

CHUKA



UNIVERSITY

**UNIVERSITY EXAMINATIONS**

**FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF  
SCIENCE IN NURSING**

**NURU 121: MEDICAL MICROBIOLOGY I**

**STREAMS: BSC (NURSING) Y2T1**

**TIME: 2 HOURS**

**DAY/DATE: MONDAY 01/11/2021**

**11.30 A.M. – 1.30 P.M.**

---

**INSTRUCTIONS:**

- Answer ALL questions
- Answers for section A should be on the first page of the answer booklet
- Do not write anything on the question paper
- This is a **closed book exam**, No reference materials are allowed in the examination room
- There will be **No** use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely

**SECTION A**

1. Bacteria that cause nosocomial infections often produce extracellular substances that allow them to stick firmly to medical devices such as intravenous catheters. What is the name of this substance?
  - a. Endotoxin
  - b. Glycocalyx
  - c. Porin
  - d. Flagella
2. During which phase of the bacterial growth curve are antibiotics such as penicillin most likely to kill bacteria? \_\_\_\_\_
3. What term denotes the transfer of plasmids carrying one or more transposons through a sex pilus? \_\_\_\_\_
4. The colon is the site of the largest number of normal flora bacteria. The bacteria found in the greatest number in the colon is
  - a. *Bacteroides fragilis*

- b. *Escherichia coli*
  - c. *Enterococcus faecalis*
  - d. *Lactobacillus* species
5. If the venipuncture site is inadequately disinfected, blood cultures are most often contaminated with
- a. *Streptococcus pyogenes*
  - b. *Escherichia coli*
  - c. *Staphylococcus epidermidis*
  - d. *Pseudomonas aeruginosa*
6. Which of the following chemicals is used to sterilize heat sensitive surgical instruments?
- a. Benzalkonium chloride
  - b. Formaldehyde
  - c. Hypochlorite solution
  - d. Ethylene oxide
7. The laboratory technician concludes that a patient has *Staphylococcus epidermidis* bacteremia. Which one of the following sets of results did the technician find with the organism recovered from the blood culture?
- a. Gram-positive cocci in chains, catalase positive, coagulase positive
  - b. Gram-positive cocci in chains, catalase negative, coagulase negative
  - c. Gram-positive cocci in clusters, catalase positive, coagulase negative
  - d. Gram-positive cocci in clusters, catalase negative, coagulase positive
8. Which of the following laboratory tests is the most appropriate to distinguish *Streptococcus pyogenes* from other  $\beta$ -hemolytic streptococci?
- a. Ability to grow in 6.5% NaCl
  - b. Hydrolysis of esculin in the presence of bile
  - c. Inhibition by optochin
  - d. Inhibition by bacitracin
9. Which of the following statements regarding the differences between *Neisseria meningitidis* (meningococci) and *Neisseria gonorrhoeae* (gonococci) is the most accurate?
- a. Meningococci are oxidase-positive whereas gonococci are not
  - b. Meningococci have a thick polysaccharide capsule where as gonococci do not
  - c. Meningococci have lipid A whereas gonococci do not have
  - d. Meningococci synthesize IgA protease whereas gonococci do not
10. Your patient is a 20-year-old man with urethral exudate. You do a Gram stain of the pus and see gram-negative diplococci with neutrophils. Which is the best antibiotic to treat the infection?
- a. Norfloxacin and Doxycycline
  - b. Metronidazole and clotrimazole
  - c. Norfloxacin and clotrimazole
  - d. Doxycycline and clotrimazole

