

## **DSCC4 Model Questions**

Unit 1: Microbial Growth and effect of environment on microbial growth:

### **Very short answer type/one word questions (1 mark each)**

SL. No.

1. Define eurythermal microorganisms.
2. What is plasmolysis?
3. Name an osmotolerant microorganism.
4. What is FACS?
5. Define thermophilic bacteria.
6. What are capnophiles?
7. What are piezophiles?
8. Give an example of halotolerant microorganism.

### **Short answer type questions (2 marks each)**

SL. No.

1. What is steady state growth? What advantages does it offer?
2. Why bacterial growth in a medium is not synchronous?
3. What is a turbidostat?
4. How can you measure bacterial growth?
5. What are the limitations of membrane filter technique for bacterial growth measurement?
6. Define diauxic growth curve.
7. What are cardinal temperatures?
8. Why does the growth rate rise with increasing temperature and then fall again at higher temperature?
9. What is a dilution rate?

### **Broad answer type questions (greater than 2 marks)**

SL. No.

1. Compare direct and indirect methods for estimating bacterial growth.

2. How steady state growth can be obtained by using chemostat.
3. Classify microorganisms based on different oxygen sensitivity.
4. Why is it difficult for microorganisms to grow at low water activity? Give an example of a microorganism which can grow at low water activity.
5. Mention the advantages and disadvantages of direct microscopic counting technique for bacterial growth measurement.
6. How microorganisms protect themselves from toxic oxygen intermediates.
7. Describe methods for culture of anaerobes in the laboratory.
8. What are barophilic and barotolerant bacteria? Where would you find them?
9. Define Liebig's law and Shelford's law with proper justification.
10. Explain plate count for measuring bacterial population.
11. Why is it important to perform serial dilution before plating a culture? Show with a diagram the method of serial dilution.

Unit 2: Nutrient uptake and transport:

**Very short answer type/one word questions (1 mark each)**

SL. No.

1. What are siderophores?
2. What are porins?
3. Define osmosis.
4. What is a hypotonic solution?
5. What is a symport?
6. Which pump is present in the lysosomal membrane?
7. Which ion is transported by valinomycin?
8. Which symporter are present in the loop of Henle in the renal tubules of the kidney?
9. Give an example of anion transporter.
10. Which process would be directly affected by a lack of cellular ATP?

**Short answer type questions (2 marks each)**

SL. No.

1. Define secondary active transport with examples.
2. Differentiate between V class proton pump and P-class ion pumps.
3. What is the main function of a V-class proton pumps?
4. How are cotransporters differentiated from uniporters?
5. A bacterium is living in a pond where the concentration of sodium ions is 0.005mM. This ion is found in the bacterial cytoplasm at a concentration 0.10 mM. Therefore the sodium ion is probably entering by which transport method?
6. What are the two factors that are responsible for diffusion rate?
7. How does the opening and closing of ion channels occur in a cell?
8. Why is the sodium-potassium transport mechanism called a pump?

**Broad answer type questions (greater than 2 marks)**

SL. No.

1. What are F-class ion pumps? How do they differ from the other classes of ion pumps?
2. Give a brief overview of the structural organization of the ABC transport proteins.
3. Explain glucose transporter or GLUT1 with a diagram.
4. How mediated transport can be differentiated from non-mediated transport. Explain with a graph.
5. Explain Na<sup>+</sup> /K<sup>+</sup> pump with a schematic diagram.
6. What are the types of permeases?
7. Differentiate among Transporters, pumps and channels.
8. Are calcium pumps and ATP dependent proton pumps the same?
9. What is the composition of the outer membrane and its functions that has a role in the transport mechanism of a cell?

**Unit 3: Chemoheterotrophic Metabolism-Aerobic respiration**

**Short answer type questions (2 marks each)**

1. Name the enzymes and the coenzymes involved in of PDH complex

2. Name the enzyme involved in glycolysis which is regulated by phosphorylation dephosphorylation
3. Explain how PFK-1 is regulated by ATP
4. Define PMF
5. Explain the oxidative steps of PP pathway
6. Why non-oxidative steps of PP pathway occur?
7. Write down the NADH producing steps of the TCA cycle. Where does it occur?
  
8. Why is pyruvate dehydrogenase enzyme called enzyme complex?
9. What is the effect of ATP on pyruvate dehydrogenase complex?
10. State chemiosmosis hypothesis.
11. Define ionophore. Give example
12. What is substrate channeling? Explain with an example
13. How is the TCA cycle regulated in a cell?
14. What happens when a cell is treated with 1) 2,4 DNP 2) oligomycin separately
15. Write down the step of glycolysis where substrate level phosphorylation occurs
16. Describe the fate of pyruvate formed in glycolysis during aerobic & anaerobic conditions
17. What is the difference between ED Pathway and Glycolysis?
18. Define uncoupler. Give examples.
19. Write down the carbon dioxide producing reactions of TCA cycle
20. Why anti malarial drug quinolone is not prescribed for the people deficient in glucose 6 phosphate dehydrogenase?
21. Write down the ATP/GTP generating step of the TCA cycle.
22. Name the two three carbon molecules that are generated from cleavage of fructose – 1, 6 –bisphosphate.
23. Why is the pentose phosphate pathway called shunt? What are the two main functions of the pentose phosphate pathway?
24. Name the complexes present in ETC
25. What is the P/O ratio?

