BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Sc.(MLT)-2022
Course Name – Microbial Techniques and Bacteriology
Course Code - BMLTS403
(Semester IV)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Select the appropriate incubation time for optimal growth of bacterial samples
   a) 0-12 hrs
   b) 24-48 hrs
   c) 6-10 hrs
   d) 12-24 hrs

(ii) How does an anaerobic incubator create an oxygen-free environment?
   a) By increasing CO2 levels
   b) By reducing humidity
   c) By removing oxygen
   d) By using UV light

(iii) Select the primary purpose of an acidic stain in microbiology
   a) To visualize bacterial capsules
   b) To detect acid-fast bacteria
   c) To stain cell nuclei
   d) To stain cell background and provide contrast

(iv) Select the type of bacteria that retains the crystal violet stain during Gram staining
   a) Gram-positive
   b) Gram-negative
   c) Acid-fast
   d) Non-motile

(v) Acid-fast staining is based on the principle of differential staining, which means it
   a) Stains all bacteria the same colour
   b) Differentiates between types of bacteria based on their staining properties
   c) Uses multiple staining agents simultaneously
   d) Is not suitable for clinical use

(vi) Select the purpose of using standardized inoculum in antibiotic susceptibility testing
   a) To ensure uniformity in bacterial growth
   b) To enhance bacterial resistance to antibiotics
   c) To increase the size of the inhibition zone
   d) To promote bacterial motility

(vii) Why is it essential to standardize the depth and concentration of agar in Kirby-Bauer testing?
   a) To prevent bacterial contamination
   b) To ensure uniform diffusion of antibiotics
   c) To promote bacterial growth
   d) To increase the size of the inhibition zone

(viii) Choose the factor that does not influence the MIC of an antibiotic

a) pH of the growth medium
b) Temperature of incubation
c) Bacterial species being tested
d) Time of antibiotic exposure

(ix) How does CBNAAT detect the presence of Mycobacterium tuberculosis in a sample?

a) By staining bacterial cells
b) By amplifying specific DNA sequences
c) By measuring bacterial growth
d) By culturing bacteria in specific media

(x) How does CBNAAT contribute to the diagnosis of drug-resistant tuberculosis strains?

a) By analyzing bacterial morphology
b) By detecting specific genetic mutations
c) By measuring antibiotic concentrations
d) By identifying bacterial species

(xi) Choose the purpose of adding Kovac's reagent in the Indole test

a) To detect ammonia production
b) To detect indole production
c) To neutralize acids
d) To enhance color development

(xii) Choose the option indicating the primary purpose of RT-PCR

a) To amplify DNA fragments
b) To detect and quantify RNA molecules
c) To analyze protein expression
d) To study cell morphology

(xiii) Choose the primary objective of quantitative PCR

a) To amplify DNA fragments
b) To detect and quantify nucleic acid molecules
c) To analyze protein expression
d) To study cell morphology

(xiv) Choose the purpose of using control tubes in the phenol coefficient test

a) To compare the growth of bacteria with and without disinfectant exposure
b) To adjust the pH of the disinfectant
c) To measure the optical density of the bacterial culture
d) To filter the disinfectant solution

(xv) Choose the method that is used to enumerate bacterial colonies in a sample

a) Streaking
b) Pouring
c) Serial dilution
d) Spreading

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain the role of autoclave in microbiology lab (3)
3. Explain the term acid fastness with respect to Mycobacterium tuberculosis bacteria (3)
4. If a bacterial smear appears red after acid-fast staining but lacks blue background staining, what could be the possible reasons? (3)
5. Explain the reason why conventional staining techniques cannot be applied to stain bacterial capsules (3)
6. Analyze the role of fluorescence-based technology in the BACTEC system for rapid microbial detection. (3)

OR

Analyze the principle behind CBNAAT and how it amplifies nucleic acids to detect specific pathogens. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Describe the basic principle of an antibiotic susceptibility test (5)
8. Discuss the role of acid production and pH changes in the methyl red test reaction and how it reflects bacterial metabolic activity. (5)
9. Discuss the factors that can influence the accuracy of MIC and MBC determinations in microbiological assays. (5)

10. How does Gram staining aid in the rapid identification of bacterial infections, and what are the key characteristics used to differentiate Gram-positive and Gram-negative bacteria? (5)
11. Bacteria A was observed as pinkish color under microscopic view after doing Gram Stain and also need special supplement nutrient for growth. Write the interpretation of your observation point on Gram staining procedure and bacterial culture medium of said bacterium. (5)
12. Analyze the effectiveness of CBNAAT in reducing the time-to-diagnosis and improving patient outcomes in tuberculosis management. (5)

OR

Compare and contrast the sensitivity and specificity of CBNAAT with traditional tuberculosis diagnostic methods, such as sputum microscopy. (5)

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