in microbiology. 3
19. a) Write down the stages in the life cycle of *puccinia graminis* f. sp. *tritici* leading to the expression of the symptoms of the disease in the wheat and berberry plants. 4
b) Schematically show the mechanism of reactions which lead to synthesis of ammonia. 3
c) Write the contributions of S. Winogradski in soil microbiology. 2
d) What is rhizosphere effect? 1
20. a) What is an elicitor molecule in relation to disease resistance in host-plant? 2
b) What is meant by enrichment culture of microorganism? 2
c) Mention the structural and compositional peculiarities of methanogenic archaeobacteria. 2
d) What is the role of non-starter lactic acid bacteria during ripening of cheese? 2
e) What information does the phosphatase test give regarding the quality of milk? 2

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