RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2016

SECOND YEAR [BATCH 2014-17]

Date : 20/05/2016 **MICROBIOLOGY (Honours)**

Time : 11 am – 3 pm **Paper :** IV Full Marks : 100

[Use a separate Answer Book for each group]

Group – A

Answer **any three** questions of the following : (3 × 10)

1. a) Human cells at different stages of the cell cycle were fund to yield a single cell. What would be the change in morphology of chromatin if (2)
   i) a cell at G_1 phase is fused with a cell at S phase
   ii) a cell at G_1 phase is fused with a cell at M phase
   iii) a cell at S phase is fused with a cell at M phase. What conclusion can be drawn from these results.
   b) Protein misfolding is believed to be the root cause of many diseases – comment. (2)
   c) You have been given an eukaryotic cell culture (say yeast cells). How will you ensure that all the cells in the culture are in the same state of division that is are at the same point of cell cycle? (2)
   d) What is the purpose of ubiquitination of proteins? (2)
   e) Write a brief account on apoptosis. (2)
2. a) Why there is no gene expression during the M phase of the cell cycle? (2)
   b) What will happen to a cell cycle if the gene for the protein Cdc25c is mutated? (2)
   c) Discuss the role of 'HO endonuclease' in mating type switching of a yeast cell. (3)
   d) Regulation of MPF activity is crucial for driving the fission yeast cells into mitosis from G_2 phase. Explain how is this regulation carried out. (3)
3. a) Write down the locations and functions of the protein – cohesin and kinesin. (2)
   b) Explain the hall marks of Type I secretory pathway. (2)
   c) Explain with examples :- (2 + 2)
   i) Active Acquired Natural Immunity
   ii) Passive Acquired Artificial Immunity
   d) *'cdc'* mutants are lethal. How were they discovered then? (2)
4. a) State the strategic difference in regulation of cell cycle in budding yeast and fission yeast. (3)
   b) What are secretory proteins? Mention their significance in a bacterial cell. (1 + 1)
   c) Name two methods by which protein denaturation can be assessed. Name two protein denaturing agents. (2)

d) The native structure of a protein represents the 'global minima' which is attained over coming several 'local minima'. Explain the statement with proper energy contour diagram of protein folding. (3)

5. a) State the roles of Cdc 20 and Cdh1 in anaphase promoting complex. (2)
   b) Which secretory system in bacteria resembles closely the basal body of bacterial flagella? Draw a representative diagram. (2)
   c) What do you mean by "Respiratory Burst"? (4)
   d) What are defensins? (2)
6. Write short notes on : (2·5 × 4)
   a) Lymphoid and Myeloid lineage of HSC
   b) Pattern Recognition Receptor
   c) ADCC
   d) Functional difference between haptens and adjuvants.

Group – B

Answer **any three** questions of the following : (3 × 10)

7. a) Calculate the number of ATP molecules produced upon complete oxidation of one molecule of palmitoyl – CoA within mitochondria. (3)
   b) Fat metabolism is very important to meet up the needs for energy as well as water in hybernating animals – explain. (3)
   c) What are ketone bodies? Write down their structures. What is their importance in keeping brain active during starvation? (1 + 1 + 2)
8. a) Mention the steps in purine biosynthesis that are controled by feedback inhibition. (4)
   b) Outline the metabolic pathway for the *de novo* synthesis of UMP. Provide only reaction schemes and names of enzymes. Description is not needed. (4)
   c) How does 8-hydroxyquinoline inhibits the enzyme ribonucleotide reductase (RNR) in *E. coli*? (2)
9. a) 'Transamination does not result in any net deamination' – Explain. (2)
   b) Give examples of one (i) only ketogenic amino acid and (ii) only glucogenic amino acid. (2)
   c) How does the urea cycle and TCA cycle become linked? (2)
   d) 'The diseases phenylketonuria, which cause severe mental retardation, is characterized by the urinary excretion of phenyl pyruvate' – why is this formed? (2)
   e) How is urea cycle regulated? (2)
10. a) Mg^{+2} is required for the enzyme hexokinase in presence of ATP. Explain how Mg^{+2} acts on this reaction? (2)
    b) How is gluconeogenesis different from glycolysis? (3)
    c) Explain the effect of uncoupler of oxidative phosphorylation with example. (2)
    d) What is the function of Thermogenin? (2)
    e) What is glucose alanine cycle? (1)

11. a) Write down the rate determining steps of glycolysis. (2)

b) What is the biological basis of arsenate poisoning? (2)

c) How will you covert alanine to acetate? (3)

d) How does anaplerotic reaction differ from cataplerotic reaction? (3)

12. a) Redox loop mechanism contradict exit level of proton from matrix to intermembrane space – justify. (2)

b) What are C4 plants? (2)

c) What are the differences between alpha – Ketoglutarate DH and PyDH? (2)

d) What do you mean by Entner Duodoroff pathway? (2)

e) What is glyoxalate cycle? (2)

Group – C

Answer **any four** questions of the following : (4 × 10)

13. a) What is meant by the term "metagenomics"? Briefly mention its importance. (2 + 2)

b) Explain the phenomenon of "cooperation" with suitable example in the context of microbial ecology. (3)

c) What is leg-haemoglobin? State its function. (3)

14. a) R_1 and R_2 are the genes for disease resistance in host plants. These genes are dominant to the genes for disease susceptibility r_1 and r_2 respectively. On the other hand the genes for avirulence in pathogen A_1 and A_2 are dominant to virulence genes a_1 and a_2. Two plant populations with the genotypes r_1R_2 and R_1r_2 were infected by the pathogens with the genotype A_1a_2 and a_1A_2 respectively. What would be the host-pathogenic interaction? Explain. (3)

b) What is meant by bioleaching? (2)

c) What do you mean by dissimilatory nitrate reduction? (2)

d) What is the 12D concept in canning? (3)

15. a) Write the differences between the zymogenous and autochthonous bacteria. (3)

b) State the objectives of acetylene reduction assay in soil microbiology. (2)

c) How does slow freezing affect quality of food? (2)

d) What do you mean by hurdle technology in food preservation? (3)

16. a) With the help of a flow-chart, present the mechanism of nitrogen fxation in *Azotobacter vinelandii*. (3)

b) What is meant by rhizospheric effect? (2)

c) Distinguish between pathogenicity and virulence genes. Cite one example for each. (3)

d) What is meant by : D value of *Bacillus* at 70^0C is 5.2 min? (2)

17. a) Do you think that fermented foods are spoiled food? (2)

b) What are the starter cultures of yoghurt? Is there any symbiotic relationship between them? (1 + 3)

c) Write down four characteristic features of probiotic bacteria. (2)

d) Write down the symptoms of shigellosis. (2)

18. a) What is a disease triangle? (2)

b) Name the stages of the life cycle of rust fungus. Mention the names of the host where each of the stages is completed. (3)

c) What are phytoanticipin and phytoalexein? State their role in pathogenesis. (3)

d) What is pathogenecity? (2)

19. a) State the antimicrobial property of egg white. (3)

b) What is tempe? (2)

c) Write down the pathogenicity of *Salmonella*. (3)

d) What is mutualism? (2)

20. a) What is a disease cycle? (2)

b) Mention the pathways of penetration of pathogens into the host plant. (2)

c) Write down the major symptoms and control measures of rice tungro disease. (3 + 2)

d) What is the plant quarantine act? (1)

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