

**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF HEALTH SCIENCES

QUALIFICATION : MEDICAL LABORATORY SCIENCES	
QUALIFICATION CODE: 08BMLS	LEVEL: 6
COURSE CODE: HAM611S	COURSE NAME: HAEMATOLOGY 2A
SESSION: JUNE 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS
<ol style="list-style-type: none">1. Answer ALL the questions.2. Write clearly and neatly.3. Number the answers clearly.

PERMISSIBLE MATERIALS

1. Necessary stationery
2. Non-programmable Calculator

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

SECTION A (30 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.

- 1.1 The first haematopoietic cells are observed in the... (1)
- A) Egg yolk sac
 - B) Aorta Gonads Mesonephros
 - C) Liver
 - D) Bone Marrow
- 1.2 Which of the following bones will contain more red marrow in an adult? (1)
- A) Skull
 - B) Sternum
 - C) Spine
 - D) Rib cage
- 1.3 Describe a normoblast. (1)
- A) 14-25um big, with 1:8 N:C ratio, 1-2 nucleoli, deep blue cytoplasm
 - B) 12-17um, 75% nucleus, 1-2 nucleoli, blue cytoplasm with reddish tint
 - C) 10-15um, 25-50% nucleus, no nucleoli, nucleus eccentric location, blue grey cytoplasm
 - D) 10-15um, 25% nucleus, pyknotic nucleus, blue-grey nucleus
- 1.4 Ineffective erythropoiesis is characterized by: (1)
- A) Increased reticulocytes with decreased bilirubin
 - B) Increased reticulocytes with increased bilirubin
 - C) Decreased reticulocytes with increased bilirubin
 - D) Decreased reticulocytes with decreased bilirubin
- 1.5 Identify the enzyme that is key for the haemoglobin synthesis (1)
- A) Lactate dehydrogenase
 - B) Pyruvate Kinase
 - C) G6PD
 - D) δ -aminolaevulinic acid synthase

- 1.6 A Haemoglobin molecule which has four gamma chains is known as: (1)
- A) Bart's Haemoglobin
 - B) Haemoglobin S
 - C) Adult Haemoglobin 2
 - D) Haemoglobin C
- 1.7 How long does a reticulocyte take to mature into a mature erythrocyte? (1)
- A) 23 days
 - B) 2-3 days
 - C) 1 day
 - D) 120 days
- 1.8 Which of the following reticulocyte parameters gives us an idea of bone marrow compensation in anaemic states? (1)
- A) Relative count
 - B) Corrected Count
 - C) Reticulocyte Production Index
 - D) Absolute count
- 1.9 You counted 5 retics in 5 fields with a total of 500 red cells. Calculated the relative reticulocyte count. (1)
- A) 1%
 - B) 10%
 - C) 5%
 - D) 50%
- 1.10 Identify the abnormality consistent with microangiopathic haemolytic anaemia. (1)
- A) Spherocyte
 - B) Sickle cell
 - C) Burr cell
 - D) Schistocyte

QUESTION 2

[10]

Assess the following statements and decide whether they are true or false. Write only the number of the question and TRUE for a true statement or FALSE for a false statement next to the number of the question.

- 2.1 Haemoglobin A2 contains of 2 alpha chains and 2 gamma chains. (1)
- 2.2 Haemopoiesis in an adult is mainly extramedullary. (1)
- 2.3 CFU-GEMM is a mixed progenitor that gives rise to all blood cells (erythrocytes, granulocytes, megakaryocytes and monocytes) except the lymphocytes. (1)
- 2.4 It is normal for people living on higher altitudes like the Himalayas to have a high red cell reference range than those on lower altitudes. (1)
- 2.5 Oxidizing drugs can increase methaemoglobin levels. (1)
- 2.6 Schistocytes are formed when there is an increased lipid red cell membrane content. (1)
- 2.7 HB electrophoresis is based on the fact that the haem ring carries a different distribution of electrical charges in buffered solutions. (1)
- 2.8 Bone marrow examinations are routinely performed in the haematology department. (1)
- 2.9 A sickle cell patient with low Reticulocyte production index may be going through an aplastic crisis. (1)
- 2.10 When blood is kept at 4°C the effects on the blood count are usually insignificant for up to 24 hours. (1)

QUESTION 3

[10]

For each of the following phrases, suggest the appropriate technical term

- 3.1 Red cell production. (1)
- 3.2 Process by which nucleus is expelled from a normoblast as it matures into a reticulocyte. (1)
- 3.3 10-15% of developing erythroblasts are destroyed within the bone marrow despite sufficient production. (1)

