



UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION
OCTOBER 2025 SEMESTER

COURSE CODE : HDB10502
COURSE TITLE : BASIC MICROBIOLOGY
PROGRAMME NAME : BACHELOR OF BIOMEDICAL SCIENCE (HONOURS)
DATE : 26 JANUARY 2026
TIME : 2:00PM - 5:00PM
DURATION : 3 HOURS



INSTRUCTIONS TO CANDIDATES

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*

THERE ARE 16 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

1. Identify which of the following is an example of a trace element in a culture medium.
 - A. Maltose
 - B. Maltodextrin
 - C. Yeast extract
 - D. Magnesium sulfate

2. McFarland standards are used to _____.
 - A. adjust the turbidity of fungal spore suspension so that the number of spores will be within a given range
 - B. adjust the turbidity of bacterial suspension so that the number of bacteria will be within a given range
 - C. study the susceptibility of pathogen on a particular antibiotic
 - D. ensure the growth of microorganism in a culture medium

3. A culture medium contains sucrose, beef extract, sodium chloride, and vitamin H. This medium can be classified as a _____ medium.
 - A. chemically defined
 - B. selective
 - C. complex
 - D. enrichment

4. Identify which of the following is an example of a carbon source in a culture medium.
- A. Sodium chloride
 - B. Carbon dioxide
 - C. Sucrose
 - D. Carboxylic acid
5. Which of the following techniques may be performed quantitatively to determine the number of bacteria of a particular type?
- A. Spectrophotometer
 - B. Viable cell count
 - C. Streak plate
 - D. Measurement of dry cell mass

6. The following image is most probably obtained via _____.

Refer Below - Figure1 : Microscopic view of bacterial cells. .



Figure 1: Microscopic view of bacterial cells.

- A. compound microscope
- B. scanning electron microscope
- C. transmission electron microscope
- D. light microscope

7. A researcher isolated a microbial agent from a seawater sample. Under an electron microscope, the particles are extremely small, lack cellular organization, and consist of genetic material enclosed within a protein coat. The agent shows no nucleus. The microorganism is most probably a _____.
- A. fungal cell
 - B. bacterial cell
 - C. virus
 - D. yeast cell
8. The term obligate anaerobe refers to an organism that _____.
- A. does not use oxygen but tolerates it.
 - B. requires less oxygen than is present in air
 - C. requires oxygen for growth.
 - D. is killed by oxygen.
9. This scientist is well known for his contributions in the concept of vaccines and created the smallpox vaccine, the world's first vaccine.
- A. Robert Koch
 - B. Edward Jenner
 - C. Joseph Lister
 - D. Antonie Leeuwenhoek
10. Identify the correct order of taxonomic hierarchy.
- A. Kingdom- Phylum- Order- Class- Family- Genus- Species
 - B. Kingdom- Phylum- Class- Family- Order- Genus- Species
 - C. Kingdom- Phylum- Class- Order- Family- Genus- Species
 - D. Kingdom- Class- Phylum- Order- Family- Genus- Species

11. Round shape bacteria in pair arrangement are termed as _____.
- A. bacillus
 - B. staphylococci
 - C. diplococci
 - D. streptococci
12. In a lysogenic infection, the viral genome attached to the bacterial genome is defined as _____.
- A. bacteriophage
 - B. capsid
 - C. prophage
 - D. lysogeny
13. Yeasts reproduce by _____.
- A. multiple fission
 - B. binary fission
 - C. endospore
 - D. budding
14. Gram-negative and Gram-positive bacteria are differentiated based on the structure of _____.
- A. fimbriae
 - B. capsule
 - C. cell wall
 - D. cell membrane

15. A culture of *Escherichia coli* produces 6 generations in 2 hours. Calculate the generation time for this bacterium under this growth condition.
- A. 6 minutes
 - B. 12 minutes
 - C. 120 minutes
 - D. 20 minutes
16. The organisms that live inside the body of a host, such as in the intestines, blood, or tissues, are defined as _____.
- A. endoparasite
 - B. microparasite
 - C. exoparasite
 - D. macroparasite
17. Define thermal death time.
- A. Minimal length of time required to kill all cells at a given temperature.
 - B. Minimal time required for an autoclave system to kill all microbial cells.
 - C. Minimal time and temperature needed to kill all cells.
 - D. Minimal temperature that kills all cells in a given time.
18. The most appropriate way to sterilize a heat sensitive culture medium is _____.
- A. membrane filter with pore size 0.45 μm
 - B. membrane filter with pore size 0.2 μm
 - C. ultraviolet radiation
 - D. autoclave

19. Which bacterial structure is primarily responsible for motility in liquid environments?
- A. Pili
 - B. Flagella
 - C. Endospore
 - D. Capsules
20. _____ is the portal of entry for hookworms.
- A. Skin
 - B. Respiratory tract
 - C. Blood
 - D. Urogenital tract
21. Identify the structure used by *Paramecium* for movement and feeding.
- A. Cilia
 - B. Flagella
 - C. Tentacles
 - D. Pseudopods
22. Which group of microorganisms grows optimally at temperatures between 20 and 45 °C, similar to human body temperature?
- A. Mesophiles
 - B. Thermophiles
 - C. Psychrophiles
 - D. Hyperthermophiles

