



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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## University Examinations 2024/2025

THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR  
OF MEDICAL MICROBIOLOGY

### HMM 3317: MICROBIAL PATHOGENICITY

DATE: JANUARY 2025

TIME: 3 HOURS

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#### INSTRUCTIONS:

Answer *All* questions

Ensure that all your answers are properly numbered

Part I multiple Choice Questions (MCQ): Write the correct answer on the space provided in the answer booklet. Each MCQ is one mark

Part II: Short Answer Questions – Answer questions following each other on the answer booklet

Part III: Long Answer Questions – Answer each question on the answer booklet

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#### SECTION A: MULTIPLE CHOICE QUESTIONS (20 marks)

1. Which of the following would be a sign of an infection?
  - a) Muscle aches
  - b) Headache
  - c) Fever
  - d) Nausea
2. Which of the following is an example of a noncommunicable infectious disease?
  - a) Infection with a respiratory virus
  - b) Food poisoning due to a preformed bacterial toxin in food
  - c) Skin infection acquired from a dog bite
  - d) Infection acquired from the stick of a contaminated needle

3. During an oral surgery, the surgeon nicked the patient's gum with a sharp instrument. This allowed Streptococcus, a bacterium normally present in the mouth, to gain access to the blood. As a result, the patient developed bacterial endocarditis (an infection of the heart). Which type of disease is this?
  - a) Iatrogenic
  - b) Nosocomial
  - c) Vectors
  - d) Zoonotic
4. Which period is the stage of disease during which the patient begins to present general signs and symptoms?
  - a) Convalescence c
  - b) Incubation
  - c) Illness
  - d) Prodromal
5. A communicable disease that can be easily transmitted from person to person is which type of disease?
  - a) Contagious
  - b) Iatrogenic
  - c) Acute
  - d) Nosocomial
6. Pathogen A has an ID<sub>50</sub> of 50 particles, pathogen B has an ID<sub>50</sub> of 1,000 particles, and pathogen C has an ID<sub>50</sub> of  $1 \times 10^6$  particles. Which pathogen is most virulent?
  - a) pathogen A
  - b) pathogen B
  - c) pathogen C
7. Which of the following choices lists the steps of pathogenesis in the correct order?
  - a) Invasion, infection, adhesion, exposure
  - b) Adhesion, exposure, infection, invasion
  - c) Exposure, adhesion, invasion, infection
  - d) Disease, infection, exposure, invasion

8. Which of the following would be a virulence factor of a pathogen?
- a) A surface protein allowing the pathogen to bind to host cells
  - b) A secondary host the pathogen can infect
  - c) A surface protein the host immune system recognizes
  - d) The ability to form a provirus
9. You have recently identified a new toxin. It is produced by a gram-negative bacterium. It is composed mostly of protein, has high toxicity, and is not heat stable. You also discover that it targets liver cells. Based on these characteristics, how would you classify this toxin?
- a) Superantigen
  - b) Endotoxin
  - c) Exotoxin
  - d) Leucocidin
10. Which of the following applies to hyaluronidase?
- a) It acts as a spreading factor.
  - b) It promotes blood clotting.
  - c) It is an example of an adhesin.
  - d) It is produced by immune cells to target pathogens.
11. Phospholipases are enzymes that do which of the following?
- a) Degrade antibodies
  - b) Promote pathogen spread through connective tissue.
  - c) Degrade nucleic acid to promote spread of pathogen
  - d) Degrade cell membranes to allow pathogens to escape phagosomes
12. Which of the following is a major virulence factor for the fungal pathogen *Cryptococcus*?
- a) Hemolysin
  - b) Capsule
  - c) Collagenase
  - d) Fimbriae
13. Which of the following pathogens undergoes antigenic variation to avoid immune defenses?
- a) *Candida*
  - b) *Cryptococcus*

c) *Plasmodium*

d) *Giardia*

14. Which toxin is released by verotoxigenic *E. coli* into the small intestine in oedema disease?

a) Alpha-haemolysin.

b) Enterotoxin.

c) Shiga-like toxin.

d) Endotoxin.

e) Siderophores

15. Which of the following toxins-releasing bacteria is frequently encountered as causative agents of human gastroenteritis?

a) *Cryptococcus neoformans*

b) *Streptococcus pneumoniae*

c) *Salmonella typhi*

d) *Staphylococcus aureus*

16. The following is the most possible bacteria associated with the opportunistic infections that occur in patients who have cystic fibrosis

a) *Staphylococcus aureus*

b) *Pseudomonas aeruginosa*

c) *Chlamydia trachomatis*

d) *Candida albicans*

17. Which of the following bacteria is predominantly present as normal flora in urine?

a) *Escherichia coli*

b) *Staphylococcus epidermidis*

c) *Staphylococcus aureus*

d) *Streptococcus pyogenes*

18. Which of the following pathogens is predominantly present as a normal flora in the urogenital tract of a mother and a newborn female infant?

a) *Candida albicans*

b) *Lactobacillus acidophilus*

c) *Histoplasma capsulatum*

d) *Neisseria gonorrhoeae*

19. The upper respiratory tract of the human body typically harbors as part of its normal flora, but an excessive proliferation of these bacteria can result in respiratory tract infections.

a) *Lactobacillus acidophilus*

b) *Streptococcus spp*

c) *Vibrio cholerae*

d) *Clostridium difficile*

20. What does *Pseudomonas aeruginosa* produce that damages the lung parenchyma?

a) Exotoxin A

b) Lipopolysaccharide (LPS)

c) Elastase

d) Proteases

e) Phospholipase C

**SECTION B: SHORT ANSWER ALL QUESTIONS (40 MARKS)**

1. Outline the mode of action of the shigatoxin. (8 Marks)
2. Describe how the tetanospasmin causes opisthotonos and paralysis. (8 Marks)
3. Outline the role of the immunity in the pathogenesis of Hepatitis infections. (8 Marks)
4. Write short notes on microbial adhesins and disease. (8 Marks)
5. Summarize four classes of bacterial exoenzymes. (8 Marks)

**SECTION C: LONG ANSWER TWO QUESTIONS (40 MARKS)**

1. Discuss host immune evasion mechanisms utilized by bacterial pathogens. (20 Marks)
2. Discuss three categories of exotoxins and their mechanisms of action and disease (20 Marks)
3. Describe the mechanism of action of the following A-B exotoxin (20 Marks)
  - a. Diphtheria toxin
  - b. Pertusin toxin
  - c. Botulinum toxin
  - d. Tetanus pasmin