11. Which of the following is a large gram-positive rod that causes necrosis of tissue by producing an exotoxin that degrades lecithin, leading to lysis of cell membranes?
  - a. *Bacillus anthracis*
  - b. *Bacillus cereus*
  - c. *Clostridium perfringens*
  - d. *Corynebacterium diphtheria*
12. A two-week-old boy is admitted in the intensive care unit with fever and signs of meningitis. Gram stain of the spinal fluid reveals small gram-positive rods. Colonies on blood agar show a narrow zone of  $\beta$ -hemolysis. Which is the most likely cause of the neonatal meningitis?
  - a. *Bacillus anthracis*
  - b. *Neisseria meningitidis*
  - c. *Clostridium perfringens*
  - d. *Listeria monocytogenes*
13. A 30-year-old man who works in a slaughter house has a 2-cm lesion on his arm. The lesion began as a painless papule that enlarged and within a few days ulcerated and formed a black crust. A Gram stain of fluid from the lesion reveals large gram-positive rods. Which is the most likely bacteria?
  - a. *Bacillus anthracis*
  - b. *Clostridium botulinum*
  - c. *Clostridium perfringens*
  - d. *Clostridium tetani*
14. A patient has third-degree burns over most of his body. He was doing well until two days ago he developed fever and his dressing revealed pus that had a blue-green color. Gram stain of the pus revealed a gram-negative rod that formed colorless colonies on EMB agar. Which of the following bacteria is the most likely cause of the infection?
  - a. *Campylobacter jejuni*
  - b. *Escherichia coli*
  - c. *Haemophilus influenza*
  - d. *Pseudomonas aeruginosa*
15. Regarding members of the family Enterobacteriaceae, which of the following is most accurate?
  - a. All the members of the family are anaerobic
  - b. All the members of the family ferment lactose
  - c. All the members of the family have an endotoxin
  - d. All the members of the family produce an enterotoxin
16. Your patient is a 30-year-old woman with dysuria and cloudy urine but no fever or flank pain. She has not been hospitalized. You suspect she probably has cystitis. A Gram stain of urine reveals gram-negative rods. Culture of the urine on EMB agar shows colorless colonies and a urease test was positive. Swarming motility was noted on blood agar plate. Which of the following bacteria is the most likely cause?
  - a. *Bacillus anthracis*
  - b. *Clostridium botulinum*
  - c. *Clostridium perfringens*
  - d. *Clostridium tetani*

- a. *Escherichia coli*
  - b. *Proteus mirabilis*
  - c. *Pseudomonas aeruginosa*
  - d. *Serratia marcescens*
17. A patient is seen in the outpatient clinic complaining of epigastric pains which gets relieved by antacids for several months. After taking complete history and doing a physical exam, you discuss the case with the clinician who suggests doing a urea breath test. Which of the following bacteria does the clinician think is the most likely cause of the patient's disease?
- a. *Helicobacter pylori*
  - b. *Shigella dysenteriae*
  - c. *Proteus mirabilis*
  - d. *Salmonella typhi*
18. A 75-year-old man who has smoked for the last 50 years and consumed alcohol for most of his adult life has signs and symptoms of pneumonia. Gram stain of his sputum reveals polymorphonuclear cells but no bacteria. Colonies appear on buffered charcoal yeast agar but not on blood agar. Which of the following bacteria is the most likely cause of his pneumonia?
- a. *Legionella pneumophilla*
  - b. *Klebsiella pneumoniae*
  - c. *Haemophilus influenza*
  - d. *Bordetella pertussis*
19. A 60-year-old woman with a history cigarette smoking has a fever of 39°C and a cough productive of yellowish sputum. Gram stain of the sputum shows gram-negative rods. There is no growth on blood agar but colonies grow on chocolate agar enriched with hemin and NAD. The most likely cause of her pneumonia is
- a. *Legionella pneumophilla*
  - b. *Klebsiella pneumoniae*
  - c. *Haemophilus influenza*
  - d. *Bordetella pertussis*
20. When preparing surgical instruments for sterilization, the instruments are soaked in 0.5% chlorine solution. The nurse understands that this
- a. Gets rid of all micro-organisms from the instruments
  - b. Is a world health organization recommendation
  - c. Makes the instruments safe for handling during processing
  - d. Is in the nurse's scope of practice
21. A 20-year-old patient has urethral discharge. Gram stain of the pus shows many neutrophils but no bacteria. You suspect the infection may be caused by *Chlamydia trachomatis*. Which one of the following laboratory results best support your diagnosis?
- a. The organism produces beta-hemolytic colonies on blood agar plate when incubated

