



**KENYATTA UNIVERSITY**  
**EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MEDICAL**  
**LABORATORY SCIENCE**  
**HML 305: CLINICAL BACTERIOLOGY I**

**1<sup>ST</sup> SEMESTER 2022/2023**

**TIME: 2 Hours**

**INSTRUCTIONS:**

**SECTION A: ANSWER ALL QUESTIONS (4 MARKS EACH)**

1. Outline the clinical forms of botulism (4 marks)
2. State the diagnostic features that differentiate;
  - a) *Streptococcus pyogenes* and *Streptococcus agalactiae* (2 marks)
  - b) *Streptococcus pneumoniae* and *Streptococcus mutans* (2 marks)
3. Explain the mechanism of action of Diphtheria toxin (4 marks)
4. Outline the toxins and hemolysins associated with group A streptococci pathogenesis (4 marks)
5. Delineate the types of lesions in Tuberculosis (4 marks)

**SECTION B: ANSWER ONE QUESTIONS (20 MARKS)**

6. Describe the
  - a) laboratory diagnosis of Chlamydia infections (10 marks)
  - b) pathogenesis of *Bacillus anthracis* (10 marks)
7. Describe the clinical findings in *Treponema pallidum* disease (20 marks)

**SECTION C: ANSWER ALL QUESTIONS IN THE ANSWER BOOKLET (0.5 MARKS EACH)**

1. Which one of the following is a large gram-positive rod that causes necrosis of tissue by producing an exotoxin that degrades lecithin, resulting in the lysis of cell membranes?
  - a) *Bacillus anthracis*
  - b) *Clostridium perfringens*

- c) *Corynebacterium diphtheriae*
  - d) *Listeria monocytogenes*
2. The following bacterial gram-stained cell morphology is shown by:



- a) *Staphylococcus aureus*
  - b) *Bacillus anthracis*
  - c) *Corynebacterium diphtheriae*
  - d) *Clostridium perfringens*
3. Regarding syphilis, which one of the following is most accurate?
- a) In secondary syphilis, the number of organisms is low, so the chance of transmitting the disease to others is low.
  - b) In secondary syphilis, both the rapid plasma reagin (RPR) and the fluorescent treponemal antibody-absorbed (FTA-ABS) tests are usually positive.
  - c) The antibody titer in the FTA-ABS test typically declines when the patient has been treated adequately.
  - d) In congenital syphilis, no antibody is formed against *T. pallidum* because the fetus is tolerant to the organism
4. A pore-forming exotoxin produced by *Staphylococcus aureus* that kills cells and is important in the severe, rapidly spreading necrotizing lesions caused by MRSA strains is:
- a) enterotoxin.
  - b) exfoliatin
  - c) P-V leukocidin
  - d) Staphyloxanthin



- a) Lifelong immunity usually follows an episode of disease caused by these organisms.
  - b) Their life cycle consists of elementary bodies outside of cells and reticulate bodies within cells.
  - c) They can only replicate within cells because they lack the ribosomes to synthesize their proteins.
  - d) The vaccine against *C. pneumoniae* contains the capsular polysaccharide as the immunogen conjugated to a carrier protein.
6. The cells involved with pyogenic inflammation are mainly neutrophils, whereas the cells involved with granulomatous inflammation are mainly macrophages and helper T cells. Infection by which one of the following bacteria is most likely to elicit granulomatous inflammation?
- a) *Mycobacterium tuberculosis*
  - b) *Helicobacter pylori*
  - c) *Streptococcus pyogenes*
  - d) *Staphylococcus aureus*
7. Bacteria that cause nosocomial (hospital-acquired) infections often produce extracellular substances that allow them to stick firmly to medical devices, such as intravenous catheters. Which one of the following is the name of this extracellular substance?
- a) Porins
  - b) Endotoxin
  - c) Flagella
  - d) Glycocalyx
8. A 20-year-old man has a urethral discharge, which on gram staining reveals many neutrophils but no bacteria. This infection is suspected to be caused by *Chlamydia trachomatis*. Which one of the following is the laboratory result that best supports the clinical diagnosis?
- a) The organism produces beta-hemolytic colonies on blood agar plates when incubated aerobically.
  - b) The organism produces alpha-hemolytic colonies on blood agar plates when incubated anaerobically.
  - c) Fluorescent-antibody staining of cytoplasmic inclusions in epithelial cells in the exudate.
  - d) Fourfold or greater rise in antibody titer against *C. trachomatis*

