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 SECOND SEMESTER FINAL EXAMINATIONS

APRIL 2024

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 34 year old male patient comes into the hospital with episodes of fever and chills. He had visited a malaria-endemic village. Malaria is the most likely diagnosis. Which confirmatory tests can you do?**

a) T F Determination of parasite antigen using Rapid Diagnostic Test kits

b) T F Thin and Thick blood smear slides to determine the species and as a prognostic indicator

c) T F Detecting abnormalities in blood cells including mild anemia and thrombocytopenia

d) T F Drug resistance tests based on the PCR amplification of drug resistance genes

2. **Infections due to parasites:**

a) T F Are less common in tropical and subtropical regions of the world

b) T F Can be diagnosed in the laboratory using, immuno-chromatographic assays,

c) T F Can be treated with antibacterial drugs.

d) T F Pose challenges in early diagnosis as some people may be asymptomatic.

3. **Which of the following can be used to treat parasitic infections?**

a) T F Penicillin G

b) T F Albendazole

c) T F Ketoconazole

d) T F Praziquantel

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

			DISEASE	SAMPLE
a)	T	F	Tinea corporis	Skin scrapping
b)	T	F	Onychomycosis	Nail clippings
c)	T	F	Candidemia	Pus swab
d)	T	F	Histoplasmosis	Tissue biopsies transported in formalin

5. **Medically important fungal infections can be classified based on the site of infection or disease they cause. Match the site or type of infection to the most likely aetiological agent:**

a) T F Subcutaneous infection – *Sporothrix* species

b) T F Superficial infection – *Trichosporon* species

c) T F Mycotoxicosis – *Aspergillus* species

d) T F Systemic infections - *Histoplasma* species

6. **Regarding Candida:**

a) T F *Candida auris* is a common cause of hospital acquired infections

b) T F Azole compounds are effective in treating all *Candida* infections

c) T F *Candida albicans* is the only species that causes vaginal thrush

d) T F Is a dermatophyte containing keratinases.

7. **With regards to antimicrobial resistance:**

a) T F The more you use an antibiotic, the more the risk for bacteria to become resistant to it

b) T F Antibiotic resistance is due to the human body, not the bacterial cell.

c) T F Taking antibiotics at a lower dose than prescribed will help prevent resistance from developing.

d) T F Organisms with Extended Beta Lactamases will be affected by Penicillins and Cephalosporins

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8. The following are important Antimicrobial Stewardship interventions:

a) T F Controlling the source of infection

b) T F Educating healthcare staff

c) T F Enhancing Infection prevention and control measures

d) T F Increasing the Turn-around-time for microbiology results

9. In your weekly report you notice that 10 patients from the same ward are testing positive for *Staphylococcus aureus* in their urine samples. 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 take environmental swabs, high touch surfaces as well as the hands of the ward staff to establish the source of the bacteria

c) T F inform the ward staff to start treating all patients within the ward with Ceftriaxone

d) T F disinfect the laboratory by fogging since it could be a contamination in the laboratory.

10. The following are examples of <u>bacterial</u> Sexually Transmitted Infections (STIs):

a) T F Gonorrhea

b) T F Syphilis

c) T F Genital Herpes

d) T F Trichomoniasis

11. The following are common microbial causes of acute gastroenteritis:

a) T F Rotavirus.

b) T F *Salmonella enterica*.

c) T F *Escherichia coli* O157:H7.

d) T F *Clostridium difficile*.

12. Which of the following are risk factors for urinary tract infections (UTIs):

a) T F are more common in females because their urethras are shorter and closer to the rectum.

b) T F are more common in pregnant women than those females who are not.

c) T F are more common in the elderly.

d) T F are more common in patients who have structural problems in the urinary tract

13. Human papillomaviruses (HPV) are a group of more than 200 viruses. They can cause infections that include:

a) T F Anal cancer

b) T F Genital warts

c) T F Oropharyngeal cancer

d) T F Cervical cancer

14. Some properties of viruses that are used in virus control include:

a) T F They are inactivated by UV radiation

b) T F Non - Enveloped viruses are susceptible to 100% (absolute) alcohol

c) T F They are heat stable

d) T F Some viral proteins (antigens) can still elicit an immune response and these can be used to make vaccines.

15. Which of the following statements should be considered during blood sample collection?

a) T F Sufficient quantity of specimen should be collected.

b) T F Contamination must be avoided during collection.

c) T F Specimen should be collected after beginning antimicrobial therapy.

d) T F Specimen should be representative of infectious process.

16. Approved Antiretroviral (ARV) drugs are classified based on how each drug interferes with the HIV life cycle. Which drug class matches with the specific mechanism of action?

	DRUG CLASS	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

17. With regards to immunity:

a) T F Passive immunization involves the transfer of humoral immunity, in the form of "ready-made" antibodies, from one individual to another.

b) T F Passive immunity can occur naturally by transplacental transfer of maternal antibodies 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. Exposing humans to a pathogen can result in any of the following

a) T F Infection

b) T F immunity

c) T F carrier state

d) T F allergic reaction

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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 Start using pneumatic tube systems to transport Ebola suspect specimens to the laboratory.

b) T F Encourage staff to bring their own 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 Separate serum and plasma from suspected patient's laboratory before sending it to the reference laboratory in cold chain for confirmation.

20. With regards to infectious spills in the laboratory

a) T F they can be contained by swabbing with 0.1% sodium hypochlorite

b) T F they can be prevented from spreading by pouring 1% sodium hypochlorite directly on top of the spill to prevent proliferation of the infectious material

c) T F a spill kit containing gloves, disinfectant, absorbent material, brush and an infectious waste bag should always be available in every room that will deal with infectious material.

d) T F laboratory hands should be trained on how to handle infectious spills

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SECTION B: [20 MARKS]

Answer all questions on separate answer sheets provided

1. State and describe any 5 antibiotics and their mechanism of action.**[5]**
2. State any five microorganisms by stating their full scientific names, that can cause Central Nervous system infections. **[5]**
3. List 5 factors that promote eye infections**. [5]**
4. Outline the steps involved in the laboratory diagnosis of *Candida* species. **[5]**

SECTION C: [75 marks]

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

1. Your laboratory wants to establish a Quality Management System. Discuss what will be involved and how it will contribute to improved patient outcomes in terms of infectious diseases. **[25]**
2. A new strain of polio virus has been discovered. To prevent the virus from spreading, the government has employed you and a team to develop a vaccine. Discuss issues you need to consider and the steps you would take to develop the vaccine from concept to deployment. **[25]**
3. A drug-resistant strain of Aspergillus is circulating causing drug-resistant Aspergillosis of the lungs.
   a) Discuss how the resistance might have come about and how laboratory scientists can be involved to reduce the burden of the resistance. **[5]**
   b) Discuss the pathophysiology associated with the disease. **[10]**
   c) Discuss in detail the laboratory diagnosis needed. **[10]**
4. Cholera has persisted in the country for more than 12 months.
   a) Outline the transmission and pathophysiology of cholera. **[10]**
   b) Discuss in detail the laboratory diagnosis of cholera. **[10]**
   c) Discuss your role as a scientist in controlling the disease. **[5]**
5. Parasitic diseases have continued to be a global health threat.
   a) Draw the life cycle of a parasitic worm infection of your choice highlighting the diagnostic stages. **[15]**
   b) Discuss why it is difficult to eradicate parasitic diseases. **[10]**