



NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES
SCHOOL OF HEALTH SCIENCES
DEPARTMENT OF CLINICAL HEALTH SCIENCES

QUALIFICATION : BACHELOR of MEDICAL LABORATORY SCIENCES	
QUALIFICATION CODE: 08BMLS	LEVEL: 7
COURSE: MEDICAL MICROBIOLOGY 2B	COURSE CODE: MMB621S
DATE: NOVEMBER 2025	SESSION: 1
DURATION: 3 HOURS	MARKS: 110

FIRST OPPORTUNITY: EXAMINATION PAPER

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MODERATOR: *MS VANESSA TJIJENDA*

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 QUESTION PAPER CONSISTS OF 8 PAGES (Including this front page)

SECTION A**(35)****QUESTION 1****[20]**

Choose the correct answer and report only the suitable letter next to the relevant question number.

- 1.1 The K antigens of enterobacteriaceae is associated with:
A) The flagellar proteins.
B) The lipopolysaccharides in the outer membrane.
C) Components of the polysaccharide capsule.
D) The types of linkages between sugar components. (1)
- 1.2 The causative organism of Lyme disease is:
A) *Borrelia burgdoferi*.
B) *Treponema pallidum*.
C) *Leptospirosis icterohaemorrhagie*.
D) *Borrelia recurrentis*. (1)
- 1.3 Quinolone antibiotics act on organisms through:
A) Inhibiting folic acid synthesis
B) Inhibiting DNA synthesis.
C) Inhibiting cell wall synthesis.
D) Inactivating enzymes. (1)
- 1.4 Virulence factors found in *S. pneumoniae* that damages host cells are:
A) Autolysins.
B) The polysaccharide capsules.
C) Neuramidases.
D) The pneumolysins. (1)
- 1.5 A bacterial pyuria can be defined as:
A) Urine containing excess pus cells and numerous bacteria.
B) Urine containing excess pus cells and a sterile culture.
C) Urine containing numerous bacteria with no pus cells.
D) Urine containing no bacterial and no pus cells in the. (1)
- 1.6 The following organism can be identified as a lactose fermenter when grown on MacConkey agar.
A) *N. meningitidis*.
B) *P. aeruginosa*.
C) *E. coli*.
D) *P mirabilis*. (1)

- 1.7 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) Both A and C. (1)
- 1.8 *Leptospira* can be classified as:
- A) A strict aerobe.
 - B) A commensal of the human intestine.
 - C) A strict anaerobe.
 - 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 cannot 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) *Stenotrophomonas maltophilia*.
 - D) *Yersinia enterocolitica*. (1)
- 1.11 Bacitracin sensitivity assists in the positive identification of:
- A) *S. bovis*.
 - B) *S. pneumoniae*.
 - C) *S. agalactiae*.
 - D) *S. pyogenes*. (1)
- 1.12 The causative organism of tick bite fever is:
- A) *Treponema pallidum*.
 - B) *Chlamydia trachomatis*.
 - C) *Ureaplasma* species.
 - D) *Rickettsia connori*. (1)
- 1.13 *Brucella* is an organism known to be:
- A) Often transferred from person to person.
 - B) A zoonotic infection.
 - C) Only causing infections amongst animals.
 - D) Not a pathogenic organism. (1)

