



**KENYA MEDICAL TRAINING COLLEGE
FACULTY OF CLINICAL SCIENCES
DEPARTMENT OF CLINICAL MEDICINE**

**END OF SEMESTER EXAMINATION
FOR
MARCH 2021 CLASS – YEAR 1 SEMESTER I
PAPER: MEDICAL MICROBIOLOGY I**

DATE: 3rd August, 2021

TIME: 2 HOURS (8:00AM – 10:00 AM)

INSTRUCTIONS

1. This paper consists of:
 - Section 1 (20 Multiple Choice Questions)
 - Section 2 (4 Short Answer Questions)
 - Section 3 (2 Long Answer Question)
2. Attempt **ALL** Questions
3. Write your **ADMISSION NUMBER** on all the answer sheets provided and on the question paper.
4. Ensure that all examination answer scripts are handed in at the end of the examination
5. Ensure you sign in the 'sign IN and OUT' examination register provided

EXAMINATION NUMBER

Section 1 (20 Multiple Choice Questions) (20 Marks)

1. You're watching a television program that is discussing viruses called bacteriophages that can kill bacteria. Your roommate says, "Wow, maybe viruses can be used to kill the bacteria that infect people! You're taking the Microbiology course now, what's the difference between viruses and bacteria?" Which one of the following would be the most accurate statement to make?
- Viruses do not have mitochondria, whereas bacteria do.
 - Viruses do not have a nucleolus, whereas bacteria do.
 - Viruses do not have ribosomes, whereas bacteria do.
 - Viruses replicate by binary fission, whereas bacteria replicate by mitosis.
 - Viruses are prokaryotic, whereas bacteria are eukaryotic.
2. Bacteria, fungi (yeasts and molds), viruses, and protozoa are important causes of human disease. Which one of the following microbes contains either DNA or RNA but not both?
- Bacteria
 - Molds
 - Protozoa
 - Viruses
 - Yeasts
3. Which one of the following contains DNA that is not surrounded by a nuclear membrane?
- Bacteria
 - Molds
 - Protozoa
 - Yeasts
4. Several bacteria that form spores are important human pathogens. Which one of the following is the most accurate statement about bacterial spores?
- They are killed by boiling for 15 minutes.
 - They are produced primarily by gram-negative cocci.
 - They are formed primarily when the bacterium is exposed to antibiotics.
 - They are produced by anaerobes only in the presence of oxygen.
5. 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?
- Axial filament
 - Endotoxin
 - Flagella
 - Glycocalyx
 - Porin
6. Which one of the following is the most accurate description of the structural differences between gram-positive bacteria and gram-negative bacteria?
- Gram-positive bacteria have a thick peptidoglycan layer, whereas gram-negative bacteria have a thin layer.
 - Gram-positive bacteria have an outer lipid-rich membrane, whereas gram-negative bacteria do not.

- c. Gram-positive bacteria form a sex pilus that mediates conjugation, whereas gram-negative bacteria do not.
- d. Gram-positive bacteria have plasmids, whereas gram-negative bacteria do not.
7. 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?
- It has a large number of pili that absorb the purple dye.
 - It has a large amount of lipid that prevents entry of the purple dye.
 - It has a very thin cell wall that does not retain the purple dye.
 - It is too thin to be seen in the Gram stain.
8. The colon is the site of the largest number of normal flora bacteria. Which one of the following bacteria is found in the greatest number in the colon?
- Bacteroides fragilis
 - Clostridium perfringens
 - Enterococcus faecalis
 - Escherichia coli
9. An outbreak of postsurgical wound infections caused by *S. aureus* has occurred in the hospital. The infection control team was asked to determine whether the organism could be carried by one of the operating room personnel. Using your knowledge of normal flora, which one of the following body sites is the most likely location for this organism?
- Colon
 - Gingival crevice
 - Mouth
 - Nose
10. Handwashing is an important means of interrupting the chain of transmission from one person to another. Infection by which one of the following bacteria is most likely to be interrupted by handwashing?
- Borrelia burgdorferi
 - Legionella pneumophila
 - Staphylococcus aureus
 - Streptococcus agalactiae (group B streptococcus)
11. Vertical transmission is the transmission of organisms from mother to fetus or newborn child. Infection by which one of the following bacteria is most likely to be transmitted vertically?
- Chlamydia trachomatis
 - Clostridium tetani
 - Haemophilus influenzae
 - Shigella dysenteriae
12. A 22 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?
- Staphylococcus aureus and Streptococcus pyogenes
 - Staphylococcus saprophyticus and Enterococcus faecalis
 - Streptococcus agalactiae and Staphylococcus epidermidis
 - Streptococcus pneumoniae and Enterococcus faecalis
13. Regarding the differences between Neisseria meningitidis (meningococci) and Neisseria gonorrhoeae (gonococci), which one of the following is the most accurate statement?

