UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

MARCH 2025 SEMESTER

COURSE CODE	:	HDB30504
COURSE TITLE	:	CLINICAL LABORATORY MICROBIOLOGY
PROGRAMME NAME	:	BACHELOR OF BIOMEDICAL SCIENCE (HONOURS)
DATE	:	23 JUNE 2025
TIME	:	9:00AM - 12:00PM
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 10 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

Question 1

(a) State the purpose of using oxidase test in Gram-negative identification.

(2 marks)

(b) If the oxidase test gives a delayed positive result (after more than 1 minute), should it be considered valid? Justify your answer.

(4 marks)

(c) Name the sugar fermentation test that is commonly used to differentiate *E. coli* from *Salmonella* spp.

(2 marks)

(d) A student reports a non-motile result for *Salmonella* spp. What is the possible reason behind this?

(2 marks)

Question 2

(a) State the main difference between yeast and mold in terms of morphology.

(2 marks)

(b) Provide a reason why bacteria may not grow on Sabouraud Dextrose Agar (SDA).

(2 marks)

(c) List two culture-based tests to identify *Candida albicans*.

(4 marks)

(d) Give the main purpose of a KOH mount in fungal identification.

(2 marks)

Question 3

(a) List two limitations of a cell culture technique for diagnostic purpose during a disease outbreak.

(4 marks)

(b) Name two common techniques for identification of viruses that apply the immunoassay approach in diagnostic laboratories.

(4 marks)

(c) State one role of ELISA in viral diagnostics.

(2 marks)

Question 4

(a) State one limitation of each method.
i) Broth microdilution
ii) Disc diffusion method

(4 marks)

(b) Give an ideal criteria of Mueller Hinton Agar (MHA) for accurate antibiotic sensitivity testing.

(2 marks)

(c) Antibiotic susceptibility testing was conducted on the same bacterial species using the same set of antibiotics, yet the results differed. Suggest two possible factors that might have contributed to this discrepancy.

(4 marks)

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Analyzing a respiratory specimen typically involves examining samples collected from the respiratory tract, such as sputum, bronchoalveolar lavage (BAL) fluid, or nasopharyngeal swabs.

(a) Give two common challenges faced during the processing of respiratory specimens in a diagnostic bacteriology laboratory.

(4 marks)

(b) State one reason why chocolate agar is used for lower respiratory tract cultures.

(2 marks)

(c) Several studies can be employed to successfully grow the bacterial culture from small volume of sputum specimens for identification of *Mycobacterium tuberculosis*. Outlines possible strategies to culture the bacteria.

(12 marks)

(d) How do you interpret a positive AFB smear but negative culture after 8 weeks?

(2 marks)

Question 2

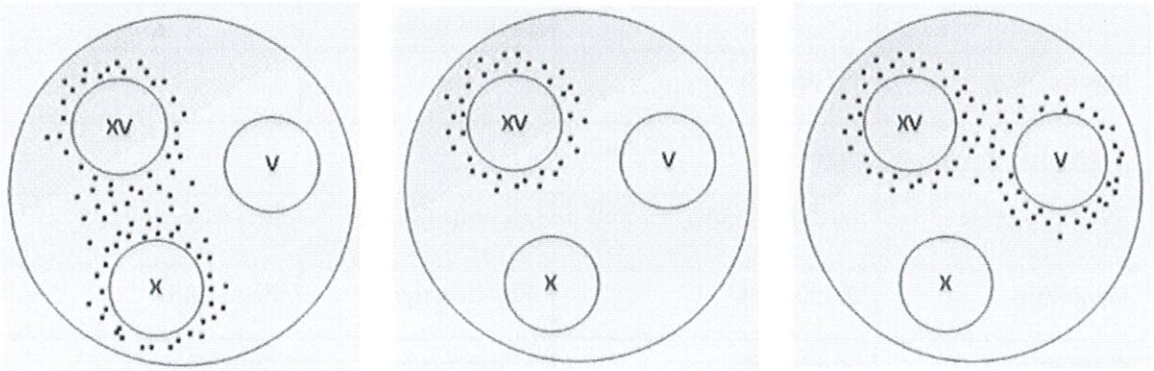
Haemophilus influenzae is one of pathogens that can cause life-threatening infections such as bacteremia, pneumonia and meningitis. Laboratory tests on specimens should be conducted to diagnose the infection.

