

CANDIDATE NUMBER.....



"Investing in Africa's Future"

**COLLEGE OF HEALTH, AGRICULTURE AND NATURAL
SCIENCES**

DEPARTMENT OF BIOMEDICAL AND LABORATORY SCIENCES

BACHELOR OF MEDICAL LABORATORY SCIENCES HONOURS DEGREE

NSLS404: MICROBIOLOGY II

END OF SEMESTER FINAL EXAMINATIONS

APRIL 2025

LECTURER: Mr Z CHIWODZA

DURATION: 3 HOURS

INSTRUCTIONS

1. Write your candidate number on the space provided on top of each page
 2. Answer **all** questions in sections A on the question paper.
 3. Answer **all** questions in section B on separate answer sheets provided.
 4. Answer any **3** questions in section C on separate answer sheets provided
 5. The mark allocation for each question is indicated at the end of the question
 6. Credit will be given for logical, systematic and neat presentations in sections B and C
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SECTION A: MULTIPLE CHOICE [40 MARKS]

- Answer all questions by encircling the correct response T for TRUE or F for FALSE for each statement in all the questions
- Each correct response is allocated half a mark

1. Regarding fungal infections

- a) T F Cryptococcal IRIS can happen when an patient is started on HIV medication.
- b) T F *Pneumocystis jirovecii* can be seen as gram positive yeast cells.
- c) T F *Histoplasma* can be seen after giemsa staining
- d) T F *Candida albicans* can be observed after vaginal dysbiosis.

2. Which statement is true regarding antifungal drugs

- a) T F Only target cholesterol in the cell wall
- b) T F Nystatin is a polyene
- c) T F Amphotericin B causes hepatic toxicity and cannot be administered for extended periods of time
- d) T F Moulds, can develop resistance to Azole compounds.

3. Which one of the following parasites are correctly matched to typical signs and symptoms caused by that parasite?

- a) T F *Toxoplasma gondii* – neuropsychiatric disorders
- b) T F *Schistosoma mansoni* - Haematuria
- c) T F *Entamoeba histolitica* – Dysentery
- d) T F *Taenia saginata* - Cystercicosis

4. Match the disease to the sample that can be taken to the laboratory for diagnosis.

			DISEASE	SAMPLE
a)	T	F	TB meningitis	Serum for CrAg Test
b)	T	F	Onychomycosis	Corneal scrappings
c)	T	F	Aspergillosis	Blood for Beta-D Glucan analysis
d)	T	F	Candidemia	Tissue biopsies transported in saline

5. A 40-year-old patient presents with symptoms of pneumonia. What would be your plan of action?

- a) T F Request sputum culture for bacterial identification.
- b) T F Administer broad spectrum antibiotics then take sputum for culture.
- c) T F Refer the patient for a bronchoscopy.
- d) T F Request for a bronchoalveolar lavage for fungal cultures

6. Diarrhoea is described as

- a) T F chronic if it lasts longer than 2 weeks.
- b) T F acute if it lasts less than 7 days.
- c) T F persistent if symptoms are present for 14 days or more.
- d) T F severe if accompanied by significant dehydration.

7. The major public health concerns regarding antimicrobial resistance are that

- a) T F It leads to increased healthcare costs.
- b) T F It results in higher morbidity and mortality.
- c) T F it can be acquired from animals
- d) T F it is expensive to manage

8. The following are important Infection Prevention and Control Practices

- a) T F Hand hygiene is essential in preventing healthcare-associated infections.
- b) T F Use of gloves is sufficient to prevent infections.
- c) T F Environmental cleaning plays a role in infection prevention.
- d) T F Increasing the Turn-around-time for microbiology results

9. In your weekly report, you notice an increase in cases of a specific fungal infection. What further steps can you take?

- a) T F inform the superintendent, EHTs, Matron, the medical director, Africa CDC and WHO of a potential pandemic
- b) T F Start a public awareness campaign on fungal infections.
- c) T F inform the ward staff to start treating all patients within the ward with Ceftriaxone
- d) T F Monitor environmental factors that could contribute to outbreaks..

10. The following are causes of acute gastroenteritis

- a) T F *Salmonella bongori*
- b) T F Rotavirus
- c) T F *Escherichia coli* O157:H7
- d) T F *Trichomonas vaginalis*

11. Which of the following are risk factors for pulmonary Tuberculosis

- a) T F a CD4+ count of less than 200 cells/mm³
- b) T F A deficiency in Interferon Gamma
- c) T F Tobacco smoke
- d) T F Living in crowded and poorly ventilated areas

12. Regarding the Hepatitis B Virus

- a) T F Human infections is associated with increased Alanine aminotransferase
- b) T F Chronic HBV can lead to liver cancer

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- c) T F it can be treated with Metronidazole
- d) T F The vaccine is made by weakening the toxoids produced by the virus

13. Some properties of viruses that are used in viral diagnosis include

- a) T F they have a glycoproteins that can be recognised by Toll Like Receptors (TLR) 2 and 4
- b) T F They contain DNA or RNA which can be detected using a lateral flow assay
- c) T F They can cause a cytopathic effect in susceptible cells like L20B cell lines
- d) T F Some viral proteins (antigens) can still elicit an immune response and the immune cell response can be used as a diagnosis.

