



QUALIFICATION : <b>BACHELOR of MEDICAL LABORATORY SCIENCES</b>	
QUALIFICATION CODE: <b>08BMLS</b>	LEVEL: <b>7</b>
COURSE: <b>MEDICAL MICROBIOLOGY 2B</b>	COURSE CODE: <b>MMB621S</b>
DATE: <b>NOVEMBER 2023</b>	SESSION: <b>1</b>
DURATION: <b>3 HOURS</b>	MARKS: <b>100</b>

**FIRST 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 7 pages including this front page**

## QUESTION 1: MULTIPLE CHOICE QUESTIONS

[20 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 BOOK. [20]

- 1.1 The PorB/Protein I of *Neisseria* species:
- A) is the major porin protein which assists the organism to penetrate the columnar epithelial cells of the host in order to cause an infection.
  - B) blocks the antibodies that have been produced against the *Neisseria*.
  - C) is the protein which inhibits the phagocytes of the organism by host cells species.
  - D) is the protein that is present in the outer membrane of the *Neisseria* and promotes adherence of the gonococcus to the host cells. (1)
- 1.2 Sources of error that needs to be consider for the Citrate utilisation test includes:
- A) a light inoculum.
  - B) an excess of oxygen.
  - C) the incubation time of the test.
  - D) a heavy inoculum. (1)
- 1.3 Tetracycline antibiotics act on organisms through:
- A) Inhibiting DNA synthesis.
  - B) Inhibiting of protein synthesis.
  - C) Inhibiting cell wall synthesis.
  - D) Inactivating enzymes. (1)
- 1.4 Virulence factors found in *S. pneumoniae* that damages host cells are:
- A) the pneumolysins.
  - B) the polysaccharide capsules.
  - C) neuramidases.
  - D) autolysins. (1)
- 1.5 Abacterial pyuria can be defined as:
- A) urine containing no bacteria and no pus cells.
  - B) urine containing excess pus cells and numerous bacteria.
  - C) urine containing numerous bacteria with no pus cells.
  - D) urine containing excess pus cells and a sterile culture. (1)

- 1.6 A short course (48hrs) of Glycopeptide antibiotic would be used to treat a:  
A) *S. aureus* infection acquired from an intravenous catheter.  
B) Coagulase-negative staphylococcal infection acquired from an intravenous catheter.  
C) Corynebacterial infection acquired from an intravenous catheter.  
D) A patient diagnosed with primary syphilis. (1)
- 1.7 The most common organism responsible for gas gangrene is known to be:  
A) an anaerobic spore forming gram positive bacilli.  
B) an aerobic spore forming gram positive bacilli.  
C) an anaerobic gram negative bacilli.  
D) an aerobic gram negative bacilli. (1)
- 1.8 *Leptospira* can be classified as:  
A) A strict anaerobe.  
B) A commensal of the human intestine.  
C) A strict aerobe.  
D) As a fastidious organism. (1)
- 1.9 The lag between the onset of infection and production of antibodies can be define as:  
A) the time when a person is already infected but antibodies are not yet produced.  
B) the time when a person is not yet infected with and organism.  
C) the time when a person's immune system is not able to cope with an infection.  
D) the time when a person's body do not recognise the infection as foreign. (1)
- 1.10 Identify the organism that is motile at 22°C and not motile at 37°C.  
A) *Clostridium perfringens*.  
B) *Salmonella paratyphi*.  
C) *Yersinia enterocolitica*.  
D) *Stenotrophomonas maltophilia*. (1)
- 1.11 Bacitracin sensitivity assists in the positive identification of:  
A) *S. pyogenes*.  
B) *S. pneumoniae*.  
C) *S. agalactiae*.  
D) *S. bovis*. (1)
- 1.12 *Brucella* is an organism known to:  
A) often be transferred from person to person.  
B) be a zoonotic infection.  
C) only cause infections amongst animals.  
D) not being pathogenic to humans. (1)

- 1.13 Identify the drugs belonging to the 2nd generation cephalosporins from the list below:
- A) Cefamandole & cefaclor.
  - B) Amikacin, & streptomycin.
  - C) Cephalothin & cefazolin.
  - D) Ceftriaxone & cefotaxime. (1)
- 1.14 The hanging drop test is specifically used in the identification of:
- A) *Listeria monocytogenes*.
  - B) *Corynebacteria diphtheria*.
  - C) *Actinomyces israelii*.
  - D) *Nocardia* spp. (1)
- 1.15 Organism motility is closely associated with:
- A) the O antigens.
  - B) the H antigens.
  - C) the K antigens.
  - D) the Vi antigens. (1)
- 1.16 A positive test for clindamycin inducibility indicates that:
- A) that clindamycin can be reported as sensitive.
  - B) that both clindamycin and erythromycin is sensitive.
  - C) that both clindamycin and erythromycin should be reported as resistant.
  - D) that erythromycin can be reported as sensitive. (1)
- 1.17 *Rickettsia rickettsii* is the causative organisms of:
- A) Rocky Mountain spotted fever.
  - B) Murine typhus.
  - C) Boutonneuse fever.
  - D) Epidemic typhus. (1)
- 1.18 The toxin produced by *C. diphtheria*:
- A) penetrate into the deeper tissues of the host, causing tissue damage.
  - B) may spread through the blood stream to other parts of the body.
  - C) results in only a localised infection.
  - D) cause cellulitis at the area of introduction. (1)
- 1.19 *N. asteroides* and *A. israelii* can be differentiated by means of the following stain:
- A) Gram stain.
  - B) Capsular stain.
  - C) Albert stain.
  - D) Ziehl-Neelson stain. (1)
- 1.20 Conditions predisposing patients to nosocomial infections include:
- A) antibiotic treatment.
  - B) invasive devices.
  - C) environmental settings.
  - D) all of the above. (1)

