Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(BT-OLD))/SEM-3/BT-301/2011-12

2011

CELL BIOLOGY AND 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 any *ten* of the following : 10 × 1 = 10

   i) The net gain of ATP molecules resulting from Glycolysis is

   a) 2 b) 4

   c) 36 d) 38.

   ii) Any phosphorylation reaction catalyzed by Kinase require

   a) Mn^{+2} /Mg^{+2} b) Inorganic phosphate

   c) Epinephrine d) all of these.

iii) The hexose monophosphate shunt has greater importance in cellular metabolism because it produces

a) NADH b) ATP

c) Acetyl CoA d) NADPH.

iv) The chemical substance that enters the Krebs cycle for further metabolism is

a) Ethyl alcohol b) Pyruvic acid

c) Acetyl CoA d) Lactic acid.

v) Amino acid not involved in urea cycle is

a) Arginine b) Histidine

c) Citruline d) Aspartic acid.

vii) A key substance in pyrimidine biosynthesis is

a) Carbamoyl phosphate b) ATP

c) Thiouracil d) Ribose 5 phosphate.

vii) The most abundant lipid in a cell membrane is

a) Phospholipids b) Steroid

c) Cholesterol d) Cutin.

viii) A membrane is held together primarily by

a) Hydrophobic attractions

b) Hydrophilic attractions

c) covalent bonds

d) Ionic bonds.

ix) In the fluid mosaic model, the phospholipids bilayer

a) is sandwiched between two protein layers

b) has protein embedded in it

c) lies on top of a single protein layer

d) is covered by a single protein layer.

x) When phospholipids molecules are placed in water, they may cluster into a spherical structure called a

a) micelle b) coated pit

c) vacuoles d) centriole.

xi) All membrane processes, such as pumping and channeling of molecules are carried out by

a) lipids b) carbohydrates

c) proteins d) nucleic acids.

xii) The lipid bilayer is impermeable to

a) hydrocarbons

b) hydrophobic molecules

c) small uncharged polar molecules

d) large uncharged polar molecules.

GROUP – B

(Short Answer Type Questions)

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

2. Discuss the steps in pentose phosphate pathway with overall reactions.

3. How glycogen metabolism is controlled by cAMP and insulin ?

4. Write the steps of citric acid cycle. What is its importance ?

5. Calculate pI for Aspartic acid, where pK_1 (αCOOH) =2·09, pK_2 (α NH_3^+) = 9·9, pK_3(R-gr.) = 3·9.

6. a) If the melting temperature of one DNA sample is more than the other, what will be your conclusion ?

b) Name two purine and two pyrimidine bases. 3 + 2

GROUP – C

(Long Answer Type Questions)

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

7. Write short notes on any five of the following : 5 × 3

   a) Phospholipid

   b) Sphingomyelin

   c) Glycosphigolipid

   d) Polysaccharide

   e) Amino acid with non-polar side chain

   f) Genetic redundancy

   g) Nucleotide and Nucleoside.

8. a) Determine the sequence of hexapeptide based on the following data :

   Amino acid composition : 2R, A S, V, Y.

   R = Arginine, A = Alanine, S = Serine, V = Valine, Y = Tyroine

   N terminal analysis of the hexapeptide : A

   Trypsin digestion : (R, A, V) & (R, S, Y)

   Carboxypeptidase digestion : No

   Chymotrypsin digestion : (A,R,V,Y) & (R, S)

b) Compare "negative supercoiling" with "positive super coiling" of DNA.

c) The three dimensional structure of biomolecules is more conserved evolutionarily than the sequence. Why ?

6 + 6 + 3

9. a) Discuss the basic concept and principles of UV Spectroscopy.

b) A solution contains a mixture of Hemoglobin and Blue dextran. The mixture has an absorbance of 0.88 at 414.5 nm and 0.69 at 640 mm in an 1 cm cubette. The molar absorption co-efficient of Hemoglobin and Blue dextran are given below

	ε_M (414.5 nm)	ε_M (640 nm)
Hemoglobin	125000	1000
Blue dextran	3500	42000

Calculate the molar concentration of Hemoglobin and Blue dextran. Justify whether the extinction co-efficient cannot be

	ε_M (414.5nm)	ε_M (640 nm)
Hemoglobin	0.01	0.85
Blue dextran	0.91	0.002

7 + 8

10. a) Write the different classes of enzyme.

    b) What do you mean by allosteric enzyme ?

    c) What are cofactors ? 9 + 3 + 3

11. a) Classify vitamin.

    b) State the coenzyme activities of vitamins.

    c) What are the mineral elements ?

    d) Show that cAMP is the second messenger for many hormones. 3 + 4 + 3 + 5

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