



NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY

**FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES**  
**SCHOOL OF HEALTH SCIENCES**  
**DEPARTMENT OF CLINICAL HEALTH SCIENCES**

<b>QUALIFICATION : BACHELOR OF MEDICAL LABORATORY SCIENCES</b>	
<b>QUALIFICATION CODE: 8BMLS</b>	<b>LEVEL: 7</b>
<b>COURSE CODE: HAM611S</b>	<b>COURSE NAME: HAEMATOLOGY 2A</b>
<b>SESSION: JUNE 23</b>	<b>PAPER: THEORY</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 102</b>

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	<b>MRS EDWIG HAUWANGA</b>
<b>MODERATOR:</b>	<b>DR ELZABE VAN DER COLF</b>

<b>INSTRUCTIONS</b>
<ol style="list-style-type: none"><li>1. Answer ALL the questions.</li><li>2. Write clearly and neatly.</li><li>3. Number the answers clearly.</li></ol>

**PERMISSIBLE MATERIALS**

1. N/A

**THIS QUESTION PAPER CONSISTS OF 7 PAGES (Including this front page)**

## SECTION A (20 MARKS)

### QUESTION 1

[10]

Evaluate the statements in each numbered section and select the most appropriate answer or phrase from the given possibilities. Write the appropriate letter next to the number of the statement/phrase on your answer sheet.

1.1 The following cells all stem from the myeloid progenitor except: (1)

- A) Neutrophils
- B) Lymphocytes
- C) Platelets
- D) Megakaryocytes

1.2 Cytokine (growth factors) are secreted from which part of the bone marrow? (1)

- A) Adipose tissue
- B) Microvascular network
- C) Stroma
- D) Fibroblast

1.3 A small organelle in an immature blood cell (blasts) contains protein and RNA and is the site for the synthesis of ribosomal RNA: (1)

- A) Nucleoli
- B) Nucleus
- C) Chromatin
- D) Cytoplasm

1.4 A cell that is 10 -15  $\mu\text{m}$  diameter with a nucleus comprising of 25% of the cell with a pyknotic nucleus best describes the... (1)

- A) Mature red cell
- B) Reticulocyte
- C) Nucleated Red Blood Cell
- D) Early erythroblast

1.5 Identify the haemoglobin molecule consisting of 2 alpha chains and 2 epsilon chains: (1)

- A) Foetal HB
- B) Embryonic
- C) Barts Haemoglobin
- D) Sickle Haemoglobin

1.6 Identify the enzyme responsible for completion of protoporphyrin ring by

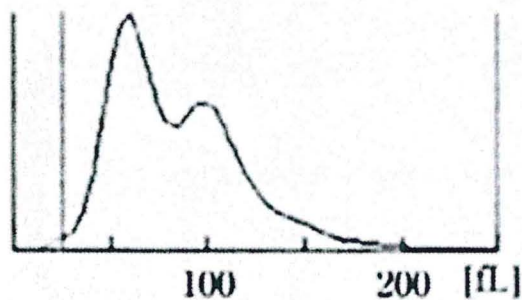
addition of iron:

(1)

- A) Ferrochelatase
- B) ALA synthase
- C) G6PD
- D) Pyruvate Kinase

1.7 Using the histogram below, predict the most likely RBC morphology.

(1)



- A) Normocytic
- B) Microcytic
- C) Normocytic and Microcytic
- D) Macrocytic

1.8 A high ESR results is consistent with which red cell morphology?

(1)

- A) Crenated Red Cells
- B) Fibrin clots
- C) Agglutination
- D) Rouleaux formation

1.9 Which of the following morphologies is indicative of depleted ATP in a red cells?

(1)

- A) Spherocyte
- B) Acanthocyte
- C) Heinz Body
- D) Target cell

1.10 Identify the type of anaemia that is classified under decreased production.

(1)

- A) Megaloblastic
- B) Aplastic
- C) Iron deficiency
- D) All of the above

**QUESTION 2**

**[10]**

For each of the following phrases, suggest the appropriate technical/scientific term:

