



NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES  
SCHOOL OF HEALTH SCIENCES  
DEPARTMENT OF CLINICAL HEALTH SCIENCES

<b>QUALIFICATION: BACHELOR OF MEDICAL LABORATORY SCIENCES</b>	
<b>QUALIFICATION CODE: 08BMLS</b>	<b>LEVEL: 8</b>
<b>COURSE CODE: ICP811S</b>	<b>COURSE NAME: INTEGRATED CLINICAL PATHOLOGY</b>
<b>SESSION: JUNE 2023</b>	<b>PAPER: THEORY</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 160</b>

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	<b>MS BELINDA ROSELIN TSAUSES, MS CARA MIA DUNAISKI, MS MARIEN NAUDE, MS FREDRIKA ENGELBRECHT</b>
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<b>INSTRUCTIONS</b>	
1. Answer ALL the questions. 2. Write clearly and neatly. 3. Number the answers clearly.	

**PERMISSIBLE MATERIALS**

1. Calculator.

**THIS QUESTION PAPER CONSISTS OF 10 PAGES** (Including this front page)

## SECTION A [40 MARKS]

### QUESTION 1

[40]

Please read the following case study and answer the questions below:

A 60-year-old man was admitted in a hospital in a comatose state. His wife stated that prior to this episode, he had complained of excessive thirst for about a week. She thought he had lost weight over the past few weeks. On the day of admission, he had vomited repeatedly and become drowsy.

#### Diagnostic Findings:

The physical examination revealed a comatose patient, with deep and rapid breathing. The patient's breath smelled of acetone. Signs of dehydration were present, including loss of skin turgor, dry mouth, and sunken eyes. Pulse 110, Blood pressure measurement 90/50 mmHg. Urine dip-stick test on urine showed glucose 3+, ketones 4+, and pH 5.

Blood samples were collected for arterial blood gases analysis and urea and electrolyte measurement. The results are presented in the table below (table 1).

**Table 1. Laboratory Findings:**

Na <sup>+</sup>	130 mmol/L (136-144)	Glucose	32.0 mmol/L (3.9-6.1)
K <sup>+</sup>	5.8 mmol/L (3.6-5.1)	pH	7.05 (7.35-7.45)
CO <sub>2</sub>	10.0 mmol/L (22-29)	pCO <sub>2</sub>	15 mm Hg (35-45)
Cl <sup>-</sup>	100 mmol/L (96-106)	HCO <sub>3</sub> <sup>-</sup>	5 mmol/L (23-29)
Urea	18.0 mmol/L (2.1-7.1)	Base Excess	26 mmol/L (-2-+2)
Creatinine	140 μmol/L (35-88)		

- 1.1 Based on the above findings, provide the most likely diagnosis. (2)
- 1.2 Calculate the anion gap. Comment on its value. (6)
- 1.3 Detail the type of acid-base disturbance which is present in this patient. (2)
- 1.4 Describe other biochemical tests which can be ordered to support the diagnosis and give expected results. (6)
- 1.5 Describe how the laboratory results obtained support the pathophysiology of the condition proposed for this patient in section 1.1. (24)

## SECTION B [40 MARKS]

### QUESTION 2

[40]

Please read the following case study and answer the questions below:

A 14-year-old girl was admitted in the Katutura State Hospital Casualty unit. She presented with haemorrhage of her ears, eyes, nose, and gums. The mother explained that when the girl bumps herself against an object, she starts to bleed and appears to have easy bruising of the skin. The girl suffers from persistent fatigue and night sweats. She has been having recurrent upper respiratory tract infections which seem to be reappearing monthly.

Upon evaluation of her Chemistry tests, the Lactate Dehydrogenase (LD) was noted to be extremely high at 1025 IU/L. The normal range for LD is 105 – 333 IU/L. On initial screen testing, her D-dimer result came out as critical high (>850 ng/mL) (Reference range: <250 ng/mL). An FBC was analysed using a Sysmex1000N, and a manual differential count (table 2) and morphology analysis (figure 1) was performed.