26. Discuss the role of 1) ubiquinone 2) oligomycin 3) rotenone 4) DNP in ETC
27. Define 1) oxidative phosphorylation 2) substrate level phosphorylation
28. What is the pacemaker enzyme in glycolysis? What are its characteristics?
29. How is the TCA cycle linked with the urea cycle?
30. What is the significance of succinate dehydrogenase and the reaction catalyzed by the enzyme?
31. What is the significance of G6P dehydrogenase enzyme?
- 32.. Mention the effect of following inhibitors in ETC 1) Rotenon 2) antimycin 3) ascorbate 4) cyanide
33. How do you prove that ETC is coupled with ATP synthesis?
34. How do the uncouplers function?

**Broad answer type questions (greater than 2 marks)**

1. Name the enzymes involved in glycolysis regulation. What mechanisms do they follow for regulation?
2. Explain how glycolysis is hormonally regulated
3. Write down the irreversible steps of glycolysis
4. How the enzyme PFK-1 is regulated by PFK-2
5. Compare hexokinase and glucokinase
6. Explain regulation of metabolic pathways by three different modes with examples.
7. Describe complex V of ETC.
8. How do you prove that chemiosmosis is required for ATP synthesis?
9. Explain how PMF is generated along the mitochondrial inner membrane.
10. Discuss the role of fructose 2,6 bisphosphate in the regulation of glycolysis
11. Write short notes on
  1. Electron transport chain
  2. ED pathway
  3. HMP shunt
  4. PDH complex
  5. Chemiosmotic hypothesis
  6. Uncoupler

## 7. Ionophores

### Unit 4: Chemoheterotrophic Metabolism- anaerobic respiration & fermentation

#### **Short answer type questions (2 marks each)**

SL. No.

1. What is the utility of fermentation in anaerobic microorganism?
2. Explain/ differentiate between homolactic and heterolactic fermentation
3. Explain mixed acid and butene-di-ol fermentation
4. Compare lactic acid fermentation vs. alcoholic fermentation.
5. Write the name of enzymes & coenzymes involved in 1) alcoholic fermentation  
2) homolactic fermentation.
6. What is the Pasteur effect?
7. Where do we find anaerobic respiration in animals? What is the end product?
8. Why do we get less energy by anaerobic respiration compared to aerobic respiration?
9. Define linear and branched chain fermentation
10. What are the effects of denitrification in the environment?
11. How is denitrification controlled?
12. Differentiate between assimilative & dissimilative metabolism
13. if both nitrate and carbonate is available in medium during anaerobic respiration which will act as electron acceptor?
14. Why does oxygen inhibit the fermentation process?

#### **Broad answer type questions (greater than 2 marks)**

1. Explain the mechanism of PDC in alcoholic fermentation in yeast
2. Explain how amino acid fermentation is done by *clostridium species*
3. Explain how nitrate is used as electron acceptor in anaerobic respiration

## Unit 5

1. What is phycobilisome? 1
2. What is chemosynthesis? 1
3. Name one species of bacteria that can oxidise pyrite. 1
4. What is methanogenesis? 1
5. Give an example of green sulphur bacterium. 1
6. What do you mean by nitrate assimilation? 1
7. What is knallgas reaction? 1
8. What is photosynthetic reaction center? 1
9. Name one hydrogen oxidising bacterium. 1
10. What is photoheterotrophy? 1
11. Define phototrophy and chemotrophy with examples. 2
12. Define lithotrophs and organotrophs with examples. 2
13. Distinguish between photolithoautotrophs and chemolithoautotrophs with examples. 2
14. Define photoorganoheterotrophs and chemoorganoheterotrophs with examples. 2
15. What is mixotrophy? Give examples. 2
16. Distinguish between purple sulphur bacteria and purple nonsulphur bacteria. 2
17. Distinguish between ammonification and nitrification with examples. 2
18. Name two species of bacteria that can oxidise hydrogen. 2
19. What is holotrophy? 2
20. What is anoxygenic photosynthesis? 2
21. Classify bacteria on the basis of energy sources. 3
22. What is microbial leaching of ores? Give the metabolic pathways. 1+3
23. What are sulphur oxidising bacteria? Give the metabolic pathways. 1+3
24. Why are hydrogen oxidising bacteria called facultative chemoautotrophs? Give the metabolic pathways. 2+3

25. What are the basic differences between photoautotrophic and photoheterotrophic bacteria based on nutritional requirements? 3
26. What is bacteriochlorophyll? Write the chemical structure of it. 1+2
27. What is oxygenic photosynthesis? Describe briefly the light reactions of cyanobacteria. 2+3
28. Describe briefly the light reactions of purple bacteria. 4
29. Describe briefly the light reactions of green bacteria. 4
30. Classify bacteria based on bacteriochlorophyll. 3

## Unit 6: Nitrogen Metabolism

Short answer type questions (2 marks each)

SL. No.

What do you mean by nitrogen fixation?

Define Bacteroids.

What is nod factor?

How does aerobic nitrogen-fixing bacteria protect Nitrogenase from oxygen?

What is leghemoglobin?

What do you mean by assimilatory nitrate reduction and dissimilatory nitrate reduction?

Answer the followings ( 3 marks each)

SL. No.

Write the role of nod genes in nitrogen fixation.

Write the role of nitrogenase in nitrogen fixation.

Write the importance of nif genes in nitrogen fixation process

Write short note on Leghemoglobin.

Describe how ammonia gets incorporated in the plant body system?