



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY
FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES
DEPARTMENT OF HEALTH SCIENCES

QUALIFICATION: BACHELOR MEDICAL LABORATORY SCIENCES	
QUALIFICATION CODE: 08BMLS	LEVEL: 8
COURSE NAME: INTEGRATED CLINICAL PATHOPHYSIOLOGY	COURSE CODE: ICP811S
SESSION: JULY 2022	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 140

SUPPLEMENTARY/ SECOND OPPORTUNITY EXAMINATION PAPER	
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MODERATOR:	Prof Glenda Davison

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 [70]

QUESTION 1

[5]

1.0 Review the patient results below and enumerate the following:

<u>PATIENT RESULTS</u>	
Na	146 mmol/L
K	9.1 mmol/L
Cl	97 mmol/L
CO ₂	23 mmol/L
Urea	39.8 mmol/L
Creatinine	1112 μmol/L
Total calcium	1.65 mmol/L
Fe	19.7 μmol/L
Transferin	3.56g/L
Total protein	83g/L
Albumin	32g/L
Glucose	19.5 mmol/L
Cholesterol	4.7 mmol/L
Triglyceride	3.38 mmol/L
HDL	1.1 mmol/L

- 1.1 Osmolality (1)
- 1.2 % Transferin saturation (2)
- 1.3 Corrected calcium (1)
- 1.4 LDL (1)

QUESTION 2

[5]

A critical patient's blood gas results are as follows:

<u>Blood gas results</u>		
pH	7.21	(7.35-7.45)
pCO ₂	61 mmHg	(35-45)
pO ₂	64 mmHg	(75-100)
HCO ₃ ⁻	24 mmol/L	(22-26)

- 2.1 Select **THREE** important transport related requirements for blood gas samples. (2)
- 2.2 Showing all steps, determine the acid base and compensation status of the patient above. (3)

QUESTION 3

[10]

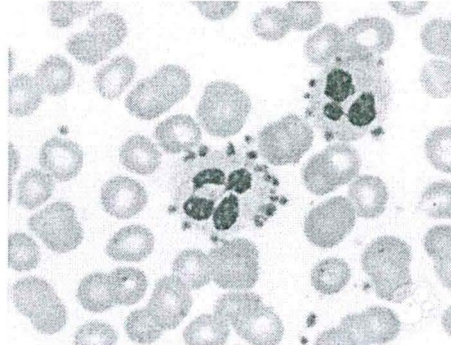
Using the thyroid gland as an example, explain the following methods of hormone assessment:

- 3.1 Direct static (2)
- 3.2 Direct dynamic (4)
- 3.3 Indirect (4)

QUESTION 4

[10]

- 4.1 State the recommended order of blood draw for plastic vacutainer tubes. (2)
- 4.2 Is heparin recommended for coagulation and haematology testing? Motivate your answer. (2)
- 4.3 Is the ratio of anticoagulant to blood critical? Motivate your answer. (2)
- 4.4 The picture below illustrates an in vitro effect of EDTA on a blood smear. Name and describe this phenomenon. (4)



QUESTION 5

[10]

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

QUESTION 6

[20]

A 7 years old scholar was admitted into Red Cross children hospital with a high fever and vomiting. She presented with severe headache and was unable to bend her neck. A preliminary diagnosis of meningitis was made. Cerebrospinal fluid was taken and the following cell count was reported 250 White blood cells predominately Polymorph nuclear cells, chemistry results: Protein: >200mg/dL (ref 50-80mg/dL), Glucose <40 (ref 70-80mg/dL)

- 6.1 Which type of meningitis do you think this patient has? (1)
- 6.2 Mention the microorganisms that are normally associated with neonatal meningitis. (3)
- 6.3 After the CSF was cultured, a gram stain was performed and gram negative diplococci were observed. Which is the most likely microorganism involved? (1)
- 6.4 How would you differentiate between the two species of microorganisms involved? (5)
- 6.5 Discuss the pathogenesis of the microorganism involved. (10)

QUESTION 7

[10]

A 20-year-old woman, with a 22-year-old partner who has a provisional diagnosis of gonorrhoea (confirmed by the lab), visits a physician even though she does not have any pain or vaginal irritation. On physical examination, the woman has greenish discharge emanating from the mouth of her cervix. Her cervix is inflamed and bleeds easily when a swab is used to remove adherent secretions. Her male partner had a purulent discharge from his penis for the past 2 days and was given antibiotics by his first physician. He now notices a milder but persistent urethral discharge and dysuria. Gram stains from both patients reveal numerous neutrophils, but no evidence of Gram-negative diplococci.

