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| **Name:**<br>**Enrolment No:** | UPES<br>UNIVERSITY OF TOMORROW |

**UPES**

**End Semester Examination, December 2024**

**Course :** Diagnostic Microbiology
**Semester :** V
**Program:** INT-BMSC-MICROBIO **Duration :** 3 Hours
**Course Code:** HSMB3014_2 **Max. Marks:** 100

| S. No. | Section A<br>Short answer questions/ MCQ/T&F<br>(20Qx1.5M= 30 Marks) | Marks | COs |
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| 1 | **These bacteria are capable of forming endospores:**<br><br>a) Gram-positive cocci<br>b) Gram-negative bacilli<br>c) Gram-positive bacilli<br>d) Gram-negative cocci | 1.5 | CO 1 |
| 2 | **Select the option that best describes a selective medium.**<br><br>a) It allows all organisms to grow<br>b) It contains chemicals that inhibit the growth of certain organisms while allowing others to grow<br>c) It enhances the growth of all organisms<br>d) It supports the growth of fungi only | 1.5 | CO 1 |
| 3 | **A major challenge in diagnosing anaerobic infections is**<br><br>a) Lack of appropriate growth media<br>b) Difficulty in collecting specimens<br>c) Low bacterial load in clinical samples<br>d) Absence of clear clinical symptoms | 1.5 | CO 1 |
| 4 | **The causative agent of syphilis is**<br><br>a) *Treponema pallidum*<br>b) *Neisseria gonorrhoeae*<br>c) *Chlamydia trachomatis*<br>d) *Streptococcus pyogenes* | 1.5 | CO 1 |
| 5 | **A key feature of rickettsial infections is** | 1.5 | CO 1 |

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| | a) Obligate intracellular lifestyle<br>b) Ability to form endospores<br>c) Aerobic metabolism<br>d) Inability to grow in artificial media | | |
| **6** | **A primary atypical pneumonia caused by:**<br><br>a) *Streptococcus pneumoniae*<br>b) *Mycoplasma pneumoniae*<br>c) *Haemophilus influenzae*<br>d) *Legionella pneumophila* | **1.5** | **CO 1** |
| **7** | **…… bacteria are commonly associated with community-acquired pneumonia.**<br><br>a) *Mycobacterium tuberculosis*<br>b) *Streptococcus pneumoniae*<br>c) *Clostridium difficile*<br>d) *Legionella pneumophila* | **1.5** | **CO 1** |
| **8** | **MBC (Minimum Bactericidal Concentration) represents:**<br><br>a) The lowest concentration of antibiotic that inhibits bacterial growth<br>b) The concentration at which bacterial growth is highest<br>c) The lowest concentration of antibiotic that kills bacteria<br>d) The highest concentration that can be safely administered | **1.5** | **CO 1** |
| **9** | ***Streptococcus pneumoniae:***<br><br>a) It is a Gram-negative bacterium<br>b) It is the most common cause of pneumonia in adults<br>c) It causes foodborne illness<br>d) It is primarily transmitted by arthropod vectors | **1.5** | **CO 1** |
| **10** | **_____ is the causative agent of Guinea Worm Disease (Dracunculiasis).**<br><br>a) *Wuchereria bancrofti*<br>b) *Dracunculus medinensis*<br>c) *Schistosoma mansoni*<br>d) *Onchocerca volvulus* | **1.5** | **CO 1** |
| **11** | **The purpose of the enzyme conjugate (e.g., horseradish peroxidase) in ELISA is……..**<br><br>a) To amplify the antigen signal<br>b) To bind the sample to the well<br>c) To catalyze a color change or luminescence in the presence of substrate<br>d) To purify the sample | **1.5** | **CO 1** |

