UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

OCTOBER 2025 SEMESTER

COURSE CODE	:	HDB10503
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 17 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 antibiotics inhibit bacterial cell wall synthesis.

   A. Chloramphenicol

   B. Polymyxin E

   C. Penicillin

   D. Ketoconazole

2. A culture of *Escherichia coli* produces 5 generations in 200 minutes. Calculate the generation time for this bacterium under this growth condition.

   A. 200 minutes

   B. 20 minutes

   C. 40 minutes

   D. 100 minutes

3. The organisms which live inside the body of their host is defined as:

   A. Microparasite

   B. Endoparasite

   C. Macroparasite

   D. Ectoparasite

4. "He is well known for discovering the world's first broadly effective antibiotic substance, which he named penicillin". The description refer to:

   A. Hans Christian Gram

   B. Robert Koch

   C. Louis Pasteur

   D. Alexander Fleming

5. The term obligate aerobe refers to an organism that:

   A. does not use oxygen but tolerates it.

   B. requires less oxygen than is present in air.

   C. live only in the absence of oxygen.

   D. live only in the presence of oxygen.

6. Determine the total magnification if the eye piece magnification on light microscope is 10X and the objective is 40X.

   A. 50X

   B. 40X

   C. 400X

   D. 10X

7. The protein shell that encloses the genetic material of a virus is known as:

   A. Pathogen

   B. Nucleic acid

   C. Bacteriophage

   D. Capsid

8. To assess the water quality, the water sample is filtered through a sterile membrane filter. Then, the filter is removed and placed on an agar plate. This technique is known as:

   A. Membrane filter technique

   B. Membrane imprint technique

   C. Standard plate count

   D. Water filter technique

9. A researcher isolated a microbial species from a river water sample. Under electron microscope, the cells are rod-shaped, and a unit cell keeps regular dimensions of about 1.5 µm long and 0.5 µm wide, with no presence of nucleus. The cell is most probably a:

   A. Fungal cell

   B. Yeast cell

   C. Virus

   D. Bacterial cell

10. On Medium X, organisms capable of fermenting lactose will lower the pH and change the color of the medium from green to yellow. The medium can be classified as:

    A. Enrichment medium

    B. Selective medium

    C. Differential medium

    D. General medium

11. The small circular DNA molecule found in bacteria is known as:

    A. Chromosome

    B. Nucleoid

    C. Nucleus

    D. Plasmid

12. Define thermal death time.

A. The lowest temperature that kills all cells in a given time.

B. The minimal length of time required to kill all cells at a given temperature.

C. The minimal time and temperature needed to kill all cells.

D. The minimal time required for an autoclave system to kill all bacterial cells.

13. The infection of parasitic worms can be treated with:

A. Antivirals

B. Anthelmintic drugs

C. Antibiotics

D. Antifungal drugs

14. Choose the most appropriate way to sterilize a heat sensitive vitamin solution.

A. Membrane filtration

B. Ozone

C. Ethylene oxide

D. Autoclave

15. The image of *Saccharomyces cerevisiae* shown in figure below is most probably obtained via:

Refer Below - Figure1 : Microscopic image of S. cerevisiae .

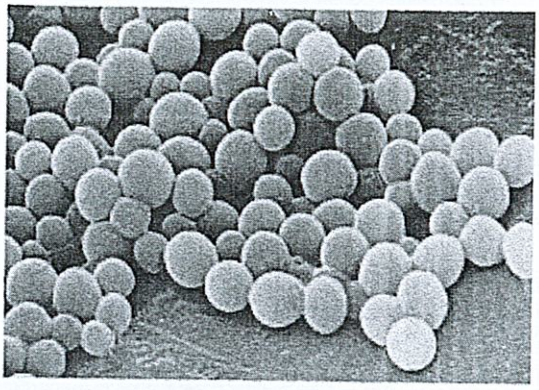

Figure 1: Microscopic image of S. cerevisiae

A. Transmission electron microscope (TEM)

B. Compound microscope

C. Scanning electron microscope (SEM)

D. Light microscope

16. Identify the cell morphology shown in figure below.
Refer Below - Figure2 : Microscopic view of a bacterial culture. .

Figure 2: Microscopic view of a bacterial culture.

A. Diplococcus

B. Streptococcus

C. Staphylococcus

D. Spirochete

17. Identify the CORRECT statements about secondary metabolites.

I. Made during the stationary growth phase.
II. Give the microorganism an ecological advantage.
III. Important as biological catalyst to speed up microbial metabolism.
IV. Made during exponential growth phase.

A. II, IV

B. I, III

C. I, II

D. III, IV

18. "He is the inventor of the Wu mask, which is the forerunner of today's N95 respirator." The statement above refers to:

A. Louis Pasteur

B. Robert Koch

C. Edward Jenner

D. Wu Lien-Teh

19. Identify the group of microorganisms that are most likely to spoil food kept at refrigerator temperature.

A. Thermophiles

B. Acidophiles

C. Halophiles

D. Psychrophiles

20. Identify the group of microorganisms that live in seawater with high salinity.

A. Halophiles

B. Acidophiles

C. Psychrophiles

D. Thermophiles

21. Select the characteristics of fungi.

I. Surrounded by a thin peptidoglycan cell wall.
II. Reproduce by multiple fission.
III. Eukaryotes.
IV. Cell wall is made up of chitin.

