

BITS, PILANI – DUBAI
DUBAI INTERNATIONAL ACADEMIC CITY
FIRST SEMESTER 2009 – 2010
BIO C211 BIOLOGICAL CHEMISTRY
COMPREHENSIVE EXAMINATION (CLOSED BOOK)

Duration: 3 hours

Date: 29.12.2009

Max. Marks: 40

Note: a) Attempt all questions in the order

b) Draw diagrams if required

1. Draw the structure, functions and clinical conditions associated with the following cell organelles. [2.0]
a. plasma membrane and b. mitochondria
2. What are the different factors which lead to protein denaturation and its effect on primary, secondary, tertiary and quaternary structure of the protein. Mention the role of β -Mercaptoethanol and Urea. [2.0]
3. Name an amino acid in which the R group contains the following: a. hydroxyl; b. sulfur; c. amide and d. branched side chain. [1.0]
4. What are enzyme inhibitors? Explain in detail any three types of enzyme inhibition with suitable diagram. [3.0]
5. What is the turnover number of the enzyme? [1.0]
6. What is an allosteric effector? Explain with concerted and sequential model for allosteric regulation of enzymes. [3.0]
7. What are steroids? Name at least three hormones and their specific functions. [1.0]
8. Name any three essential fatty acids and their functions [1.0]
9. What is lignin? Mention its functions. [1.0]
10. Name any three water soluble and lipid soluble vitamins, functions and their deficiency symptoms. [2.0]
11. Write the sequence of the glycolysis with enzymes, cofactors and energetics (structure of the molecules not required). [2.0]
12. What are the fate of pyruvate? Mention at least three and the enzymes. [1.0]
13. What is the ATP yield from complete oxidation of Glucose. [1.0]
14. How the glucose enters the TCA cycle? Write the complete sequence with enzymes, cofactors and energetic (structure of the molecules not required). [2.0]
15. What are chylomicrons? Draw the structure, composition and functions. [1.0]
16. How are photosystem I and II involved in the light reactions of photosynthesis? Explain with a suitable diagram and the ATP synthesis by chemiosmotic model. [3.0]
17. How do dark reactions of photosynthesis fix atmospheric CO_2 into glucose? Mention the key substrate molecule and enzymes involved? [3.0]
18. TCA cycle is central to the metabolism. Justify with pathways & intermediates. [1.0]
19. What are cytochromes? How it is classified. Mention its functions. [2.0]
20. What are shuttle mechanisms? Explain any one of the following:
a. Glycerol-phosphate shuttle (or) b. malate-aspartate shuttle [2.0]
21. What are ketone bodies? Briefly explain "ketosis" and its clinical symptoms. [1.0]
22. What is the starting material/substrate/precursor and the key intermediate in the synthesis of fatty acids? Mention the key enzyme involved. [1.0]
23. What are transamination reactions? Give an example and the enzyme involved. [1.0]
24. Differentiate between plant and animal cell structure with a suitable diagram. [1.0]
25. Explain in detail on the flow of nitrogen in the biosphere (nitrogen cycle). [1.0]

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FIRST SEMESTER 2009 – 2010
COURSE No: BIO C211
BIOLOGICAL CHEMISTRY TEST-II (OPEN BOOK)

Duration: 50 min.

Date: 17.12.2009

Max. Marks: 20

Note: a) Attempt all questions in the order

b) Answer all questions

c) Answer to the point

1. What is the structural feature common to ATP, FAD, NAD⁺ and CoA? Draw the structure. [1.0]
2. Suggest a reason that catabolic pathways generally produce NADH and FADH₂, whereas anabolic pathways generally use NADPH. [2.0]
3. Sucrose is commonly used to preserve fruits and sweets. Why is glucose not suitable for preserving foods? Justify your answer with respect to the (a) properties and (b) metabolic pathways. [2.0]
4. Glucose labeled with ¹⁴C at C-1 is incubated with the glycolytic enzymes and necessary cofactors. What is the distribution of ¹⁴C in the pyruvate molecule that is formed? Write the sequence of the reaction with ¹⁴C in the pathway upto the pyruvate (Assume that the interconversion of glyceraldehyde 3-phosphate and dihydroxyacetone phosphate is very rapid compared with the subsequent step. [3.0]
5. Gluconeogenesis takes place during intense exercise, which seems counterintuitive. Why would an organism synthesize glucose and at the same time use glucose to generate energy? Briefly explain. [1.0]
6. Compare the sequence of reactions of glyoxylate pathway in Plants and in Bacteria. [2.0]
7. Why was dinitrophenol once used as a diet drug was rejected. Briefly explain. [1.0]
8. Predict the effect of the herbicide dichlorophenyldimethylurea on a plant's ability to perform cyclic photophosphorylation. Support your reason with a diagram. [2.0]
9. C₃ Plants are most common in higher latitudes and become less common at latitudes near the equator. The reverse is true of C₄ plants. How might global warming affect this distribution? Reason with the metabolites. [1.0]
10. An illuminated suspension of *Chlorella* is actively carrying out photosynthesis. Suppose that the light is suddenly switched off. How would the levels of 3-phosphoglycerate and ribulose 1,5-bisphosphate change in the next minute. Reason with the metabolic pathways. [2.0]
11. Compare and contrast fatty acid oxidation and synthesis with respect to [3.0]
 - a. Site of the process
 - b. Acyl carrier
 - c. Reductants and oxidants
 - d. Direction of synthesis or degradation
 - e. Control mechanism
 - f. Organization of the enzyme system

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FIRST SEMESTER 2009 – 2010
COURSE No: BIO C211
BIOLOGICAL CHEMISTRY TEST-I (CLOSED BOOK)

Duration: 50 min.

Date: 01.11.2009

Max. Marks: 25

Note: a) Attempt all questions in the order

b) Answer all questions

c) Answer to the point

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1. What are acidic and basic amino acids? Give any two examples for each. [2.0]
 2. Why the peptide bond show partial double bond character? Explain with structure of the peptide bond. [2.0]
 3. What are cyclic peptides? Give two examples with functions. [2.0]
 4. How the secondary structure is important in the stability of polypeptide chains and formation of twist and turns in a protein molecule? Briefly explain with suitable diagram. Mention the aminoacids responsible for such bending in protein structures. [3.0]
 5. Define: i) apoenzyme
ii) holoenzyme [1.0]
 6. How does phosphorylation of specific residues regulate enzyme activity? Briefly explain with an example. [3.0]
 7. Differentiate between competitive and non-competitive enzyme inhibition with suitable diagram. [4.0]
 8. What are [3.0]
 - i) spingolipids
 - ii) cerebroside
 - iii) spinghomyelin
 9. What are “coenzymes”? Give two examples for organic (coenzymes) and inorganic (cofactors). [1.0]
 10. Phosphoglycerides are amphipathic in nature. Why (draw the diagram)? Mention the significance of phosphoglycerides. [2.0]
 11. What are Chitin? Mention its functions. [1.0]
 12. What are Glycoproteins? Mention any two examples with biological functions. [1.0]

5. What are the difference between maltose and cellobiose. [1.0]

6. Differentiate between starch and glycogen. [2.0]

7. Write the functions of the following: [1.0]

a. Hyaluronic acid :

b. Chondroitin sulfate :

c. Heparin :

d. Chondroitin-4-sulfate :