The Sysmex1000N analyser flagged some parameters as “Critical”.

**Table 2.** Full blood count (FBC)

Rbc	2.70 x 10 <sup>12</sup> /L	Critical (L)	Neutrophils	10%	
Hb	3.2 g/dL	Critical (L)	Lymphocytes	2%	
Hct	28.4%	(L)	Monocytes	0%	
MCV	105.3 fl	(H)	Eosinophils	0%	
MCH	35.7 pg	(H)	Basophils	0%	
MCHC	34.8 g/dL	(H)	Promyelocytes with numerous Auer rods (pictured below)	88%	Abnormal cells
WBC	1.8 x 10 <sup>9</sup> /L	Critical (L)	Platelets	18 x 10 <sup>9</sup> /l	Critical (L)

\*\* H = High, N = Normal, L = Low \*\*

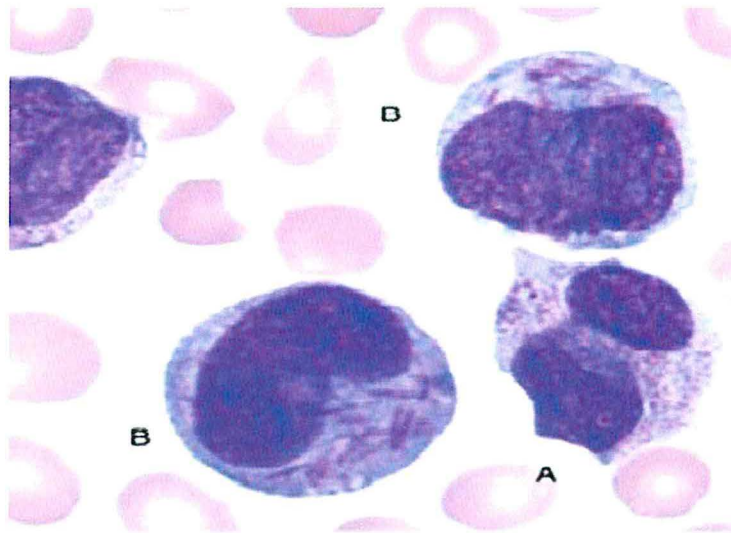
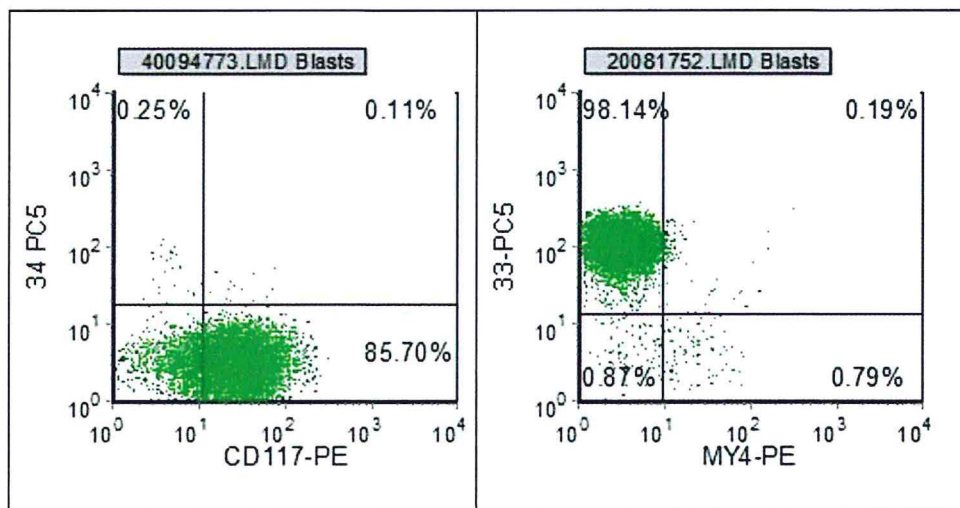
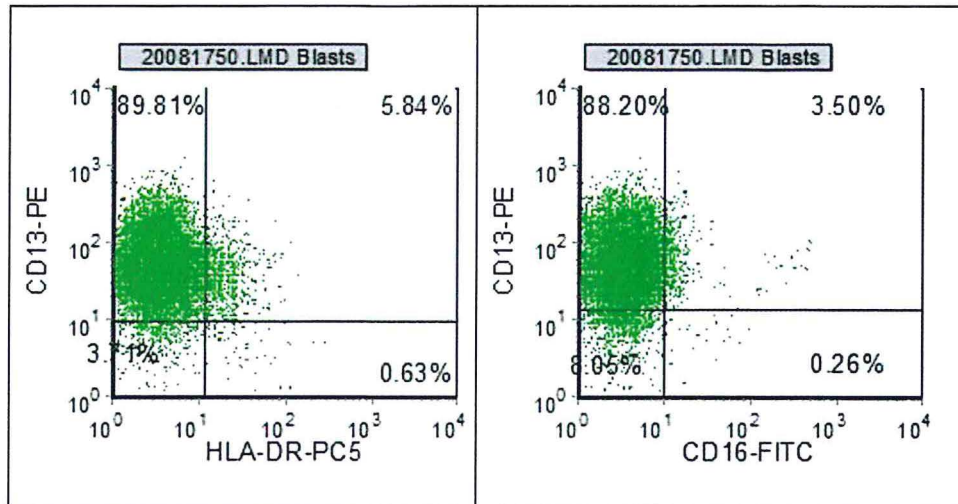


