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Your Roll No

5804 **J**

B.Sc. (Hons.)/II

BIOCHEMISTRY—Paper IX

(Metabolism of Carbohydrates and Lipids)

(Admissions of 2000 and onwards)

Time 3 *Hours* *Maximum Marks* 60

(Write your Roll No on the top immediately on receipt of this question paper)

Answer **Five** *questions, in all including Question No 1 which is compulsory*

1 (a) Explain briefly

(i) Why are catabolic and anabolic pathways different ?

(ii) Why oxidation of odd chain fatty acids leads to net synthesis of oxaloacetate ?

(iii) Why water is excluded from the active site of hexokinase ?

(iv) Why do some tissues continue to produce CO_2 in the presence of fluoride ion, which inhibits glycolysis ?

(v) Why citrate synthase exhibits sequential binding of substrates ?

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(vi) Why is it logical that pyruvate carboxylase is activated by acetyl CoA ?

(vii) Why is the formation of ketone bodies increased during starvation ?

(viii) Why is the amount of ATP derived from circulating glucose less than the amount of ATP that would be obtained by mobilizing the same amount of glucose from glycogen ? 12

(b) Predict the major consequences of each of the following deficiencies

(i) Hexokinase in adipose tissue,

(ii) Glucose-6-phosphatase in liver,

(iii) Carnitine acyltransferase I in skeletal muscle,

(iv) Defective Glycogenin 4

2 The following enzymes act on the same substrate but are not active at the same time Explain the significance of their action and regulation 3+3+3+2

(i) Hexokinase and glucokinase

(ii) Isocitrate dehydrogenase and isocitrate lyase

(iii) Glycogen synthase and phosphorylase

(iv) Ribulose 1, 5 bisphosphate carboxylase and Ribulose 1, 5 bisphosphate oxygenase

3 (a) After how many rounds of citric acid cycle will the labelled CO_2 be produced if the acetyl-CoA is labelled

with ^{14}C at its (i) carbonyl carbon, (ii) methyl carbon ? Show the reactions 4

(b) If Glucose 6 phosphate is labelled at its C_2 position, where will the label appear in the product of the pentose phosphate pathway ? 2

(c) Write a balanced equation for the catabolism of six molecules of Glucose-6-phosphate by the pentose phosphate pathway followed by conversion of ribulose-5-phosphate back to Glucose-6-phosphate by gluconeogenesis 3

(d) Write a balanced equation for the net synthesis of citrate from pyruvate 2

4 (a) Differentiate between the following

(i) Malate aspartate shuttle and glycerol phosphate shuttle

(ii) Fatty acid oxidation in mitochondria and peroxisome

(iii) Cori and glucose alanine cycle 6

(b) How does the liver regulate the level of Glucose in blood ? Why does the muscle glycogen not contribute its glucose to blood ? 5

5 (a) How many ATPs will you get on complete oxidation of the following ? Write the important reactions

(i) A Pentadecanoic Acid,

(ii) A Lenolenic Aid, 7

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(b) How many ATP/NADPH are required for the synthesis of one molecule of oleic acid ? 4

6 (a) Answer the following

(i) Why is pyruvate kinase under allosteric regulation ?

(ii) Why the rate of glucose consumption decreases when yeast that has been maintained under anaerobic condition is exposed to aerobic condition ?

(iii) Why when Pi is limiting, Fructose-16-bis-phosphate accumulates ? 3

(b) Discuss the transport of lipids in blood as

(i) Chylomicrons,

(ii) LDL 3

(c) How is the activity of acetyl CoA carboxylase regulated ? How are the acetyl CoA and NADPH made available for the synthesis of palmitic acid What ensures that when fatty acid synthesis takes place there is no fatty acid oxidation ? 5

7 (a) Write the reaction for the synthesis of the following

(i) Phosphotidylcholine from phosphotidylethanol-amine

(ii) Ethanolamine from serine

(iii) A ceramide

(iv) Sphingomylin from phosphotidylcholine 8

(b) Why is TAG synthesis in adipose tissue dependent on the availability of glucose ? 3

8 (a) How are the following regulated ? (any 3) 3+3+3

(i) Calvin Cycle

(ii) Ketogenesis

(iii) Glycogen breakdown

(iv) Cholestrol synthesis

(b) Is arachidonic acid an essential fatty acid Justify. 2