

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 6372 **D** Your Roll No.....

Unique Paper Code : 249303

Name of the Course : **B.Sc. (Hons.) Biochemistry**

Name of the Paper : Metabolism of Carbohydrates and Lipids (BCHT-305)

Semester : III

Duration : 3 Hours

Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question No. **1** is compulsory.

1. (a) Explain Why/How ?

(i) Water is excluded from the active site of hexokinase.

(ii) Phosphofructokinase is the committed step of glycolysis and not hexokinase.

(iii) Oxidation of odd chain fatty acids leads to net synthesis of oxaloacetate.

(iv) Galactosemics whose diet devoid of galactose, get their galactose for the synthesis of glycoproteins and glycolipids ?

(v) Glycolysis is important.

(vi) Glycogen is an efficient storage form of glucose. (12)

(b) Identify the following compounds/enzymes:

(i) The ketone body which increases in concentration during uncontrolled diabetes.

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- (ii) The enzyme in muscle because of which muscle glycogen does not contribute to blood glucose.
- (iii) The acid which is a precursor of series-3 prostaglandins.
- (iv) The membrane bound enzyme of TCA cycle.
- (v) The enzyme if absent produces an abnormal glycogen with long outer branches.
- (vi) The compound which is an intermediate in the synthesis of both phospholipid and triacylglycerol.
- (vii) The major product of TAG digestion. (7)
2. (a) How is sucrose synthesized in plants ? (2)
- (b) Why glucose and not glucose 6 phosphate is given intravenously ? (2)
- (c) What is the significance of Pentose Phosphate Pathway ? Describe the fate of glucose-6-phosphate when the need for NADPH exceeds that of ribose-5-phosphate. (5)
- (d) Nursing infants metabolize galactose obtained from the hydrolysis of milk lactose. Compare the anaerobic ATP yield from glucose and galactose. Write the series of reactions of galactose oxidation. (5)
3. (a) What is the primary cause of the following disease :
- (i) Refsum's disease
- (ii) NieMann Pick Disease
- (iii) Respiratory Distress syndrome (3)
- (b) Write a series of known enzymatic reactions that result in the net synthesis of  $\alpha$ -ketoglutarate from pyruvate. (3)
- (c) When [3- $^{14}\text{C}$ ]-pyruvate is added to culture of hepatocytes which carbon of oxaloacetate will be labeled after one turn of the TCA cycle ? Explain by tracing the  $^{14}\text{C}$  label through the pathway. (3)

- (d) How many ATP/NADPH will be required for the synthesis of one molecule of oleic acid ? (3)
- (e) Is arachidonic acid an essential fatty acid ? Justify your answer. (2)
4. (a) How are the following coordinately regulated ?
- (i) Fatty acid synthesis and breakdown
  - (ii) Glycogenesis and glycogenolysis (6)
- (b) Why mammals cannot convert fatty acid to glucose while plants can ? Show the pathway. (4)
- (c) Describe the role of carbohydrate metabolism in the synthesis and hydrolysis of TAG in adipose tissue. (4)
5. (a) Differentiate between the two shuttles for the transport of NADH from the cytosol to mitochondria. Give one advantage of each over the other. (5)
- (b) Describe how acetyl CoA is transported from its site of synthesis to its site of utilization for fatty acid synthesis. What is the energy cost of transporting one molecule of acetyl CoA ? Also how fatty acids are transported from there site of synthesis to their site of oxidation. (5)
- (c) Why does glycolysis and gluconeogenesis do not occur simultaneously ? How is glycerol a gluconeogenic substrate ? Write the net equation for its conversion to glucose. (4)
6. (a) Explain the regulation of Rubisco in Calvin cycle. (4)
- (b) Describe the structure of fatty acid synthase complex in mammals. How does it function to synthesis a molecule of palmitic acid ? (6)
- (c) How is ketogenesis regulated ? (4)
7. (a) Name the enzyme/s and the activated reactants in each of the following reactions :

- (i) Ganglioside  $G_{m1}$  from ganglioside  $G_{m2}$
  - (ii) Glycogen<sub>(n+1)</sub> from glycogen<sub>(n)</sub>
  - (iii) Oxaloacetate from pyruvate
  - (iv) Phosphotidyl serine from serine
  - (v) Phosphotidyl choline from phosphotidyl ethanolamine
  - (vi) Geranylpyrophosphate from isoprene units (6)
- (b) How many ATPs will you get on complete oxidation of the following ? Briefly outline the important reactions :
- (i) A pentadecanoic acid
  - (ii) Arachidonic acid (6)
- (c) How is Aspirin an anti-inflammatory drug ? (2)

8. Write short notes on :

- (i) Multi enzyme complex
- (ii) Regulation of cholesterol biosynthesis
- (iii) Cori cycle (5,5,4)