- 1.14 Antibiotic synergy can be defined as:
- A) The presence of plasmid-mediated resistance for 1 mechanism results in resistance to numerous drugs.
 - B) The utilisation of a combined effect of antibiotic for therapeutic success.
 - C) The interaction between drugs with each drug counteracting the other.
 - D) The same resistance mechanism affecting several antibiotics. (1)
- 1.15 In the asymptomatic phase of this disease, the pathogen clears from most areas in the body, except for the eyes, brain and kidneys:
- A) Leptospirosis.
 - B) Murine typhus.
 - C) Boutonneuse fever.
 - D) Epidemic typhus. (1)
- 1.16 Post-operative sepsis of the abdomen is associated with
- A) *Escherichia coli*.
 - B) *Campylobacter* species.
 - C) *Bacteroides fragilis*.
 - D) *Bordetella pertussis*. (1)
- 1.17 From a rice water stool sample one expects to isolate:
- A) *Campylobacter* species.
 - B) *Vibrio cholera*.
 - C) Enteroinvasive *E.coli*.
 - D) *Haemophilus ducreyi*. (1)
- 1.18 The toxin produced by *C. diphtheria*:
- A) Penetrate into the deeper tissues of the host, causing tissue damage.
 - B) Results in only a localised infection.
 - C) May spread through the blood stream to other parts of the body.
 - D) Cause cellulitis at the area of introduction. (1)
- 1.19 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)
- 1.20 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)

QUESTION 2**[15]**

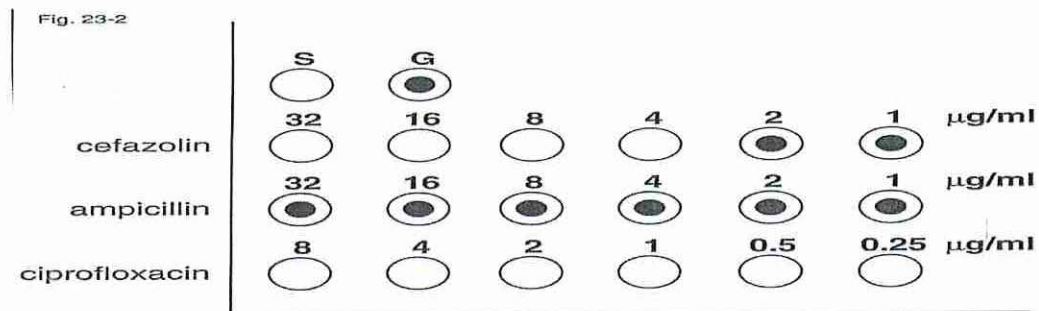
Assess the following statements and decide whether they are true or false. Write only the number of the question and next to it **TRUE** for a true statement and **FALSE** for a false statement and **give a reason for calling a statement FALSE**.

- 2.1 Pseudomembranous colitis is associated with the organism *Corynebacterium perfringens*.
- 2.2 Transient bacteraemia is presence of bacteria in the blood over several hours/days.
- 2.3 Boric acid is a bacteriostatic agent that inhibits the growth of organisms when it is added to urine to give a final concentration of 1.8%.
- 2.4 *R. prowazekii* directly causes human infection.
- 2.5 *Coxiella burnetii* is associated with Q fever.
- 2.6 Acinetobacter species typically present as gram negative cocci usually in pairs (diplococci) with flattened adjacent sides "Kidney bean"/" Coffee bean" shape.
- 2.7 Indole differentiates between *Proteus vulgaris* and *Proteus mirabilis*.
- 2.8 Beta-lactamases is an antibiotic that inactivated the β -lactam ring.
- 2.9 IgM antibodies will indicate that the patient is in the convalescent stage of the disease and that he has been previously exposed to the micro-organism.

SECTION B**(35)****QUESTION 3****[9]**

- 3.1 Categorize the following antibiotics according to its mechanism of action it uses to have a bacteriocin or bacteriostatic effect.
- 3.1.1 Vancomycin (1)
- 3.1.2 Aminoglycosides (1)
- 3.1.3 Tetracyclines (1)
- 3.1.3 Quinolones (1)

3.2 Analyse and evaluate the reactions illustrated in the micro titre plate below and answer the questions that follows:



3.2.1) As a scientist, can you consider the results from the micro titre plate to be accurate? **Justify your answer.** (3)

3.2.1 Which antimicrobial agent **and** at what concentration would effectively treat the patient when you interpret the results of the micro titre plate. (2)

QUESTION 4

[19]

4.1 Match the following organisms with its associated disease. Write only the number and the corresponding letter on your answer sheet.