Figure 1. Peripheral Smear

- 2.1 Examine the results presented in table 1 and figure 1, and suggest the haematological malignancy the patient is most likely to be suffering from. Motivate your answer. (20)
- 2.2 The Immunophenotyping results (figure 2) of the patient's bone marrow aspirate came back from the Flow Cytometry laboratory. Examine the results and clearly explain the consequence of the results associated with this type of malignancy. (8)







**Figure 2.** The Immunophenotyping results

- 2.3 What is usually the prognosis of this type of malignancy and describe the pathogenesis behind the prognosis? (5)
- 2.4 Which type of anemia is this hematological malignancy mainly associated with and which poikilocyte will be prominent in this type of anaemia? (2)
- 2.5 It was further noted that the patient's upper respiratory tract infection would not clear after administration of a week's antibiotics, and her previous history showed that the infection is reappearing monthly on the same regime of antibiotics. Clearly explain why this is appearing with this type of malignancy related to her results provided. (3)
- 2.6 Predict if her C-reactive protein (CRP) will be low, normal or high in this case and motivate your prediction? (2)

### SECTION C [40 MARKS]

#### QUESTION 3

[40]

Please read the following case study and answer the questions below:

A 30-year-old male patient fell down from a height of 1.5 m and sustained injuries on both the thighs and left knee. Four days later, he reported to a zonal hospital with complaints of tenderness on both thighs and swelling of the left knee. He was admitted as a case of 'Contusion knee with pyomyositis' and was managed conservatively with rest, nonsteroidal anti-inflammatory drugs (NSAIDs) and antimicrobials. After 24 hours of admission, he developed fever, tachycardia, tachypnoea, slurred speech, confusion and features suggestive of acute renal failure

and pulmonary thromboembolism. The same day he was transferred to this tertiary care centre for further management.

Examination revealed: temperature: 38.9 °C; pulse: 130 beats/min; respiratory rate: 50/min and blood pressure: 84/50 mm Hg.

Both thighs were swollen and indurated (left more than right). Blanching erythematous rash was present all over the body. Therapy was instituted with a combination of broad-spectrum antimicrobials and Dopamine in addition to other supportive measures. Within the next 6 hours, the condition of the patient deteriorated, and he was placed on a ventilator. He became comatose and lapsed into hypotensive shock. Three hours later he suffered a cardiac arrest and passed away.

Detailed investigations were carried out in both hospitals (table 3).

