



**KISII UNIVERSITY**  
**UNIVERSITY EXAMINATIONS**

**SECOND YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF  
BACHELOR OF SCIENCE IN MEDICAL LABORATORY SCIENCES  
FIRST SEMESTER, 2021/2022  
(FEBRUARY - JUNE, 2022)**

**MELS 241: BASIC HAEMATOLOGY**

**STREAM: Y2 S1**

**TIME: 3 HOURS**

**DAY: THURSDAY, 9:00 – 12:00 P.M.**

**DATE: 12/05/2022**

**INSTRUCTIONS:**

- 1. Do not write anything on this question paper.***
- 2. Answer ALL the questions in section A and B (Compulsory) in section C, answer question ONE (Compulsory) and any other question.***

**SECTION A (ANSWER ALL QUESTIONS)-20 MARKS**

1. What is a significant morphological difference between irreversibly sickled cells and reversible sickled cells?
  - A. Puddled haemoglobin
  - B. Crystal formation central to sickle cell
  - C. Pointed projections to the sickle cell
  - D. Fragmentation of the red cell membrane
2. What are two integral proteins in the red blood cell structure that house red cell antigens?
  - A. Glycoproteins and glycolipids
  - B. Glycophorin A and glycophorin B
  - C. Cholesterol and spectrin
  - D. Sodium and Potassium
3. Which of these haemoglobins is an embryonic haemoglobin?
  - A. Haemoglobin A
  - B. Haemoglobin Gower
  - C. Haemoglobin F
  - D. Haemoglobin A2
4. When the iron in the haemoglobin molecule is in the ferric ( $Fe^{3+}$ ) state, haemoglobin is termed?
  - A. Carboxyhaemoglobin
  - B. Methaemoglobin

- C. Ferrihaemoglobin
  - D. Sulfhaemoglobin
5. Which of the following statements regarding 2,3-DPG is correct?
    - A. It catalyzes porphyrin synthesis
    - B. It controls haemoglobin affinity for oxygen
    - C. It prevents oxidative penetration of haemoglobin
    - D. It converts methaemoglobin to oxyhaemoglobin
  6. Vasoconstriction is caused by several regulatory molecules, which include?
    - A. Fibrinogen and vWF
    - B. ADP and EPI
    - C. Thromboxane A<sub>2</sub> and serotonin
    - D. Collagen and actomyosin
  7. The life span of a platelet is?
    - A. 5 to 8 days
    - B. 7 to 10 days
    - C. 6 to 9 days
    - D. 9 to 12 days
  8. In Leishman staining procedure, after the undiluted stain is added to the entire upper surface of the smear, waiting for 2 minutes before pouring buffered water is?
    - A. For staining of smear
    - B. To clean the background
    - C. For smear to stain uniformly
    - D. For fixation of smear.
  9. The feature typical of non-megaloblastic type of macrocytic anaemia is?
    - A. Macro-ovalocyte
    - B. Round macrocyte
    - C. Howell-Jolly bodies
    - D. Hypersegmented neutrophil
  10. Bite cells are seen in?
    - A. Paroxysmal nocturnal haemoglobinuria
    - B. G6PD deficiency
    - C. Microangiopathic haemolytic anaemia
    - D. Haemolytic disease of newborn
  11. Shrunken red cells with pointed projections over cell surfaces are called as?
    - A. Sickle cells
    - B. Echinocytes
    - C. Acanthocytes
    - D. Schistocytes
  12. Howell-Jolly bodies are seen in?
    - A. Tuberculosis
    - B. Septicaemia
    - C. Megaloblastic Anaemia
    - D. Haemophilia
  13. What does heparin inhibit?
    - A. The conversion of prothrombin to thrombin

- B. The conversion of fibrinogen to fibrin
  - C. Both of these
  - D. None of these.
14. Anticoagulant of choice for ESR by Wintrobe's method is?
- A. Trisodium Citrate in 1:4 ratio
  - B. EDTA
  - C. Heparin
  - D. Warfarin
15. Standard precautions in a haematology laboratory involve?
- A. Behavior that prevents contact with virally infected patients
  - B. Behavior that prevents direct contact with bodily fluids or contaminated surfaces
  - C. Behavior that prevents contact with pediatric patients
  - D. Behavior that prevents contact with terminally ill patients
16. Which chemical substance are responsible for differentiation and replication of the pluripotent stem cell?
- A. Cytokines
  - B. Insulin
  - C. Thyroxin
  - D. Oxygen
17. What is the most stable parameter of the complete blood count?
- A. White blood cell count
  - B. Mean corpuscular volume
  - C. Red cell distribution width
  - D. Platelet count
18. Why are RBCs unable to synthesize proteins, grow or divide?
- A. Because they are fragile
  - B. Because they are anucleate
  - C. Because they are too small
  - D. Because they are flexible
19. Hypochromia is used to define
- A. Color change in the red cell.
  - B. Variation in shape of the red cell
  - C. Variation in size of the red cell
  - D. Decrease in haemoglobin content of the red cell.
20. All of the following are characteristic of the red cell in stage of development *except*?
- A. Nuclei are "baseball" round
  - B. Immature cells are larger
  - C. N:C ration decreases as the cell mature
  - D. Distinct granulation in the cytoplasm

**SECTION B-STRUCTURED QUESTIONS (ANSWER ALL QUESTIONS)-20**

**MARKS**

1. Differentiate between CFUs and stem cells [4 marks]
2. Discuss Tri-sodium citrate anticoagulant [4 marks]

3. Explain osmotic fragility test [4 marks]
4. List the common causes of poor peripheral blood film [4 marks]
5. Define Romanowsky and explain the precautions in Staining peripheral blood film [4 marks]

**SECTION C (QUESTION ONE IS COMPULSORY THEN CHOOSE ANY OTHER**

**QUESTION ONE (15MKS)**

A 50-year-old woman was referred to a haematologist. At present, her WBC was  $2.5 \times 10^9/L$ ; RBC,  $3.0 \times 10^{12}/L$ ; Hct, 30%; platelet count,  $40 \times 10^9/L$ ; MCV, 68fL; MCH, 26pg; and MCHC, 36.5%. She has been experiencing shortness of breath and fatigue for the past 3 weeks, and lately these symptoms had gotten worse. Her family history was unremarkable, but she explained that she had had excessive menstrual bleeding for the past 4 months.

- i. From the CBC parameters provided calculate the haemoglobin level of the patient.
- ii. What is the picture of the CBC findings the patient is presenting with?
- iii. What is the most likely diagnosis?
- iv. What are other diagnostic possibilities?
- v. Does the CBC readings provided meet the rule of three? Elaborate.

**QUESTION TWO (15MKS)**

With an aid of a diagram discuss haemopoiesis and explain the functions of the following factors:

- i. Stem cell factor
- ii. Erythropoietin
- iii. Thrombopoietin
- iv. Tumour necrosis factor

**QUESTION THREE (15MKS)**

Explain the Leishman staining procedure and give the key morphological differentiation between mononuclear and polymorphonuclear leucocytes.