



UNIVERSITI KUALA LUMPUR  
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

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

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COURSE CODE : HDB10502  
COURSE TITLE : BASIC MICROBIOLOGY  
PROGRAMME NAME : BACHELOR OF BIOMEDICAL SCIENCE (HONOURS)  
DATE : 21 JUNE 2025  
TIME : 9:00AM - 12:00PM  
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. Answer ALL questions for Section A.
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

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THERE ARE 16 PAGES OF QUESTIONS INCLUDING THIS PAGE

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**SECTION A (Total: 40 marks)**

**Answer ALL questions.**

**Please use the answer booklet provided.**

1. Select the most appropriate way to sterilize a culture medium which contains a heat sensitive protein.
  - A. Membrane filter with pore size 0.45  $\mu\text{m}$
  - B. Membrane filter with pore size 0.22  $\mu\text{m}$
  - C. Autoclave
  - D. Ultraviolet radiation
  
2. In the stationary phase, the number of bacterial cells remains constant because \_\_\_\_\_.
  - A. sudden increase in temperature
  - B. accumulation of toxic waste and depletion of nutrients
  - C. genetic mutation of the bacterial cells
  - D. entry into dormancy
  
3. A medium that contains yeast extract, glucose and magnesium sulfate can be classified as \_\_\_\_\_.
  - A. chemically defined medium
  - B. selective medium
  - C. complex medium
  - D. differential medium

4. In a medium composed of glucose, ammonium sulfate, vitamin C, and sodium chloride, identify the component that serve as the carbon source in the medium.
- A. Vitamin C
  - B. Glucose
  - C. Ammonium sulfate
  - D. Sodium chloride
5. Polyenes inhibit fungal growth by inhibition of \_\_\_\_\_.
- A. RNA synthesis
  - B. ergosterol synthesis
  - C. DNA synthesis
  - D. enzyme synthesis
6. Choose which protozoa uses pseudopodia for movement and feeding
- A. *Paramecium* spp.
  - B. *Cryptosporidium* spp.
  - C. *Amoeba* spp.
  - D. *Taenia saginata*
7. The primary function of bacterial flagella is to \_\_\_\_\_.
- A. enable movement
  - B. provide structural support
  - C. aid in reproduction
  - D. help in nutrient absorption

8. Identify the cell morphology in the image below.

*Refer Below - Figure 1 : The arrangement of bacterial cells under light microscope. .*



Figure 1: The arrangement of bacterial cells under light microscope.

- A. Staphylococcus  
B. Diplococcus  
C. Streptococcus  
D. Tetrad
9. The maximum total magnification typically achievable by a standard light microscope is \_\_\_\_\_.
- A. 1,000×  
B. 400×  
C. 40×  
D. 10,000×

10. The term microaerophile refers to an organism that \_\_\_\_\_.
- A. is killed by oxygen
  - B. requires oxygen for growth
  - C. requires environments containing lower levels of oxygen
  - D. does not use oxygen but tolerates it
11. Identify during which phase of the bacterial growth curve do bacteria actively divide at a constant rate.
- A. Stationary phase
  - B. Log phase
  - C. Death phase
  - D. Lag phase
12. Choose which of the followings is an example of beta-lactam antibiotics.
- A. Chloramphenicol
  - B. Erythromycin
  - C. Rifampin
  - D. Penicillin
13. A culture of *Escherichia coli* produces 4 generations in 2 hours. Calculate the generation time for this bacterium under this growth condition.
- A. 2 hours
  - B. 1 hour
  - C. 20 minutes
  - D. 30 minutes

14. Identify which of the following techniques may be performed quantitatively to determine the number of bacteria of a particular type.
- A. Dry cell mass
  - B. Spectrophotometer
  - C. Viable cell count
  - D. Haemocytometer
15. Choose where are psychrophilic microorganisms most likely to be found.
- A. Arctic and Antarctic regions
  - B. Hot springs and geothermal vents
  - C. Tropical rainforests
  - D. Human skin surface
16. Identify which group of microorganisms is most likely to spoil fruits preserved with salt.
- A. Halophiles
  - B. Acidophiles
  - C. Psychrophiles
  - D. Alkaliphiles
17. In a test tube of thioglycollate broth, predict at which level will obligate anaerobes typically grow.
- A. Near the bottom
  - B. At the surface
  - C. In the middle of the broth
  - D. Evenly throughout the broth

