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

NOVEMBER 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**

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1. A 21-year-old college student presents with fever, stiff neck, and photophobia. What are the next steps?

a) T F CSF analysis is required urgently.
b) T F *Neisseria meningitidis* is a likely cause.
c) T F Latex agglutination can identify capsular antigens.
d) T F A pandy's test to determine CSF glucose can be done

2. Polio is a vaccine preventable disease. What immunological principles does the vaccination process rest upon?

a) T F Adaptive immunity has memory
b) T F Adaptive immunity develops more strength with each encounter with a pathogen
c) T F A weak version of the virus is enough to boost the immune system
d) T F Once the body makes antibodies against measles, the virus will never attack again

3. Which drug class matches with the specific mechanism of action?

a) T F **Entry inhibitors** – Bind to viral gp41 or gp120 or host cell CD4+ or chemokine (CCR5) receptors
b) T F **Non-nucleoside reverse transcriptase inhibitors** – Nucleic acid analogues mimic the normal building blocks of DNA, preventing transcription of viral RNA to DNA
c) T F **Integrase inhibitors** – Inhibits the enzyme necessary for integration of viral mRNA into host cells
d) T F **Protease inhibitors** – Prevents the catalytic cleavage of proteins needed for viral replication

4. About Sterilization and Disinfection:

a) T F Autoclaving uses moist heat under pressure.
b) T F Dry heat sterilization is suitable for glassware.
c) T F 70% ethanol is more effective than 100% ethanol.
d) T F Filtration can sterilize heat-labile solutions.

5. Regarding bacteria:

a) T F Biofilms protect bacteria from host defenses and antibiotics.
b) T F Quorum sensing is a bacterial communication mechanism.
c) T F Endotoxins are heat-stable lipopolysaccharides from Gram-positive bacteria.
d) T F can pass genetic information via conjugation

6. A 60-year-old diabetic patient develops a black necrotic lesion on the palate.

a) T F The likely pathogen is *Mucor* or *Rhizopus* species.
b) T F The infection is known as mucormycosis.
c) T F Culture on Sabouraud dextrose agar will confirm the diagnosis.

d) T F Fluconazole is the drug of choice.

7. Regarding the Rapid Plasma Reagin (RPR) test for Syphilis:

a) T F It measures IgA antibodies found in the sick patient
b) T F It tests for Cardiolipin found in the sick patient
c) T F It is a useful Lateral flow assay with high accuracy
d) T F If antibodies are not present, the charcoal reacts with the commercial antigen to form small clumps.

8. A 7-year-old child presents with bloody diarrhea and hemolytic uremic syndrome (HUS).

a) T F The causative agent is likely *E. coli* O157:H7.
b) T F MacConkey agar with salt is useful in laboratory diagnosis.
c) T F Antidiarrhoeals are contraindicated
d) T F Shiga-like toxin is the main virulence factor.

9. Regarding specimen collection in microbiology:

a) T F Blood cultures should be collected before starting antibiotics.
b) T F Midstream urine is preferred for culture.
c) T F CSF must be transported at room temperature without delay.
d) T F Sputum is always a sterile specimen.

10. A 28-year-old woman presents with recurrent foul-smelling vaginal discharge and clue cells on microscopy.

a) T F The most likely diagnosis is bacterial vaginosis.
b) T F *Gardnerella vaginalis* is the causative agent.
c) T F Metronidazole is the recommended treatment.
d) T F *Candida glabrata* is the main pathogen.

11. Regarding the Immune Reconstitution Syndrome (IRIS):

a) T F It occurs in TB patients who are not taking medication
b) T F It occurs in HIV patients who are not taking medication
c) T F It occurs in patients associated with Aspergillosis
d) T F It occures in patients with drug resistance HIV infections

12. Concerning Aspergillus:

a) T F Aspergilloma develops in pre-existing lung cavities.
b) T F *Aspergillus fumigatus* is the most common species causing invasive disease.
c) T F Azole resistance in Aspergillus can be detected by antifungal susceptibility testing.
d) T F All Aspergillus infections are superficial.

13. About culture media in bacterial analyses:

a) T F MacConkey agar with bile salts can detect Enterobacteria
b) T F Group D *Streptococci* are Beta haemolytic on Sheep Blood agar
c) T F Neutral red is used as an indicator for Kligler's Iron Agar
d) T F Antibiotic Susceptibility testing is done on Muller Hinton Agar

14. The following are statements about Normal Flora:

a) T F The gut microbiota aids in vitamin K production.

b) T F The vagina is normally dominated by *Lactobacillus* species.
c) T F The skin microbiota includes *Staphylococcus epidermidis*.
d) T F The lungs are heavily colonized in healthy individuals.