14. Antibiotics target specific mechanisms in bacteria. Which mechanism matches with the antibiotic class?

	DRUG CLASS	MECHANISM OF ACTION
a) T F	Beta-Lactams	Inhibit cell membrane synthesis
b) T F	Sulphonimides	Inhibit DNA gyrase
c) T F	Aminoglycosides	Bind to bacterial mitochondria, limiting energy production
d) T F	Fluoroquinolones	Disrupt bacterial cell membranes

15. Which of the following are signs and symptoms of Malaria

- a) T F Elevated eosinophil count
- b) T F Bilirubin levels above 20mg/dL
- c) T F Haemoglobinuria
- d) T F Anemia

16. Which laboratory safety measures should be taken when handling pathogenic samples?

- a) T F Always wear gloves in the microbiology section of the laboratory
- b) T F Dispose of blood contaminated waste in a Red lined bin
- c) T F Disinfect all surfaces with 1% sodium hypochloride.
- d) T F Work in a Biosafety Cabinet when handling all infectious disease samples

17. With regards vaccine - preventable diseases

- a) T F Two doses of a vaccine will ensure lifelong immunity
- b) T F Passive immunity can occur naturally by transplacental transfer of maternal antigens to the developing foetus
- c) T F Artificially injecting a recipient with exogenous antibodies targeted to a specific pathogen or toxin is a form of passive immunisation
- d) T F Herd immunity can prevent an individual from being infected.

18. Which of the following are zoonotic diseases

- a) T F Rabies
- b) T F Cholera
- c) T F Shigellosis
- d) T F Toxoplasmosis

19. A hemorrhagic fever that is showing symptoms similar to Ebola has been causing deaths in your province. Which precautions can you take from a laboratory's perspective?

- a) T F Conduct staff training on how to handle such specimens
- b) T F Encourage staff to wash their lab coats from home
- c) T F Do a risk assessment to identify weak areas that need to be strengthened in terms of biosafety and biosecurity
- d) T F Establish a foot bath containing 5% NaClO for decontamination

20. Which of the following are components of a Quality Management System (QMS) that ensure the reliability of results in an infectious disease laboratory?

- a) T F Regular calibration and maintenance of laboratory equipment.
- b) T F Implementation of standardized operating procedures (SOPs) for specimen handling and testing
- c) T F Enrolling for an External Quality Assessment once every 5 years
- d) T F Continuous training and competency assessments for laboratory personnel.

SECTION B: [20 MARKS]

Answer all questions on the separate answer sheets provided

1. State five bacterial pathogens (stating Genus and Species Name) that commonly cause urinary tract infections (UTIs). **[5 marks]**
2. State five reasons why a blood culture test may yield false-negative results in sepsis diagnosis. **[5 marks]**
3. List five diagnostic techniques used to identify viral pathogens in the laboratory giving an example for each. **[5 marks]**
4. State the HIV drug class that matches the following mechanisms of action:
 - a) Prevents the cleavage of viral proteins necessary for maturation of virions.
 - b) Inhibits the integration of viral DNA into the host genome.
 - c) Binds to gp120 or CCR5 receptors to block HIV entry into host cells.
 - d) Interferes with reverse transcriptase activity by binding to its active site.
 - e) Are nucleoside analogs with a disfunctional 3'hydroxyl group.

[5 marks]

SECTION C: [75 marks]

Answer any 3 questions from this section on separate answer sheets provided

1. Malaria is still a leading cause of death in tropical countries
 - a) Draw and label the life cycle of *Plasmodium falciparum*, highlighting the stages used for microscopic and molecular diagnosis in a clinical setting. **[15 marks]**
 - b) Discuss any 5 challenges in controlling and eradicating malaria. **[10 marks]**

2. *Cryptococcus neoformans* is continuing to be a major opportunistic fungal pathogen in patients with advanced HIV disease, which some cases showing antifungal resistance.
 - a) Describe the laboratory workflow for diagnosing cryptococcal meningitis from cerebrospinal fluid (CSF), from sample collection to report. **[15 marks]**
 - b) Discuss the factors that have led to the increase in the burden of drug-resistant fungal infections. **[10 marks]**

3. Nixon was diagnosed with HIV 3 years ago. His viral load for the last 3 visits have been above 1000 copies/ μ L
 - a) Discuss the physiological issues that may have led to the continued high viral load. **[15 marks]**
 - b) Describe in detail, the Laboratory test that is used monitor his viral load. **[10 marks]**

4. A patient is admitted with suspected bacterial sepsis.
 - a) Outline the conventional laboratory diagnosis of sepsis, from blood sample collection to final reporting. **[15 marks]**
 - b) Explain the role of the microbiology laboratory in sepsis outbreak investigations, including epidemiological typing, antimicrobial resistance monitoring, and infection control strategies. **[10 marks]**

5. A microbiology laboratory is offering services for a clinical trial for a new antibiotic. Discuss the key components of a Quality Management System in this microbiology laboratory. In your discussion, explain how each component contributes to improved diagnostic accuracy and trial outcomes. **[25 marks]**