BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Sc.(FND)-Hons-2023
Course Name – Nutritional Biochemistry - I
Course Code - BFD30110
(Semester III)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Choose the biochemical technique you would use to analyze the protein content of a cell sample.

a) DNA sequencing
b) Spectrophotometry
c) X-ray crystallography
d) PCR (Polymerase Chain Reaction

(ii) Recognize which of the following is a key area of study within biochemistry.

a) Geological formations
b) Enzyme activity
c) Atmospheric pressure
d) Population dynamics

(iii) Classify the reaction type catalyzed by an enzyme that rearranges the structure of a molecule without adding or removing atoms:

a) Phosphorylation
b) Oxidation
c) Hydrolysis
d) Isomerization

(iv) Apply the concept of enzyme inhibition to predict the outcome of introducing a non-competitive inhibitor to an enzyme-catalyzed reaction:

a) The enzyme's Km increases, but Vmax remains unchanged
b) The enzyme's activity increases due to inhibition
c) The enzyme becomes more efficient
d) The enzyme's maximum velocity (Vmax) decreases, but Km remains unchanged

(v) Name the parameter that represents the substrate concentration at which the reaction rate is half of the maximum velocity:

a) Vmax
b) Km (Michaelis constant)
c) Ki (inhibition constant)
d) kcat

(vi) Explain the effect of non-competitive inhibition on Km and Vmax:

a) Km increases, and Vmax remains unchanged
b) Both Km and Vmax increase
c) Km decreases, and Vmax increases
d) Km remains the same, but Vmax decreases

(vii) Describe how the HMP shunt pathway contributes to cellular metabolism.

a) By generating ATP through substrate-level phosphorylation.
b) By producing NADPH and ribose-5-phosphate for biosynthetic reactions.
c) By converting glycogen into glucose.
d) By transporting glucose into the mitochondria.

(viii) Explain how ATP is generated during the TCA cycle.
a) Through oxidative phosphorylation only
b) By substrate-level phosphorylation and electron transport
c) Via the breakdown of fatty acids
d) Through the conversion of NADH to NAD+

(ix) Name the primary regulatory enzyme of glycolysis.
a) Pyruvate kinase
b) Aldolase
c) Hexokinase
d) Phosphofructokinase-1

(x) Predict the outcome of a deficiency in pyruvate dehydrogenase on carbohydrate metabolism.
a) Accumulation of pyruvate and reduced acetyl-CoA production
b) Increased conversion of pyruvate to acetyl-CoA
c) Enhanced TCA cycle activity
d) Increased synthesis of glycogen

(xi) Predict the metabolic consequence of excessive fatty acid oxidation during starvation:
a) Increased ketone body production leading to ketosis
b) Decrease in blood glucose
c) Increase in cholesterol levels
d) Decrease in glycogen reserves

(xii) Compare saturated and unsaturated fatty acids based on their chemical structure:
a) Saturated fatty acids contain one or more double bonds, while unsaturated fatty acids contain only single bonds.
b) Saturated fatty acids contain only single bonds, while unsaturated fatty acids contain one or more double bonds.
c) Both saturated and unsaturated fatty acids contain only single bonds.
d) Both contain multiple double bonds.

(xiii) Recall the molecule that carries amino groups for the synthesis of urea:
a) Alanine
b) Glutamine
c) Aspartate
d) Glutamate

(xiv) Determine the effect of excessive protein intake on the urea cycle:
a) No change, as the urea cycle only functions during fasting.
b) Increased protein intake leads to greater ammonia production, thus increasing urea cycle activity to detoxify excess ammonia.
c) Excess protein intake stops the urea cycle, causing a buildup of amino acids.
d) Increased protein intake leads to a reduction in urea production.

(xv) Identify the molecule that enters the urea cycle from the mitochondria:
a) Aspartate
b) Citrulline
c) Arginine
d) Ornithine

Group-B
(Short Answer Type Questions) 3 x 5=15

2. Describe gluconeogenesis and the methods used to process gluconeogenesis in our body. (3)
3. Illustrate the structure of ATP. (3)
4. Determine two glucogenic amino acids and explain the reason it is called so. (3)
5. Describe the term isoenzyme. (3)
6. Differentiate between competitive and non-competitive inhibition. (3)

OR

Evaulate the importance of Km. (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Write down rate-limiting steps of glycolysis with structure. (5)
8. Calculate the net energy production in glycolysis. (5)
9. Write the note on fatty acid synthase. (5)
10. Explain ketone body synthesis with reactions. (5)
11. Classify enzyme inhibition with the explanation. (5)
12. Evaluate the factors affecting fatty acid synthesis

OR

Evaluate the net energy production from one unit of propionyl CoA. (5)

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