



(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

(MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

MAIN EXAM

2023/2024 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER EXAMINATION

FOR THE DEGREE OF BACHELORS OF SCIENCE IN CLINICAL NURSING

COURSE CODE: NRN 124

COURSE TITLE: MEDICAL BACTERIOLOGY

DATE: 9TH APRIL, 2024

TIME: 11.30PM-2.30PM

INSTRUCTIONS TO CANDIDATES: ANSWER SECTION A AND B ALL QUESTIONS AND SECTION C TWO QUESTIONS.

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

Paper Consists of 2 Printed Pages. Please Turn Over

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SECTION A: Multiple Choose Question (MCQ).

(60 Marks)

1. Which of the following microorganism is the major inhabitant of the human skin?
 - a) *Escherichia coli*
 - b) *Staphylococcus epidermidis*
 - c) *Staphylococcus aureus*
 - d) *Streptococcus pyogenes*
2. Select all the medically important bacteria which are frequently isolated pathogen human infections?
 - a) Enteric bacteria
 - b) *Pseudomonas spp*
 - c) *Plasmodium spp*
 - d) *Staphylococcus spp*
 - e) *Mucor spp*
 - f) *Mycobacterium spp*
3. All of the following pathogens are the major congenital pathogens that are transmitted from infected mother to baby, Except?
 - a) *Treponema pallidum*
 - b) *Zika virus*
 - c) *Herpesvirus*
 - d) *Clostridium perfringens*
4. Which of the following cocci-shaped bacteria usually grow in pairs?
 - a) *Klebsiella spp*
 - b) *Neisseria spp*
 - c) *Pseudomonas spp*
 - d) *Clostridium spp*
 - e) *Nocardia spp*
5. Which of the following microbe can live only inside the cell (obligate intracellular pathogen)?
 - a) *Salmonella*
 - b) *Mycobacterium*
 - c) *Rickettsia*
 - d) *Vibrio*
6. The upper respiratory tract of the human body typically harbors as part of its normal flora, but an excessive proliferation of these bacteria can result in respiratory tract infections.
 - a) *Lactobacillus acidophilus*
 - b) *Streptococcus spp*
 - c) *Vibrio cholerae*
 - d) *Clostridium difficile*
7. Which of the following bacteria releases an endotoxin that causes muscular paralysis and ultimately may lead to infection of nervous system?
 - a) *Clostridium botulinum*
 - b) *Bacillus cereus*
 - c) *Streptococcus pyogenes*

d) *Salmonella typhi*

8. Which enzyme produced by *Staphylococcus* spp. is involved in the bacteria's defence mechanisms?

a) Coagulase

b) Lipase

c) Hyaluronidase

d) Proteases

9. Which of the following bacteria is predominantly present as a normal flora in the urogenital tract of a mother and a newborn female infant?

a) *Candida albicans*

b) *Lactobacillus acidophilus*

c) *Histoplasma capsulatum*

d) *Neisseria gonorrhoeae*

10. Which of the following gram-positive bacteria is the causative pathogen for infection known as 'lock jaw'?

a) *Clostridium tetani*

b) *Neisseria gonorrhoeae*

c) *Yersinia pestis*

d) *Mycobacterium leprae*

11. Name the bacterial pathogen transmitted to humans by the bite of fleas and can cause a serious and deadly infection

a) *Salmonella typhi*

b) *Yersinia pestis*

c) *Shigella dysenteriae*

d) *Escherichia coli*

12. Some bacteria and fungi need an iron receptors molecule for their growth which is an important virulence factor of bacterial pathogenesis, what is it called?

a) Siderophores

b) Ionophores

c) Siderocytes

d) None of the above

13. Which of the following is the example of toxin produced by *Streptococcus pyogenes*?

a) Cyanotoxin

b) Endotoxins

c) Pyrogenic toxin (exotoxins)

d) Shiga like toxin

14. Name the bacteria that is a common cause of toxic shock syndrome infection due to the release of the toxins.

a) *Staphylococcus epidermidis*

b) *Staphylococcus aureus*

c) *E. coli*

d) *Yersinia pestis*

15. Catalase test is one of the primary microbiological tests used for the

identification of the enzyme catalase in bacterial cells and differentiating various bacteria.

Which of the following is catalase negative bacteria?

