



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY
FACULTY OF HEALTH AND APPLIED SCIENCES**

DEPARTMENT OF HEALTH SCIENCES

QUALIFICATION : BACHELOR OF MEDICAL LABORATORY SCIENCES	
QUALIFICATION CODE: 08BMLS	LEVEL: 7
COURSE CODE: HAM711S	COURSE NAME: HAEMATOLOGY 3
SESSION: JUNE 2019	PAPER: THEORY
DURATION: 2 HOURS 30 MINUTES	MARKS: 140

First Opportunity Examination Question Paper	
EXAMINER(S)	Mr Maurice Nyambuya
MODERATOR:	Dr Aaron Maramba

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. Pen
2. Calculator

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

SECTION A (71 MARKS)

QUESTION 1

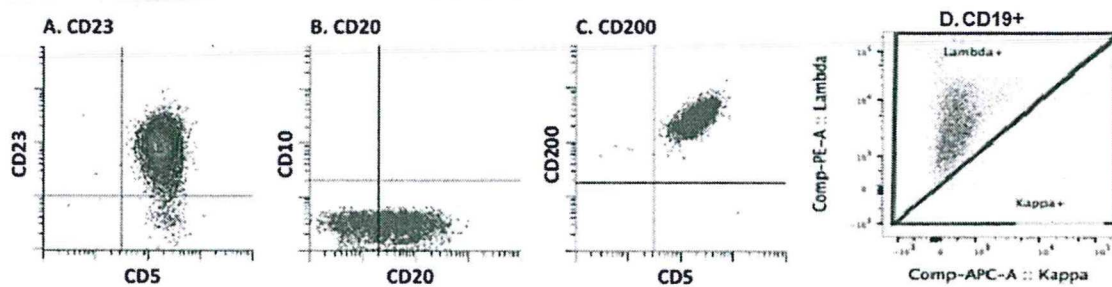
[31]

An 81-year-old gentleman was seen by his local general practitioner after complaining of progressive fatigue and tiredness. He had history of prostate cancer which had been treated with radiation. On examination, he appeared pale and frail and had no lymphadenopathy, splenomegaly or hepatomegaly. Blood was taken for testing at the haematology laboratory.

The full blood count and differential were as follows

Parameter	Result
White cell count	22 x 10 ⁹ /L
Red cell count	2.93 x 10 ¹² /L
Haemoglobin	9.7g/dL
Haematocrit	29.2%
MCV	99.9fl
MCHC	33.2g/dL
Platelets	90 x 10 ⁹ /L
Neutrophils	41%
Lymphocytes	55%
Monocytes	3%
Eosinophils	1%
Basophils	1%

After an examination of blood smear, a lymphoproliferative disorder was suspected and flow cytometry was requested.



- 1.1 Examine the above results and suggest which of the lymphoproliferative disorders this is most likely to be. Explain your answer using the above results (5)
- 1.2 Explain the relevance of including CD200 in the panel of antibodies. (2)
- 1.3 The Medical Laboratory Scientist performing the flow cytometry described the lymphocytes as monoclonal. Explain what led to this conclusion (3)

- 1.4 Which additional antibodies would you add to the panel in order to diagnose Hairy Cell leukaemia? (3)
- 1.5 In your own words, describe the morphology and full blood count features of a patient with Hairy Cell leukaemia (5)
- 1.6 Name a cytochemical stain which could be used in the diagnosis of Hairy cell leukaemia (1)
- 1.7 Complete the following table in order to differentiate between chronic lymphocytic leukaemia (CLL) and prolymphocytic leukaemia (PLL). (12)

Characteristic	CLL	PLL
Peripheral blood morphology	(2)	(2)
Splenomegaly and lymphadenopathy	(1)	(1)
CD22	(1)	(1)
CD23	(1)	(1)
Anaemia	(1)	(1)

QUESTION 2

[24]

A 22 year old female was seen at the antenatal clinic for a routine pre-natal appointment. She was at 24 weeks gestation and had no pre-natal care. Bruises were noted on both her arms and legs. The full blood count showed a low haemoglobin of 11.1g/dL and coagulation results were as follows:

International normalised ratio (INR): 2.7

Activated partial thromboplastin time (APTT): 44 seconds with a control of 25 seconds

Fibrinogen: 4.9g/L

Thrombin time: 19 seconds

- 2.1 Which of the following may be the cause of this result? Please select the best answer (1)
- Factor VII
 - Liver disease
 - Vitamin K deficiency
 - Factor VII deficiency
 - b and c
- 2.2 Explain in detail in your own words your choice of answer for question 2.1 (5)

2.3 The following factor assays were performed. What is the cause of abnormal coagulation result? (1)

Parameter	Result	Reference interval
Factor II	0.33 U/mL	0.50-1.50 U/mL
Factor V	1.98 U/mL	0.50-1.50 U/mL
Factor VII	0.09 U/mL	0.50-1.50 U/mL
Factor X	0.14 U/mL	0.50-1.50 U/mL
Factor VIII	6.23 U/mL	0.50-1.50 U/mL
Factor IX	0.29 U/mL	0.50-1.50 U/mL
Factor XI	0.73 U/mL	0.50-1.50 U/mL
Factor XII	2.48 U/mL	0.50-1.50 U/mL

2.4 Explain the principle of Thrombin Time and the causes of a prolonged result (5)

2.5 Blood grouping results showed that the mother was group B- and the father was group O+. What implication could this have for the developing foetus? (5)

2.6 Name and explain the principle of a test that could be used to detect the presence of foetal cells in the mother's blood. (4)

2.7 The patient had a haematocrit of 22.4% and red cell count of $3.4 \times 10^{12}/L$. What is the most likely cause of her anaemia and describe the expected red cell morphology? (3)

QUESTION 3

[16]

A 21 year old HIV+ male was seen at the clinic for routine full blood count and CD4⁺ count.

