SET-B *Roll No:* _____

JAMIA HAMDARD

Department of Biochemistry
School of Chemical and Life Sciences

M.Sc. BIOCHEMISTRY EVEN-SEMESTER (II) EXAMINATION, MAY 2025

Paper Code: MBC 203
(Metabolism-I: Bioenergetics, Carbohydrates, and Intermediary Metabolism)

Time: **2½ h** Max Marks: **60**

Note: *This paper has 3 Sections, A, B, and C. Attempt all three sections. Section A: Answer all the questions; Section B: Answer any two; Section C: Answer all the questions, each question in this section has an internal choice.*

Abbreviations: *CLO- Course Learning Outcome, PLO- Program Learning Outcome, BTL- Bloom Taxonomy Level: BT level 1- Remember; BT level 2-Understand; BT level 3-Apply; BT level 4-Analyse; BT level 5-Evaluate, BT level 6-Create.*

SECTION A

Attempt All Questions
(10 x 1 = 10 Marks)

Q 1a	OBJECTIVE QUESTIONS - Do as directed	BTL	CLO	PLO
i.	In the Citric Acid Cycle, decarboxylation of isocitrate to α-ketoglutarate is catalyzed by _____	2	2	3
ii.	The photorespiratory pathway involves organelles such as _____, _____, and _____.	2	2	3
iii.	Glyoxylate Cycle enables plants and some microorganisms to convert _____ into carbohydrates.	4	5	2
iv.	In C4 photosynthesis, _____ catalyzes the initial fixation of CO_2 into oxaloacetate.	4	4	3
v.	Most glycolytic enzymes require Mg^{2+} ions for their catalytic activity. (True/False)	3	3	2
vi.	ΔS of cellular respiration (ΔG= -686 kcal/mol) is predicted to be _____ (Positive/ Negative/ Zero/ Can't be predicted)	3	4	3
vii.	_____ is a non-physiological source of electrons for Electron Transport Chain (Acetyl Phosphate/ Phosphoenolpyruvate/ FMN/ reduced Ascorbate)	4	4	3
viii.	Q cycle is associated with complex _____ of electron transport chain. (Complex I/ Complex II/ Complex III/ Complex IV)	4	4	3
ix.	NAD & NADP are derived from Vitamin _____	2	2	3
x.	On an average transfer of 4 protons from inter	2	2	3

	membrane space to matrix results in _____ rotation on ATP synthase. (60°, 90°, 120°, 360°)			

SECTION B

Answer ANY TWO of the following questions

(2 x 10 = 20 Marks)

Q. No 2	LONG ANSWER QUESTIONS	BTL	CLO	PLO
a)	Discuss why ATP is a high energy compound. What is phosphorylation potential of ATP.	3	2	3
b)	Write about Glyoxylate pathway, as well as a description of how fatty acids are converted to sugars in plants.	5	3	2
c)	How does the Pentose Phosphate Pathway link with glycolysis to supply NADPH, ribose-5-phosphate, or both, based on cellular requirements?	2	2	3
d)	Discuss the structure and functioning of electron transport chain. Give emphasis on generation of proton gradient.	1	1	2

SECTION C

Attempt ALL SIX questions

(each question has an internal choice)

(6 x 5= 30 Marks)

Q No. 3	SHORT ANSWER QUESTIONS **(Write Short Notes)**	BTL	CLO	PLO
a)	What is the importance of second law of thermodynamics/ **OR (a')** Write a brief note on Nicotinamide electron carriers	4	5	3
b)	Discuss the possible fates of pyruvate and the enzymes responsible/ **OR (b')** Why are phosphorylated glycolytic intermediates beneficial for the cell? Mention at least two reasons.	3	2	3
c)	Write a short note on Lactate metabolism/ **OR (c')** How is glycolysis regulated by phosphofructokinase (PFK), and how do other key enzymes of glycolysis reinforce this regulation?	4	3	2
d)	Explain how fructose is funneled into the glycolytic pathway in both liver and muscle tissues, mentioning the enzymes and intermediates involved/ **OR (d')** Describe Glycogenesis or Glycogenolysis, along with the enzymes involved.	2	2	3
e)	Briefly discuss the binding change mechanism of ATP synthesis/ **OR (e')** What is Malate-Aspartate shuttle. Discus its importance	4	2	3
f)	Discuss the inhibitors of electron transport chain and their effects on it/ **OR (f')** Write a note on P/O ratio	4	3	2

END OF THE QUESTION PAPER