



**UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES**

**DEPARTMENT OF PHARMACY**

**FIRST BPHARM PART II EXAMINATION – JUNE/JULY 2023**

**PH 1232 BIOCHEMISTRY II SEQ PAPER**

**TIME: TWO HOURS**

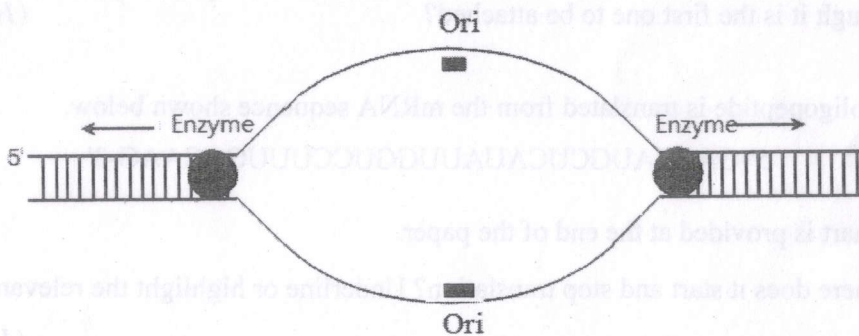
**INSTRUCTIONS**

- There are **four** questions in part A and B in this SEQ paper.
- Answer all the questions.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Use illustrations where necessary.

**PART A**

1.

1.1. The drawing below shows an origin of DNA replication. A double-stranded DNA partially opened up to provide single-stranded regions where replication can occur. Rectangles and solid circles represent RNA primers and enzyme, respectively.



- 1.1.1. In which direction does DNA synthesis usually proceed? Briefly explain your answer. **(10 marks)**
- 1.1.2. In the above diagram, show how the new strands would be synthesized, using arrows (short and long) to represent new DNA being made. Label their 3' and 5' ends correctly. **(25 marks)**
- 1.1.3. Label the leading and lagging strands. **(10 marks)**
- 1.1.4. What is the enzyme represented by the solid circles? **(05 marks)**
- 1.1.5. What is the effect of a drug that blocks the activity of ligase on replication process? **(10 marks)**



1.2. *De novo* synthesis of both purine and pyrimidine nucleotides occurs from readily available precursor molecules.

1.2.1. Draw the structure of PRPP and explain briefly how it is utilized in the *de novo* synthesis of purines and pyrimidines (state only the difference and long synthetic schemes are not expected). (20 marks)

1.2.2. What are the five precursors important for the *de novo* biosynthesis of purine-base nucleotides? (20 marks)

2.

2.1. Answer the following questions pertaining to protein biosynthesis.

2.1.1. Distinguish between codon and anticodon. (10 marks)

2.1.2. What is the difference between a tRNA and a charged tRNA? (10 marks)

2.1.3. Which amino acid always begins the protein synthesis during translation? Give reason for your answer. (10 marks)

2.1.4. Why the amino acid mentioned in 2.1.3 is not present in every protein sequence, though it is the first one to be attached? (10 marks)

2.2. A short oligopeptide is translated from the mRNA sequence shown below.

5'-GACUAUGCUCUAUAUUGGUCCUUUGACAAG-3'

Codon chart is provided at the end of the paper.

2.2.1. Where does it start and stop translation? Underline or highlight the relevant codons. (10 marks)

2.2.2. How many amino acids are encoded? What is the amino acid sequence of the oligopeptide that is transcribed? (Make sure to begin translation from the start codon). (20 marks)

2.2.3. What is unusual about the amino acids that are encoded? (05 marks)

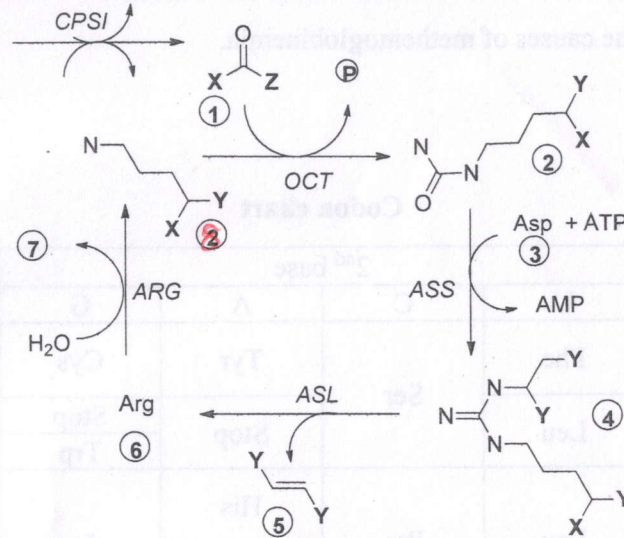
2.2.4. Draw the base sequence of both coding and non-coding strands of the DNA molecule that transcribes this mRNA. Make sure to indicate the correct polarity of each strand. (25 marks)



3.

3.1. Most of the amino acids are catabolized by the process called transdeamination. Explain what is meant by transdeamination. Use alanine as an example. (10 marks)

3.2. An incomplete diagram of the urea cycle is shown below:



3.2.1. What are the cellular locations of the urea cycle reactions? (10 marks)

3.2.2. Draw the complete structures of all intermediates ① - ⑦ in the diagram. (20 marks)

3.2.3. Illustrate how the intermediate ① can be derived from amino acid catabolism. Include all enzymes, structures, intermediates and coenzymes/cofactors. (10 marks)

### PART B

3.3. State the difference between plasma and serum. (15 marks)

3.4. List five functions of plasma proteins. (15 marks)

3.5. Draw and label the common structure of immunoglobulin. (20 marks)

4.

4.1. Briefly describe the structure of hemoglobin molecule. (20 marks)

4.2. List three hemoglobin types found in a normal adult human and state the main differences of the structures. (15 marks)

4.3. Plot the oxygen dissociation curve for hemoglobin and myoglobin. (15 marks)

4.4. List three factors that affect the affinity of hemoglobin for oxygen. (06 marks)

4.5. State how the above factors mentioned in 4.4 affect the oxygen dissociation curve of hemoglobin. (06 marks)

4.6. Briefly explain the biochemical basis of sickle cell anemia. (20 marks)

4.7. Briefly explain the causes of methemoglobinemia. (18 marks)

**Codon chart**

1 <sup>st</sup> base	2 <sup>nd</sup> base				3 <sup>rd</sup> base
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U
	Leu		Stop	Stop Trp	C A G
C	Leu	Pro	His	Arg	U C A G
			Gln		
A	Ile	Thr	Asn	Ser	U C
	Met/Start		Lys	Arg	A G
G	Val	Ala	Asp	Gly	U C A G
			Glu		

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