



NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

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

QUALIFICATION: BACHELOR OF MEDICAL LABORATORY SCIENCES	
QUALIFICATION CODE: 08BMLS	LEVEL: 7
COURSE CODE: MMB711S	COURSE NAME: MEDICAL MICROBIOLOGY 3
SESSION: JUNE 2023	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 103

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	Ms. V Tjijenda and Dr Markus Schuppler
MODERATOR:	Prof R. T. Mavenyengwa

INSTRUCTIONS
1. Answer ALL the questions 2. Write clearly and neatly 3. Number the answers clearly

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

Permissible materials

Calculator

SECTION A (15)

QUESTION 1

[10]

Provide one word/term which best fits the description below. Write only the number and corresponding term on your answer sheet.

- 1.1 A strain of Mycobacteria which has been used to immunise susceptible individuals against tuberculosis (1)
- 1.2 A viral infection also known as German Measles (1)
- 1.3 Fungal infection characterized by oral thrush. (1)
- 1.4 Insect vector that causes African Sleeping sickness (1)
- 1.5 Toxins produced by *Aspergillus flavus* and *Aspergillus parasiticus* which grow in soil, decaying vegetation, hay and grains (1)
- 1.6 Mention the enzyme that is specific for *E. coli* and used for their identifications an "Indicator organism" in drinking water analysis (1)
- 1.7 Hepatitis B serum marker which indicates convalescent or immune status (1)
- 1.8 A patient in a coma is suffering and has exhibited seizure, confusion and drowsiness and has a history of swimming in a lake 3 days ago (1)
- 1.9 Major viral changes in the antigens caused by antigenic reassortment by two different viral strains. (1)
- 1.10 Parasitic ova with a prominent terminal spine and are excreted in urine. (1)

Question 2

Choose the correct answer and report only the suitable letter next to the relevant question number. (5)

- 2.1.1 What is the main purpose of wastewater treatment? (1)
- A. Elimination of readily degradable carbon *
 - B. Elimination of pathogens
 - C. Elimination of heavy metals
 - D. Elimination of prions
- 2.1.2 Microbes play a major role in secondary wastewater treatment because: (1)
- A. they remove organic matter in the aeration tank
 - B. they digest complex polymers in the anaerobic sludge digester
 - C. they produce methane in the anaerobic sludge digester
 - D. All of the above*
- 2.1.3 Which bacterium is a truly waterborne bacterial pathogen? (1)
- A. *Listeria ivanovii*
 - B. *Rhanella aquatilis*
 - C. *Shigella flexneri**
 - D. *Staphylococcus aureus*
- 2.1.4 Why are “indicator organisms” used in drinking water analysis? (1)
- A. It is impractical to screen drinking water for every pathogen*
 - B. Not all waterborne bacterial pathogens grow on agar plates
 - C. “Indicator organisms” signal definite presence of pathogens
 - D. all of the above
- 2.1.5 Which enzyme is specific for *Escherichia coli* and often used for their identification as “indicator organism” in drinking water analysis? (1)
- A. β -Glucosidase
 - B. β -Glucuronidase*
 - C. β -Galactosidase
 - D. none of the above

SECTION B (73)

QUESTION 3

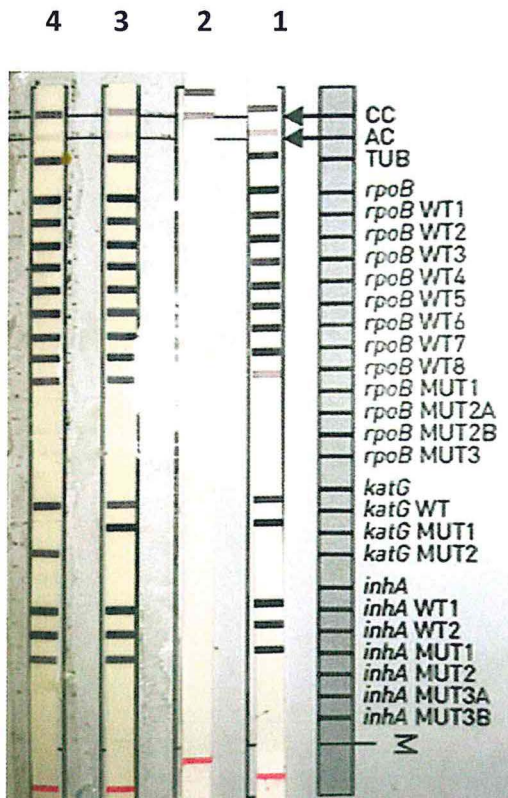
[18]

