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University Examinations 2024/2025

SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF MEDICAL LABORATORY SCIENCES

HML 3218: PRINCIPLES OF HEAMATOLOGY

DATE: JANUARY 2025 **TIME: 3 HOURS**

INSTRUCTIONS:
Answer ***All*** *questions in section* ***A &B.*** *Answer only two question in section* ***C***
Ensure that all your answers are properly numbered
Part I multiple Choice Questions (MCQ): Write the correct answer on the space provided in the answer booklet. Each MCQ is one mark
Part II: Short Answer Questions – Answer questions following each other on the answer booklet
Part III: Long Answer Questions – Answer two question on the answer booklet

SECTION A: MULTIPLE CHOICE QUESTIONS (20 marks)

1. What is the primary function of erythrocytes (red blood cells)?
   a) To phagocytose foreign material
   b) To transport oxygen and carbon dioxide
   c) To produce histamine
   d) To kill infected cells
2. What is the role of eosinophils in the immune system?
   a) Phagocytosis of foreign material and activation of bactericidal mechanisms
   b) Defense against parasites and regulation of immediate hypersensitivity reactions
   c) Killing of virus-infected cells

d) Production of immunoglobulins

3. What is the main site of haemopoiesis during the first 6 weeks of gestation?
   a) Bone marrow
   b) Liver
   c) Spleen
   d) Yolk sac
4. Which of the following cell types is produced along the lymphoid lineage?
   a) Neutrophils
   b) Erythrocytes
   c) B lymphocytes
   d) Megakaryocytes
5. Which progenitor cell is responsible for producing granulocytes, erythrocytes, monocytes, and megakaryocytes?
   a) CFU-L
   b) CFU-GEMM
   c) BFU-E
   d) CFU-Baso
6. Where do lymphoid precursors develop into T cells?
   a) Bone marrow
   b) Thymus
   c) Spleen
   d) Yolk sac
7. Which of the following is NOT part of the non-lymphoid (myeloid) lineage?
   a) Erythrocytes
   b) Basophils
   c) NK cells
   d) Neutrophils

8. Which of the following is TRUE about reticulocytes?
    a) They contain no organelles
    b) They synthesize 50% of total haemoglobin
    c) They mature after 3-5 days in peripheral blood
    d) They account for 1-2% of the red cell count
9. Which of the following is a type of embryonic hemoglobin?
    a) HbA
    b) HbF
    c) Hb Gower 1
    d) HbA2
10. HbF (fetal hemoglobin) is the predominant hemoglobin during which stage of life?
    a) Embryonic life
    b) Fetal life and until about 12 weeks of age
    c) From birth to adulthood
    d) Throughout adult life
11. Which of the following pathways is responsible for glucose metabolism in red blood cells due to the absence of mitochondria?
    a) TCA cycle
    b) Beta-oxidation
    c) Glycolytic pathway (Embden—Meyerhof pathway)
    d) Oxidative phosphorylation
12. What compound is formed when Methaemoglobin combines with the cyanide radical?
    a) Cyanomethaemoglobin (CNHb)
    b) Sulphaemoglobin (SHb)
    c) Carbaminohemoglobin
    d) Hemoglobin Alc
13. Where should a tourniquet be applied during a venipuncture procedure?
    a) On the forearm

b) On the upper arm

c) Around the wrist

d) Around the thigh

14. What is the surgical opening or puncture of a vein to withdraw blood or introduce fluid called?

a) Venipuncture

b) Arteriotomy

c) Phlebotomy

d) Thoracentesis

15. An alternative method to fix a blood film involves:

a) Immersing the blood film in absolute methanol for about 2 minutes

b) Using saline for fixation

c) Air drying the blood film for 10 minutes

d) Spraying the blood film with ethanol

16. What effect do water spots have on a stained blood smear?

a) They improve the visibility of the erythrocytes

b) They wash away the stain

c) They persist through staining and cover items of interest

d) They remove any unwanted artifacts

18. Which of the following conditions is associated with a rapid ESR?

a) Chronic infection, such as tuberculosis

b) Hypertension

c) Asthma

d) Diabetes

19. Which of the following will prolong the prothrombin time?

a) von Willebrand's disease.

b) Haemophilia A.

c) Haemophilia B.

d) Protein C deficiency.

20. A 55-year-old woman undergoes a hysterectomy. During surgery her vena cava is damaged. She proceeds to lose a great deal of blood but the vena cava is eventually repaired. Over the course of the next 24 hours she receives 12 units of crossmatched red cells. She appears much better. The foundation doctor orders some clotting tests and notices that the prothrombin time (PT) and the activated partial thromboplastin time (APTT) are both prolonged. Which blood product should be given?
    a) Albumin.
    b) Fresh frozen plasma.
    c) O negative red cells.
    d) Whole blood.

SECTION B: SHORT ANSWER QUESTIONS (40 MARKS)

a) Describe the erythrocyte inclusions seen in abnormal RBC morphology (8 marks)
b) Describe different types of leukocytes (8 marks)
c) Describe two methods used in ESR estimation (6 marks)
d) Describe preparation of thin blood film (6 marks)
e) Describe hemopoetic pathways of erthrocytes (6 marks)
f) Describe staining techniques of leishman (6 marks)

SECTION C: LONG ANSWER QUESTIONS (40 MARKS)

1. A 15-year-old male named Alex has been diagnosed with hemophilia A since early childhood. He has experienced several episodes of spontaneous bleeding, particularly into his joints, leading to pain and mobility issues.

a. Highlight the coagulation factor he lacks while stating its diagnostic significance (3 marks)
b. Using an illustration, discuss haemostasis (17 marks)

2. A 24-year-old female visited Baringo County Hospital presenting with paleness, fever, lethargy, shortness of breath and jaundice. The full hemogram results were as follows; HB-9.4g/dl (reference ranges: 12-16g/dl), RBC-5.0x106/ul (4.7-6. IXI 06/111) and Haematocrit-33% (42-50%), RDW-9.6% (11-15%), Reticulocyte (0.5-1.0%) PLT-90x103/111 (150-200x103/111), WBC-13. 1 03/111 (4-1 ox 103/111), Neutrophils (6070%), Lymphocytes- (20%-30%), and Monocytes- 2% (1-2%).

a) Outline the anticoagulant used and its principle of action (3 marks)
b) Calculate the MCH, MCHC, MCV (9 marks)
c) Give a detailed report of the blood film (5 marks)
d) State the principle of the stain used in the peripheral blood film smear (3 marks)

3. Describe using arrows the formation of different blood components clearly indicating the regulators involve (20 marks)