



UNIVERSITI KUALA LUMPUR  
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

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**FINAL EXAMINATION**  
**MARCH 2025 SEMESTER**

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COURSE CODE : HGD10403  
COURSE TITLE : MICROBIOLOGY FOR ENVIRONMENTAL HEALTH  
PROGRAMME NAME : DIPLOMA IN ENVIRONMENTAL HEALTH  
DATE : 23 JUNE 2025  
TIME : 2:00PM - 5:00PM  
DURATION : 3 HOURS



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**INSTRUCTIONS TO CANDIDATES**

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1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Section A consist 25 MCQ or EMQ questions. Answer ALL questions.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet.  *Tick if applicable*
9. Refer to the attached Formula/ Appendies.  *Tick if applicable*



SECTION A (Total: 25 marks)

Answer ALL questions.

Please use the objective answer sheet provided.

1. The field of microbiology that is concerned with the study of fungi is known as \_\_\_\_\_.
  - A. protozoology
  - B. mycology
  - C. bacteriology
  - D. virology
  
2. According to the rules of binomial nomenclature, which of the following is written correctly?
  - A. Staphylococcus Aureus
  - B. *Staphylococcus aureus*
  - C. staphylococcus aureus
  - D. *staphylococcus Aureus*
  
3. The primary purpose of Koch's postulates is to \_\_\_\_\_.
  - A. develop new methods for growing pure cultures
  - B. introduce aseptic techniques into medical procedures
  - C. verify that a specific microbe causes a specific disease
  - D. disprove the theory of spontaneous generation

4. An assemblage of different microbial populations that live together in a specific location is known as a \_\_\_\_\_.
- A. ecosystem
  - B. microbial community
  - C. prokaryotic population
  - D. habitat
5. Which of the following is a key characteristic of prokaryotic cells that differentiates them from eukaryotic cells?
- A. Prokaryotic cells have no nucleus or other membrane-bound organelles.
  - B. Prokaryotic cells genome is composed of DNA.
  - C. Prokaryotic cells contain ribosomes.
  - D. Prokaryotic cells possess a cell membrane.
6. In the Gram stain procedure, which reagent acts as the primary stain?
- A. Crystal violet
  - B. Safranin
  - C. Alcohol
  - D. Gram's iodine
7. \_\_\_\_\_ are small, circular, double-stranded DNA molecules that are separate from the main chromosome and may encode for traits like antibiotic resistance.
- A. Ribosomes
  - B. Endospores
  - C. Plasmids
  - D. Inclusions

8. The cell wall of acid-fast bacteria like *Mycobacterium* is primarily composed of a waxy lipid known as:\_\_\_\_\_.
- A. mycolic acid
  - B. peptidoglycan
  - C. teichoic acid
  - D. lipopolysaccharide
9. A bacterium possessing the flagella arrangement as shown in the figure below is described as \_\_\_\_\_.
- Refer Below - Figure1 : Flagella .*

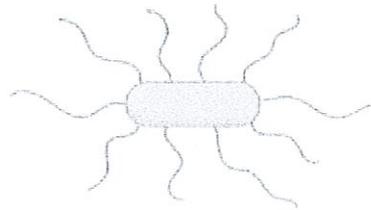


Figure 1: Flagella

- A. peritrichous
- B. amphitrichous
- C. lophotrichous
- D. monotrichous

10. A bacteria shown in the figure below is referred to as having a \_\_\_\_\_ shape.

*Refer Below - Figure2 : Bacteria .*

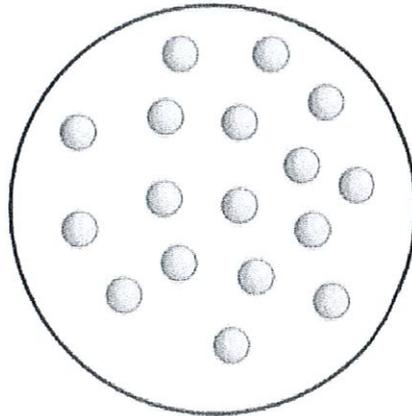


Figure 2: Bacteria

- A. vibrio
  - B. coccus
  - C. bacillus
  - D. spirillum
11. Bacteria that grow best at moderate temperatures (30-40°C), such as those associated with warm-blooded animals, are classified as \_\_\_\_\_.
- A. psychrophiles
  - B. mesophiles
  - C. halophiles
  - D. thermophiles
12. Yeasts typically reproduce by \_\_\_\_\_.
- A. fragmentation
  - B. budding
  - C. conjugation
  - D. sporulation

