Assistant Professor (Biochemistry) {PAPER-II (S.A.T.)}

T.B.C.: 2025/Biochem./II **Roll No. _____**

Time: 03 hours **Maximum marks: 120**

QUESTION PAPER SPECIFIC INSTRUCTIONS

Please read each of the following instructions carefully before attempting questions.

1. There are **EIGHT (08)** questions in TWO parts in this paper.
2. The candidate has to attempt **SIX (06)** questions by choosing at least **THREE (03)** questions from each part.
3. All questions carry equal marks. Each question will consist of 04 sub parts having 05 marks and word limit will be 150 words for each sub-part.
4. Write answers in legible handwriting. Illustrate your answers with suitable sketches, diagrams and figures, wherever considered necessary.
5. Each part of the question must be answered in sequence and in same continuation.
6. Attempts of the questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in answer booklet must be clearly struck off.

IMPORTANT NOTE: ANSWER ANY (03) THREE QUESTIONS FROM EACH PART.

USE OF MOBILE PHONES OR ANY OTHER COMMUNICATION DEVICES IS STRICTLY PROHIBITED IN THE EXAMINATION.

Part-I (60 marks)

Q. No. 1: Answer the following questions:

(a) Write the reaction catalyzed by Pyruvate Kinase indicating the substrate(s), co-substrate(s), product(s) and thermodynamically favourable direction. How is the enzyme regulated? How does its deficiency lead to haemolytic anaemia?

(b) List **three** enzymes that use Biotin as coenzyme? Why does buccal fat decrease (a feature of Biotin face) in chronic Biotin deficiency?

(c) With the help of a schematic diagram show how Iron absorption occurs across enterocytes. Depict the role of different molecules in this process and in diseases associated with iron homeostasis defect.

(d) List three enzymes involved in phage 2 reactions of xenobiotic metabolism and mention the reaction catalyzed by them. Explain why 'slow acetylators' are more prone to Isoniazid-induced neuropathy.

Q. No. 2: Answer the following questions:

(a) Define Catalytic efficacy, Km, Vmax and Kcat of an enzyme. Write the relation between Km and Vmax.

(b) With a suitable schematic diagram depict the diagnostic window of Myoglobin, Lactate dehydrogenase, CK-MB and Trop-T in Acute Myocardial infarction. Write pathophysiology of reperfusion injury. Which cardiac marker is most suitable for diagnosis of reinfarction in a patient with Acute Myocardial infarction?

(c) Write how cyanide, oligomycin, atractylocide, 2, 4 DNP and Nigericin inhibit ATP synthesis in mitrochondria?

(d) How many protons are pumped out of inner mitochondrial membrane by Complex I, Complex II, Complex III and complex IV when two electrons from a NADH reaches the oxygen molecule through these complexes of respiratory chain? How many ATP can be produced from one molecule of cytosolic NADH? Can this number vary?

Q. No. 3: Answer the following questions:

(a) Write the biochemical basis of liver failure in metabolic defect of galactose. Why patients with galactosemia due to 4-epimerase deficiency often develop hypoglycaemia but patients with galactosemia due to galactokinase deficiency do not develop it?

(b) How is glucoronic acid synthesized in human body? Write **two** uses of glucoronic acid.

(c) What is an anapleuretic reaction? Write three substrates of anapleuretic reaction for TCA cycle.

(d) If 14C labelled acetyl CoA is allowed to be catabolised in TCA cycle, what percentage of acetyle CoA is expected to liberate radio labelled carbon dioxide if TCA is allowed to complete its (i) first cycle, (ii) second cycle and (c) third cycle after adding permeabilysed 14C labelled acetyl CoA to mitochondrial concentrate.

Q. No. 4: Answer the following questions:

(a) "Valine and phenyl alanine are essential amino acids but glycine is not" Justify the statement with suitable reactions.

(b) Why does eating of unripe fruit of Ackee tree leads to hypoglycaemia? Explain its biochemical basis.

(c) Why does patient with Phenylketonuria (PKU) suffer from hypopigmentation and low IQ? Why non-classical PKU is often more severe than its classical form?

(d) Write the role of LCAT enzyme and CETP molecule in reverse cholesterol transport.

Part-II (60 marks)

Q. No. 5: Answer the following questions:

(a) List the parameters assayed in 'triple test' for antenatal screening. How is the test interpreted?

(b) Write the WHO diagnostic criteria for Diabetes mellitus in pregnant and non-pregnant women.

(c) How is adequacy of hemodialysis assessed by laboratory testing?

(d) Write the mechanism of antibiotic action of ciprofloxacin, Rifampicin, tetracycline, cyclohexamide and puromycin.

Q. No. 6: Answer the following questions:

(a) How do diphtheria toxin and Ricin exert their toxicity on human?

(b) "Allopurinol acts as competitive as well as suicidal inhibitor of xanthine oxidase." Explain how?

(c) Define differential splicing? Explain the process with suitable example.

(d) Explain polymerase switch. Why does it occur only in eukaryotes?

Q. No. 7: Answer the following questions:

(a) Write the mechanisms of gene regulation by miRNA.

(b) Define RNA editing and explain its physiological importance with an example.

(c) Write markers of Treg cells, mention two cytokines produced by it and their functions.

(d) Why is Hyper IgM syndrome associated with failure of both affinity maturation and class switching?

Q. No. 8: Answer the following questions:

(a) Describe the bonds involved in primary, secondary and tertiary structure of proteins. List example of two protein conformation disorders and describe their biochemical pathogenesis.

(b) How is lab diagnosis of Sickle cell anaemia established? Why does oxygen flow from maternal blood to foetal blood across placenta?

(c) List two epi drugs. Mention one use of each of them. How do they act?

(d) How do tumour cells escape immune surveillance mechanisms?

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