00068

The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc. Degree Programme

Department	**: Chemistry**
Level	**: 5**
Name of the Examination	: Final Examination
Course Title and - Code	**: Biochemistry - CYU5306**
Academic Year	**: 2024/2025**
Date	**: 18/05/2025**
Time	**: 1.30 pm – 3.30 pm**
Duration	**: 2 hours**

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **FOUR** questions in **Five** pages.
3. Answer **All** questions only. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. Draw fully labelled diagrams where necessary
6. Involvement in any activity that is considered as an exam offense will lead to punishment
7. Use blue or black ink to answer the questions.
8. Clearly state your index number in your answer script

1. Answer any **Two (2)** parts from **A-C**.

A) i) What is the main function of the citric acid cycle?

ii) Write down two chemical equations in the citric acid cycle in which CO_2 is produced.

(Hint- chemical structures of the compounds are not necessary)

iii) What are the two regulatory steps of the citric acid cycle?

iv) Briefly describe the fate of acetyl CoA in the citric acid cycle.

(50 marks)

B) i) What do you mean by catabolism and anabolism?

ii) Name two anabolic pathways.

iii) Write down two anaplerotic reactions of the citric acid cycle.

iv) Using a diagram, briefly explain the glycerol-3-phosphate shuttle operated in the cell to transport NADH released from glycolysis in the cytosol to mitochondria.

(50 marks)

C) i)What do you mean by photolysis?

ii)What is the function of the Rubisco enzyme?

iii)What are the two photosystems found in the chloroplast? Write down two events that take place during photosynthesis.

iv) Write down four (4) main features of the Calvin cycle.

(50 marks)

2. A) i) Using a suitable diagram, briefly explain the induced fit model of enzyme-substrate binding.

ii) Write down five (5) factors that can affect the rate of the enzymatic reaction.

iii) Write down three (3) characteristic features of the active site of an enzyme.

iv) Define the term catalytic capacity.

(50 marks)

B)i) Write down the steady state approximation in chemical kinetics.

ii) Name four (4) characteristics of competitive inhibitors.

iii) Write down the Michaelis - Menton equation (M-M equation) for competitive inhibition and define terms.

iv) What do you mean by isozyme? Give two examples of isozymes.

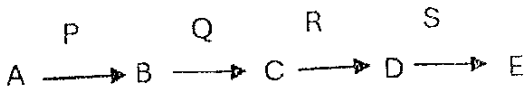
(50 marks)

C) i) Write down three (3) important features of allosteric enzymes.

ii) What is the difference between metalloenzymes and metal-activated enzymes with two (2) examples each?

iii) What do you mean by product inhibition?

iv) Consider the metabolic pathway shown below. A, B, C. D and E are amino acids. P, Q, R and S are the enzymes that are required to synthesize each amino acids. Explain end product inhibition using this metabolic pathway.

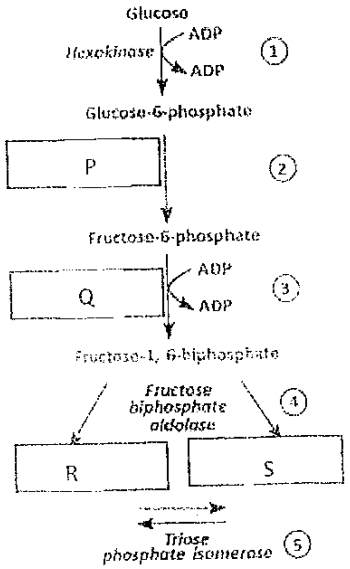


(50 marks)

3. Answer any **Two (2)** parts from **A-C**

A) Glycolysis is an important metabolic pathway in the body. The first five reactions are given below.

i) Name the enzymes (P and Q) and the products (R and S).



ii) Name the above phase in the Glycolysis.

iii) Briefly explain how step 3 is controlled in the liver.

iv) Pyruvate can be metabolized by aerobic oxidation. Briefly explain the aerobic oxidation of pyruvate.

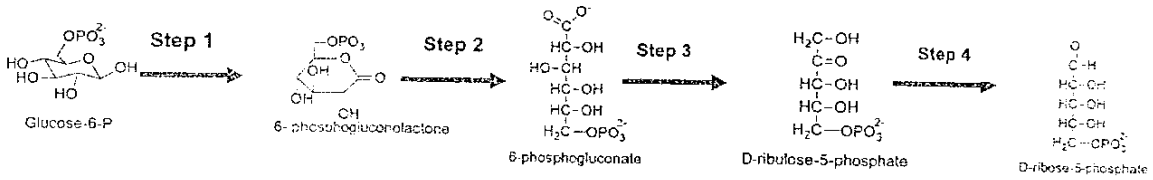
B) i) Explain why glucose is considered a store for energy production rather than fat stores.

ii) Name the two major structural units of starch.

iii) Name the three major enzymes involved in glycogenolysis and describe their uses.

(50 marks)

C) Pentose Phosphate Pathway is a secondary glucose metabolic pathway. The reaction scheme for the oxidative Pentose Phosphate Pathway is given below.



i) Give two purposes of the Pentose Phosphate Pathway.

ii) Name the major cofactor synthesized in the Pentose Phosphate Pathway.

iii) Indicate the step/s synthesizing the cofactor mentioned in 3) ii).

iv) Give the enzyme in step 2.

v) Name the product produced and give the enzyme responsible for step 4 during the non-oxidative pathway.

vi) Explain the mode of operation of the Pentose Phosphate Pathway when the cells require more ATP.

(50 marks)

4. Answer any **Two** (2) parts from **A-C**

A) fatty acid synthesis take place in the cytosol of the cell.

i) Name two reactions that produce AcetylCoA in mitochondria.

ii) Why AcetylCoA cannot be transported directly from mitochondria to the cytosol?

iii) Name three hormones involved in the control of fatty acid synthesis.

iv) Explain the process of chain elongation in palmitic acid (C-16) during fatty acid metabolism.

(50 marks)

B) Nitrogen removal is an essential process in our body.

i) How do ureotelic, ammnotelic, and ureotelic animals differ from each other?

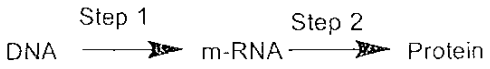
ii) Give an example for each ureotelic, ammnotelic and ureotelic animal.

iii) Briefly explain the transamination process.

iv) Briefly explain two important aminotransferases involved in the transamination reaction and their reactions.

(50 marks)

C) The process of the biosynthesis of proteins under genetic control is shown in the figure below.



i) Identify steps 1 and 2.

ii) Briefly explain the processes at step 1.

iii) Name the three steps of protein synthesis.

iv) Briefly explain the characteristics of the genetic code.

(50 marks)

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