

MICHAEL AND CECILIA IBRU UNIVERSITY
SECOND SEMESTER EXAMINATION, 2016/2017 SESSION
COURSE CODE: BCH 212
COURSE TITLE: FUNCTIONAL BIOCHEMISTRY II (3 Credits)

Date: 15TH JUNE, 2017

Time Allowed: 2 hours 30 minutes.

INSTRUCTION: Answer question 1 and any other three questions.

1. a. Calculate the total energy yield (expressed in moles of ATP) when glucose is completely oxidized to carbon (iv) oxide and water? (Assume that one mole FADH₂ oxidized in the respiratory chain yields 2 moles of ATP and one mole of NADH + H⁺ yields 3 moles of ATP; it should be taken also that the glycerol phosphate shuttle has been used). 10 marks
- b. Deficiencies in the level of activity of glucose-6-phosphate dehydrogenase have been observed to be associated with resistance to the malarial parasite *Plasmodium falciparum* among individuals of African descent. Explain briefly. 5 marks
- c. Enumerate the 10 steps in glycolysis highlighting the enzymes involved at each step of the metabolic pathway (only write the names of the intermediate metabolites, structures are not needed). 5 marks
- d. Discuss the fate of pyruvate under different metabolic conditions (aerobic and anaerobic). 5 marks
2. a. Stating all the enzymes and relevant agents of digestion, outline fully the steps required for the digestion of dietary fat to monoacylglycerol and fatty acids. 5 marks
- b. Explain how the above end products are transferred and stored in adipocytes. 5 marks

- c. Discuss the steps of β -oxidation of fatty acid (palmitic acid) highlighting the enzymes and coenzymes involved. 5 marks
3. a. i. What is TCA cycle? 1 marks
- ii. Describe the steps and explain the reason why TCA cycle can operate only in the presence of oxygen. 8 marks
- b. Explain why, when glucose is the sole carbon source, bacteria grow much more slowly in the absence of O_2 than in the presence of oxygen. 3 marks
- c. i. What are anaplerotic reactions? 1 marks
- ii. What do you understand by the sparing action of tyrosine on phenylalanine? 2 marks
5. a. Different animals dispose of ammonia waste in different forms. This has resulted in the classification of the animals as ammonotelic, ureotelic and uricotelic animals. Give the meaning of these and state two examples of each. 6 marks
- b. i. If a diet rich in alanine but deficient in aspartate is fed on by an individual, will there be signs of aspartate deficiency shown? $\frac{1}{2}$ mark
- ii. Explain your reason briefly. $2\frac{1}{2}$ marks

c. Draw the structural reactions and give the names of the α -keto acids resulting when the following amino acids undergo transamination with α -ketoglutarate:

i. Alanine 2 marks

ii. Aspartate 2 marks

iii. Glutamate 2 marks

5. a. The transport across the inner mitochondrial membrane through carnitine shuttle involves three steps. Discuss the three steps of transport of fatty acid.

6 marks

b. i. Digestion of protein occurs in two regions of the alimentary canal. State them. 1 marks

ii. Outline briefly how proteins are digested and absorbed in the duodenum.

5 marks

c. Blood plasma contains all the amino acids required for the synthesis of body proteins, but they are not present in equal concentrations. Two amino acids, alanine and glutamine are present in much higher concentrations in normal human blood plasma than any of the other amino acids. Suggest possible reasons for their abundance. 3 marks

6. a. With respect to their structure and functions, state 2 differences each between

i. HDL and LDL 2 marks

ii. Chylomicron and micelle 2 marks

iii. ACAT and LCAT 2 marks

b. Compare and contrast fatty acid oxidation and synthesis with respect to

i. site of the process. 1 mark

ii. acyl carrier 1 mark

iii. reductants and oxidants 1 mark

c. In five sentences, each representing one of the five enzymic steps of the cycle (with supporting equations of reaction), describe the Urea cycle. An alternative use of diagram is accepted. 6 marks