



QUALIFICATION : BACHELOR of MEDICAL LABORATORY SCIENCES	
QUALIFICATION CODE: 08BMLS	LEVEL: 6
COURSE: HAEMATOLOGY 2B	COURSE CODE: HAM621S
DATE: NOVEMBER 2023	SESSION: 1
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY: QUESTION PAPER

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MODERATOR: *Dr Elzabe Van Der Colf*

INSTRUCTIONS :

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

PERMISSIBLE MATERIALS:

1. Non-Programmable Calculator

ATTACHMENTS

1. Cytochemistry answer table

This paper consists of 7 pages including this front page.

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 Which organ is the primary site of haemopoiesis in a developing foetus: (1)

- A) Liver
- B) Bone Marrow
- C) Spleen
- D) All of the above

1.2 Which bone marrow pool holds the largest number of band cells and mature neutrophils? (1)

- A) Mitotic
- B) Post mitotic
- C) Storage
- D) Functional

1.3 Primary granules also known as azurophilic granules contain: (1)

- A) Myeloperoxidase
- B) Lactoferrin
- C) Iron
- D) Collagenase

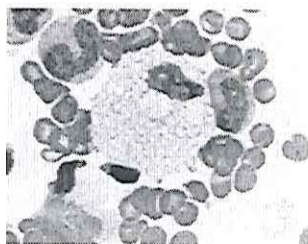
1.4 A neutrophil precursor with 10-18µm in diameter, with round or oval nucleus, no nucleoli, prominent primary granules and a few secondary granules best describes: (1)

- A) Blast
- B) Band cells
- C) Myelocyte
- D) Metamyelocyte

1.5 Which of the following conditions do not result in a leukemoid reaction? (1)

- A) Severe infection
- B) Chronic myeloid Leukaemia
- C) Metastatic Cancer
- D) Acute Haemolysis

1.6 Identify the disorder associated with the following morphology: (1)



- A) Neiman Picks Disease
- B) Chediak-Higashi Syndrome
- C) Plegler Huet Syndrome
- D) Gauscher's Disease

1.7 Mary suffers from hay-fever during spring, due to pollen allergies. Which of her leukocytes are likely to be increased? (1)

- A) Neutrophils
- B) Monocytes
- C) Eosinophils
- D) Basophils

1.8 Identify the number of blasts in bone marrow necessary to diagnose acute myeloid leukaemia according to WHO criteria. (1)

- A) 30%
- B) 10%
- C) 15%
- D) 20%

1.9 Identify the chromosomal abnormality associated with Acute Myeloid Leukaemia (AML) M2? (1)

- A) t(8:21)
- B) t(9:22)
- C) t(15:17)
- D) t(1:19)

1.10 Which cytochemical stain is best for differentiating AML from Acute Lymphoblastic Leukaemia (ALL)? (1)

- A) Alpha-naphyl acetate
- B) Non-specific esterase
- C) Periodic Acid Schiff
- D) Myeloperoxidase

QUESTION 2 [20]

- 2.1 Identify the white cells that stem from the myeloid progenitor stem cells. (4)
- 2.2 For each of the granulocytes identified in 2.1, state the percentages found in the peripheral blood and their main functions. You may tabulate your answers. (8)
- 2.3 What is the difference in maturation between B cells and T cells? (2)
- 2.4 For each of the following lymphocytes, suggest at least two specific antigenic cluster differentiation (CD) markers. (6)
- A) B cells:
 - B) T Cells:
 - C) Natural Killers

SECTION B: SHORT ANSWER QUESTIONS [41 MARKS]

QUESTION 3 [21]

- 3.1 Outline the World Health Organization (WHO) and French British American (FAB) classification methods for haematological malignancies. (6)
- 3.2 Haematological malignancies have the following general symptoms of which are tied to physiological processes in these patients. Identify the physiological reasoning behind each of the following symptoms. (5)
- 3.2.1 Pallor & Lethargy:
 - 3.2.2 Recurrent infections:
 - 3.2.3 Ecchymoses or Petechiae:
 - 3.2.4 Fever:
 - 3.2.5 Bone Pain:
- 3.3 Immunophenotyping is a very valuable method of diagnosis for haematological malignancies. Answer the following questions regarding immunophenotyping.
- 3.3.1 Briefly explain what immunophenotyping is? (2)
 - 3.3.2 In which two ways is sample prepared for immunophenotyping analysis? (2)
 - 3.3.3 The most common method of immunophenotyping used is flow cytometry. Briefly explain its principle. (6)