- a) *E. Coli*
- b) *Bacillus subtilis*
- c) *Staphylococcus aureus*
- d) *Streptococcus agalactiae*

16. *Staphylococcus aureus* releases various types of toxins that increase the virulence of the bacteria, select all the toxins released by *S. aureus*:

- a) Aflatoxin
- b) Mycotoxins
- c) Leukocidins
- d) Enterotoxins

17. Which pathogen is a major cause of dental disease?

- a) *Staphylococcus epidermidis*
- b) *Streptococcus mutans*
- c) *Staphylococcus aureus*
- d) *Streptococcus agalactiae*

18. The bacteria that commonly causes an eye infection is.....

- a) *Chlamydia trachomatis*
- b) *Staphylococcus aureus*
- c) *Streptococcus pneumoniae*
- d) *Streptococcus sanguinis*

19. The most significant bacteria found in acne isacnes.

- a) *Staphylococcus*
- b) *Streptococcus*
- c) *Propionibacterium*
- d) *Bacillus*

20. Which of the following bacteria is predominantly present as normal flora in urine?

- a) *Escherichia coli*
- b) *Staphylococcus epidermidis*
- c) *Staphylococcus aureus*
- d) *Streptococcus pyogenes*

21. The virulence factors of a bacteria are the important constituents of the bacteria that help in invading the host and initiating the infection.

Select all the important virulence factors which help in the process of bacterial pathogenesis:

- a) Siderophores
- b) Exotoxins and endotoxins
- c) Pili/ fimbriae
- d) Capsules
- e) All of the above

22. Name the most possible bacteria associated with the opportunistic infections that occur in patients who have cystic fibrosis

- a) *Staphylococcus aureus*
- b) *Pseudomonas aeruginosa*
- c) *Chlamydia trachomatis*
- d) *Candida albicans*

23. Select all the microorganisms which are commonly transmitted to humans by the vectors such as ticks and fleas.

- a) *Rickettsia spp*
- b) *Yersinia spp*
- c) *Borrelia spp*
- d) *Bacillus spp*

24. Which of the following toxins releasing bacteria is frequently encountered as causative agents of human gastroenteritis?

- a) *Cryptococcus neoformans*
- b) *Streptococcus pneumoniae*
- c) *Salmonella typhi*
- d) *Staphylococcus aureus*

25. Identify the bacterial pathogen that commonly transmitted to humans through the consumption of contaminated food can invade the skin and lead to tissue damage

- a) *Rhizopus stolonifer*
- b) *Bacillus cereus*
- c) *Clostridium perfringens*
- d) *Proteus mirabilis*

26. Which of the following microorganism has the cocci cell shapes and sizes arranged usually in tetrad structures?

- a) *Streptococcus pneumoniae*
- b) *Staphylococcus aureus*
- c) *Chlamydia trachomatis*
- d) *Neisseria meningitidis*

27. What are the different growth morphology and cell structures used for the classification of fungi? Select all the correct answers:

- a) Yeast
- b) Mold
- c) Mycelia
- d) Protozoa

28. Which of the following media is formulated with additional nutrients to support the growth of fastidious or nutritionally demanding bacteria that may not grow well on basic media?

- a) Differential media
- b) Enriched media
- c) Nutrient agar (media)
- d) Selective media

29. Which of the following metabolic characteristic is a distinguishing characteristic and identification of colonies of *E. coli*?

- a) Hydrogen sulfide formation
- b) Indole Formation
- c) Lactose fermentation
- d) Urea Degradation

30. Which of the following bacteria is an endospore-forming bacteria that is also a common foodborne pathogen?

- a) *Bordetella pertussis*
- b) *Clostridium botulinum*
- c) *Klebsiella pneumoniae*
- d) *Streptococcus pneumoniae*

31. A 19-year-old male living in a tropical region of India visits a local healthcare center. He has a lesion on the lower part of the left leg, he reports the lesion first appeared 5 days ago. A skin biopsy test confirms a parasitic infection.

Which of the following is a vector-borne parasitic infection that can be transmitted to humans by the bite of infected sandflies?

- a) Leishmaniasis
- b) Lassa fever
- c) Malaria
- d) Yellow fever

32. Which of the following is the example of encapsulated gram-positive bacteria?

- a) *Klebsiella pneumoniae*
- b) *Clostridium perfringens*
- c) *Streptococcus pneumoniae*
- d) *Haemophilus influenzae*

33. Which of the following morphological characteristics is an important identification characteristic of *Neisseria gonorrhoeae*?

- a) Gram-Negative Diplococci
- b) Gram-Positive Bacilli
- c) Gram-Negative Bacilli
- d) Gram-Positive Diplococci

34. A 7-year-old girl is brought to a healthcare clinic, she has developed sore throat and fever for last 2 days, no other symptoms is observed by the physician. Microscopic examination and culture of the sputum sample reveals gram-positive cocci that appear in chains.