- 3.4 A drop of blood spread on glass slide and stained for morphological examination of cells. (1)
- 3.5 A lack of this membrane protein leads to spherocyte formation. (1)
- 3.6 A group of diseases characterized by abnormalities, both quantitative and qualitative in the synthesis of haemoglobin. (1)
- 3.7 Needle biopsy of bone marrow, usually from the iliac crest, in which either blood without clots or no material at all is obtained. (1)
- 3.8 Painful episodes that sickle cell anaemia patients go through. (1)
- 3.9 Anticoagulant used for coagulation samples. (1)
- 3.10 The statistical process used to monitor and evaluate the analytical process that produces patient results. (1)

SECTION B (31 MARKS)

QUESTION 4

[16]

4.0 Evaluate the following Full Blood Count results and answer the following questions:

Parameters	Units	Reference ranges
WBC	5.2x10 ⁹ /L	4-11 x10 ⁹ /L
RBC	4.2... (4.1.1)	4.4-6
HCT	43.4... (4.1.2)	(4.2.1)
MCV	79... (4.1.3)	(4.2.2)
MCH	26... (4.1.4)	(4.2.3)
MCHC	32.5... (4.1.5)	(4.2.4)
PLT	450x10 ⁹ /L	140-450x10 ⁹ /L
RDW-CV	18.1...(4.1.6)	14-18

- 4.1 Complete the table by filling in the missing units. (6)
- 4.2 Complete the table by filling in the missing reference ranges. (4)
- 4.3 Use the appropriate patient results from the above table to sketch the red cell histogram. (4)
- 4.4 Predict the red cell morphology. (2)

QUESTION 5

[15]

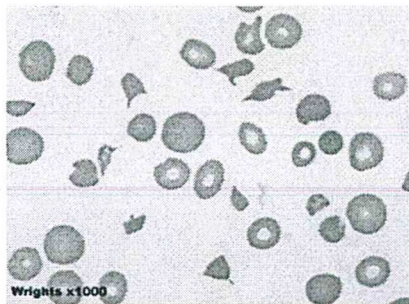
- 5.0 As the site of haemopoiesis, the bone marrow can be very valuable in the diagnosis of haematological disorders.
- 5.1 By means of a flow diagram, illustrate the circulation of blood from and to the bone marrow. (7)
- 5.2 Aplastic anaemia is a form of anaemia affecting the bone marrow where all cell lines are reduced. With examples, state the major classification of aplastic anaemia. (6)
- 5.3 What is the most likely bone marrow sample to be obtained in a patient with aplastic anaemia and why? (2)

SECTION C (39 MARKS)

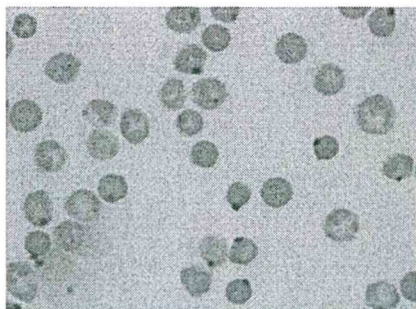
QUESTION 6

[20]

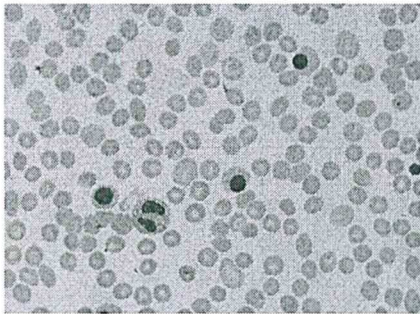
- 6.1 For each of the following cases, suggest a diagnosis and briefly narrate the likely pathogenesis.
 - 6.1.1 A patient diagnosed with Disseminated Intravascular Coagulation with the following blood picture. (6)



- 6.1.2 A patient with low levels of the enzyme G-6PD and the following blood picture with supravital stains. (6)



- 6.1.3 A new born baby who is Rhesus Positive whose mother is Rhesus negative with the following blood picture. (6)



- 6.2 What is the collective term for the above (6.1.1-6.1.3) disorders? (2)

QUESTION 7 [19]

A young pregnant lady presented with mild anaemia. This is her 3rd pregnancy with one of the pregnancies being unsuccessful due to spontaneous abortion. The mother and the father are first cousins. Induction of labour was performed, and the baby was born prematurely at 31 weeks. The baby was born with respiratory distress, enlarged abdomen due to hepatosplenomegaly and ascites (typical features of hydrops fetalis). The baby's blood tests revealed the following: HB of 6.4, negative coombs test and an HB electrophoresis with high levels of Bart's Haemoglobin. Sadly, the baby died shortly.

- 7.1 Predict diagnosis. (2)
- 7.2 What is Bart's Haemoglobin? (3)
- 7.3 Describe the pathogenesis of this disorder (10)
- 7.4 Could the parents of the baby be carriers of this disorder? Give supporting evidence from the case study. (4)

(TOTAL 100 MARKS)