



QUALIFICATION : <b>BACHELOR of MEDICAL LABORATORY SCIENCES</b>	
QUALIFICATION CODE: <b>08BMLS</b>	LEVEL: <b>6</b>
COURSE: <b>MEDICAL MICROBIOLOGY 2B</b>	COURSE CODE: <b>MMB621S</b>
DATE: <b>JANUARY 2024</b>	SESSION: <b>1</b>
DURATION: <b>3 HOURS</b>	MARKS: <b>100</b>

**SECOND OPPORTUNITY: EXAMINATION QUESTION PAPER**

**EXAMINER:** *MRS FREDRIKA ENGELBRECHT*

**MODERATOR:** *MRS CARA-MIA DUNAISKI*

**INSTRUCTIONS:**

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

**PERMISSIBLE MATERIALS:**

1. Non-Programmable Calculator

**ATTACHEMENTS**

1. None

**This paper consists of 6 pages including this front page.**

## QUESTION 1: MULTIPLE CHOICE QUESTIONS

[10 MARKS]

Evaluate the statements in each numbered section and select the most appropriate answer or phrase from the given possibilities. Fill in the appropriate letter next to the number of the correct statement/phrase on your ANSWER SHEET.

- 1.1 The K antigens of enterobacteriaceae is associated with:  
A) The flagellar proteins.  
B) Components of the polysaccharide capsule.  
C) The lipopolysaccharides in the outer membrane.  
D) The types of linkages between sugar components. (1)
- 1.2 Mycoplasma can be defined as:  
A) a gram-negative bacillus.  
B) an intracellular parasite.  
C) the smallest self-sufficient bacteria.  
D) a common causative organism of eye infections. (1)
- 1.3 Bacterial cross-resistance refers to:  
A) Resistance constantly expressed.  
B) One change that result in resistance to several drugs.  
C) Resistance expressed when micro-organism is exposed to a specific drug.  
D) Resistance expressed by an entire population. (1)
- 1.4 Durham tubes are used in microbiology in order to:  
A) Interpret the ability of a specific organism to produce gas.  
B) Interpret carbohydrate utilization by a specific organism.  
C) Interpret the ability of a specific organism to change the pH of media.  
D) Interpret whether an organism ferments or oxidize a carbohydrate. (1)
- 1.5 The cytokines released during an infection with *S. typhi* results in:  
A) Leucocytosis.  
B) Inflammatory reaction in the Peyer's patches.  
C) Spread of the organism to the mesenteric lymph nodes.  
D) Bacteraemia. (1)
- 1.6 The following organism ferment lactose when grown on MacConkey agar  
A) *N. meningitidis*.  
B) *E. coli*.  
C) *P. aeruginosa*.  
D) *Proteus mirabilis*. (1)

- 1.7 The sample required for diagnosing the causative organism for infective endocarditis is a:
- A) nasopharyngeal swab.
  - B) urine sample.
  - C) blood culture.
  - D) tissue biopsy. (1)
- 1.8 Novobiocin are used to distinguish between:
- A) *Staphylococcus epidermidis* & *Staphylococcus saprophyticus*.
  - B) *Staphylococcus aureus* & *Staphylococcus saprophyticus*.
  - C) *Streptococcus* spp and *Staphylococcus* spp.
  - D) *Staphylococcus aureus* & *Staphylococcus epidermidis*. (1)
- 1.9 Virulence factors of *Streptococcus pyogenes* that aids the organism to escape host defense is(are):
- A) The outermost capsule of hyaluronic acid.
  - B) Streptokinases A & B lyse.
  - C) Hyaluronidase.
  - D) All of the above. (1)
- 1.10 The Salmonellae Vi antigen:
- A) Is an acidic polysaccharide antigen that overlay the O antigen.
  - B) Exhibit the property of diphasic variation
  - C) Are fimbria antigens
  - D) Are determined by the complete sugar sequence. (1)

## QUESTION 2

[15]

Assess the following statements and decide whether they are **true or false**. Write only the number of the question and next to it TRUE for a true statement and FALSE for a false statement and **give a reason for calling a statement FALSE**.

- 2.1 *C. diphtheria* to only pathogenic when it is infected with the tox gene via a bacteriophage.
- 2.2 Bacillus species is only causing infectious and is always harmful to society.
- 2.3 Citrate utilization should be incubated anaerobically for accurate results.
- 2.4 *Bacteroides fragilis* is an aerobic organism usually responsible for conjunctivitis.
- 2.5 *Clostridium perfringens* is the causative organism of Bubonic plague.
- 2.6 The anthrax toxin causes an increase in vascular permeability resulting in shock.
- 2.7 Permease is the enzyme that transport glucose into cells.

- 2.8 Citrate utilization should be analysed in anaerobic conditions.
- 2.9 Scientists rely on the K-antigens of Shigella species to serologically distinguish between the different Shigella species.