Which of the following bacteria could be the possible pathogen?

- a) *Acinetobacter baumannii*
- b) *Chlamydia trachomatis*
- c) *Staphylococcus aureus*
- d) *Streptococcus pyogenes*

35. Which of the following are the growth morphology of the protozoa?

- a) Multicellular and non motile

- b) Unicellular and non motile
- c) Multicellular
- d) Unicellular and motile

36. A 24-year-old sexually active woman comes to a local healthcare center with infection in the vaginal area and genital discharge while urinating. Urinary tract infection (UTI) is suspected, urine sample and genital swab specimen is taken for culture and identification of the possible pathogen. Which of the following gram negative sexually transmitted bacteria has special growth requirements?

- a) *Mycobacterium tuberculosis*
- b) *Chlamydia trachomatis*
- c) *Neisseria meningitidis*
- d) *Klebsiella oxytoca*

37. Which of the following gram positive bacteria is a strict anaerobe and can only grow in the absence of oxygen?

- a. *Streptococcus pneumoniae*
- b. *Bordetella pertussis*
- c. *Clostridium tetani*
- d. *Staphylococcus epidermidis*

38. A 70 year old male visits a emergency department with chronic cough, chest pain, fever, chills, and weakness. He reports the cough first started three weeks ago with no other symptoms in the first week, he complains about the loss of appetite due to which he has lost some of his body weight. Upon examination fever is noted, a chest X-ray reveals infection in both lungs, pneumonia is suspected. A sputum sample and a throat swab specimen is taken for the identification of the pathogen and diagnosis of the disease. Which of the following could be the possible infection?

- a) Candidiasis
- b) Tuberculosis
- c) Measles
- d) Cystic fibrosis

39. Among the following respiratory pathogens, which of the following is difficult to identify using the Gram staining technique in microscopy tests?

- a) *Pseudomonas aeruginosa*
- b) *Streptococcus pneumoniae*
- c) *Bordetella pertussis*
- d) *Mycobacterium tuberculosis*

40. A bacteriological stain also known as the differential stain is used for the identification of acid-fast organisms, what is the name of the stain?

- a) Negative stain
- b) Gram stain
- c) Ziehl-Neelsen stain
- d) Schaeffer Fulton stain

41. A Capsule is a.....layer lying outside the bacterial cell and can be found in both gram-positive and gram-negative bacteria

- a) Lipopolysaccharide layer
- b) Polysaccharide
- c) Phospholipid
- d) None of the Above

41. Which of the following dye is commonly used for the Negative staining technique?

- a) Crystal violet
- b) India ink
- c) Lactophenol cotton blue
- d) Periodic acid- Schiff stain

42. Identify the gram-positive bacteria that shows alpha-hemolytic colonies and appear greenish on blood agar

- a) *Bacillus cereus*
- b) *Streptococcus pneumoniae*
- c) *Staphylococcus aureus*
- d) *Streptococcus pyogenes*

43. Gram staining technique is used for the differentiation of gram-positive and gram-negative bacteria. What color do gram-negative bacteria appear under the microscope after the staining procedure?

- a) Blue
- b) Pink
- c) Purple
- d) Green

44. MacConkey's agar is both selective and differential media that is primarily used for the isolation of enteric bacteria.

Which of the following metabolic property differentiate the pink-colored colonies of *E. coli* from *Salmonella spp* that does not show any color?

- a) Urease production
- b) Hemolytic activity
- c) Lactose fermentation
- d) Hydrogen sulfide production

45. All of the following bacteria are catalase positive, Except

- a) *E. coli*
- b) *Shigella spp*
- c) *Staphylococcus spp*
- d) *Streptococcus spp*

46. Which of the bacteria consists flagella and shows a positive motility test?

- a) *Staphylococcus aureus*
- b) *Yersinia pestis*
- c) *Klebsiella pneumoniae*
- d) *Proteus vulgaris*

47. The metabolic reactions by bacteria can be observed by performing different biochemical tests, this helps in the identification and classification of bacteria. Which of the following biochemical test shows a negative result for *Escherichia Coli*?

- a) Lactose
- b) Indole
- c) Citrate
- d) Glucose

48. *Clostridium perfringens* on agar can show all of the following cultural characteristics, Except?

- a) Microaerophilic
- b) Spore-forming
- c) H₂S production
- d) Haemolysis (alpha and beta)

49.....is a gram-positive, non-spore-forming virulent foodborne bacillus. It can grow at refrigeration temperatures in raw meat and vegetables, unpasteurized milk, and cheese.

