



UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES

DEPARTMENT OF PHARMACY

FIRST BPHARM PART II EXAMINATION – SEPTEMBER/OCTOBER 2020

PH 1232 BIOCHEMISTRY II (SEQ)

TIME: TWO HOURS

INSTRUCTIONS

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

PART A

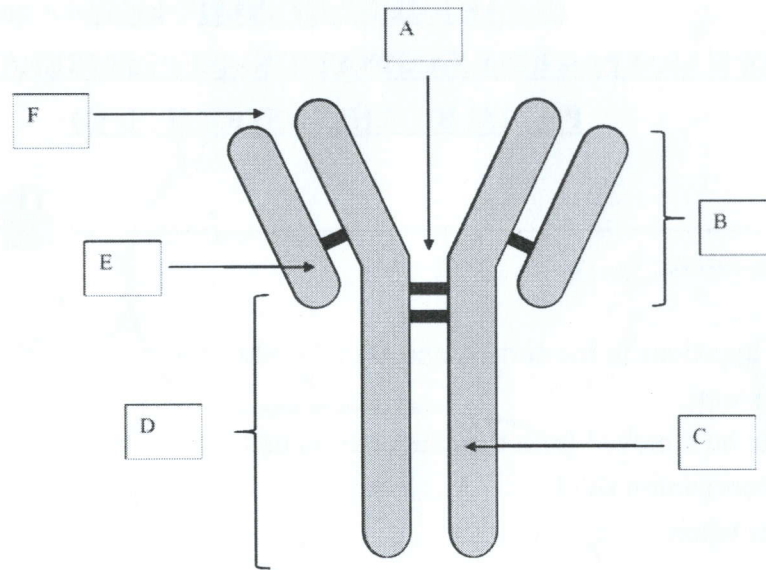
01.

- 1.1 Name the two main components of a hemoglobin molecule. **(05 marks)**
- 1.2 Briefly describe the dominant form of the hemoglobin molecule present in the fetal life. **(15 marks)**
- 1.3 Name three compounds similar to hemoglobin. **(06 marks)**
- 1.4 State the main function of each three compounds you mentioned in 1.3. **(09 marks)**
- 1.5 Briefly describe the oxygenation and deoxygenation of hemoglobin. **(30 marks)**
- 1.6 Explain how the pH of the environment affects the affinity of hemoglobin for oxygen. **(35 marks)**

02.

- 2.1 Write one example each for the following globulins present in plasma. **(08marks)**
 - 2.1.1 Alpha 1 globulin:
 - 2.1.2 Alpha 2 globulin:
 - 2.1.3 Beta globulin:
 - 2.1.4 Gamma globulin:
- 2.2 Briefly describe three major functions of plasma proteins. **(18 marks)**
- 2.3 State the mode of action of haptoglobin. **(10 marks)**

2.4 The structure of the immunoglobulin molecule is shown below.



- 2.4.1 Name the parts A to F. **(12 marks)**
- 2.4.2 What are the functions of A, D and B? **(12 marks)**
- 2.5 What is meant by paraproteinemia.? **(05 marks)**
- 2.6 State the importance of carrying out serum electrophoresis, instead of plasma electrophoresis when paraproteinemia is suspected. **(15 marks)**
- 2.7 Briefly explain the basis of electrophoresis technique in the separation of plasma proteins. **(20 marks)**

03. Sickle cell disease is an example for a hemoglobinopathy.

- 3.1 Write two similarities and two differences between hemoglobinopathy and porphyria. **(20 marks)**
- 3.2 Name one hemoglobinopathy other than sickle cell anemia. **(10 marks)**
- 3.3 Briefly explain the formation of sickle shaped red blood cell instead of normal red blood cell. **(20 marks)**

PART B

3.4 Amino acids are not stored in the body. Describe how excess amino acids are processed in the cell. (10 marks)

3.5 The first step of the urea cycle is the formation of carbamoyl phosphate. Answer following questions relevant to this process. (20 marks)

3.5.1 Name the cellular compartment where the above reaction occurs.

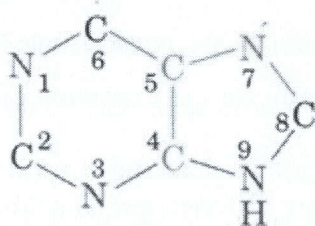
3.5.2 What are the two building blocks of carbamoyl phosphate?