- a. Humans are the reservoir for both organisms.
 b. Many clinical isolates of meningococci produce β -lactamase, but clinical isolates of gonococci do not.
 c. Meningococci have multiple antigenic types, but gonococci have only one antigenic type.
 d. The conjugate vaccine against gonorrhea contains seven types of the pilus protein as the immunogen.
14. Your patient is a 40-year-old woman with diplopia and other signs of cranial nerve weakness. History reveals she grows her own vegetables and likes to preserve them in jars that she prepares at home. She is fond of her preserved string beans, which is what she ate uncooked in a salad for dinner last night. Which one of the following is the most likely cause of this clinical picture?
 a. Bacillus anthracis
 b. Clostridium botulinum
 c. Clostridium perfringens
 d. Clostridium tetani
15. Your patient is a 30-year-old man with a 2-cm lesion on his arm. It began as a painless papule that enlarged and, within a few days, ulcerated and formed a black crust (eschar). He works in an abattoir where his job is removing the hide from the cattle. A Gram stain of fluid from the lesion reveals large gram-positive rods. Which one of the following bacteria is likely to be the cause?
 a. Bacillus anthracis
 b. Clostridium botulinum
 c. Clostridium perfringens
 d. Clostridium tetani
16. Each of the following statements concerning bacterial spores is correct EXCEPT:
 a. Their survival ability is based on their enhanced metabolic activity.
 b. They are formed by gram-positive rods.
 c. They can be killed by being heated to 121°C for 15 minutes.
 d. They are formed primarily when nutrients are limited.
17. Each of the following statements concerning the normal flora is correct EXCEPT:
 a. The most common organism found on the skin is *Staphylococcus epidermidis*.
 b. *Escherichia coli* is a prominent member of the normal flora of the throat.
 c. *Escherichia fragilis* is found in the colon.
 d. Each of the statements about the classification of streptococci is correct EXCEPT:
 a. Pneumococci (*Streptococcus pneumoniae*) are α -hemolytic and can be serotyped on the basis of their polysaccharide capsules.
 b. Enterococci are group D streptococci and can be classified by their ability to grow in 6.5% sodium chloride.
 c. Although pneumococci and the viridans streptococci are α -hemolytic, they can be differentiated by the bile solubility test and their susceptibility to optochin.
 d. Viridans streptococci are identified by Lancefield grouping, which is based on the C carbohydrate in the cell wall.
19. Each of the following agents is a recognized cause of diarrhea EXCEPT:
 a. Clostridium perfringens
 b. Enterococcus faecalis

- c. Escherichia coli
 - d. Vibrio cholera
20. Each of the following statements concerning Clostridium tetani is correct EXCEPT:
- a. It is a gram-positive, spore-forming rod.
 - b. Pathogenesis is due to the production of an exotoxin that blocks inhibitory neurotransmitters.
 - c. It is a facultative organism; it will grow on a blood agar plate in the presence of room air.
 - d. Its natural habitat is primarily the soil.

Section 2 (4 Short Answer Questions) (40 Marks)

1. Define the following terms. (10marks)
- a) Normal flora
 - b) Toxin
 - c) Microorganism
 - d) Pathogen
 - e) Virulence
2. List the agents of human infectious diseases. (10marks)
3. Outline classification of bacteria by their morphology. (10marks)
4. Describe bacterial growth cycle. (10marks)

Section 3: Long answer Questions (40 Marks)

1. Discuss Staphylococcus aureus under the following: - (20marks)
- a. Diseases
 - b. Mode of transmission
 - c. Clinical findings
 - d. Laboratory diagnosis
 - e. Prevention
2. Fully describe the gram staining procedure and its usefulness in microbiology (20 marks)