



**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS  
2019/2020 ACADEMIC YEAR**

**SECOND YEAR FIRST SEMESTER EXAMINATIONS**

**FOR THE DEGREE  
OF  
BACHELOR OF MEDICAL LABORATORY SCIENCES  
DIRECT ENTRY/UPGRADING**

**MAIN EXAM**

**COURSE CODE: BML 213**

**COURSE TITLE: FOUNDATIONS OF HEMATOLOGY**

**DATE:**

**TIME:**

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**INSTRUCTIONS TO CANDIDATES**

This paper is divided into three sections, **A B** and **C**, carrying respectively: Multiple Choice Questions (**MCQs**), Short Answer Questions (**SAQs**) and Long Answer Questions (**LAQs**).

TIME: 3 Hours

MMUST observes ZERO tolerance to examination cheating

## SECTION A

### ANSWER ALL QUESTIONS (20 MARKS)

1. Alterations in the formed elements in the blood are usually
  - A. the primary cause of disease
  - B. deviations of plasma constituents from the normal values,
  - C. a result of disease
  - D. proliferation, differentiation and maturation of formed elements
2. The space occupied by the packed red blood cells is referred to as
  - A. mean corpuscular volume
  - B. hematocrit
  - C. mean cell volume
  - D. microhematocrit
3. When anticoagulated whole blood is centrifuged, the buffy coat is made up of
  - A. plasma and plasma proteins
  - B. platelets and plasma
  - C. leukocytes and serum
  - D. platelets and leukocytes
4. The following are advantages of Red blood cell Distribution Width except
  - A. Diagnostic marker of hyperchromasia
  - B. Assist in differential diagnosis
  - C. Following the course of disease
  - D. Recognize RBC abnormality from complete blood count
5. Which of the following blood cells is a Polymorphonucleus cell
  - A. Natural killer cell
  - B. Lymphocyte
  - C. Basophil
  - D. Monocyte
6. Identify the condition associated with neutrophilia
  - A. Bacterial infection
  - B. Parasitic infection

- C. Fungal infection
  - D. Allergic reaction
7. The following cells have nuclei except
- A. Proerythroblast and erythrocyte
  - B. Orthochromatic erythrocyte and platelet
  - C. Platelet and erythrocyte
  - D. Megakaryocyte and basophilic erythroblast
8. Which of the following is essential for erythropoiesis
- A. Folic acid and Iron
  - B. All
  - C. Vitamin B<sub>12</sub>
  - D. Erythropoietin
9. Identify the statement that false describe reticulocytes
- A. This is the remnant of the basophilic cytoplasm, comprising RNA.
  - B. In the Neonates, Count is 2 – 6/Cu.mm.
  - C. Rises to >1 in the first week of life.
  - D. Reticulocytosis is the first change seen in patients treated with Vit B<sub>12</sub>
10. There are three phases of Hematopoietic Tissue Development, which one is not
- A. Mesoblastic phase
  - B. Hepatic phase
  - C. Medullary phase
  - D. Mesocytic phase
11. Which of the following cell matures in the thymus just before release to the circulatory system
- A. B-lymphocyte
  - B. T-lymphocyte
  - C. Plasma Cell
  - D. Dendritic cell
12. The first recognizable cell in each cell line is the
- A. Cytoplasmic characteristic
  - B. Nuclear characteristic

- C. Blast
  - D. Nucleoli
13. Normal maturation of cells is characterized by development of the nucleus and the cytoplasm in a precise fashion, which statement is TRUE about synchronism
- A. Nucleus and cytoplasm develop at the same rate
  - B. Nucleus and cytoplasm develop at different rates
  - C. Nucleus and cytoplasm do not develop at all
  - D. Nucleus and cytoplasm degrade after development
14. Which of the following statement is true
- A. DNA - key to division, nucleus
  - B. RNA - key to maturation, nucleus
  - C. Protein-key to division, nucleus
  - D. DNA - key to maturation, cytoplasm
15. The following are changes in red blood cell due to aging except
- A. Glycosylated hemoglobin increase
  - B. Membrane sialic acid increase
  - C. Pyruvate dehydrogenase enzymes decrease
  - D. General cell density increase
16. The haemopoietic growth factors are glycoprotein hormones that
- A. regulate the proliferation and differentiation of haemopoietic progenitor cells
  - B. are of common origin
  - C. promote apoptosis
  - D. of similar specificities
17. which of the following hematopoietic cytokine targets Colony forming unit megakaryocyte
- A. thrombopoietin
  - B. fibroblastic growth factor
  - C. interleukin-11
  - D. c-Kit ligand
18. Richard Lewisohn discovered how sodium citrate can be used to store blood in
- A. 1990
  - B. 1936

- C. 1961  
D. 1914
19. The normal value of MCHC in n anticoagulated blood is
- A. 32~36 %  
B. 30~36 %  
C. 32~46 %  
D. 32~49 %
20. Bite cells are associated with
- A. G6PD deficiency  
B. Thalassemia, lead toxicity  
C. Malaria, babesiosis  
D. Iron deficiency

## SECTION B: SHORT ANSWER QUESTIONS (40MARKS)

### ANSWER ALL QUESTIONS

1. Match the following scientists with their contribution to advances of hematology (5marks)

<b>Karl Landsteiner</b>	Defined the different blood groups: A, B, AB, and O
<b>Reuben Ottenberg</b>	Conducted transfusions and identified the universality of type O blood
<b>James Blundell</b>	Successfully completed the first recorded blood transfusion between humans
<b>William Hewson</b>	Introduced the clotting features of blood
<b>Anthony van Leeuwenhoek</b>	Built a microscope and identified blood cells

2. Briefly define and describe the importance of hematology in health care (5marks)
3. Describe the organization and structure of haemopoietic system (5marks)
4. Define haematopoiesis and distinguish between medullary and extramedullary haematopoiesis ( 5marks)
5. List the major characteristics of hematopoietic stem cells (5marks)
6. With an aid of a diagram, describe the process of haematopoiesis (10marks)
7. Briefly explain any five methods of estimating blood hemoglobin concentration (5marks)

## **SECTION C: LONG ANSWER QUESTIONS (60MARKS)**

### **ANSWER ALL THE QUESTIONS IN THIS SECTION**

1. Discuss blood under the following subtopics; composition, functions, morphologic characteristics and normal ranges (20marks)
2. (I) Red Blood Cells contain no mitochondria, hence, no respiratory chain, no citric acid cycle, and no oxidation of fatty acids or ketone bodies. Energy in the form of ATP is obtained ONLY from the glycolytic breakdown of glucose. Discuss glycolytic breakdown of glucose by red blood cells (10marks)  
(II) Describe the structure and composition of the red blood cell cytoskeleton (10marks)
3. (I) Distinguish between biosafety and biosecurity (4marks)  
(II) Discuss Quality assurance in hematology (16marks)