CANDIDATE NUMBER.....

AFRICA UNIVERSITY
A United Methodist-Related Institution

"Investing in Africa's Future"

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES
DEPARTMENT OF BIOMEDICAL AND LABORATORY SCIENCES

NSLS204: MICROBIOLOGY – BACTERIOLOGY

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER 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 MARK**

1. The bacterial cell structure includes
   - T F a) Cell membrane
   - T F b) Ribosomes for protein synthesis
   - T F c) Nucleus containing genetic material
   - T F d) Mitochondria for ATP production

2. The pathogenesis in bacterial infections involves
   - T F a) Host immune response evasion
   - T F b) Host tissue invasion
   - T F c) Biofilm formation
   - T F d) Production of exotoxins

3. Gram negative bacteria include
   - T F a) *Staphylococcus species*
   - T F b) *Escherichia coli*
   - T F c) *Pseudomonas aeruginosa*
   - T F d) *Neisseria gonorheria*

4. In bacterial genetics, plasmids are:
   - T F a) Circular RNA molecules separate from chromosomal genetic material
   - T F b) Capable of carrying antibiotic resistance genes
   - T F c) Passed between bacteria by conjugation
   - T F d) Only found in Gram positive bacteria

5. The following are ways of reducing transmission of infectious agents from the laboratory
   - T F a) Disinfecting benches after finishing work
   - T F b) Wearing laboratory coats and scrubs outside the laboratory
   - T F c) Wearing gloves at all times in the laboratory
   - T F d) disposing sample waste together with office litter

6. Bio safety and Bio-security in a laboratory entails that
   - T F a) waste should be segregated
   - T F b) biohazardous material should be autoclaved or incinerated
   - T F c) Samples should be transported in triple packaging
   - T F d) Lab personnel use a BSC Class II for materials that may cause respiratory infections

7.

Fig 1

The sign in Fig 1 is used on

T F a) Acids and Alkalis
T F b) Harmful substances chemical that cause fumes
T F c) Corrosive substances
T F d) Biohazard materials

8. The following are characteristics of Gram positive bacteria

T F a) thick peptidoglycan layer
T F b) outer lipid membrane
T F c) presence of lipopolysaccharides
T F d) Stain pink in the gram-staining process

9. The bacterial biofilms are:

T F a) Formed only on living tissues
T F b) Resistant to many antibial treatments
T F c) Easily removed by standard disinfectants
T F d) Complex communities of bacteria in a self-produced matrix

10. In molecular diagnostics of bacteria

T F a) PCR can be used for rapid bacterial identification
T F b) MALDI-TOF MS identifies bacteria based on protein profiles
T F c) Nucleic acid probes can be used to detect specific bacterial genes
T F d) sequencing can determine bacteria that cannot be cultured

11. Which statement best describes how to prepare a 1%(v/v) NaClO solution from a 10%(v/v) NaClO

T F a) Mix 1 part NaClO with 9 parts water
T F b) Mix 9 parts NaClO with 1 part water
T F c) Mix 1 part NaClO with 10 parts water
T F d) Mix 10 parts NaClO with 90 parts water

12. In infection control, common practices include
T F a) Proper specimen transport
T F b) Hand hygiene
T F c) Reusing single-use PPE
T F d) Sterilization of equipment

13. The Selective media are designed to promote

T F a) Promote the growth of all bacterial species
T F b) Inhibit the growth of unwanted bacteria
T F c) differentiate bacterial species based on biochemical properties
T F d) enhance the growth of specific bacteria

14. Organisms that can be isolated from a High Vaginal Swab include
T F a) *Candida albicans*
T F b) *Candida glabrata*
T F c) *Lactobacillus* spp
T F d) *Neisseria* gonorrhoea

15. A *Staphylococcus epidermidis* can be differentiated from other Staphylococci based on
T F a) Coagulase test
T F b) DNAse test
T F c) Mannitol fermentation
T F d) Beta-haemolysis on blood agar

16. Serotyping is used to
T F a) Identify bacteria based on cell surface antigens
T F b) Differentiate bacterial strains
T F c) Detect bacterial proteins
T F d) identify bacteria based on the nucleic acid

17. On Kliger Iron Agar
T F a) Lactose fermeters keep the media yellow
T F b) Hydrogen peroxide is used to identify Salmonella
T F c) Pseudomonas does not change the colour of the media
T F d) An acid butt and an alkaline slope signifies a non-lactose fermenter

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18. With regards to a Laboratory Request Form, the following information is mandatory

T	F	a) Sex
T	F	b) Age
T	F	c) Clinical Data
T	F	d) Signature of patient to show consent for the test being done

19. The following are Catalase positive organisms

T	F	a) *Streptococcus pneumoniae*
T	F	b) *Enterococcus faecalis*
T	F	c) *Enterococcus faecaum*
T	F	d) Group B *Streptococcus*

20. Bacterial organisms can be tested based on

T	F	a) cell surface antigens
T	F	b) different enzyme functionalities
T	F	c) Nucleic acid sequences
T	F	d) Cell wall structure

SECTION B [20 MARKS]

Answer all questions on separate answer sheets provided

1. List 4 factors that affect antimicrobial susceptibility testing using the Kirby Bauer Disk Diffusion Assay .**[4 marks]**
2. List 4 mechanisms of antibiotic resistance. **[4marks]**
3. Give examples of bacteria (Genus and species) in the following categories **[4 marks]**
   a) Spirochettes
   b) Gram positive rod
   c) Acid fast bacteria
   d) Intracellular bacteria
4. State the use of the following media
   a) Skirrow agar
   b) Thayer Martins
   c) Deoxycolate Agar
   d) TCBS **[4marks]**
5. List 4 virulence factors of *Staphylococcus aureus*. **[4marks]**

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SECTION C [75 marks]

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

1. Discuss, using specific examples, the role of molecular diagnostics in the identification of bacterial pathogens. [25 marks]

2. **Susan** visited Mozambique for 2 weeks, upon return she is having rice watery stool diarrhoea.

a) Discuss the pathogenesis of the most likely causative agent given that it is bacterial. [10 marks]

b) Also outline the laboratory diagnostic process from sample collection to report.[15 marks]

3. A 10 year old boy is having night sweats and a persistent cough for more than 3 weeks. He has lost weight over the past 2 weeks.

a) Discuss the pathogenesis of the most likely cause of the disease given that it is bacterial [15 marks]

b) Describe the molecular diagnostic method for this disease. [10 marks]

4. Over the past week, 10 patients in the same ward were diagnosed with *Staphylococcus aureus* septicemia.

a) Explain how all 10 patients might have contracted the same infection, and describe measures that could help prevent this type of outbreak. [10 Marks]

b) Tests revealed that the bacteria are resistant to methicillin. Describe the step-by-step laboratory process, from sample collection to the final report, used to determine methicillin resistance. [15 Marks]

5. A patient is suspected to be having a Urinary Tract Infection. Describe how you would process the urine specimen citing the scientific principles behind all the tests that you would do from specimen collection to report [25 marks]