4.1.1 Enterotoxigenic <i>E.coli</i>	A) Bloody diarrhoea in all ages.
4.1.2 Vero cytotoxin-producing <i>E.coli</i>	B) Dysentery-like disease in all ages.
4.1.3 Enteroinvasive <i>E.coli</i>	C) Diarrhoea in infants, rarely in adults.
4.1.4 Enterpathogenic <i>E.coli</i>	D) Infant and adult watery diarrhoea.

(4)

4.2 Compare the pathogenesis and clinical manifestations of primary and secondary syphilis. (15)

QUESTION 5

[7]

5.1 Suggest how a scientist can differentiate between *E.coli* O157:H7 from the other *E.coli* species in the diagnostic laboratory. (7)

SECTION C

(40)

QUESTION 6

[20]

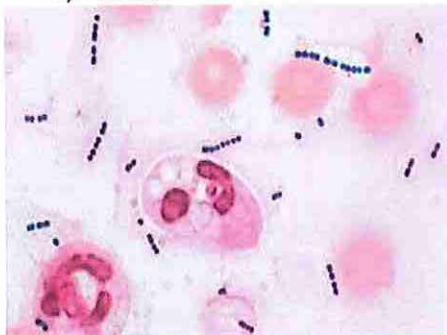
6.1 A 12-year-old Caucasian boy, always walking bare foot on the farm, presented with a one-week history of general malaise, mild fever, indolence, and anorexia. He subsequently developed dysphagia and difficulties opening the mouth and eventually dehydration. Due to parental concerns about the boy's 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.

6.1.1 Identify the causative pathogen of generalised tetanus. (1)

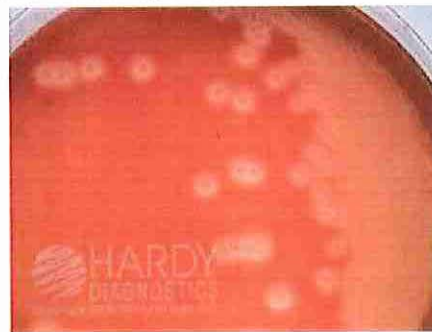
6.1.2 Illustrate by means of a drawing the gram stain morphology and gram reaction you expect for this organism. (2)

6.2 A 1-day old baby presented with an eye infection. Her doctor collected an eye swab and submitted it to the diagnostic medical microbiology laboratory for URGENT analysis. Evaluate the slides below, presenting the laboratory findings from the baby's eye swab culture and answer questions 6.2.1 – 6.2.6 based on the case study.

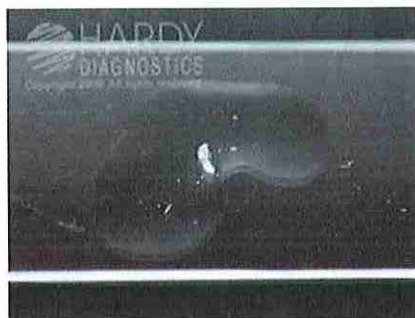
1) Gram stain result from the eye swab:



2) The culture from the eye swab on a blood agar after incubation.



3) Catalase test result:



4) Additional test that was preformed:



- 6.2.1 Report your findings on the gram-stained slide, presented in image 1. (3)
- 6.2.2 Report your findings of the growth seen in image 2. (2)
- 6.2.3 Report the catalase results from the test presented in image 3. (1)
- 6.2.4 Identify the reagent used for the catalase test. (2)
- 6.2.5 Discuss the principle of the catalase test. (3)
- 6.2.6 Name the test that was performed and presented in image 4. Using a labelled illustration of the test, explain the principle of the test. (6)

QUESTION 7 [20]

- 7.1 Design a flow chart for the identification of gram-positive cocci, starting with gram positive cocci seen on the gram-stained slide and ending at specie level identification.
Please ensure to include all crucial steps in the flow-chart. (20)

TOTAL: 110 MARKS