3.1 A 56-year-old San male reports with 4 weeks of a productive cough, fever, night sweats and weight loss. A sputum sample was collected and sent for analysis. The Xpert MTB/RIF results are as follows: MTB +/RIF resistance

3.1.1 What is the diagnosis? (2)

3.1.2 Motivate the significance of this test in TB control and prevention. (4)

3.1.3 Below are results obtained from a TB test done following the Xpert MTB/RIF.



3.1.3.1 Identify the test done in 3.1.3 (1)

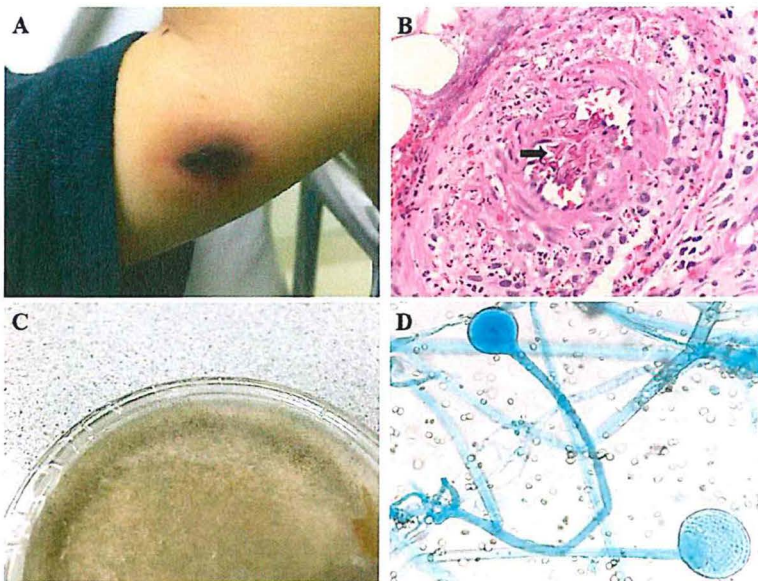
3.1.3.2 Interpret the results for both Patients. (4)

3.3 Two types of carbol fuchsin acid fast methods are used to stain *Mycobacterium tuberculosis*. Name the two stains and write short notes to differentiate between them. (5)

3.4 Name the two first line drugs used for treating *Mycobacterium tuberculosis*. (2)

QUESTION 4 [9]

A 4-year-old male presented to the emergency department with a worsening skin lesion at the prior intravenous (i.v.) injection site on his left arm. He had been diagnosed with Acute Lymphoblastic Leukemia (ALL) 10 days prior and was currently undergoing induction chemotherapy. The lesion was first noticed by his father 2 days earlier as a dime-sized erythematous papule with no pain or focal swelling. Physical examination revealed a painful patch with an irregular erythematous border and central dark bulla overlying the left medial epicondyle. **Figure A** = Skin lesion; **Figure B** = Stained tissue biopsy; **Figure C** = Culture and **Figure D** = Microscopy of the fungi from the culture.



