Total No. of printed pages = 7

63/2 (SEM-1) BIT 101

2021

(held in 2022)

BIOTECHNOLOGY

(Theory Paper)

Paper : BIT-101

(Bio-Chemistry)

Full Marks – 80

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Choose the correct answer : 2×10=20

(a) Which of the following statements best describes glucose ?

(i) It is a C-4 epimer of galactose.

(ii) It is a ketose and usually exists as a furanose ring in solution.

[Turn over

(iii) It is produced from dietary starch by the action of α-amylase.

(iv) It is utilized in biological systems only in the L-isomeric form.

(b) Which of the following statements is true for anabolic pathways only ?

(i) Their irreversible (non-equilibrium) reactions are regulated.

(ii) They are called cycles if they regenerate an intermediate.

(iii) They are convergent and generate a few simple products.

(iv) They are synthetic and require energy.

(c) The conversion of pyruvate to acetyl coenzyme A and CO_2 :

(i) involves the participation of lipoic acid.

(ii) is activated when pyruvate decarboxylase of the pyruvate dehydrogenase (PDH) complex is phosphorylated by PDH kinase in the presence of ATP.

(iii) is irreversible.

(iv) requires the coenzyme biotin.

(d) The following is the sum of three steps in the citric acid cycle.

$A+B+FAD+H_2O \rightarrow C+FADH_2+NADH$

Choose the answer that corresponds to the missing "A", "B" and "C" in the equation :

Reactant A	Reactant B	Reactant C
(i) Succinyl CoA	GDP	Succinate
(ii) Succinate	NAD^+	Oxaloacetate
(iii) Fumarate	NAD^+	Oxaloacetate
(iv) Succinate	NAD^+	Malate
(v) Fumarate	GTP	Malate

(e) In contracting skeletal muscle, a sudden elevation of the sarcoplasmic calcium concentration will result in :

(i) activation of cyclic adenosine monophosphate (cAMP)-dependent protein kinase A.

(ii) conversion of cAMP to AMP by phosphodiesterase.

(iii) direct activation of glycogen synthase b.

(iv) direct activation of phosphorylase kinase b.

(f) Lactose synthesis is essential in the production of milk by mammary glands. In lactose synthesis :

(i) galactose from galactose 1-phosphate is transferred to glucose by galactosyltransferase (protein A), generating lactose.

(ii) protein A is used exclusively in the synthesis of lactose.

(iii) α-lactalbumin (protein B) regulates the specificity of protein A by increasing its K_m for glucose.

(iv) protein B expression is stimulated by prolactin.

(g) In preparation for a trip to an area of India where chloroquine-resistant malaria is endemic, a young man is given primaquine prophylactically. Soon thereafter, he develops a hemolytic condition due to a deficiency in glucose 6-phosphate dehydrogenase. A less-

than-normal level of which of the following is a consequence of the enzyme deficiency and the underlying cause of the hemolysis ?

(i) Glucose 6-phosphate

(ii) Oxidized form of nicotinamide adenine dinucleotide.

(iii) Reduced form of glutathione.

(iv) Ribose 5-phosphate.

(h) When oleic acid, 18:1(9), is desaturated at carbon 6 and then elongated, what is the product ?

(i) 19 : 2(7,9) (ii) 20 : 2(n-6)

(iii) 20 : 2(6,9) (iv) 20 : 2(8,11)

(i) Calculate the amount of cholesterol in the low-density lipoproteins in an individual whose fasting blood gave the following lipid-panel test results : total cholesterol = 300 mg/dl, high-density lipoprotein cholesterol = 25 mg/dl, triglycerides = 150 mg/dl.

(i) 55 mg/dl (ii) 95 mg/dl

(iii) 125 mg/dl (iv) 245 mg/dl

(j) Which one of the following statements concerning amino acids is correct ?

(i) Alanine is ketogenic.

(ii) Amino acids that are catabolized to acetyl coenzyme A are glucogenic.

(iii) Branched-chain amino acids are catabolized primarily in liver.

(iv) Cysteine is essential for individuals consuming a diet severely limited in methionine.

2. Write short notes on any *eight* of the following questions : 5×8=40

(a) Gluconeogenesis

(b) Urea Cycle

(c) Coenzyme

(d) Secondary Metabolites of Plants

(e) Iso-enzyme

(f) Competitive Inhibition

(g) Pentose Phosphate Pathway

(h) Prostaglandin

(i) CAM Pathway

(j) Ramachandran Plot.

3. Answer any *two* of the following questions : 10×2=20

(a) Describe the cholesterol biosynthesis mechanism in tissues with illustrations. 10

(b) What do you mean by Photophosphorylation ? Differentiate the C_3 and C_4 pathways of CO_2 fixation. 2+8=10

(c) Mention the structural differences of A–, B– and Z–DNA with diagrams. 10