This question paper contains 4+2 printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **8672**

Unique Paper Code : **249303** **C**

Name of the Paper : **BCHT-305 : Metabolism of Carbohydrates & Lipids**

Name of the Course : **B.Sc. (H) Bio-Chemistry Part II**

Semester : **III**

Duration : **3 Hours** Maximum Marks : **75**

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

Attempt *five* questions in all.

Question No. **1** is compulsory.

Use of scientific calculator/log tables may be allowed.

1. (A) State True *or* False and justify your choice :

(*a*) A low NAD^+/NADPH ratio decreases the oxidation of acetyl CoA by TCA?

(*b*) An abnormal poorly branched glycogen was isolated from the liver of a patient of type IV glycogen storage disease. The deficiency is Amylo α 1,4 $\rightarrow$ α 1-6 transglycosylase.

(*c*) RUBISCO is a bifunctional enzyme.

P.T.O.

(*d*) Mutations and / or deficiency of Aldolase II leads to Tay Sach's disease.

(*e*) The rate limiting step in cholesterol metabolism is β Hydroxybutyrate dehydrogenase.

(*f*) Glucose 6 phosphate is present in serum. (1.5×6=9)

(B) Write the reaction catalyzed by the following Enzymes and their metabolic significance :

(*a*) Lactate dehydrogenase

(*b*) Hormone sensitive lipase

(*c*) UDP glucose 1 phosphate pyrophosphorylase

(*d*) Carnitine acyl transferase

(*e*) Malic enzyme. (2×5=10)

2. Comment on the following statements :

(*a*) Gluconeogenesis does not occur in adipocytes.

(*b*) Glucokinase has a Km considerably greater than normal blood glucose.

(*c*) Glucose-6-phosphate dehydrogenase is required for the metabolism of glutathione in erythrocytes.

(*d*) Transaldolase and transketolases form covalent addition compound with donor substitute.

(*e*) Bile helps in fat digestion and absorption.

(*f*) In germinating seeds, fats stored in oleosomes are used as glucose precursors.

(*g*) A young rat maintained on a diet deficient in methionine fails to thrive unless choline is included in the diet. (2×7=14)

3. Answer in brief :

(*b*) Acetyl CoA is produced in the mitochondria, but is utilized in the cytosol for fatty acid synthesis. How is it transported out of the mitochondria?

(*b*) High intake of fructose leads to lipogenesis.

(*c*) Oxidation of fatty acids yields more energy than oxidation of equivalent weight of carbohydrates.

(*d*) Individual having a defect in enzyme Enoyl CoA isomerase have more difficulty in metabolizing butter or olive oil. (3.5×4=14)

4. (A) If [3–^{14} C] propionate (^{14}C in the methyl group) is added to a liver homogenate, ^{14}C-labelled oxaloacetate is rapidly produced. Draw a flow chart for the pathway by which propionate is transformed to oxaloacetate and indicate the location of the ^{14}C in oxaloacetate.

(B) Calculate the total number of ATP produced from the complete oxidation of linoleic acid.

(C) Fatty acid biosynthesis in a rat liver homogenate is severely inhibited when avidin is added.

(D) Write the net equation for complete oxidation of β-hydroxybutyrate in the kidney. (4,4,3,3)

5. (A) In the regulation of sucrose synthesis from the triose phosphates produced during photosynthesis, 3 phosphoglycerate and Pi play critical roles. Explain.

(B) Mutations in the enzymes of Pentose Phosphate pathway is less deleterious to plants than to animal cells. Explain why ?

(C) What is substrate level phosphorylation ? Where does it take place in the conversion of the following ? Indicate the reactions :

(*a*) Glucose to alpha Ketoglutarate

(*b*) Acetyl CoA to Malate

(D) Which reactions are affected by the following drugs :

(*a*) Fluoride

(*b*) Arsenate

(*c*) Iodoacetate (3,4,4,3)

6. (A) In separate experiment fresh pigeon flight muscle is incubated with the following compounds labeled as indicated. Indicate what metabolic events occur before the radioactivity is found in CO_2.

(*i*) ^{14}C carboxyl label pyruvate

(*ii*) ^{14}C methyl label pyruvate.

(*iii*) ^{14}C carboxyl label succinate.

(*iv*) ^{14}C malate label in secondary alcohol

(B) Explain the reciprocal regulation of gluconeogenesis and glycolysis with specific reference to PFK I and II.

(C) Mutations and or deficiency of enzymes involved in sphingolipid metabolism lead to diseases. Explain. (5,4,5)

7. (A) The following sets of enzymes act on the same substrate. What reaction do they catalyse and what is their metabolic significance ?

(*i*) Hexokinase and Glucokinase

(*ii*) Isocitrate dehydrogenase and Isocitrate lyase

(*iii*) Pyruvate carboxylase and Pyruvate decarboxylase

(*iv*) Lipooxygenase and Cyclooxygenase

(*v*) Citrate lyase and Aconitase (5×2=10)

(B) How is cholesterol concentration maintained at normal levels in human blood ? (4)

8. Write short notes on any *four* :

(*a*) Synthesis of phospholipids

(*b*) Pyruvate dehydrogenase complex

(*c*) Regulation of glycogen metabolism

(*d*) Fatty acid synthase complex

(*e*) Heterotrophic organism. (3.5×4=14)