**Table 3.** Laboratory findings

Haemoglobin	13.5 g/dL (140-180)	Peripheral blood smear	toxic granules ++
WBC	5.8 x 10 <sup>9</sup> /L (3.5-12)	Serum Bilirubin	79.6 µmol/L (0-20.5)
Neutrophils	0%	ALT	264 U/L (7-35)
Lymphocytes	15%	AST	178 U/L (15-41)
Monocytes	1%	Urea	6.5 mmol/L (2.1-7.1)
Eosinophils	4%	Creatinine	176.8 µmol/L (35-88)
Basophils	0%	Total CPK	4054 U/L (20-215)
Promyelocytes	68%	CKMB	160 U/L
Band forms	8%	CRP	108 mg/L (0-10)
Metamyelocytes	6%	Ultrasonography thigh	Cellulitis-bilaterally
Platelets	135 x 10 <sup>9</sup> /L (150-400)	Blood culture	<b>Please see pictures below.</b>

Evaluate the picture of the cultures that was done from a blood culture that was collected from the patient in the case study, and report what you see on each picture.

- 3.1 Report the results seen on this gram-stained slide (figure 3). (3)



Figure 3. Gram stained smear

- 3.2 Report on the type of growth seen on the blood agar plate (figure 4). (1)



Figure 4. Culture on blood agar plate

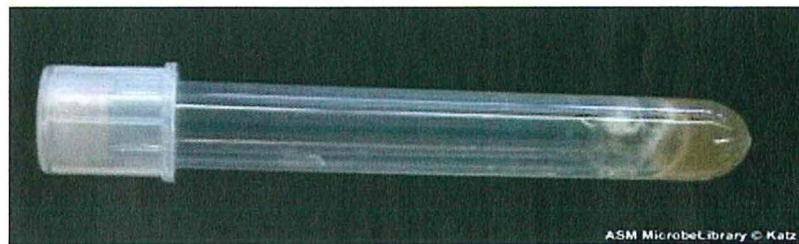
- 3.3 A test was done by mixing a colony of the organism with 3% Hydrogen peroxidase. Name the test, and the result for this organism, as seen in figure 5. (2)





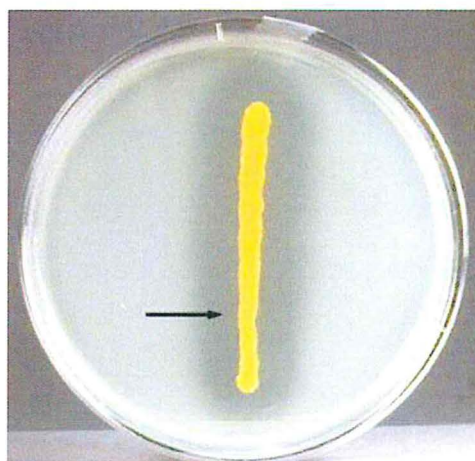
**Figure 5.** Colony of the organism with 3% Hydrogen peroxidase

- 3.4 Plasma was used for the test below. Give the name of the test and the results as seen in the picture below (figure 6). (2)



**Figure 6.** Microbiology biochemical test using plasma

- 3.5 The following result was seen after inoculation of the organism isolated from the patient on an agar plate followed by overnight incubation. Identify the test and report the result for this specimen, as on figure 7. (2)



**Figure 7.** Culture on an agar plate

- 3.6 Identify the causative organism for this man's death, by using all the information gathered from the tests above. (2)



- 3.7 Discuss the virulence factors of the microorganism responsible for this condition in the patient (4)
- 3.8 The measured CRP was elevated, clearly explain why an increased CRP was seen. (10)
- 3.9 Identify a biomarker other than CRP that is a very good indicator of severe bacterial infection. (1)
- 3.10 The CK-MB is also highly elevated. Please motivate why the CK-MB was elevated in this patient. (2)
- 3.11 Discuss the possible causes of thrombocytopenia in this patient. (4)
- 3.12 Analyse and evaluate the patient's liver function test results. (7)

## SECTION D [40 MARKS]

### QUESTION 4

[40]

Please read the following case study and answer the questions below:

A 38-year-old busy mother of two with severe, heavy menstrual bleeding required pad and tampon change every hour for the heavy three days of her period. She also suffered from bladder symptoms and severe period pain. She felt she was too young to have a hysterectomy and chose to have Uterine fibroid embolization (UFE) instead (figure 8). She also had a Mirena IUD inserted. Her fibroid shrank from 87ml to only 2ml. Her periods are now 'amazingly light' and she is extremely happy with the UFE outcome.