4.1.1 Identify the stain used in **figure B** (1)

4.1.2 Identify the fungi identified in **Figure D** (1)

4.1.3 Identify the test done in **Figure D** and explain the principle of the test. (4)

4.2 The clinical infections caused by dermatophytes are generally referred to as ringworm or tinea. Name Tinea species which affects the following body parts: (3)

4.2.1 Foot

4.2.2 Nails

4.2.3 Beard

QUESTION 5

[21]

5.1.1 Give another name for the following parasites: (5)

(a) Whip worm

(b) Thread worm

(c) Pin worm

(d) Pork tape worm

(e) Hookworms

5.1.2 Which of the above parasites (a), (b), (c), (d) or (e) has an intermediate host. (1)

5.1.3 In which of the above parasites (a), (b), (c), (d) or (e) do eggs hatch in the soil. (1)

5.1.4 In which of the above parasites (a), (b), (c), (d) or (e) does larval migration occur? (2)

5.1.5 In which of the above parasites (a), (b), (c), (d) or (e) is the cellulose Tape (scotch tape) preparation the recommended diagnostic test. (1)

- 5.2 An adult man, an immigrant from El Salvador (Central America), went to the Emergency Room of a U.S. hospital with fever and confusion that did not respond to antibiotic treatment. A CT scan showed a brain lesion. The patient was HIV-positive and his last visit to El Salvador was one year earlier. A spinal tap showed low glucose and high protein levels in the CSF. In addition, the organisms shown in Figures A below is found in the CSF (size approximately 20 micrometers: Giemsa stain).

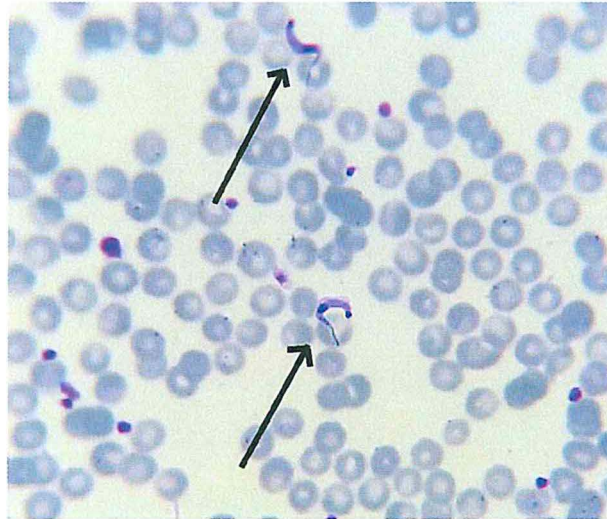


Figure A

- 5.2.1 Identify the organism to species level. (1)
- 5.2.2 What stage of the parasite is this? (1)
- 5.2.3 Mention the disease associated with this pathogen. (1)
- 5.2.4 Summarize the life cycle of this pathogen. (8)

QUESTION 6

[25]

- 6.1 A 15-year-old girl, who is presumed to have been perinatally infected with HIV presents to the clinic. She is classified as WHO stage III and is aware of her status and is started on ARVs. She is a maternal orphan; her mother having passed away 4 years ago. She is currently in the care of an aunt who receives her Care Dependency Grant (CDG) on her behalf. They live in a hostel, with inadequate access to good nutrition. After 8 months she returns to the clinic, alone, she is underweight and sick. She is referred to the wards and is admitted. Her CD4 count has decreased and her viral load has increased.

6.1.1 Explain what is meant by 'perinatal infection'. (2)

6.1.2 Compare the use of ELISA and DNA-PCR in monitoring perinatal infection.(4)

6.1.3 Discuss the significance of the low CD4 count and increased viral load in HIV patient management and propose a reason for what might have led to it. (3)

6.1.4 Describe the pathogenesis of HIV-1 virus. (8)

6.2 Complete the table below (3)

Virus	Genome	Mode of transmission	Diagnostic Marker
Hepatitis B	5.2.1	5.2.2	5.2.3
Hepatitis A	5.2.4	5.2.5	5.2.6

