



"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 2026

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
-

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. About *Staphylococcus aureus*:

- a) T F It produces coagulase, which converts fibrinogen to fibrin.
- b) T F MRSA strains are resistant due to mutations in penicillin-binding protein 2a.
- c) T F It is a leading cause of food poisoning via preformed enterotoxins.
- d) T F All strains are uniformly sensitive to vancomycin.

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

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

3. Regarding Hepatitis Viruses

- a) T F Hepatitis A is transmitted primarily by the fecal–oral route.
- b) T F Hepatitis B can be diagnosed using HBsAg detection.
- c) T F Hepatitis C virus infection is commonly treated with direct-acting antivirals.
- d) T F Hepatitis D virus requires HBV for replication.

4. About HIV Infection

- a) T F HIV primarily targets CD4+ T cells.
- b) T F Reverse transcriptase is responsible for converting viral RNA into DNA.
- c) T F Kaposi's sarcoma is an AIDS-defining illness.
- d) T F The p24 antigen test is used in early diagnosis.

5. Concerning antifungal drugs

- a) T F The only target ergosterol in the cell wall
- b) T F Nystatin is an echinocardin
- c) T F Amphotericin B causes lumbar toxicity and cannot be administered for extended periods of time
- d) T F Moulds, can develop resistance to Azole compounds.

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

- a) T F TB meningitis – Serum for CrAg Test
- b) T F Tinea corporis – Skin scrapings
- c) T F Gastroenteritis – Urine
- d) T F Aspergillosis – Tissue biopsies transported in formalin

7. With regards to vaccine-preventable diseases

- a) T F Three doses of a vaccine will ensure lifelong immunity for all vaccines
- b) T F Passive immunity can occur naturally by transplacental transfer of maternal antigens to the developing fetus

- c) T F Artificially injecting a recipient with endogenous antibodies targeted to a specific pathogen or toxin is a form of passive immunisation
- d) T F Herd immunity prevents an individual from being infected.

8. About Trypanosomiasis

- a) T F *Trypanosoma brucei* causes African sleeping sickness.
- b) T F It is transmitted by the tsetse fly.
- c) T F Antigenic variation of surface glycoproteins allows immune evasion.
- d) T F Metronidazole is effective in early disease treatment.

9. Regarding Helminthic Infections

- a) T F *Schistosoma haematobium* increases the chances of contracting HIV and genital cancer.
- b) T F *Taenia solium* infection can lead to neurocysticercosis.
- c) T F Hookworm infection leads to iron-deficiency anemia.
- d) T F *Enterobius vermicularis* is diagnosed by the "scotch tape test."

10. About Candida Infections

- a) T F *Candida albicans* forms germ tubes in serum at 37°C.
- b) T F Vulvo-vaginal candidiasis is more common in diabetics.
- c) T F *Candida auris* is of concern due to multidrug resistance.
- d) T F *Candida krusei* is inherently resistant to azoles.

11. 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 Internal Quality Assessment once every 10 years
- d) T F Continuous training and competency assessments for laboratory personnel.

12. A 30-year-old man with AIDS presents with chronic diarrhea and weight loss. Oocysts are detected on modified acid-fast staining.

- a) T F The likely pathogen is *Cryptosporidium parvum*.
- b) T F The infection is acquired from contaminated water.
- c) T F Nitazoxanide is an option for treatment.
- d) T F The oocysts are acid-fast negative.

13. A 70-year-old patient develops sepsis after catheterization. Blood cultures yield a Gram-positive coccus in chains.

- a) T F The organism is likely *Enterococcus faecalis*.
- b) T F It is part of the normal gut flora.
- c) T F Vancomycin resistance may occur in these organisms.
- d) T F They are catalase positive.

14. A 22-year-old woman presents with vesicular lesions on her lips.

- a) T F The most likely pathogen is HSV-1.
- b) T F PAP smear can show multinucleated giant cells.
- c) T F Acyclovir is used in treatment.

d) T F The infection is preventable by routine childhood vaccination.