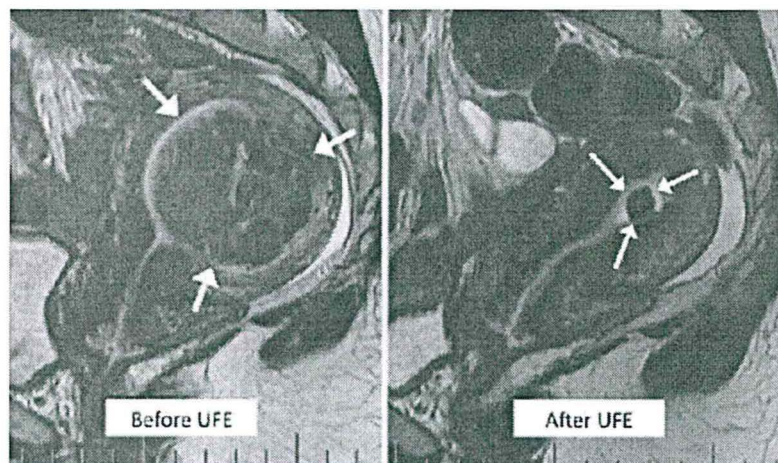
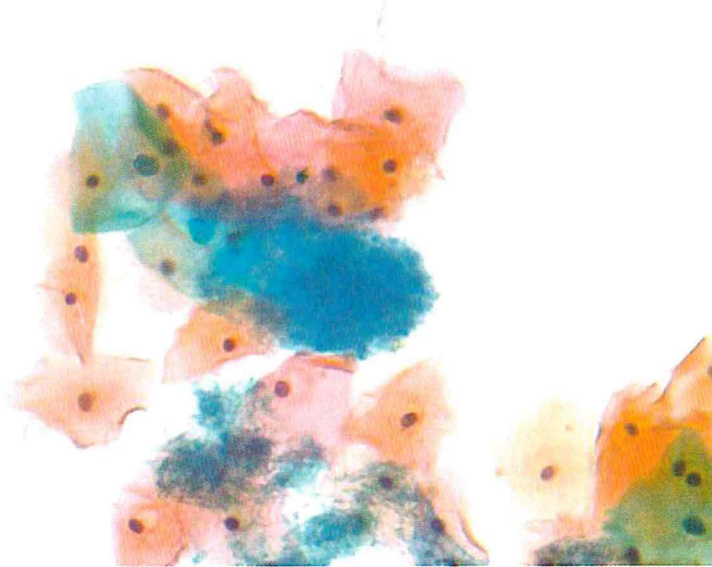


Figure 8. Radiology images of pre- and post-uterine fibroid embolization (UFE)

- 4.1 Explore three (3) possible differential diagnosis for this patient, excluding uterine leiomyomas. Motivate your answer. (4)
- 4.2 Suggest the most likely diagnosis and justify your answer. (5)
- 4.3 Summarize the histologic features associated with the patient's clinical presentation and the most likely diagnosis 4.2. (10)
- 4.4 Describe the etiology of the disease related to the most likely diagnosis, based on the patient's physical examination and figure 9. (5)
- 4.5 Analyze the following results of a Pap test performed on the patient and critically report the significance of your findings in relation to the case study. (5)



- 4.6 Propose three (3) biochemical tests you would most probably suggest for this patient. Substantiate your answer. (6)
- 4.7 Appraise the value of uterine fibroid embolization as opposed to a hysterectomy. (5)

**END OF EXAMINATION**