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| **12** | **_____ is NOT a typical feature of the microbiota in the elderly.**<br><br>a) Decreased microbial diversity<br>b) A higher abundance of pro-inflammatory bacteria<br>c) A greater abundance of beneficial bacteria<br>d) A reduction in the production of certain short-chain fatty acids | **1.5** | **CO 1** |
| **13** | **This factor can influence the composition of an individual's microbiota:**<br><br>a) Diet<br>b) Antibiotic use<br>c) Age<br>d) All of the above | **1.5** | **CO 1** |
| **14** | **A target of the antibiotic vancomycin is…….**<br><br>a) Bacterial ribosomes<br>b) Bacterial DNA gyrase<br>c) Peptidoglycan in the bacterial cell wall<br>d) Bacterial folic acid synthesis | **1.5** | **CO 1** |
| **15** | **Antibiotic class, which inhibits bacterial protein synthesis by binding to the 50S ribosomal subunit is……..**<br><br>a) Aminoglycosides<br>b) Tetracyclines<br>c) Macrolides<br>d) Fluoroquinolones | **1.5** | **CO 1** |
| **16** | **A common infection in patients with HIV/AIDS due to immunodeficiency is…….**<br><br>a) Staphylococcus aureus infection<br>b) Pneumocystis jirovecii pneumonia (PCP)<br>c) Candida albicans infection<br>d) Malaria | **1.5** | **CO 1** |
| **17** | **_____ is the most appropriate specimen for detecting a bacterial infection in the blood.**<br><br>a) Serum<br>b) Whole blood<br>c) Sputum<br>d) Stool | **1.5** | **CO 1** |
| **18** | **For diagnosing parasitic infections such as *Leishmania* or *Trypanosoma*, which specimen is typically used?**<br><br>a) Blood smear<br>b) Sputum<br>c) Urine<br>d) Stool | **1.5** | **CO 1** |
| **19** | **_____ specimens is typically used for diagnosing viral** | **1.5** | **CO 1** |

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| | **infections such as HIV or Hepatitis C.**<br><br>a) Stool<br>b) Serum or plasma<br>c) Sputum<br>d) Nasopharyngeal swabs | | |
| **20** | **An advantage of PCR over traditional culture methods in diagnosing infections:**<br><br>a) PCR provides faster results than cultures<br>b) PCR can detect infections caused by non-culturable organisms<br>c) PCR is less expensive than traditional culture methods<br>d) PCR identifies the pathogen based on its clinical symptoms | **1.5** | **CO 1** |
| | **Section B**<br>**(4Qx5M=20 Marks)** | | |
| **Q 1** | Explain the difference competitive and non-competitive ELISA. | **5** | **CO 2** |
| **Q 2** | Describe how normal microbiota differ from pathogenic microorganisms in terms of their roles in the human body. | **5** | **CO 2** |
| **Q 3** | Design a protocol for collecting and transporting clinical specimens to ensure optimal diagnostic accuracy. | **5** | **CO 2** |
| **Q 4** | Define the concepts of Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC). | **5** | **CO 2** |
| | **Section C**<br>**(2Qx15M=30 Marks)** | | |
| **Q 1** | Mrs. Shashi has a history of recurrent urinary tract infections (UTIs), occurring approximately every 6–8 months over the past 5 years. She has been treated with antibiotics on multiple occasions. She has no history of diabetes, hypertension, or other chronic diseases. Mrs. Shashi does not smoke and drinks alcohol occasionally.<br><br>A) Explain the diagnosis for Mrs. Shashi based on her symptoms, history, and urinalysis findings. (5)<br>B) Discuss the initial management for Mrs.Shashi. (5)<br>C) Write the potential complications of untreated or inadequately treated UTIs in women. (5) | **15** | **CO 3** |
| **Q 2** | Mrs. Khushi is a 50-year-old woman diagnosed with HIV 8 years ago. She has been on ART (efavirenz, tenofovir, and lamivudine) for the past 7 years and has generally had good adherence to her regimen. She has a history of tuberculosis (TB) in the past but completed her treatment successfully. Her current CD4 count is 280 cells/$mm^3$, and her HIV viral load is undetectable.<br><br>A) Discuss the most likely diagnosis for Mrs. Khushi based on her | **15** | **CO 3** |

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| | clinical presentation and test results? (5)<br>B) Define the preventive measures (e.g., prophylaxis), which should be considered to reduce the risk of opportunistic infections in HIV patients like Mrs. Khushi? (5)<br>C) Explain the other infections or complications. (5) | | |
| **Section D**<br>**(2Qx10M=20 Marks)** | | | |
| **Q 1** | D) Discuss the process of sporulation in spore-forming bacteria, detailing the stages involved.<br>E) Explain its key molecular mechanisms, and the factors that influence the formation of spores. | **5+5** | **CO 3** |
| **Q 2** | F) Explain the principle and steps involved in the Polymerase Chain Reaction (PCR).<br>G) Discuss its applications and types. | **5+5** | **CO 3** |