**QUESTION 2: TRUE/FALSE QUESTIONS****[15 MARKS]**

Evaluate the statements and select whether the statement is true or false. Write the word 'True' or 'False' next to the corresponding number on your ANSWER BOOK and **give a reason for calling any statement FALSE.** (15)

- 2.1 Transient bacteraemia in a patient will present with multiple positive blood cultures obtained over several hours.
- 2.2 Streptokinases A & B lyses blood clots and facilitate the spread of bacteria in tissues.
- 2.3 *Klebsiella pneumoniae* form mucoid non-lactose fermenting colonies on the MacConkey agar.
- 2.4 Bubonic plaque is associated with Clostridium.
- 2.5 Metronidazole is not effective in treating the majority of anaerobic organisms that are pathogenic to humans.
- 2.6 OrthoNitroPhenyl- $\beta$ -D-Galactopyranoside test detects  $\beta$ -galactosidase.
- 2.7 Human infections with *Brucella melitensis* are associated with cattle.
- 2.8 The anthrax toxin causes an increase in vascular permeability resulting in shock.
- 2.9 Gram negative, oxidase positive diplococci, are diagnostic for *Neisseria gonorrhoea* infections in female patients.

**SECTION B: SHORT/LONG ANSWER QUESTIONS****[65 MARKS]**

Please answer ALL of the questions in this section.

**QUESTION 3:****[15 MARKS]**

- 3.1 Categorise the following drugs by means of its mechanism of action.
  - A) Gentamycin (1)
  - B) Metronidazole (1)
  - C) Vancomycin (1)
  - D) Ciprofloxacin (1)
- 3.2 Match the following organisms with its associated disease. Write only the number and the corresponding letter on your answer sheet. (4)

3.2.1 Enterotoxigenic <i>E.coli</i>	A) Bloody diarrhoea in all ages.
3.2.2 Vero cytotoxin-producing <i>E.coli</i>	B) Dysentery-like disease in all ages.
3.2.3 Enteroinvasive <i>E.coli</i>	C) Diarrhoea in infants, rarely in adults.
3.2.4 Enteropathogenic <i>E.coli</i>	D) Infant and adult watery diarrhoea.

- 3.3 In a table form, indicate how you will distinguish between *Bacillus anthracis*, *B. cereus* and *B. subtilis* using the following criteria:
- A) Capsule,
  - B) Motility,
  - C) Catalase,
  - D) Lecithinase production.
- (1/2 x 12 = 6)

**QUESTION 4** **[9]**

- 4.1 Illustrate what a positive satellitism test would look like, using a **labelled illustration** **AND** explain the **principle** of the test.

**QUESTION 5** **[10]**

Summarise the pathogenesis and clinical manifestations of primary and secondary syphilis.

**QUESTION 6** **[16]**

A 7-year-old female, accompanied by her mother, who presents to the community clinic with complaints of sore throat and fever, looking for medications to take to relieve her symptoms. She describes the pain when she swallows as feeling if her throat is “on fire.” Her symptoms started the previous morning. She was referred to the local clinic, and the doctor collected a throat swab. From the swab culture and slides, the following results was obtained:

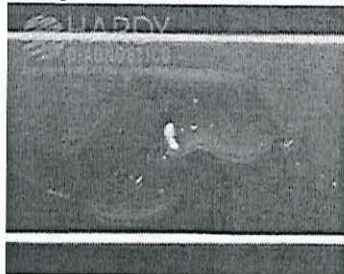
**Image 1:** Gram stain result from the throat swab:



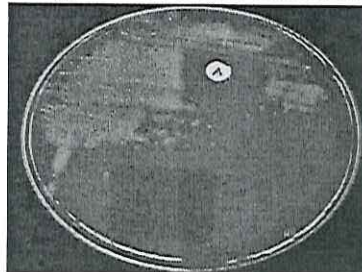
**Image 2:** The culture from the swab on a blood agar after incubation.



**Image 3:** Catalase test result:



**Image 4:** Bacitracin disc test:



- 6.1) Discuss how you would process the throat swab that was received from the patient in the case study, and justify your answer. (6)

- 6.2) Name the expected pathogen responsible for the patients' condition? (2)
- 6.3) Illustrate, by means of a flow chart, how you would identify this organism. (8)

**QUESTION 7**

**[4]**

A 4-year-old Caucasian boy presented with a one-week history of general malaise, mild fever, indolence, and anorexia. He subsequently developed dysphagia, sialorrhoea, difficulties opening the mouth and eventually dehydration. Due to parental concerns about the boy's refusal of fluids, a paediatrician was consulted. At that time of presentation, he showed signs of trismus and muscle rigidity. Together with the lack of immunization and a toenail infection, the doctor suspected generalised tetanus.

- 7.1) Identify the causative pathogen of generalised tetanus. (2)
- 7.2) Illustrate by means of a drawing the gram stain morphology and gram reaction you expect for this organism. (2)

**QUESTION 8**

**[5]**

Your supervisor asks you to verify the use of a newly registered antibiotics in your microbiology laboratory. You've just received the box of this new antibiotic in the laboratory. Explain how you will validate and ensure that accurate results will be send to the doctor with regards to this specific antibiotic. (5)

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**END OF QUESTION PAPER**

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