Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (BT)/SEM-3/BT-301/2010-11

2010-11

CELL BIOLOGY & BIOCHEMISTRY

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : 10 × 1 = 10

   i) The stage of the cell cycle where the cell is preparing to begin DNA replication is called

   a) G1 b) G2

   c) S d) M.

   ii) The activity of which of the following enzymes is not required for the release of large amount of glucose from liver glycogen ?

   a) Glucose-6-phosphatase

   b) Fructose-1, 6-bisphosphatase

   c) Phosphoglucomutase

   d) Debranching enzyme (–1, 6-glucosidase)

   e) Glycogen phosphorylase.

iii) Which of the following is not a product of the pentose phosphate pathway ?

a) NADPH

b) Glutathione

c) CO_2

d) Ribulose 5-phosphate

e) Sedoheptulose 7-phosphate.

iv) Hexokinase

a) catalyzes the conversion of glucose-6-phosphate to fructose-1, 6-bishosphate

b) requires Ca^{2+} for activity

c) uses inorganic phosphate to form glucose-6-phosphate

d) transfers a phsophoryl group to a variety of hexoses

e) is not found in muscle cells.

v) Which steps of β oxidation of fatty acids require CoA ?

a) 1st and last steps

b) last step

c) not at all required

d) 1st step.

vi) Treatment of a mitochondrial preparation with oligomycin inhibits oxidative phosphorylation. If the preparation is treated simultaneously with oligomycin and DNP which of the following will occur ?

a) ATP synthesis

b) Electron transport with oxygen consumption but no ATP synthesis

c) No electron transport and no ATP synthesis

d) None of these.

vii) Each cycle of β-oxidation produces

a) 1 FAD, 1 NADH and 1 acetyl-CoA

b) 1 $FADH_2$, 1 NADH and 1 acetyl-CoA

c) 1 FAD, 1 NAD and $2CO_2$ molecules

d) 1 $FADH_2$, 1 NAD and 1 acetyl-CoA.

viii) Glyceraldehyde 3 phosphate dehydrogenase is inhibited by

a) Magnesium

b) Zinc

c) Iodide

d) Iodoacetate.

ix) The proteins which complex with DNA producing the "beads on a string" or nucleosomes are called

a) Kinases

b) Proteases

c) Histones

d) Spindle fibres.

x) The ..... portion of the cell membrane functions as a barrier while the ..... portion determines specific functions including pumps, receptors, adhesion, etc.

a) carbohydrate, nucleic acid

b) lipid, protein

c) lipid, carbohydrate

d) nucleic acid, lipid.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. State the function of Pyruvate dehydrogenase complex in the conversion of Pyruvate of Acetyl CoA.

3. Substrate cycle amplifies metabolic signal. Explain.

4. What are the main reactions involved in ω oxidation ? Mention name of the enzymes with coenzymes & cofactors. 2 + 3

5. Discuss the interactions between NADPH and glutathione metabolism and the consequence of glucose-6-phosphate dehydrogenase deficiency.

6. What are glucogenic and ketogenic amino acids ? Give examples. Explain why plants have no need to produce urea and yet contain nearly all the enzymes of urea cycle. 2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. In the coordinated control of phosphofructokinase-1 (PFK-1) and fructose-1, 6-bisphosphatase (F-1, 6-bisPase) identify the effects of AMP, citrate and fructose-2, 6-bisphosphate on the activities of the following enzymes.

   a) Amytal

   b) Arsenate. 9 + 6

8. What are the main features of fluid mosaic model of membrane structures ? Write down the reaction catalyzed by phospholipase *C*. Briefly summarize the "second messenger" roles of the two products of the phospholipase *C* reaction. Describe the mode of action of cholera toxin creating diarrhoea ? Would an individual who has a congenital defect in enoyl CoA isomerase has more difficulty in metabolizing butter or olive oil ? Why ? 3 + 2 + 4 + 3 + 3

9. Describe the steps when palmitic acid is activated for beta oxidation ? Name the transport protein involved in fatty acid oxidation. Calculate the number of NADH and FADH produced during this complete oxidation. How phosphatidyl choline is synthesized ? State mode of cleavage of phosphatidyl choline by different phospholipases.
3 + 1 + 3 + 3 + 3 + 2

10. Phe is an essential amino acid. Why ? Is Tyrosine an essential amino acid in patients with Phenylketonuia ? Why ? How does Na^+ K^+ ATPase pump work ? 1 + 2 + 6 + 6

11. What are the main three stages of Calvin cycle ? Describe the reactions converting 3-phosphoglycerate to hexose sugars. Explain photorespiration with reactions. 3 + 7 + 5