23. Selective media are designed to _____.
- A. provide extra nutrients for injured or slow-growing bacteria
 - B. suppress unwanted microbes and encourage growth of desired ones
 - C. distinguish between different bacteria based on colony appearance
 - D. support the growth of a wide variety of microorganisms
24. What does microbial growth specifically refer to?
- A. Increase in metabolic activity only.
 - B. Increase in the number of cells.
 - C. Increase in cell size.
 - D. Formation of endospores.
25. Identify the organism that indicates fecal contamination of water.
- A. *Staphylococcus aureus*
 - B. *Saccharomyces cerevisiae*
 - C. *Candida albicans*
 - D. *Escherichia coli*
26. The optimum growth temperature for most bacteria is approximately _____ °C.
- A. 4
 - B. 37
 - C. 50
 - D. 25

27. Bacteria growth curve is _____.
- A. composed of three distinct phases
 - B. obtained by measuring bacterial metabolic activity
 - C. plotted by measuring the total number of bacteria against time
 - D. generated by measuring individual bacterial cell size
28. Identify which of the following statement is applicable to endotoxins.
- A. Found only in Gram positive bacteria.
 - B. Produced by yeasts.
 - C. Found only in Gram negative bacteria.
 - D. Usually binds to specific cellular receptor of the host.
29. _____ inhibits cell wall synthesis.
- A. Quinolones
 - B. Chloramphenicol
 - C. Penicillin
 - D. Rifampin
30. The golden age of antibiotics began in 1928 with Sir Alexander Fleming's discovery of an antibacterial compound known as _____.
- A. tetracycline
 - B. penicillin
 - C. quinolones
 - D. chloramphenicol

31. Fungal cells can be stained using _____.
- A. lactophenol cotton blue
 - B. crystal violet
 - C. safranin
 - D. iodine
32. Identify which of the following is not a characteristic of Archaea.
- A. They are commonly found in extreme environments.
 - B. They lack peptidoglycan in their cell walls.
 - C. They include methanogens, extreme halophiles, and extreme thermophiles.
 - D. They are common human pathogens.
33. Identify which of the following is true about bacterial endospores.
- A. They allow bacteria to survive harsh conditions for long periods.
 - B. They are highly sensitive to heat and radiation.
 - C. They are formed under favorable growth conditions.
 - D. They are produced by all bacterial species.
34. Identify the primary structural component of fungal cell walls.
- A. Cellulose
 - B. Chitin
 - C. Lipopolysaccharide
 - D. Peptidoglycan

35. Identify how do yeasts primarily differ from filamentous fungi.
- A. Yeasts are multicellular and produce mycelia.
 - B. Yeasts are prokaryotic organisms.
 - C. Yeasts are unicellular.
 - D. Yeasts contain peptidoglycan in their cell walls.
36. Identify which of the following statements about helminths is true?
- A. They reproduce directly within the vertebrate host.
 - B. They are microscopic in their adult form.
 - C. They often have complex life cycles involving one or more hosts.
 - D. They are primarily ectoparasites.
37. Choose what is the primary difference between autotrophs and heterotrophs in terms of carbon source.
- A. Autotrophs use organic molecules, while heterotrophs use CO_2 .
 - B. Autotrophs require light for energy, while heterotrophs use chemical oxidation.
 - C. Autotrophs are always aerobic, while heterotrophs are anaerobic.
 - D. Autotrophs use CO_2 as their sole carbon source, while heterotrophs use preformed organic molecules.
38. Choose the main purpose of sodium thioglycollate in anaerobic culture media.
- A. To inhibit the growth of Gram-positive bacteria
 - B. To act as a pH indicator in the medium
 - C. To provide a carbon source for fast-growing bacteria.
 - D. To combine with dissolved oxygen and create an anoxic environment.

39. Identify the primary purpose of the autoclave in microbiology.
- A. To filter out bacteria from heat-sensitive liquids.
 - B. To sterilize materials using moist heat under pressure.
 - C. To measure bacterial growth using turbidity.
 - D. To provide a low-temperature environment for storing cultures.
40. The highest magnification in a light microscope is _____ times.
- A. 10
 - B. 10000
 - C. 1000
 - D. 100

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Answer all questions.

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

(10 marks)

- (b) Describe the life cycle of filamentous fungi, including both sexual and asexual modes of reproduction.

(10 marks)

Question 2

Answer all questions.

- (a) State five different modes of action of antibiotics.

(5 marks)

- (b) A public health officer was tasked with assessing the bacterial load in a municipal water supply following a maintenance operation. A water sample was collected and sent for microbial analysis. The sample was serially diluted ten-fold, and 0.1 mL from the 10^{-5} , 10^{-6} , and 10^{-7} dilutions was plated and incubated under appropriate conditions. The following results were obtained:

10^{-5} dilution: Too numerous to count

10^{-6} dilution: 164 colonies

10^{-7} dilution: 18 colonies

Using the countable plate range, calculate the colony-forming units per millilitre (CFU/mL) of the original water sample.

(5 marks)

- (c) Describe the lytic cycle of a virus, outlining the main stages involved from attachment to release of new viral particles.

(10 marks)

Question 3

Answer all questions.

- (a) By using a suitable diagram, describe different phases of a bacterial growth curve.
(8 marks)
- (b) Explain the economic benefits of filamentous fungi.
(8 marks)
- (c) State four aseptic techniques used in microbiology.
(4 marks)

Question 4

Answer all questions.

- (a) State four differences between bacterial cells and fungal cells.
(4 marks)
- (b) State five physical methods to control microbial growth.
(5 marks)
- (c) State five chemical methods used to control microbial growth.
(5 marks)
- (d) You are given two unlabeled Petri dishes containing bacterial cultures. One contains *Escherichia coli* and the other *Staphylococcus aureus*. Suggest three approaches that could be used to differentiate between the two bacterial species.
(6 marks)

END OF EXAMINATION PAPER