- a) *Bacillus subtilis*
- b) *Clostridium botulinum*
- c) *Listeria monocytogenes*
- d) *Yersinia pestis*

50. Which of the following bacteria exhibits beta hemolysis on blood agar plates?

- a) *Bacillus anthracis*
- b) *Proteus vulgaris*
- c) *Streptococcus pyogenes*
- d) *Candida albicans*

51. All of the statements regarding *Bacillus anthracis* are true, Except

- a) Causative agent of smallpox
- b) Colonies are non-hemolytic when grown on Blood agar
- c) Gram positive, spore-forming bacteria
- d) Transmitted to humans through animals

52. Which of the following bacteria is a part of the human gut and mouth flora that is also important in making some fermented dairy products?

- a) *Candida albicans*
- b) *Lactobacillus acidophilus*
- c) *Staphylococcus aureus*
- d) *Micrococcus luteus*

53.is a type of fungus that is a member of natural gut flora and is known to be a common cause of skin, vaginal, and oral infections.

- a) *Neisseria gonorrhoea*
- b) *Yersinia pestis*
- c) *Coccidioides immitis*
- d) *Candida albicans*
- e) *Penicillium marneffe*

54. Name the bacteria of the Enterobacteriaceae family that have the following characteristics?

- swarming growth on culture media
- producing a urease enzyme
- major urinary tract pathogen

- a) *Proteus spp*
- b) *Salmonella spp*
- c) *Histoplasma spp*
- d) *Klebsiella spp*

55. The following microorganism is an encapsulated gram-negative bacillus that shows lactose fermentation when grown in MacConkey agar.

Select the correct answer:

- a) *Pseudomonas aeruginosa*
- b) *Staphylococcus aureus*
- c) *Streptococcus pneumoniae*
- d) *Klebsiella pneumoniae*

56. Which of the following media is one of the commonly used media for the proper isolation of gram-negative pathogens such as *Haemophilus spp* and *Neisseria gonorrhoeae*?

- a) Potato dextrose agar
- b) Chocolate agar
- c) Nutrient agar
- d) Mac Conkey agar

57. All of the statements are true about *Corynebacterium spp*, except

- a) Requires a tellurite agar
- b) Gram-positive
- c) Colonies appear black or gray on agar
- d) They are motile

58. Mannitol Salt agar (MSA) constitutes of high salt concentration that is used as both selective and differential culture media for the isolation of which of the following gram-positive cocci?

- a) *Klebsiella spp*
- b) *Streptococcus spp*
- c) *Staphylococcus spp*
- d) *Pseudomonas spp*

59. Which of the following culture media is a primary media used for the routine laboratory isolation of *Salmonella* and *Shigella spp*?

- a) Xylose lysine deoxycholate agar
- b) Thiosulfate citrate bile salts agar
- c) Mannitol salt agar
- d) Bile esculin agar

60. Which of the following is the selective media used for the cultivation and isolation of *Neisseria gonorrhoeae* and *N. meningitidis*?

- a) Buffered charcoal- yeast extract agar

- b) Thayer martin agar
- c) Xylose lysine deoxycholate agar
- d) Bile esculin agar

SECTION A: SHORT ANSWER QUESTIONS (20 MARKS)

1. Describe types of gene transfer that alters the bacterial genome. **(5 Marks)**
2. Using a digraph describe bacterial growth curve. **(5 Marks)**
3. Describe laboratory method of differentiation of staphylococcus spp. **(5 Marks)**
4. Using relevant example classify bacteria based on temperature. **(5 Marks)**
5. List five examples of gram-negative bacteria. **(5 Marks)**

SECTION B: LONG ANSWER QUESTIONS (20 MARKS)

1. A patient came to the clinic having a prolong fever, constipation, the doctor noticed his spleen is enlarged, blood sample confirmed bacteremia, the patient said that one week ago he ate medium done chicken burger. **(10 Marks)**
 - i. What was the bacteria causing this kind of sickness?
 - ii. Complication of fever:
 - iii. Treatment for fever
 - iv. mention the type of antigen structure?
2. A 60-year-old man presents with hematemesis, melena, guaiac-positive stools, and signs of circulatory collapse. He has a 20-year history of burning mid-epigastric pain and tenderness relieved by food, milk, or antacids. Also, he has been taking high doses of nonsteroidal anti-inflammatory drugs to relieve the pain of long-standing arthritis. **(10 Marks)**
 - i. What is the most likely diagnosis?
 - ii. What is the most common cause of PUD?
 - iii. Describe the Helicobacter Pylori?
 - iv. What is the most common site for these bacteria?
 - v. What can Helicobacter Pylori cause?
 - vi. List some signs and symptoms of this disease?