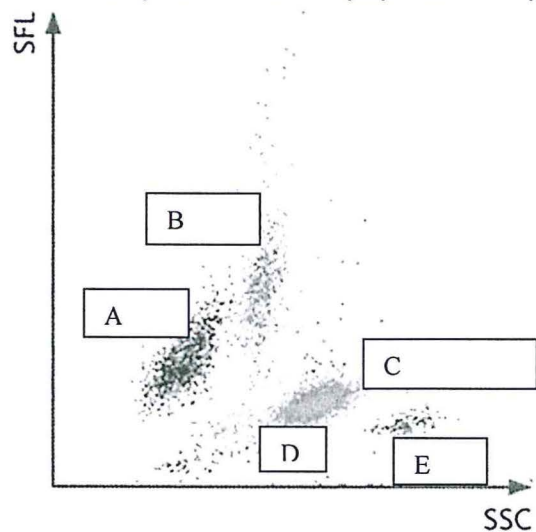
- 2.1 Increased rate of red cell destruction. (1)
- 2.2 Stains used to stain reticulocytes. (1)
- 2.3 90% of erythropoietin is produced in the: (1)
- 2.4 .....is responsible for passive transport of ions and gases and active transport of cations in a red cell. (1)
- 2.5 The amino acid that replaces glutamic acid on 6<sup>th</sup> position in sickle cell disease (1)
- 2.6 Haemolytic anaemia due to cells are fragmented by fibrin in the vessels or defective heart valve. (1)
- 2.7 Haemoglobin with all four alpha chains missing/deleted.
- 2.8 The negative charge between red cells (1)
- 2.9 Transporter of Vitamin B12 from gastric intestinal tract to the bone marrow and other tissues. (1)
- 2.10 Disorder whereby there is a lack of haemoglobin beta chains resulting in excess alpha chains. (1)

## SECTION B (44 MARKS)

### QUESTION 3

[22]

3.1 Identify the white cell populations by labelling the following white cell scatter plot. (5)



3.2 Explain how the scatter plot is generated. (5)

3.3 For each of the following anticoagulants used in the haematology laboratory, explain the mode of action, and mention at least one test they are indicated for. (6)

3.3.1. EDTA

3.3.2. Sodium Chloride

3.3.3. Lithium Heparin

3.3 State three each reason for falsely decreased and falsely increased platelet values. (6)

## QUESTION 4

[22]

- 4.1 Briefly explain the mechanisms of the following red cell morphologies by completing the table. (10)

Number	RBC Morphology	*Cause or mechanism responsible
4.1.1	Rouleaux formation	
4.1.2	Heinz Bodies	
4.1.3	Basophilic stippling	
4.1.4	Howell-Jolly Bodies	
4.1.5	Hypochromia	
4.1.6	Target cells	
4.1.7	Microcytes	
4.1.8	Red cell agglutination	
4.1.9	Polychromasia	
4.1.10	Schistocytes	

- 4.2 Explain how red cell indices are used in the classification anaemias? (8)
- 4.3 How is the bone marrow's effectiveness in responding to the anaemic state assessed in the haematology department? (4)

## SECTION C (38 MARKS)

### QUESTION 5

[20]

A 48-year-old man reports that he is becoming progressively fatigued at the end of each day. This has been going on for the past 6 months. In the past month he has noted tingling with numbness in his hands and feet. He admitted to having gastric issues in the past which were resolved by a surgery. On physical examination he has decreased vibration and position sensation in both hands and feet. Laboratory studies include a full blood count (FBC) with peripheral blood smear. His FBC results were as follows: ***Hgb is 9.6 g/dL, Hct 31.6%, MCV 123, platelet count 498, and WBC count  $12 \times 10^{12}/L$ .***

- 4.1 Describe the expected findings on the peripheral blood smear? (5)
- 4.2 What is the most likely diagnosis and underlying cause? Explain your answer. (5)

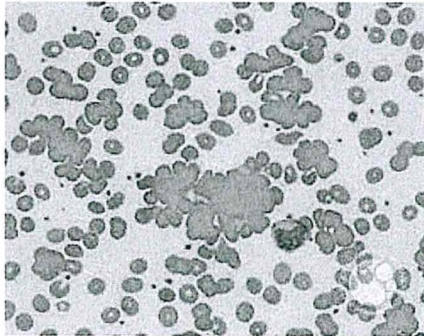
4.3 The treating doctor orders a bone marrow aspirate for further investigation. Discuss (4)  
the expected findings in this patient.

4.4 Mention three (3) other non-haematological tests that can help confirm the (6)  
diagnosis and the expected results for each.

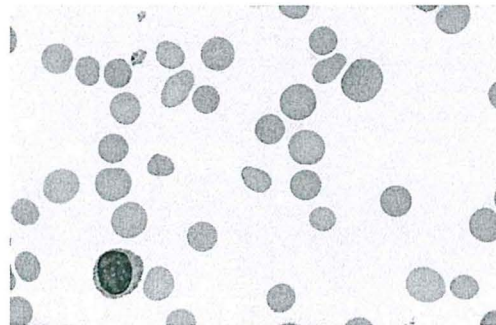
**QUESTION 6**

**[18]**

The following blood pictures are from patients with haemolytic anaemia. Answer the questions that follows (Print in colour).



**Image A**



**Image B**

(4)

6.1 Diagnose the anaemias and state whether they are acquired or inherited. (5)

6.2 Explain the mechanism of haemolysis by which the morphology in Image B occurs. (4)

6.3 Suggest confirmatory tests for each of the anaemias above and expected results. (5)

6.4 Identify five (5) common laboratory findings in haemolytic anaemias.

**(TOTAL 100 MARKS)**