A. III

B. II, IV

C. II, III, IV

D. III, IV

22. Choose the characteristics of viruses.

I. Composed of DNA and RNA surrounded by protein coat.
II. Composed of DNA or RNA surrounded by protein coat.
III. Host-specific.
IV. Highly parasitic microorganisms.

A. I, III, IV

B. II, III, IV

C. I, II, III, IV

D. III, IV

23. The medium stated in table below can be classified as:
Refer Below - Table1 : Ingredients of a microbiological medium. .

Table 1: Ingredients of a microbiological medium.

Composition	g/L
Peptone	5
Glucose	10
Magnesium sulfate	0.5
Calcium carbonate	0.2

A. chemically defined medium.

B. complex medium.

C. enriched medium.

D. differential medium.

24. The organisms which live in the internal organs or tissue of their host is defined as:

A. Macroparasite

B. Exoparasite

C. Microparasite

D. Endoparasite

25. Choose the CORRECT statement about bacteriophage.

A. Substance used to active the immune response in human cells.

B. Viruses that infect and replicate in bacterial cells.

C. The cell that is able to multiple within the living host.

D. Multicellular structure of an organisms to produce spores.

26. _____ is required for the action of the nitrogenase enzyme of nitrogen fixing bacteria.

A. Light

B. Oxygen radicals

C. ATP

D. Antibiotics

27. Identify the microorganisms that can live under extreme environmental conditions like high temperature and acidic pH, lack of oxygen, and high salt concentration.

A. Protozoa

B. Archaea

C. Yeasts

D. Viruses

28. _____ is NOT a requirement for microbial growth.

A. Oxygen

B. Trace elements

C. Ultraviolet radiation

D. Temperature

29. Identify the staining reagent used for fungal cells.

A. Acid fast staining

B. Capsule staining

C. Gram's staining

D. Lactophenol cotton blue

30. Select the purpose of autoclaving in Microbiology.

A. To stain bacterial cells

B. To isolate pure cultures

C. To promote bacterial growth

D. To sterilize equipment and media

31. Microaerophiles are microorganisms that survive best in environments with:

A. High oxygen concentration

B. No oxygen

C. Low oxygen concentration

D. Variable oxygen levels

32. Choose the main function of agar in microbiological media.

A. To solidify the media.

B. To provide nutrients for microbial growth.

C. To enhance oxygen availability.

D. To prevent contamination

33. What is the main purpose of sodium thioglycollate in anaerobic culture media?

A. To act as a pH indicator in the medium

B. To provide a carbon source for fast-growing bacteria

C. To combine with dissolved oxygen and create an anoxic environment

D. To inhibit the growth of Gram-positive bacteria

34. Which group of microorganisms grows optimally at temperatures between 20 and 45 °C, similar to human body temperature?

A. Acidophiles

B. Hyperthermophiles

C. Mesophiles

D. Thermophiles

35. 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. bacterial cell

B. virus

C. yeast cell

D. fungal cell

36. Identify what does microbial growth specifically refer to.

A. Formation of endospore

B. Increase in the number of cells

C. Increase in individual cell size

D. Increase in the dry mass of individual cell

37. _____ is used to isolate a pure culture of a bacterium from a mixture.

A. Lawn technique

B. Streak plate

C. Aseptic technique

D. Microscopy

38. _____ is the portal of entry for hookworms.

A. Respiratory tract

B. Blood

C. Urogenital tract

D. Skin

39. Identify which of the following is a common portal of entry for parasitic infections.

A. Only ingestion of contaminated food

B. Only through skin contact

C. Only via insect bites

D. Person-to-person contact, skin, congenital transmission, and sexual contact

40. Identify which of the following is a component of a complex medium.

A. Glucose

B. Sucrose

C. Yeast extract

D. Ammonium sulfate

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Answer all questions.

(a) By using a suitable diagram, describe different phases of a bacterial growth curve.

(10 marks)

(b) Microorganisms are widely used in large scale industrial processes. By using five examples, describe the roles of microorganisms in one industry of your choice.

(10 marks)

Question 2

Answer all questions.

(a) Bacteria can be classified based on their cell wall components. Describe four differences of Gram-positive and Gram-negative cell wall.

(8 marks)

(b) Describe the ecological roles of nitrogen fixing bacteria.

(7 marks)

(c) You are required to isolate anaerobic Gram-negative bacteria from a water sample collected from Kajang river. Describe in detail the method of isolation including plating technique, type of medium used and incubation conditions.

(5 marks)

Question 3

Answer all questions.

(a) State six differences between bacterial cells and fungal cells.

(6 marks)

(b) State five chemical methods to control microbial growth.

(5 marks)

(c) Describe three mechanisms of horizontal gene transfer in bacteria.

(9 marks)

Question 4

Answer all questions.

(a) *Escherichia coli* culture (100 µL) was serially diluted with 900 µL of sterile distilled water, 1/1,000 (diluted for 3 times). Then, 100 µL of the final diluent was cultured on a nutrient agar plate. The plate was then incubated for 24 hours at 37°C. A total of 87 colonies were observed after incubation. Using the given information, calculate the amount of colony forming unit (CFU) per mL of the original *E. coli* stock culture.

(5 marks)

(b) Antibiotics are widely used clinically to treat bacterial infections. State five modes of action of antibiotics.

(5 marks)

(c) With the aid of a diagram, describe the lytic cycle of bacteriophage in detail.

(10 marks)

END OF EXAMINATION PAPER