15.A 45-year-old man presents with cyclic fever every 48 hours.

- a) T F The most likely cause is *Plasmodium vivax*.
- b) T F Hypnozoites are responsible for relapse.
- c) T F The definitive host for the parasite is the mosquito.
- d) T F Blood smear shows banana-shaped gametocytes.

16.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 whenever we enter the laboratory.
- c) T F Cleaning benches with 10% bleach
- d) T F Restricting access to the laboratory

17.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 Vaping
- d) T F Living in crowded and poorly ventilated areas

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

- a) T F **Sulfonamides** – Inhibit cell membrane synthesis
- b) T F **Beta-Lactams** – Inhibit DNA gyrase
- c) T F **Aminoglycosides** – Bind to bacterial mitochondria, limiting energy production
- d) T F **Fluoroquinolones** – Disrupt bacterial cell membranes

19.About Quality Management Systems in the microbiology laboratory

- a) T F Samples should be monitored for temperature during transportation
- b) T F Clinic staff should be trained on the order of draw
- c) T F Competency assessment ensures reliable test results
- d) T F Bacteriology barely requires quality checks

20.Regarding HIV Infection Diagnosis

- a) T F HIV RNA testing is mandatory for infants <18 months born to infected mothers
- b) T F p24 antigen is useful in early infection detection
- c) T F CD4 count is used for monitoring disease progression
- d) T F Drug resistance testing should be done for patients switching drug regimens.

SECTION B: [20 MARKS]

Answer all questions on separate answer sheets provided

1. Name five (5) bacterial pathogens of clinical importance that are considered part of the ESKAPE group. **[5 marks]**

2. Provide the laboratory sample of choice for each of the following infections:

- a. Pulmonary Tuberculosis
- b. Invasive Aspergillosis
- c. Plasmodium falciparum malaria
- d. Dengue virus infection
- e. Typhoid fever

[5 marks]

3. State any organism with following virulence factors:

- a. Protein A
- b. M protein
- c. Pneumolysin O
- d. Exotoxin A
- e. *KatG* enzyme

[5 marks]

4. Outline five (5) principles of infection prevention and control (IPC) in the laboratory that directly reduce the risk of laboratory-acquired infections. **[5 marks]**

SECTION C: [75 marks]

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

1. Discuss the main components of a Quality Management System (QMS) in a microbiology laboratory that is providing diagnostic support for a clinical trial of a new antiparasitic drug. In your answer, explain how each component of the QMS helps to improve the accuracy of test results and the overall reliability of the clinical trial outcomes. **(25 marks)**

2. In 2018–2019, Madagascar experienced a severe measles outbreak that led to over 150,000 cases and more than 1,200 deaths, mostly among children.

a. Using principles of outbreak investigation, discuss how principles of epidemiology would help in characterizing this outbreak. **(10 marks)**

b. As a Medical Laboratory Scientist, explain the laboratory methods you would use to confirm measles during such an outbreak and how your findings could guide public health interventions. **(15 marks)**

3. Urinary tract infections (UTIs) are among the most common nosocomial and community-acquired infections. Discuss the key risk factors, common causative organisms, diagnostic approaches, and how surveillance and antibiotic stewardship contribute to reducing recurrence

and antimicrobial resistance. **(25 marks)**

4. A 36-year-old female presents with recurrent vulvo-vaginal candidiasis. Cultures later reveal *Candida spp.* but the infection is not responding to azole treatment.

a. Discuss the pathogenesis of vulvo-vaginal candidiasis with particular reference to the role of host and microbial factors. **(10 marks)**

b. Explain how the laboratory can identify azole-resistant *Candida* species and outline how this information can guide clinical management. **(15 marks)**

5. Bloodstream parasitic infections such as malaria and trypanosomiasis remain major causes of morbidity and mortality in Africa. Discuss the pathogenesis and laboratory diagnostic approaches for these infections. **(25 marks)**