

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF BACHELOR OF SCIENCE
IN NURSING

NURS 223: MEDICAL MICROBIOLOGY

STREAMS: BSC (NURSING) Y2S1

TIME: 3 HOURS

DAY/DATE: TUESDAY 04/12/2018

8.30 A.M – 11.30 A.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 β -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 β -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. *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. If a virus is enveloped it is more easily inactivated by lipid solvents and detergents as compared to viruses that do not have an envelope. Which of the following viruses is the most sensitive to inactivation by lipid solvents and detergents?
- a. Coxsackie virus
 - b. Hepatitis A virus
 - c. Herpes simplex virus
 - d. Rotavirus
23. Which of the following viruses that causes human disease has an animal reservoir?
- a. Yellow fever virus
 - b. Small pox virus
 - c. Hepatitis C virus
 - d. Cytomegalovirus
24. Regarding varicella-zoster virus (VZV), which of the following is most accurate?
- a. High-dose acyclovir can eliminate the latent state caused by VZV
 - b. When VZV infection occurs in immunocompromised patient acyclovir should be given to prevent disseminated infection
 - c. The principal site of latency of VZV is the nucleus of motor neurons
 - d. VZV is transmitted by dog-bite

25. Regarding parvovirus B19, which one is the most accurate?
- A vaccine that contains the killed virus as the immunogen is available
 - Parvoviruses have double-stranded DNA genome and require DNA polymerase for replication
 - Parvovirus B19 causes severe anemia because it preferentially infects erythrocyte precursors
 - Patients infected with parvovirus B19 can be diagnosed in the laboratory using cold agglutinin test
26. Regarding measles virus and the disease measles, which one of the following statements is most accurate?
- The measles vaccine contains the killed virus as the immunogen
 - One of the main sequelae of measles is autoimmune glomerulonephritis and kidney failure
 - Fecal-oral transmission during the diaper stage is the main mode of acquisition of measles virus
 - The virus has only one antigenic type and lifelong immunity occurs when one gets infected
27. Which of the following statements is most accurate regarding rotavirus?
- Rotavirus is a major cause of nosocomial diarrhea in intensive care units
 - The vaccine against rotavirus contains live attenuated virus as the immunogen
 - Rotavirus has a nonsegmented, single stranded RNA genome and there is no polymerase in the virion
 - Diarrhea caused by rotavirus is due to a viral protein that increases the release of IgA from many submucosal B lymphocytes
28. An outbreak of jaundice occurs in several children who attend the same day care centre. If the outbreak was caused by a virus, which of the following is the most likely cause?
- Hepatitis A
 - Hepatitis B
 - Hepatitis C
 - Hepatitis D
29. 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?
- Streptococcus pyogenes*
 - Staphylococcus aureus*
 - Staphylococcus epidermidis*
 - Streptococcus pneumonia*

30. The pathogenesis of which one of the following organisms is most likely to involve invasion of the intestinal mucosa?
- Vibrio cholerae*
 - Shigella sonnei*
 - Enterotoxigenic *Escherichia coli*
 - Clostridium botulinum*
31. What is the most important pathogenic component shared by *Streptococcus pneumoniae*, *Neisseria meningitidis* and *Haemophilus influenzae*?
- Protein A
 - Capsule
 - Endotoxin
 - β -lactamase
32. Each of the following statements concerning gram-negative rods is correct EXCEPT:
- Escherichia coli* is part of the normal flora of the colon; therefore it does not cause diarrhea
 - E.coli* ferments lactose, whereas the enteric pathogens Shigella and Salmonella do not
 - Klebsiella pneumoniae* although a cause of pneumonia is part of normal flora
 - Proteus species are highly motile organisms found in human colon and cause urinary tract infection
33. For which of the following enteric illnesses is a chronic carrier state MOST likely to develop
- Campylobacter enterocolitis
 - Shigella enterocolitis
 - Cholera
 - Typhoid fever
34. Which of the following host defense mechanisms is MOST important in preventing dysentery caused by Salmonella?
- Salivary enzymes
 - Normal flora of the mouth
 - Gastric acid
 - Alpha interferon

For questions 35 -45 select the ONE lettered option in the choices provided (i to xii) that is most closely associated with the numbered item

35. Causes atypical pneumonia in immunosuppressed and neonates
36. Grows in 6.5% sodium chloride
37. Anaerobic gram-negative rod that is important cause of peritonitis
38. Is bile soluble
39. Peptic ulcer disease
40. Flaccid paralysis
41. Produces enterotoxin
42. Associated with rheumatic fever
43. Does not grow on artificial media
44. Common cause of urinary tract infection
45. Not bile-soluble and not inhibited by optochin