6.3 Discuss the pathogenesis of varicella Zoster infection. (5)

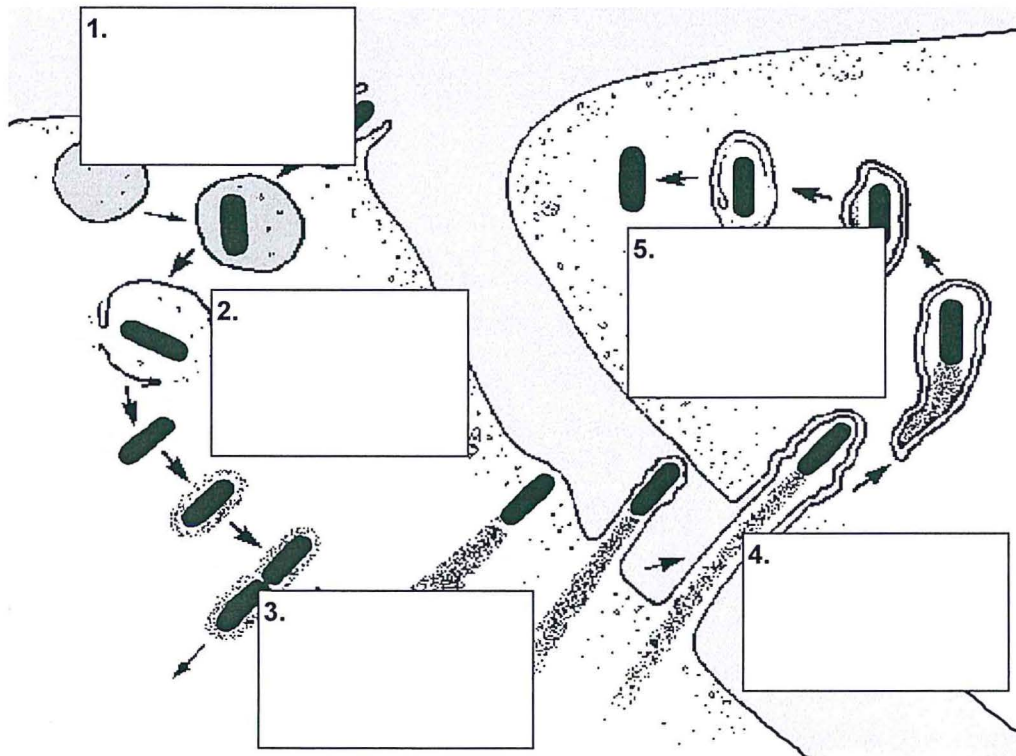
SECTION C (15)

QUESTION 7

[15]

- 7.1 Assess the following statements and decide whether they are true or false.
Write only the number of the question and next to it TRUE for a true statement and FALSE for a false statement (10)
- 7.2.1 Cereulide is the heat labile emetic-type toxin of *Bacillus cereus*, which is produced during growth of the bacteria in food.
- 7.2.2 The diarrhea-type toxins of *Bacillus cereus* are produced during growth of the bacteria in the small intestine of the host.
- 7.2.3 Typical symptoms of botulism are: double vision, droopy eyelids, wet mouth and difficulty in swallowing.
- 7.2.4 The food most likely to be contaminated with *Clostridium botulinum* neurotoxins (BoNTs) is home-canned foods.
- 7.2.5 BoNTs prevent the release of acetylcholine from the nerve end by cleavage of the acetylcholine receptor.
- 7.2.6 Infections with *Campylobacter jejuni* can trigger an autoimmune response that leads to damage of nerves and may result Guillain-Barré syndrome (GBS).
- 7.2.7 Non-typhoidal Salmonella are worldwide the leading cause of bacterial food-borne diarrheal disease.
- 7.2.8 The Stx toxins of enterohemorrhagic *E. coli* (EHEC) act as a rRNA-N-glycosidase leading to ribosome damage that results in shut down of protein synthesis, apoptosis and cell death.
- 7.2.9 Enterohemorrhagic *E. coli* (EHEC) use a type III secretion system to inject virulence factors into eukaryotic host cells.
- 7.2.10 All known bacteriophage contain dsDNA as genetic material.

7.3 Name the steps and the required pathogenicity factors of *Listeria monocytogenes* in the order they are required along the infection process. (5)



END OF EXAMINATION