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63/2(SEM-2) ZOO 203

2022

ZOOLOGY

(Theory Paper)

Paper Code : ZOO 203

(Biochemistry and Metabolism)

Full Marks – 80

Time – Three hours

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

- 1. Answer the following multiple choice questions (*all compulsory*)** **1×6=6**

(i) Phosphofructokinase is the Major Flux-Controlling Enzyme of Glycolysis in Muscle and it is allosterically inhibited by

(a) AMP

(b) ATP

(c) ADP

(d) G6P

[Turn over

(ii) Which of the following statement is NOT true ?

- (a) Chitin is the principal structural component of the exoskeletons of invertebrates such as crustaceans, insects, and spiders
- (b) Chitin is biochemically a lipoprotein
- (c) Chitin is a homopolymer of β -linked N-acetyl-D-glucosamine residues
- (d) Chitin and cellulose large polymer molecules

(iii) Which one of the following reaction is an example of substrate level phosphorylation from Kreb's cycle ?

- (a) Fumarate to malate
- (b) Citrate to isocitrate
- (c) Succinyl-CoA to succinate
- (d) Succinate to fumarate

(iv) A widely distributed enzyme that catalyzes the interchange or shuffling of disulfide bonds until the bonds of the native conformation are formed is _____.

- (a) Hsp 70
- (b) Chaperonins

(c) Peptide Prolyl cis-trans Isomerase (PPI)

(d) Protein Disulfide Isomerase (PDI)

(v) The precursor for the synthesis of catecholamines like dopamine, norepinephrine and epinephrine is

- (a) Try (b) Trp
- (c) Glu (d) N-acetyl glucosamine

(vi) Fatty acyl groups are transported into the mitochondrion via _____ for oxidation.

- (a) A Glycerophosphate shuttle
- (b) A carnitine shuttle
- (c) A malate-aspartate shuttle
- (d) Receptor mediated endocytosis.

2. Answer the following short answer type questions
(all compulsory) : $2 \times 5 = 10$

(a) Draw the structure on any *two* of the following : $1 + 1 = 2$

- (i) Peptide bond
- (ii) Tyr
- (iii) β -D-Glucopyranose

- (b) What are glycosidic bonds ? Give example.
- (c) What is physiological significance of Ketone bodies in our body ?
- (d) What do you understand by coupled reactions in metabolism ? Give example.
- (e) Differentiate between coenzyme and prosthetic group.

3. Answer any six of the following questions :

- (a) Describe the structure of the bacterial cell walls by using suitable diagrams. How does lysozyme work against the bacteria ?
- (b) Explain how the structure of cellulose and glycogen are most suited for their respective functions. Why are triacylglycerols regarded as high-energy storage molecules ?

- (c) Explain the mechanism of allosteric inhibition of enzymes by taking examples.
- (d) Explain why Krebs's cycle called an Amphibolic cycle ? Describe in detail why citric acid cycle is also known as the 'central cycle' in metabolism by giving suitable examples.

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180
2+3=5

- (e) Define the Kinetic constants (K_m , K_{cat} and Catalytic efficiency) of an enzyme catalysed reaction. Derive the Lineweaver-Burk equation from Michaelis-Menten equation and plot the kinetic constants on this graph.
- (f) Describe the role of insulin in glucose metabolism.
- (g) Write short note on enzymes as drug targets by giving examples.
- (h) Explain the significance of Ramachandran Plot. Describe the secondary structure of protein in detail.
- (i) Describe the changes in kinetic constants of an enzyme catalysed reaction in the presence of competitive and uncompetitive inhibitors. 5

4. Answer any two of the following long answer type questions :
10×2=20

- (a) Describe the process of oxidative phosphorylation in detail. What is the role of NADH and $FADH_2$ in the Electron transport chain ? What is protein motive force and how is it achieved ?
- (b) What are glycoconjugates ? Explain in detail the process of O-linked and N-linked glycosylation.

1+5+4=10

[Turn over

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(c) Write short notes on the following : $5+5=10$

(i) Protein folding and denaturation

(ii) Structure of collagen.

5. Answer any *one* of the following very long type questions : $14 \times 1 = 14$

(i) Describe Franz Knoop's classic experiment indicating that fatty acids are metabolically oxidized at their α -carbon atom. Describe the mechanism of Oxidation of Odd-Chain Fatty Acids. $7+7=14$

(ii) Describe the energy recovery pathway of Glycolysis pathway in detail. What is the fate of Pyruvate formed at the end of Glycolysis ? $7+7=14$