- b. The organism produces alpha-hemolytic colonies on blood agar plate when incubated
  - c. Fluorescent antibody staining of cytoplasmic inclusions in epithelial cells in the exudates
  - d. Four-fold or greater rise in antibody titer against *C.trachomatis*
22. A culture of skin lesions from a patient with impetigo shows numerous colonies surrounded by a zone of beta hemolysis on a blood agar plate. A Gram-stained smear shows gram-positive cocci. A catalase test was negative. Which was the most probable organism isolated?
- a. *Streptococcus pyogenes*
  - b. *Staphylococcus aureus*
  - c. *Staphylococcus epidermidis*
  - d. *Streptococcus pneumoniae*
23. The pathogenesis of which one of the following organisms is most likely to involve invasion of the intestinal mucosa?
- a. *Vibrio cholerae*
  - b. *Shigella sonnei*
  - c. Enterotoxigenic *Escherichia coli*
  - d. *Clostridium botulinum*
24. What is the most important pathogenic component shared by *Streptococcus pneumoniae*, *Neisseria meningitidis* and *Haemophilus influenzae*?
- a. Protein A
  - b. Capsule
  - c. Endotoxin
  - d.  $\beta$ -lactamase
25. Each of the following statements concerning gram-negative rods is correct EXCEPT:
- a. *Escherichia coli* is part of the normal flora of the colon; therefore it does not cause diarrhea
  - b. *E.coli* ferments lactose, whereas the enteric pathogens Shigella and Salmonella do not
  - c. *Klebsiella pneumoniae* although a cause of pneumonia is part of normal flora
  - d. Proteus species are highly motile organisms found in human colon and cause urinary tract infection
26. For which of the following enteric illnesses is a chronic carrier state MOST likely to develop
- a. Campylobacter enterocolitis
  - b. Shigella enterocolitis
  - c. Cholera
  - d. Typhoid fever
27. Which of the following host defense mechanisms is MOST important in preventing dysentery caused by Salmonella?

- a. Salivary enzymes
- b. Normal flora of the mouth
- c. Gastric acid
- d. Alpha interferon

**For questions 28 -30 select the ONE lettered option in the choices provided (i to x) that is most closely associated with the numbered item**

- 28. Grows in 6.5% sodium chloride
- 29. Is bile soluble
- 30. Flaccid paralysis

**Choices**

- i. *Viridans group of streptococci*
- ii. *Escherichia coli*
- iii. *Clostridium botulinum*
- iv. *Helicobacter pylori*
- v. *Clostridium tetani*
- vi. *Staphylococcus aureus*
- vii. *Streptococcus pyogenes*
- viii. *Streptococcus pneumoniae*
- ix. *Bacteriodes fragilis*
- x. *Chlamydia pneumoniae*

**SECTION B (30 MARKS)**

- 1. State five (5) important properties of *Mycobacteria tuberculosis* (5 marks)
- 2. Describe the Gram staining procedure (5 marks)
- 3. State five (5) virulent factors of *Streptococcus pyogenes* (5 marks)
- 4. Describe the pathogenesis of *Neisseria meningitidis* (5 marks)
- 5. State five virulent factors of *S. aureus* (5 marks)
- 6. List the main genera of Gram negative rods associated with the gastrointestinal tract (5 marks)

**SECTION C (20 MARKS)**

- 1. Regarding *Haemophilus influenzae*,
  - a. Describe the morphology and staining properties (2 marks)
  - b. Describe the pathogenesis and virulent factors (12 marks)

- c. State three (3) differences between *Haemophilus influenzae* and other bacteria causing septic meningitis (6 marks)
  - 2. Regarding bacterial genetics:
    - a. Describe four types of mutations (8 marks)
    - b. Highlight on the significance of biotechnology in healthcare (12 marks)
-