3.5.3 Which enzyme catalyzes the formation of carbamoyl phosphate?

3.5.4 Draw the structure of carbamoyl phosphate.

3.6 Direct sources of purine ring atoms in the *de novo* synthesis of inosine monophosphate (IMP) include: glutamine, aspartate, glycine, tetrahydrofolate one-carbon derivative, and carbon dioxide.

Indicate the components/molecules that are contributed the nine atoms of the purine ring system (purine skeleton is shown below). (20 marks)



04.

4.1 What is the difference between the lagging strand and the leading strand pertaining to the DNA replication? (10 marks)

4.2 A particular sequence of parent DNA has four purine bases and two pyrimidine bases.

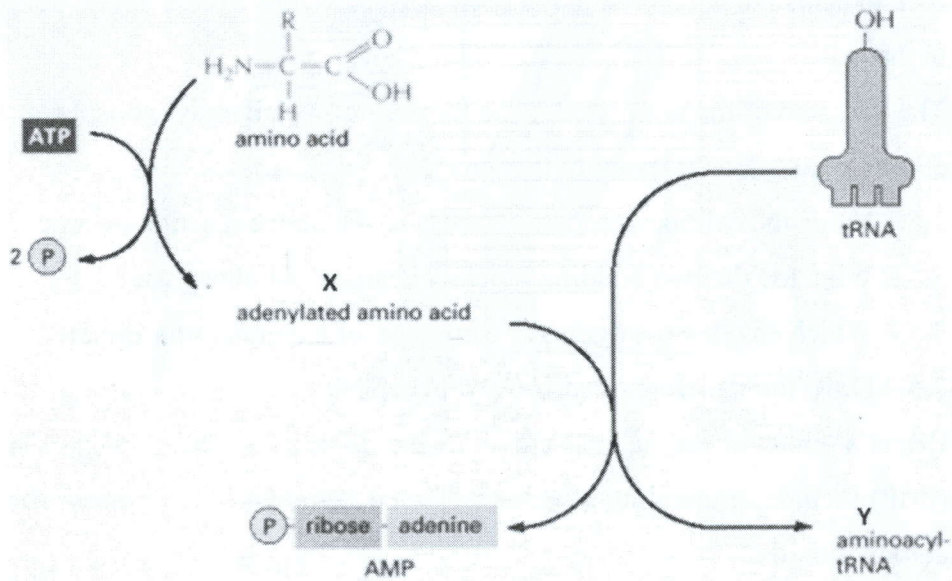
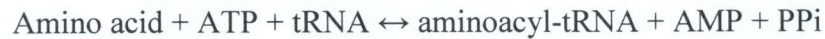
According to base-pairing rules what is the possible sequence formed during replication:

Give reasons for your answer. Represent purine as Pu and pyrimidine as Py (20 marks)

4.3 Explain the difference between transcription and translation in protein biosynthesis.

(10 marks)

4.4 In the protein biosynthesis, aminoacyl-tRNA is produced in two steps as illustrated in the following scheme and the net reaction can be given as:



4.4.1 In the tRNA molecule show the site of amino acid attachment and the point of attachment to mRNA.

4.4.2 What are the three bases found at 3' end of tRNA?

4.4.3 Draw the missing structures of the intermediate (X) and the product (Y).

4.4.4 Give a plausible mechanism for the formation of Y. (40 marks)

4.5 The messenger RNA codes for six different amino acids are shown in the table below:

RNA code	Amino Acid
CGU, CGC, CGA, CGG	Arginine
UGU, UGC	Cysteine
GAA, GAG	Glutamic acid
CUU, CUC, CUA, CUG	Leucine
AGU, AGC	Serine
GUU, GUC, GUA, GUG	Valine

In a mutated gene for hemoglobin, the normal CTC in the DNA code has been replaced by CAC. What amino acid substitution would take place in the mutated hemoglobin?

(20 marks)

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