**SECTION B: SHORT/LONG ANSWER QUESTIONS**

**[75 MARKS]**

Please answer ALL of the questions in this section.

**QUESTION 3:**

**[16 MARKS]**

- 3.1 Categorize the following antibiotics according to its bacterial targets:
- |                    |     |
|--------------------|-----|
| A) Vancomycin      | (1) |
| B) Aminoglycosides | (1) |
| C) Tetracyclines   | (1) |
| D) Quinolones      | (1) |
- 3.2 Differentiate between *C. perfringens* and *C. tetanus* under the following headings:
- |                               |     |
|-------------------------------|-----|
| A) Gram reactivity,           | (2) |
| B) Spores form and location,  | (2) |
| C) Haemolysis,                | (2) |
| D) Motility,                  | (2) |
| E) Lecithinase production and | (2) |
| F) Glucose fermentation.      | (2) |

**QUESTION 4**

**[8]**

4. A patient is presenting with the following clinical symptoms illustrated in the image below:



- 4.1) Point out what specimen should be collected to identify the causative pathogen? (1)

- 4.2) Illustration, what you expect so see on the gram stain slide from the specimen? (2)
- 4.3) Suggest tests which will enable you to identify the organism, and give the expected results. (4)
- 4.4) Predict the expected pathogen responsible for the presented clinical symptoms.

**QUESTION 5 [12]**

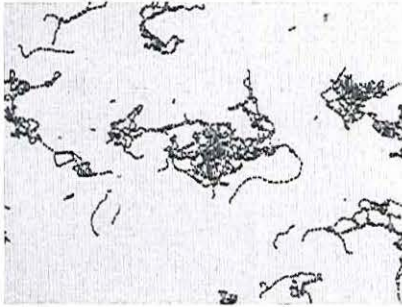
- 5.1 Justify and explain why the TPHA is considered a specific serological test. (4)
- 5.2 Summarize some of the mechanisms used by bacteria to resist the effects of antibiotics and give an example for each of the mentioned mechanisms. (8)

**QUESTION 6 [24]**

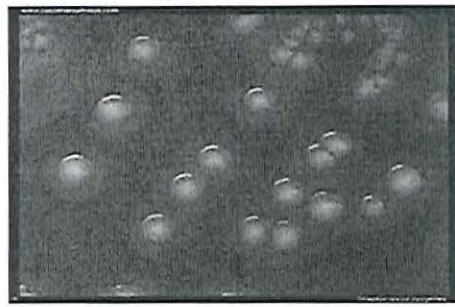
- 6.1 Using a labelled illustration indicate how a scientist will test for the presence of a toxin producing *C. diphtheriae* AND explain the principle of the test. (9)
- 6.2 Propose factors affecting the quality of the final microbiological report, and explain why these factors affect the quality. (4)

- 6.3 A pregnant woman presented with a vaginal discharge but with no further symptoms of infection. Her doctor collected a vaginal swab and submitted it to the diagnostic medical microbiology laboratory for analysis. Study the slides below presenting the laboratory findings from the pregnant patient and then answer the questions.

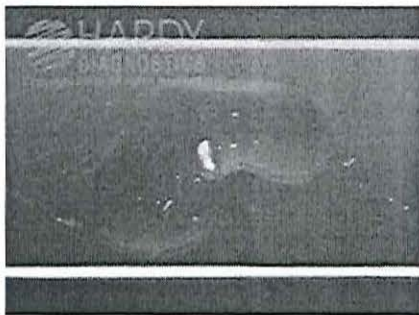
**Image 1:** Gram stain result from the swab vaginal swab:



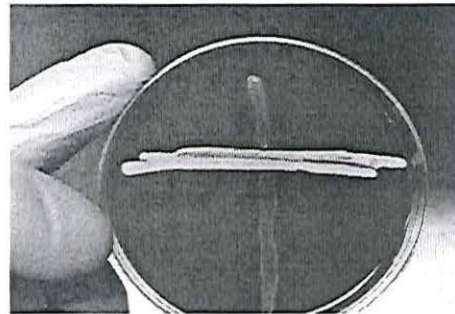
**Image 2:** The culture from the vaginal on a blood agar after incubation.



**Image 3:** Catalase test result:



**Image 4:** Additional test that was performed:



- 6.3.1) Report your findings on the gram-stained slide, presented in **Image 1**. (3)
- 6.3.2) Report your findings of the growth seen on **Image 2**. (2)
- 6.3.3) Report the catalase results from the test presented in **Image 3**. (1)
- 6.3.4) Identify the reagent used for the catalase test. (2)
- 6.3.5) Discuss the principle of the catalase test. (3)

**QUESTION 7**

Briefly identify the important steps in diagnosing typhoid fever in the microbiology laboratory.

[15]

(15)

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**END OF EXAMINATION PAPER**