- 7.1 What is your preliminary diagnosis of both patient's condition and what laboratory test(s) would you order to confirm it? (3)
- 7.2 What are the possible causative agents of this disease? (3)
- 7.3 What type of samples should be taken to confirm your diagnosis? (4)

SECTION B [70]

QUESTION 8

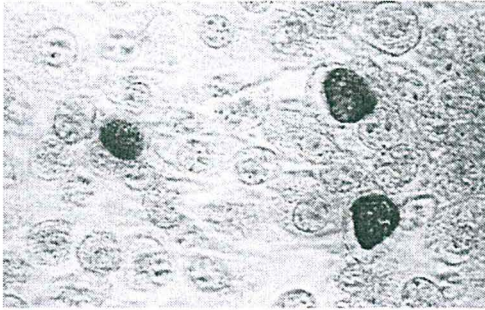
[40]

A 66 year old male with known CLL is admitted to ICU with severe lung infection and pleural effusion. Blood, sputum and pleural fluid samples are submitted to the laboratory for analysis. The following are some of the results obtained:

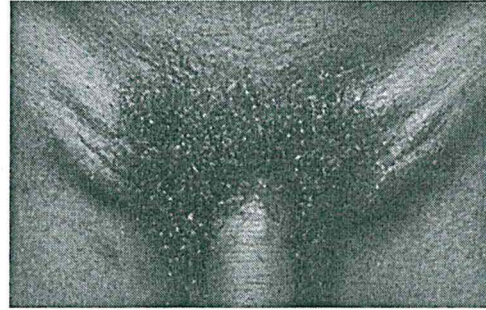
Chemistry	Microbiology – Sputum MC&S
<p>Serum</p> <p>Total bilirubin: 22 µmol/L Direct bilirubin: 5 µmol/L Total protein: 65 g/L Albumin: 31 g/L AST: 35 U/L ALT: 42 U/L GGT: 22 U/L ALP: 166 U/L LDH: 488 U/L Total calcium: 2.68 mmol/L UA: 0.67 mmol/L</p> <p>Pleural effusion</p> <p>LDH: 421 U/L Total protein: 45 g/L</p> <p>ABG</p> <p>pH: 7.31 pCO₂: 7.2 kPA (4.67-6.00 kPA) HCO₃: 24 mmol/L (22-29 mmol/L)</p>	<p><i>Klebsiella pneumoniae</i> isolated</p>

- 8.1 Identify THREE biomarkers of infection you can measure in clinical chemistry. (3)
- 8.2 Predict if the ionized calcium will be high or low. Motivate your answer. (2)
- 8.3 Elaborate on why pH is low in this patient. (4)
- 8.4 How is the plasma bicarbonate level established? (1)
- 8.5 Describe the colonial morphology of *K. pneumoniae* on a blood agar plate. (4)
- 8.6 State whether *K. pneumoniae* produces a positive or negative result for the following tests. In each case write only the question number and your answer. (6)
 - a. Motility:
 - b. ODC:
 - c. LDC:
 - d. ADH:
 - e. Urea:
 - f. Indole:

- 8.7 Briefly explain the pathogenesis of aplastic anaemia. (2)
- 8.8 Explain why infections may lead to the development of aplastic anaemia. (3)
- 8.9 Discuss the morphology characteristically observed on the bone marrow and peripheral blood smear of a patient with aplastic anaemia. (5)
- 8.10 The picture below represent an infection caused by a bacterial agent:-



(a)



(b)

- i. What is the causative agent of this infection (2)
- ii. Describe the pathology caused by this organism. (3)
- iii. What disease conditions does it cause in **women** and in **men**. (5)

QUESTION 9

[30]

A 59-year-old man complains of recurrent burning epigastric pain for the past six weeks and, during the past two weeks, the pain has often awakened him during the night. The pain lessens after meals but gets worse if he fasts for several hours. He has not been experiencing nausea or vomiting. The physical examination is unremarkable except for some slight epigastric tenderness. When asked about his family's medical history, the patient indicates that his mother and one of his two siblings have had recurring symptoms like those he is experiencing now.

- 9.1 What is your preliminary diagnosis? (1)
- 9.2 Motivate your answer (3)
- 9.3 What laboratory diagnostic tests can you perform? (6)
- 9.4 What is the likely causative agent and how can it be detected? (5)
- 9.5 After a prolonged infection with the disease causative agent, investigations of coagulations tests revealed hypercoagulation. Discuss how the primary diagnosis could have contributed to the hypercoagulable state in this patient. (10)

- 9.6 What are the histological characteristics of this infection? (4)
- 9.7 Name the technique specifically employed in histopathology to identify this organism. (1)

END OF QUESTION PAPER