15. Regarding Antimicrobial Resistance (AMR)
a) T F ESBL-producing organisms hydrolyze third-generation cephalosporins.
b) T F Carbapenem resistance may be due to carbapenemase enzymes.
c) T F Animals also get drug resistant infections
d) T F Susceptibility testing is unnecessary in hospital-acquired infections.

16. With regards to Laboratory Biosafety
a) T F BSL-2 laboratories are required for routine clinical bacteriology.
b) T F BSL-3 is required for handling Mycobacterium tuberculosis.
c) T F A Class II biosafety cabinet provides both product and personnel protection.
d) T F Biosafety level is determined only by the size of the organism.

17. About Cryptococcus:
a) T F *Cryptococcus neoformans* is associated with pigeon droppings.
b) T F The capsule is the main virulence factor.
c) T F India ink preparation can demonstrate encapsulated yeast.
d) T F It commonly causes meningitis in immunocompromised hosts.

18. A 30-year-old man returns from West Africa with fever, jaundice, and dark urine.
a) T F *Plasmodium falciparum* malaria should be suspected.
b) T F Thick and thin blood films are diagnostic tests of choice.
c) T F Hypnozoites in the liver explain the relapse of this infection.
d) T F Rapid diagnostic tests can detect parasite antigens using the Histidine Rich Protein 2.

19. Matshidiso just had a small cut, which immunological events can occur if bacteria is introduced into the cut
a) T F Leukocytes can be recruited to the site of injury via chemotaxis
b) T F The wound can eventually heal with the possibility of a scar
c) T F The site can become red, swollen, due to vascular leakage and vascular dilation
d) T F Pus may form which is a combination of lymphoid cells, mast cells, dendritic cells, pleuropotent cells and the bacteria that the cells are trying to fight

20. Regarding Molecular diagnosis of human infections
a) T F Sequencing can provide epidermiological data for disease surveillence
b) T F Drug resistance like the *Kat*G in TB can be determined by molecular methods
c) T F Syndromic testing panels can determine a number of infections in one run
d) T F qPCR for HPV biomarkers are useful in HPV management

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SECTION B: [20 MARKS]

Answer all questions on separate answer sheets provided

1. List five (5) bacterial pathogens that are important causes of sexually transmitted infections (give Genus and species). **[5 marks]**

2. State the laboratory diagnostic test of choice for each of the following infections:
a. *Pneumocystis jirovecii* pneumonia
b. Strongyloidiasis
c. Rabies
d. Syphilis
e. Norovirus gastroenteritis

[5 marks]

3. State the mode of transmission for the following parasitic infections:
a. Hookworm
b. Schistosoma
c. Leishmania
d. Trichomonas
e. Toxoplasma

[5 marks]

4. List five (5) laboratory methods used in the detection of antimicrobial resistance (AMR) **[5 marks]**

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SECTION C: [75 marks]

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

1. Discuss the steps followed in vaccine production. In your discussion, highlight the role of a Medical Laboratory Scientist. **(25 marks)**

2. **Thobekile** was infected with an aspergilloma in her left lung.

a. Given that she is a TB survivor, discuss the pathogenesis of the aspergilloma **(10marks)**
b. Discuss the detection of drug resistant Aspergillus in the laboratory. **(15 marks)**

3. In Botswana, the use of Efavirenz in HIV treatment was challenged when a significant proportion of patients showed poor treatment outcomes due to genetic variations affecting drug metabolism.

a. Discuss the role of genomic epidemiology in identifying such treatment failures and how this approach differs from traditional epidemiology. **(10 marks)**

b. Describe the monitoring of HIV drug effectiveness. **(15 marks)**

4. In 2021, Zamfara State in Nigeria experienced one of the largest cholera epidemics in the country.

a. Describe the laboratory diagnosis of cholera from sample collection to laboratory reporting. **(10 marks)**

b. Outline the role of Medical Laboratory Scientists in cholera outbreak investigations. **(15 marks)**

5. Parasitic diseases continue tobe a significant cause of morbidity and mortality in Sub-saharan Africa

a. Why has it been difficult to eradicate parasitic diseases in Sub-saharan Africa? **(10marks)**
b. Discuss how biotechnology has enhanced the diagnosis and prevention of parasitic diseases. **(15 marks)**