QUESTION 4

[20]

4.1 Complete the table provided in the answer book by identifying staining properties of the following cytochemical stains. (12)

Stain	Component Stained	Positive cells	Negative Cells
4.1.1 Myeloperoxidase			
4.1.2 Sudan Black			
4.1.3 Periodic Acid-Schiff			
4.1.4 Acid Phosphatase			

4.2 Identify and explain the four patterns in which metastatic cancers can infiltrate the bone marrow. (8)

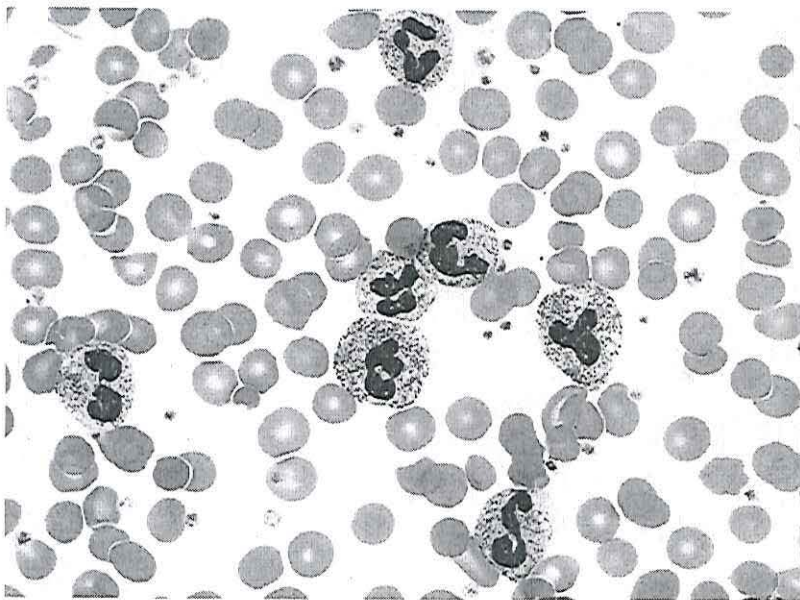
SECTION C: CASE STUDIES

[29 MARKS]

QUESTION 5

[12]

A 48-year-old man presented at the physician’s office complaining of a persistent cough. He had a high-grade fever and was fatigued. He also mentioned weight loss over the past few weeks. The doctor ordered haematology tests and tests for Tuberculosis (TB) to rule it out due to the cough. The TB tests came out positive with a +3 *acid fast bacilli (AFB)* on direct microscopy. FBC results and peripheral blood smear were as follows: *WBC: 103x10⁹, HB 13.3g/dl, Platelets 215x10⁹.*



5.1 Discuss the findings of the full blood count and the peripheral blood smear. (6)

5.2 What is the most likely diagnosis and underlying cause? Explain your answer. (4)

5.3 Suggest further tests to confirm diagnosis. (2)

QUESTION 6

[17]

A 15-year-old girl is admitted to the emergency room with complaints of abdominal pain for the past three days. The ultrasound examination revealed a uniform, well-demarcated mass on the left superolateral part of the uterus. On MRI examination, an encapsulated, well-demarcated mass was observed at the same location. On peripheral blood smear examination 20% of cells were blasts. On bone marrow aspiration, 85% of cells were large myeloid blasts with fine chromatin and striking nucleoli. Overall, there was a 10% rate of maturation of granulocytic cells. The laboratory findings were as follows:

WBC $125 \times 10^9/L$, HB 10.7 g/L, and platelets: $107 \times 10^9/L$. Lactate dehydrogenase (LDH) level was 1144 U/L

6.1 Explain the ultrasound and MRI findings. (3)

6.2 Interpret laboratory results. (4)

6.3 The Doctor made the diagnosis of AML FAB subtype M2. Discuss the rationale behind Dr's diagnosis. (4)

6.4 Suggest at least four (4) CD markers that would be positive in this case. (4)

6.5 What is the most common genetic mutation associated with this subtype? (2)

END OF QUESTION PAPER [100 MARKS]