9. Which one of the following best describes the pathogenesis of rheumatic fever?  
Streptococcus pyogenes'
- a) Exotoxin acts as a superantigen damages cardiac muscle.
  - b) capsular polysaccharide antibodies cross-react with joint tissue and damages it.
  - c) M protein antibodies cross-reacts with cardiac muscle and damages it.
  - d) Endotoxin activates macrophages to release cytokines that damage cardiac muscle.
10. Each of the following statements concerning Corynebacterium diphtheriae is correct EXCEPT:
- a) it is a gram-positive rod that does not form spores.
  - b) Toxin production is dependent on the organism's being lysogenized by a bacteriophage.
  - c) Diphtheria toxoid should not be given to children younger than 3 years because the incidence of complications is too high.
  - d) Antitoxin should be used to treat patients with diphtheria
11. Which one of the following is the virulence factor produced by Staphylococcus aureus that prevents the activation of complement and thereby reduces opsonization by C3b?
- a) Catalase
  - b) Coagulase
  - c) Endotoxin
  - d) Protein A
12. Mycobacterium tuberculosis stains well with the acid-fast stain, but not with the Gram stain. Which one of the following is the most likely reason for this observation?
- a) It has a large number of pili that absorb the purple dye.
  - b) It has a large amount of lipid that prevents entry of the purple dye.
  - c) It has a very thin cell wall that does not retain the purple dye.
  - d) It has histones that are highly negatively charged.
13. Human body louse transmits which of the following pathogens:
- a) Leptospira interrogans
  - b) Borrelia recurrentis
  - c) Treponema pallidum
  - d) Borrelia burgdorferi



14. Food poisoning is caused by which of the following clostridia?

- a) *C. difficile*
- b) *C. botulinum*
- c) *C. perfringens*
- d) *C. tetani*

15. Which of the following bacteria shows the characteristic colonies shown by the plate below;



- a) *Streptococcus agalactiae*
  - b) *Streptococcus pneumoniae*
  - c) *Streptococcus mitis*
  - d) *Streptococcus mutans*
16. A 2-week-old boy patient in a pediatric intensive care unit has a high fever and the 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 one of the following is the most likely cause of his neonatal meningitis?
- a) *Bacillus anthracis*
  - b) *Clostridium perfringens*
  - c) *Corynebacterium diphtheriae*
  - d) *Listeria monocytogenes*
17. Superantigen production by *Staphylococcus aureus* is involved in the pathogenesis of which one of the following diseases?
- a) Impetigo
  - b) Osteomyelitis
  - c) Scalded skin syndrome
  - d) Toxic shock syndrome

18. A 25-year-old complains of a cough for the past month, he has a productive cough, which is not foul-smelling and he has lost 4.5 kg but says that he doesn't eat regularly. Physical examination gives a temperature of 38°C and laboratory results show acid-fast rods, buff-colored colonies at 21 days. Which of the following organisms is most likely cause of this infection?
- a) *Mycobacterium fortuitum-chelonae*
  - b) *Mycobacterium leprae*
  - c) *Mycobacterium marinum*
  - d) *Mycobacterium tuberculosis*
19. A 20-year-old sexually active woman reports dysuria and other symptoms of a urinary tract infection. Gram stain of the urine reveals gram-positive cocci. Which one of the following sets of bacteria is most likely to cause this infection?
- a) *Staphylococcus aureus* and *Streptococcus pyogenes*
  - b) *Staphylococcus saprophyticus* and *Enterococcus faecalis*
  - c) *Streptococcus agalactiae* and *Staphylococcus epidermidis*
  - d) *Streptococcus pneumoniae* and *Enterococcus faecalis*
20. Which one of the following sets of bacteria causes disease characterized by a pseudomembrane?
- a) *Corynebacterium diphtheriae* and *Listeria monocytogenes*
  - b) *Bacillus anthracis* and *Listeria monocytogenes*
  - c) *Bacillus cereus* and *Clostridium perfringens*
  - d) *Corynebacterium diphtheriae* and *Clostridium difficile*