Department of Biosciences and Bioengineering
Indian Institute of Technology Guwahati
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Course: BT-206 Microbiology (MIDSEM) **Date:** 27/02/2024
Total marks-30 **Total time:** 2 hrs

1. A liver tissue sample collected from a patient showed some microorganisms upon analysis. The same organism inoculated in animals causes TETANUS. Identify and classify the organism based on Bergey's manual. What are the different taxonomical ranks used for the classification of a microorganism? Enlist all of them in their order. (4 marks)

2. Starting with the four bacterial cells per microliter in a rich nutreient medium, with 1 hr lag phase and a 20 min generation time, how many cells will there be in 1 liter of this culture after 1h? After 2 hr? After 2 hrs if one of the intial four cells was dead? (2 marks)

3. How could a microscopic technique be used to show that MreB protein of *E Coli* gets phosphorylated and migrating to pili at the time of exchange of genetic material. (2 marks)

4. What is Carl Woese's contribution to microbiology? (1 mark)

5. Enlist the five differences between *E. Coli* and *Mycobacteria tuberculosis*. How is mycobacterial infection different from E. coli infection in a cell? (2 marks)

6. Discuss the Koch's postulates and explain how they deviated in the case of viruses. (2 marks)

7. Classify the bacteria based on flagella. How can you generate bacteria without flagella? (3 marks)

8. How is Archaea different than bacteria? How can you generate a synthetic Archaea? (3 marks)

9. What is the mode of action of penicillin and Kenamycin? How can you engineer a bacteria that shows resistance to penicillin? (3 marks)

10. The maximum theoretical resolution limit of a microscope is 0.4 $\times 10^{-6}$ with red light. Calculate its numerical aperture (NA).
    a) With the calculated value of NA, what will be its resolution with the violet light? (3 marks)

11. Define the following: (5 marks)
    a) Synthetic media
    b) Siderophores
    c) Slime layer
    d) Carboxysome
    e) Hyphomicrobium
    f) O-side chain
    g) ABC transporter
    h) Phase contrast microscopy
    i) Lyme disease
    j) Serum