Choices

- i. *Treponema pallidum*
 - ii. *Viridans group of streptococci*
 - iii. *Escherichia coli*
 - iv. *Clostridium botulinum*
 - v. *Helicobacter pylori*
 - vi. *Clostridium tetani*
 - vii. *Staphylococcus aureus*
 - viii. *Streptococcus pyogenes*
 - ix. *Enterococcus faecalis*
 - x. *Streptococcus pneumoniae*
 - xi. *Bacteriodes fragilis*
 - xii. *Chlamydia pneumonia*
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46. Which of the following fungi is most likely to be found within reticuloendothelial cells?
 - a. *Histoplasma capsulatum*
 - b. *Candida albicans*
 - c. *Cryptococcus neoformans*
 - d. *Sporothrix schenckii*
 47. Each of the following statements concerning mucormycosis is correct EXCEPT:
 - a. The causal fungi is transmitted by airborne asexual spores
 - b. Tissue sections from a patient with mucormycosis show budding yeast
 - c. Hyphae typically invade blood vessels and cause tissue necrosis
 - d. Diabetic ketoacidosis is a predisposing factor to the infection
 48. Infection by a dermatophyte is MOST often associated with
 - a. Intravenous drug abuse
 - b. Inhalation of organism from contaminated bird droppings

- c. Adherence of organism to perspiration-moist skin
 - d. Fecal oral transmission
49. Aspergillosis is recognized in tissue by the presence of:
- a. Budding cells
 - b. Septate hyphae
 - c. Metachromatic granules
 - d. Pseudohyphae
50. Fungal cells that reproduce by budding are seen in the infected tissues of patients with:
- a. Sporotrichosis, candidiasis, and cryptococcosis
 - b. Mucormycosis, mycetoma, and candidiasis
 - c. Tinea versicolor, tinea corporis, and tinea unguium
 - d. Sporotrichosis, aspergillosis, and mycetoma
51. Each of the following clinical syndromes is associated with infection by picornaviruses EXCEPT:
- a. Myocarditis
 - b. Hepatitis
 - c. Mononucleosis
 - d. Meningitis
52. Each of the following statements is correct EXCEPT
- a. Mumps virus is a paramyxovirus hence single stranded RNA genome
 - b. Meningitis is a recognized complication of mumps
 - c. Mumps orchitis in children before puberty causes sterility
 - d. During mumps the virus spread through bloodstream to various internal organs
53. Which of the following is the MOST reasonable explanation for the ability of hepatitis B virus to cause chronic infection?
- a. Infection does not elicit the production of antibody
 - b. The liver is “immunologically sheltered” site
 - c. Viral DNA can persist within the host cell
 - d. Many humans are immunologically tolerant to HBs antigen
54. A 64-year-old man with chronic lymphatic leukemia develops progressive deterioration of mental and neuromuscular function. At autopsy the brain shows enlarged oligodendrocytes whose nuclei contain naked icosahedral particles. The most likely diagnosis is:

- a. Herpes encephalitis
 - b. Rabies
 - c. Subacute sclerosing panencephalitis
 - d. Progressive multifocal leukoencephalopathy
55. Which of the following statements about genital herpes is LEAST accurate?
- a. Acyclovir reduces the number of recurrent disease episodes
 - b. Genital herpes can be transmitted in the absence of apparent lesions
 - c. Multinucleated giant cells with inclusions are found in the lesions
 - d. Initial disease episodes are generally more severe than recurrent episodes
56. EACH of the following statements about human immunodeficiency virus (HIV) is correct EXCEPT:
- a. Screening tests for antibodies are useful to prevent transmission of HIV through blood transfusion
 - b. The opportunistic infections seen in AIDS are primarily due to loss of cell-mediated immunity
 - c. Zidovudine inhibits the RNA-dependent DNA polymerase
 - d. The presence of circulating antibodies that neutralize HIV is evidence that one is protected against HIV-induced disease
57. Which of the following is the MOST common lower respiratory pathogen in infants?
- a. Respiratory syncytial virus
 - b. Adenovirus
 - c. Rhinovirus
 - d. Coxsackie virus
58. Which of the following statements about prevention of viral disease is CORRECT?
- a. Adenovirus vaccine contains purified penton fibers and is usually given to children in conjunction with polio vaccine
 - b. Coxsackie virus vaccine contains live virus that induces IgA, which prevents infection by homologous serotypes
 - c. Flavivirus immunization consists of hyperimmune serum plus vaccine consisting of subunits containing the surface glycoproteins
 - d. One of the influenza virus vaccines contains killed virus that induces neutralizing antibody directed against hemagglutination
59. Which of the following statements is CORRECT about poliovirus?
- a. Congenital infection of the fetus is an important complication

- b. The virus replicates extensively within the gastrointestinal tract
 - c. A skin test is used to determine prior exposure
 - d. Amantadine is an effective preventive drug
60. Regarding human papilloma virus (HPV) which is the most accurate?
- a. There is no vaccine available against HPV
 - b. Acyclovir is effective in preventing lesions caused by HPV but does not cure the latent state
 - c. Antigen-antibody complexes play an important role in the pathogenesis of warts caused by HPV
 - d. The early proteins of HPV play a more important role in malignant transformation than the late proteins

SECTION B (20 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 human papilloma virus (HPV) infection (5 marks)

SECTION C (20 MARKS)

- 1. Pyogenic meningitis is a common cause of childhood morbidity and mortality in developing countries.
 - a. Describe the morphology and staining properties of the three (3) leading causes of bacterial meningitis (6 marks)
 - b. For one of the bacteria described in (a) above, describe the pathogenesis and virulent factors (11 marks)
 - c. For each of the bacteria described in (a) above, indicate the antibiotic(s) of choice in its management (3 marks)
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