

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2018

SECOND YEAR (BATCH 2016-19)

MICROBIOLOGY (Honours)

Date : 19/05/2018

Time : 11.00 am – 3.00 pm

Paper : IV

Full Marks : 100

[Use a separate Answer Book for each group]

Group – A

(Unit – I)

(Answer any two questions)

[2×10]

1. a) Mention important differences between a budding yeast and a fission yeast. [3]
b) Discuss the role of 'BiP' protein in post-translational transport of various proteins. Explain with proper diagram. [2]
c) Briefly describe the type-III secretion system as found in bacteria. [4]
d) What are 'signal sequences'? [1]
2. a) Why β -sheets are more commonly found in the hydrophobic interiors of proteins than on their surfaces? [2]
b) What is folding accessory proteins? Give example. State their mode of action very briefly. [1+1+3]
c) Justify the following statements : [1.5×2]
i) Gro EL/ES system functions as a two-stroke engine.
ii) Folding of protein inside the Gro EL/ES cage is significantly faster than folding in solution.
3. a) Write a brief account on apoptosis. [3]
b) State a few potential uses of stem cell therapy in managing human diseases. [2]
c) What will happen to cell division in yeast if *cdc 25c* gene is mutated? [2]
d) Briefly describe the mechanism of separation of sister chromatids during the anaphase of cell division. [3]
4. a) Write two examples where the cells at G_0 can be induced to enter the cell cycle. How does the checkpoint kinase exercise their action, if the cells at G_1 are irradiated with ionizing radiation? [2+3]
b) Why cyclin-dependent kinases said to be the engine of the cell cycle? [2]
c) *cdc* mutants of yeast are lethal. How were they discovered then? [2]
d) What is the role of cohesin to maintain the structural integrity of chromosome? [1]

(Unit – II)

(Answer any one question)

[1×10]

5. a) What is the purpose of the respiratory burst that occurs within macrophages? [2]
b) What are defensins? How do they function? [1+2]
c) What are the major differences between innate and adaptive immune response? [4]
d) What is the meaning of immunity? [1]
6. a) What do you mean by Opsonization? [3]
b) How is opsonization different from ADCC? [3]
c) Give examples of the following : [2×2]
i) Naturally acquired active immunity
ii) Artificially acquired passive immunity

Group – B

(Answer any three questions)

[3×10]

7. a) What is Pasteur effect? [1·5]
b) Entner-Doudoroff pathway yields one ATP, one NADPH and one NADH per glucose metabolized — explain. [2]
c) ATP is both a substrate and an allosteric regulator of PFK 1 — explain. [2]
d) What is futile cycle? Is it necessary for cell? [2+1]
e) What is galactosemia? [1·5]
8. a) Glucose 6-phosphate is partitioned between glycolysis and PPP —justify. [2]
b) Differentiate between homo and hetero lactic acid fermentation. [2]
c) What is Rapaport-Leubering cycle? [2]
d) How does liver hexokinase IV differ from other hexokinases? [2]
e) What are the possible catabolic fates of pyruvate in a living cell? [2]
9. a) ‘Conformational change drive ATP synthase’ —explain. [2]
b) What happens when 2,4 DNP is added to electron transport chain? [2]
c) Write down the roles of UQ and cytochromes in electron transport chain. [1·5+1·5]
d) Give a comparative account of oxidative phosphorylation and photophosphorylation. [2]
e) Name the major redox components of E.T.C. [1]
10. a) The Glucose-Alanine cycle transports Nitrogen to the liver —explain. [3]
b) Urea cycle is compartmentalized —justify the statement. [2]
c) Why are people on a high-protein diet instructed to drink lots of water? [2]
d) Why are phenylketonurics warned against eating products containing the artificial sweetener aspartame (chemical name L-aspartyl-L-phenylalanine methyl ester). [3]
11. a) What are the major differences between peroxisomal and mitochondrial β –oxidation? [2]
b) Pernicious Anemia results from Vit B₁₂ deficiency. —explain. [3]
c) What is ketoacidosis? [3]
d) What is ω –oxidation? [2]
12. a) Describe the salvage pathway of purine nucleotide synthesis? [3]
b) State the origin of N₁, N₃, N₉ & N₇ of purine ring atom. [2]
c) Why gout is more common in populations that eat relatively large amount of meat? [3]
d) What is Lesch-Nyhan syndrome? [2]

Group – C

(Unit – I)

(Answer any two questions)

[2×10]

13. a) What are the different casein proteins in milk? How do casein proteins help in separation of casein micelles? [1+2]
b) How is meat ripened? How does the process change meat’s texture? [1+2]
c) What are the sources of microorganisms in egg? [2]
d) How do probiotic bacteria reduce chances of colon cancer? [2]
14. a) Under what conditions can UV light and γ –radiation be used to control microbial populations in food and food preparations? [2]
b) How does a food-borne intoxication differ from a food-borne infection? [3]

- c) What major steps are used to produce cheese? Which fungal genus is often used in cheese making? [2+1]
- d) What is Aflatoxins? [2]
15. a) Why can nutrients become limiting for plants and microorganisms in tundra soil? [2]
- b) What unique stresses face a microorganism on a leaf but not in the soil? [2]
- c) How do the concentration of O₂ and CO₂ differ between the atmosphere and soil interior? [2]
- d) What types of archaeans have been detected in soils? [1]
- e) Schematically represent the root-nodule formation by Rhizobium. [3]
16. a) Write down the similarities between nitrogen and sulfur cycle. [4]
- b) What are the ultimate products of metabolism of carbon compounds by anaerobic microorganisms? [2]
- c) Write the differences between the zymogenous and autochthonous bacteria with suitable examples. [2]
- d) What is the role of *Riftia* haemoglobin to the success of the tube worm endosymbiont mutualistic relationship? [2]

(Unit – II)

(Answer any two questions)

[2×10]

17. a) Why have plant viruses not been as well studied as animal and bacterial viruses? [2]
- b) How are plant pathologists attempting to control chestnut blight? [2]
- c) Name the microorganisms causing— [1+1]
- i) Hairy root
- ii) Irish potato famine
- d) What are tripartite and tetrapartite associations? [2+2]
18. a) Name a heteroecious rust fungus pathogenic to wheat plant. At which stages of its life cycle the host plants are infected? What measures should be taken to reduce the annual recurrence of wheat rust disease? [(1+2)+2]
- b) What are elicitor molecules? Which functions are played by these molecules in host-pathogen interaction? [1.5+1.5]
- c) What is hypersensitive reaction in relation to defensive mechanism in host plants? [2]
19. a) How do viruses exercise their virulence in host plants? [3]
- b) Resistance (R) in host plant is polygenic character and dominant to susceptibility (r) character. The virulence (a) in fungal pathogen is recessive to avirulence (A) trait but also a polygenic trait. What would be the interaction if a pathogen propagule with the genotypes a₁A₂ is deposited on the host plants with the genotypes R₁R₂ and r₁R₂? [3]
- c) State the biological significance of toxins released by the pathogens to cause a successful infection. [2]
- d) What is Bordeaux mixture? [2]
20. a) Name two induced defence structure in plants. How do they defend pathogen? [1+2]
- b) Do the genes for resistance in host plants and avirulence genes in pathogens exist? If so, how were they identified? Cite one example for each. [2+2]
- c) Differentiate between phytoanticipins and phytoalexins with proper examples. [1.5+1.5]

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