13. Which essential macronutrient is a key component of nucleic acids and plays a critical role in energy transfer as part of ATP?
- A. Phosphorus
  - B. Sulfur
  - C. Nitrogen
  - D. Hydrogen
14. What is the primary goal of pasteurization?
- A. To disinfect beverages by reducing the number of spoilage organisms.
  - B. To preserve beverages by rapid freezing.
  - C. To improve the nutritional value of beverages.
  - D. To sterilize milk and other beverages.
15. The principle that an antimicrobial drug should be toxic to the microbe but not to the host is known as \_\_\_\_\_.
- A. selective toxicity
  - B. oligodynamic action
  - C. broad-spectrum activity
  - D. the therapeutic index
16. Which physical control method is most suitable for sterilizing heat-sensitive liquids like vaccines or drugs?
- A. Pasteurization
  - B. Autoclaving
  - C. Dry heat oven
  - D. Filtration

17. What is the primary effect of using cold temperatures, like refrigeration, for microbial control?
- A. It sterilizes food.
  - B. It is microbiostatic and slows the growth of microbes.
  - C. It denatures the proteins of microbes.
  - D. It is microbicidal and kills most pathogens.
18. In the Kirby-Bauer disk diffusion test, the clear area around an antibiotic disk where bacteria fail to grow is called the \_\_\_\_\_.
- A. minimum inhibitory concentration
  - B. region of resistance
  - C. zone of inhibition
  - D. therapeutic index
19. What is a primary challenge in developing effective antifungal drugs?
- A. Fungal cells are eukaryotic, similar to human cells.
  - B. Fungal cells lack a cell wall to target.
  - C. Fungal cells are much smaller than bacteria.
  - D. Fungal cells do not have ribosomes.
20. \_\_\_\_\_ is the process where the waste product of one organism becomes the building block for the next organism.
- A. Decomposition
  - B. Biotransformation
  - C. Biosynthesis
  - D. Fermentation

21. What is the term for all of the different populations of organisms living together in one location?
- A. Habitat
  - B. Community
  - C. Biosphere
  - D. Ecosystem
22. Metabolites that are produced during major metabolic pathways and are essential to a microbe's function, such as amino acids, are called \_\_\_\_\_.
- A. by-products
  - B. secondary metabolites
  - C. primary metabolites
  - D. inorganic nutrients
23. \_\_\_\_\_ is the process where certain bacteria convert atmospheric nitrogen gas ( $N_2$ ) into ammonia.
- A. Ammonification
  - B. Nitrification
  - C. Denitrification
  - D. Nitrogen fixation
24. What is the role of organisms that break down dead organic matter and return nutrients to the environment?
- A. Decomposers
  - B. Quaternary consumers
  - C. Producers
  - D. Primary consumers

25. Antibiotics such as penicillin and cephalosporin inhibits \_\_\_\_\_ of bacteria.
- A. protein synthesis
  - B. cell membrane function
  - C. cell wall synthesis
  - D. nucleic acid synthesis

SECTION B (Total: 75 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

The classification of bacteria based on their cell wall is a cornerstone of microbiology. Answer the following questions based on this principle.

- (a) With the aid of clearly labelled diagrams, compare and contrast the key structural components of a Gram-positive cell wall and a Gram-negative cell wall. (10 marks)
- (b) Explain the importance and function of the following bacterial structures:
- i. Lipopolysaccharide (LPS) (5 marks)
  - ii. Endospore (5 marks)
  - iii. Capsule (5 marks)

**Question 2**

Microorganisms are diverse, and their growth is defined by specific environmental and nutritional requirements.

- (a) The bacterial growth curve is a fundamental model for understanding microbial populations.
- i. Draw and label the four distinct phases of a typical bacterial growth curve.  
(7 marks)
  - ii. For each of the four phases, explain its primary characteristic.  
(8 marks)
- (b) Describe the optimal growth conditions for the following types of organisms.
- i. Obligate aerobe  
(2 marks)
  - ii. Obligate anaerobe  
(2 marks)
  - iii. Facultative anaerobe  
(2 marks)
  - iv. Microaerophile  
(2 marks)
  - v. Capnophile  
(2 marks)

**Question 3**

Physical methods of microbial control is essential for preventing infection and spoilage.

- (a) Explain the difference between the concepts of sterilization, disinfection and antisepsis.

(9 marks)

- (b) Compare and contrast the following physical control methods.

i. Moist Heat (Autoclave) vs. Dry Heat (Dry Oven)

(8 marks)

ii. Ionizing Radiation vs. Non-ionizing Radiation.

(8 marks)

**Question 4**

Microorganisms are essential for recycling key nutrients in ecosystems, but an imbalance of these nutrients and the presence of waste can lead to significant environmental health problems.

- (a) Describe the critical role of microorganisms in the following biogeocycles:

i. The nitrogen cycle

(6 marks)

ii. The phosphorous cycle

(6 marks)

- (b) The treatment of water and sewage is critical for public health.

i. Define the term eutrophication and state its primary cause.

(7 marks)

ii. Describe the three main stages of sewage treatment.

(6 marks)

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END OF EXAMINATION PAPER