3.1 Which of the full blood count parameters is often raised on anti-retroviral therapy? (1)

3.2 What other full blood count parameters are abnormal in patients with HIV? (2)

3.3 Why do HIV+ patients have increased Erythrocyte Sedimentation Rate (ESR)? (1)

3.4 What is the absolute CD4 count reference range of a normal adult? (1)

3.5 At what absolute CD4 count is ARV therapy recommended? (1)

3.6 CD4 counts are measured using flow cytometry. Discuss the principles of flow cytometry. (10)

SECTION B (69 MARKS)

QUESTION 4

[25]

To establish the control limits for a new lot number of level 1 PT coagulation control, the following data points were collected (the results are in seconds):

11.8; 11.6; 12.1; 12.0; 12.3; 12.6; 11.9; 12.2; 12.0; 11.5; 12.7; 12.1; 11.2; 12.3; 12.9; 13.0; 12.3; 12.9; 13.0; 12.3; 11.9; 12.4; 12.5.

4.1 Calculate the ± 2 sd limits for this control. Explain how this is done and draw a Levey Jennings chart which will be used to monitor the performance of the control. (8)

4.2 The accuracy of the full blood count can be affected by a number of factors. For each of the following, identify which FBC parameter is affected and what action should be taken to rectify the problem

4.2.1 Nucleated red blood cells (2)

4.2.2 Spherocytes (2)

4.2.3 Platelet clumping (2)

4.2.4 Lipaemia (2)

4.2.5 Sample stored at room temperature for 72 hours

4.3 Match each red cell morphology with its associated condition below: (7)

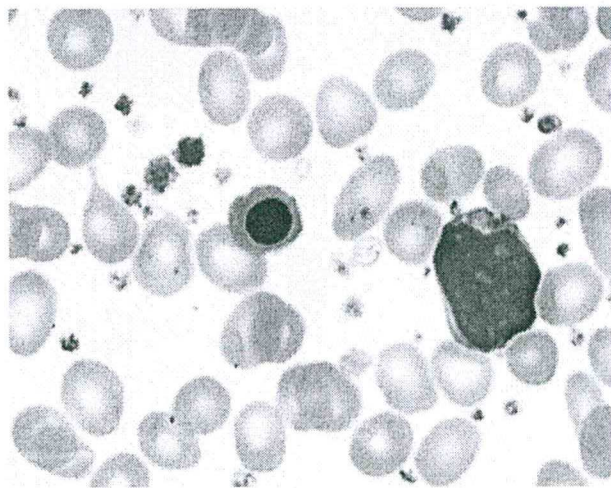
Red cell morphology	Associated condition
4.3.1 Schistocytes	AIHA
4.3.2 Target cells	Cold auto antibody
4.3.3 Rouleaux	Multiple myeloma
4.3.4 Tear drops	Myelofibrosis
4.3.5 Spherocytes	DIC
4.3.6 Agglutination	Liver disease or Haemoglobinopathies
4.3.7 Echinocytes (burr or crenated)	Artefact or uraemia

QUESTION 5

[22]

A 67 year old man had been complaining of progressive tiredness for many months. Recently he had noticed that he was bruising easily and was experiencing night sweats. A physical

examination by the doctor revealed that he had hypertension, a slight fever and an enlarged spleen. An ultra sound revealed an enlarged liver and full blood count, differential count and bone marrow biopsy were requested.



Peripheral blood smear

Differential count

	Absolute count
Neutrophils	37
Band cells	14
Metamyelocytes	9
Myelocytes	10
Promyelocytes	1
Eosinophils	2
Basophils	2
Lymphocytes	21
Monocytes	2
Blasts	2
Nucleated RBCs	17%

Full blood count

White Cell Count	18.6	$\times 10^9/l$
Red Cell Count	3.2	$\times 10^{12}/l$
Haemoglobin	9.8	g/dl
Platelets	650	$\times 10^9/l$

- 5.1 Correct the white cell count (show all calculations) (3)
- 5.2 Describe in detail the most important features of the above peripheral smear. Include all cell lines in your answer. (5)
- 5.3 Use one word to describe the above blood picture. (1)
- 5.4 Do you think this patient has a myeloproliferative disorder or myelodysplasia? Briefly motivate your answer by highlighting the main differences between the two disorders. (6)
- 5.5 A bone marrow aspirate sample was sent to the molecular genetics laboratory to test for the BCR/ABL hybrid oncogene and the JAK2-V617 and MPL gene mutations. Explain why these tests are important in the laboratory investigation of these disorders. (6)

5.6 The BCR/ABL oncogene was not present but mutation of the MPL gene was detected and the reticulin stain on the bone marrow trephine was positive. Considering all the above information, including the clinical presentations, suggest a diagnosis. (1)

QUESTION 6

[12]

6.1 State the Coulter principle and describe its use in haematology automation (10)

6.2. State the recommended order of blood draw for plastic vacutainer tubes (2)

QUESTION 7

[10]

Discuss the clinical significance of the following red cell indices, providing examples and ranges where required:

(5)

7.1 Mean Cell Volume (MCV)

(5)

7.2 Mean Cell Haemoglobin (MCH)

Total 140 Marks

Good luck!!!