18. Identify which of the following statement is applicable to endotoxins.
- A. Found only in Gram negative bacteria.
  - B. Highly toxic and fatal in microgram quantity.
  - C. Usually binds to specific cellular receptor of the host.
  - D. Found only in Gram positive bacteria.
19. The viral protein coat is known as \_\_\_\_\_.
- A. phage
  - B. virion
  - C. capsid
  - D. CD4 receptor
20. In a lysogenic infection, the viral genome attached to the bacterial genome is defined as:
- A. virulent phage
  - B. prophage
  - C. yeast
  - D. bacteriophage
21. Identify the function of the micronucleus in *Paramecium* spp.
- A. Involved in reproduction
  - B. Helps in forming cysts
  - C. Controls daily metabolic functions
  - D. Aids in movement and feeding

22. Identify how is *Ascaris lumbricoides* typically transmitted to humans.
- A. Through contaminated soil and feces
  - B. From person-to-person contact
  - C. Through contaminated water
  - D. By consuming undercooked meat
23. Select which of the following statements best describes helminths.
- A. They are unicellular microorganisms.
  - B. They reproduce asexually by binary fission.
  - C. They are endoparasites that reproduce within their host.
  - D. They are macroscopic and often have complex life cycles involving one or more hosts.
24. Select the common growth medium for filamentous fungi.
- A. Blood agar
  - B. Potato dextrose agar
  - C. Nutrien agar
  - D. Mac Conkey agar

25. The image displayed most likely shows the structure of \_\_\_\_\_.  
Refer Below - Figure2 : The microscopic image of a microorganism. .

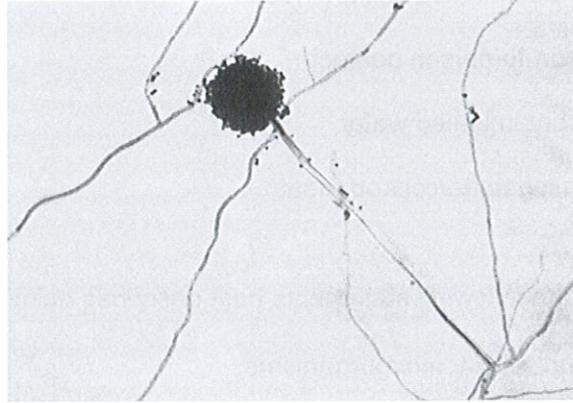


Figure 2: The microscopic image of a microorganism.

- A. *Saccharomyces cerevisiae*  
B. *Escherichia coli*  
C. *Aspergillus niger*  
D. *Staphylococcus aureus*
26. Mycelium is a network of \_\_\_\_\_.  
A. algal filaments for photosynthesis  
B. root hairs in viruses for water absorption  
C. bacterial cells forming colonies  
D. hyphae in fungi that absorb nutrients
27. Fungal cells can be stained using \_\_\_\_\_.  
A. brilliant green  
B. lactophenol cotton blue  
C. ethanol  
D. crystal violet

28. A researcher isolated a microbial species from a seawater sample. Under electron microscope, the cells are rod-shaped, and a unit cell keeps regular dimensions of about 1.5  $\mu\text{m}$  long and 0.5  $\mu\text{m}$  wide, with no presence of nucleus. The cell is most probably a:
- A. bacterial cell.
  - B. yeast cell.
  - C. virus.
  - D. fungal cell.
29. Bacteria reproduce by \_\_\_\_\_.
- A. meiosis
  - B. multiple fission
  - C. budding
  - D. binary fission
30. Choose the characteristic feature of organisms in the domain Archaea.
- A. They have membrane-bound organelles.
  - B. They live only in moderate environments.
  - C. They have prokaryotic cell structure and often live in extreme conditions.
  - D. They possess peptidoglycan in their cell walls.
31. Select which organism is an indicator of fecal contamination of water.
- A. *Escherichia coli*
  - B. *Candida albicans*
  - C. *Aspergillus niger*
  - D. *Staphylococcus aureus*

32. Bacterial endospores are formed primarily to \_\_\_\_\_.
- A. increase the bacteria's nutrient absorption.
  - B. assist in bacterial movement.
  - C. help bacteria reproduce rapidly.
  - D. enable bacteria to survive harsh environmental conditions.
33. If peptidoglycan is digested, Gram positive bacteria become:
- A. Spheroplast
  - B. Protoplast
  - C. Yeast
  - D. Gram negative bacteria
34. Identify which of the following is a correct rule when writing a binomial species name.
- A. Both genus and species names are written in uppercase.
  - B. Both names are written in bold and underlined.
  - C. The genus name is capitalized and the species name is lowercase.
  - D. The species name comes before the genus name.
35. Organisms classified under kingdom Monera are characterized by having \_\_\_\_\_.
- A. a true nucleus and membrane-bound organelles
  - B. prokaryotic cells without a true nucleus
  - C. multicellular structure with specialized tissues
  - D. chloroplasts and mitochondria for energy production

36. The person credited with pioneering the development of the smallpox vaccine, laying the foundation for modern immunology.