(a) Predict the laboratory findings of the *Haemophilus influenza*..
i) Culture on Blood agar
ii) Culture on Mac Conkey agar
iii) Culture on Chocolate agar
iv) Gram's staining
v) Oxidase test

(10 marks)

(b) Figure below shows the result of X and V factor test for identification of *Haemophilus* sp. The growth around the disc indicates requirement of the factors for the species. Name the species of *Haemophilus* based on the result.
Refer Below - Figure1 : X and V Factor Test .

(6 marks)



Bacteria A Bacteria B Bacteria C

Figure 1: X and V Factor Test

(c) Another test that can be performed to identify *Haemophilus influenza* is the Satellite test. Explain the procedure of the test.

(4 marks)

Question 3

Ali presented to the emergency department with complaints of a painful and swollen area on his right thigh. Sample was collected for laboratory test. He was then diagnosed with a skin infection caused by Methicillin-resistant *Staphylococcus aureus* (MRSA).

Refer Below - Table1 : Report of Abscess Analysis .

Table 1: Report of Abscess Analysis

Patient Name: Ali Bin Nasir

Age/Sex: MALE/25 years

Sample Type: Abscess

Abscess Culture Identification

Test	Interpretation	Test	Interpretation
Gram's staining	Cocci, Purple	Coagulase	III
Catalase Test	I	DNAse test	IV
Blood agar	II	Mannitol Fermentation	V
MacConkey	No growth		

Antibiotic Sensitivity Test

Antimicrobial	Interpretation	Antimicrobial	Interpretation
Penicillin	Resistant	Erythromycin	Resistant
Cefoxitin	Resistant	Clindamycin	Sensitive
Ampicillin	Resistant	Vancomycin	Sensitive

(a) Predict the findings of I, II, III, IV, V and VI.

(10 marks)

(b) State one reason for performing the catalase test.

(2 marks)

(c) Explain how do you determine whether the MRSA isolate exhibits inducible resistance to clindamycin or not.

(8 marks)

Question 4

Urine analysis plays a critical role in the detection and diagnosis of urinary tract infections and other urinary tract-related conditions caused by microorganisms.
Refer Below - Table2 : Report of Urine Culture .

Table 2: Report of Urine Culture

Patient Name: Aminah Binti Hassan

Age/Sex: FEMALE/45 years

Sample Type: Urine

Colony Count: 100,000 CFU/mL

Urine Culture Identification

Test	Interpretation	Test	Interpretation
Gram's staining	Pink, Rod shape	Urease	Negative
Oxidase Test	Negative	Motility	Negative
MacConkey	Pink, mucoid colonies	Indole	Negative
TSI	AG/A	MRVP	Negative
Urease	Negative	Citrate	Positive

Antibiotic Sensitivity Test

Antimicrobial	Interpretation	Antimicrobial	Interpretation
Trimethoprim	Sensitive	Cefuroxime	Sensitive
Amikacin	Sensitive	Ciprofloxacin	Resistant
Ampicillin	Sensitive	Gentamicin	Sensitive
Cefotaxime	Sensitive	Nitrofurantoin	Sensitive

(a) Determine how laboratory technicians differentiate between clinically significant bacterial growth and contamination in urine cultures.

(4 marks)

(b) Explain two impacts of delayed processing of urine specimens on bacterial culture results and interpretation.

(4 marks)

(c) Predict the possible urine pathogen based on the laboratory findings.

(2 marks)

(d) Give three strong justification of the answer (c).

(6 marks)

(e) State the main purpose of performing oxidase test.

(2 marks)

(f) Considering the sensitivity profile, which antibiotics would be appropriate for treating this patient?

(2 marks)

END OF EXAMINATION PAPER