- A. Robert Koch
- B. Leeuwenhoek
- C. Edward Jenner
- D. Joseph Lister

37. The following image of *Staphylococcus aureus* is most probably obtained via:

*Refer Below - Figure3 : Microscopic image of bacterial cells. .*

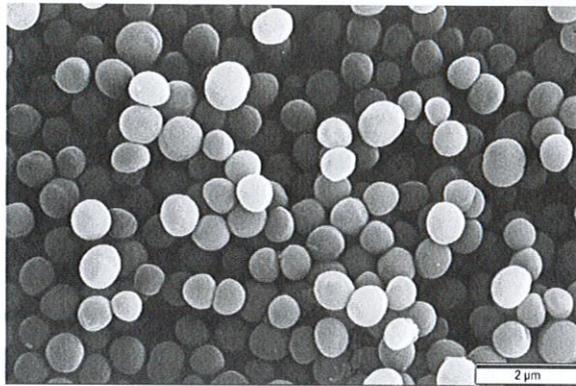


Figure 3: Microscopic image of bacterial cells.

- A. Compound microscope
  - B. Scanning electron microscope
  - C. Transmission electron microscope
  - D. Light microscope
38. This scientist was a pioneering epidemiologist best known for his role in stopping the 1910 Manchurian plague and inventing the precursor to the modern N95 mask.
- A. Leeuwenhoek
  - B. Edward Jenner
  - C. Wu Lien-Teh
  - D. Robert Koch

39. A Mac Farland standard is used:
- A. to adjust the turbidity of fungal spore suspension so that the number of spores will be within a given range.
  - B. to adjust the turbidity of bacterial suspension so that the number of bacteria will be within a given range.
  - C. to ensure the growth of microorganism in a culture medium.
  - D. to study the susceptibility of pathogen on a particular antibiotic.
40. Autoclave kills microorganisms by \_\_\_\_\_.
- A. x-ray radiation
  - B. moist heat
  - C. dry heat
  - D. ultraviolet radiation

**SECTION B (Total: 60 marks)**

**Answer THREE (3) questions only.**

**Please use the answer booklet provided.**

**Question 1**

Answer all questions.

- (a) Describe five procedures involved in aseptic techniques to prevent the introduction of unwanted organisms into a pure culture.

(5 marks)

- (b) Explain the principles of Gram's staining. Provide a detailed justification for why Gram-positive bacteria appear purple and Gram negative bacteria appear pink after the staining process

(6 marks)

- (c) Culture medium can be classified based on the functional use. Describe the following types of culture media with examples and their uses.

- (i). Enrichment media
- (ii). Selective medium
- (iii). Differential medium

(9 marks)

**Question 2**

Answer all questions.

- (a) Describe three physical and three chemical methods to control microbial growth.  
(6 marks)
- (b) Describe in detail the method for isolating psychrophilic anaerobic Gram-negative bacteria from a spoiled mink sample. Include the plating techniques, the type of culture medium used, and the specific incubation conditions required for their growth and identification  
(6 marks)
- (c) Bacteria can be classified based on their cell wall. Describe four differences of Gram positive and Gram negative cell wall.  
(8 marks)

**Question 3**

Answer all questions.

- (a) State five differences between bacteria and fungi.  
(5 marks)
- (b) *Staphylococcus aureus* culture (100  $\mu\text{L}$ ) was serially diluted with 900  $\mu\text{L}$  of sterile distilled water, 1/1,000 (diluted for 3 times). Then, 100  $\mu\text{L}$  of the final diluent was cultured on a nutrient agar plate. A total of 212 colonies were observed after incubation. Using the given information, calculate the colony forming unit (CFU) per mL of the *S. aureus* stock culture.  
(5 marks)
- (c) Discuss the industrial applications of fungi, including specific examples of fungal species used in these processes.  
(10 marks)

**Question 4**

Answer all questions.

- (a) State five modes of action of antibiotics. (5 marks)
- (b) Describe the main stages of a lytic viral life cycle. (7 marks)
- (c) Describe the life cycle of filamentous fungi, including both asexual and sexual modes of reproduction. (8 marks)

END OF EXAMINATION PAPER

