

Birla Institute of Technology and Science, Pilani
Pharmaceutical Microbiology (PHA F217)

Second Semester 2022-23; Comprehensive Examination

Time: 90 Min

40 Marks : Closed Book

Date: 15/05/2023

Q1. a) How is neonatal herpes transmitted? **b)** Discuss about the molecular strategy used by the HIV virus to get internalized in their target cells. **[2+5]**

Q2. a) Why do sugary foods promote dental caries? **b)** How does diarrhea caused by *Staphylococcus aureus* differ from diarrhea caused by *Shigella dysenteriae*? **[2+3]**

Q3. Discuss how *Salmonella enterica* survives inside the intestinal macrophages and how macrophage uptake of *S. enterica* aggravates Salmonellosis. **[3]**

Q4. a) How does smoking make an individual more susceptible to infections? **b)** How does the diphtheria pathogen form a pseudomembrane? **[2+3]**

Q5. Since we all have experienced many colds (flu infections) in our lifetime, why are we not resistant to future infections? How can you explain it based on the genetic makeup of the flu virus? **[3]**

Q6. One person is suffering from *Mycoplasma pneumoniae* infection, and the doctor has prescribed a β -lactam antibiotic. Do you think this is correct? Justify. **[3]**

Q7. a) Describe how a disease can be infectious but not contagious. **b)** Diseases that involve biofilm-producing bacteria are of serious concern. They are less easily treated than those involving free-floating (or planktonic) bacteria. Explain three reasons why biofilm formers are more pathogenic. **[2+3]**

Q8. Imagine that a mutation in the gene encoding the cholera toxin was made. This mutation affects the A-subunit, preventing it from interacting with any host protein. Would the toxin be able to enter into the intestinal epithelial cell? Would the toxin be able to cause diarrhea? **[3]**

Q9. a) How superantigens work? **b)** Discuss about different enzymes that pathogenic bacteria utilize to support their growth in the host's body and develop a disease. **[2+4]**

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Q1. Explain the difference between a positive stain and a negative stain. Explain the difference between simple and differential staining. **[3]**

Q2. Explain the role of iodine and alcohol in the Gram stain procedure. You use the Gram staining procedure to stain a *Mycoplasma* bacterium. What color will the bacterium be after the staining procedure is finished? **[3+2]**

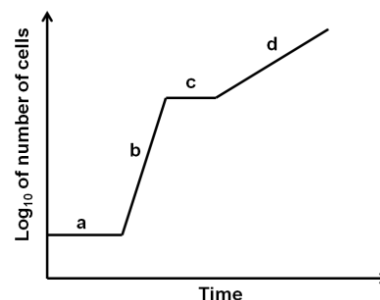
Q3. a) Why was the first virus investigated mistaken for a toxin? **b)** Which types of viruses have spikes? **c)** What aspect of the life cycle of a virus leads to a sudden increase in the growth curve? **d)** In which type of viruses will you find a role of RNA-dependent RNA polymerase? **[2+2+2+2]**

Q4. a) Name two factors that can limit microbial growth. **b)** What is the matrix of a biofilm composed of? **c)** What is the role of quorum sensing in a biofilm? **[2+2+2]**

Q5. Would you expect the oldest bacterial lineages to be aerobic or anaerobic? Explain. **[3]**

Q6. a) What DNA adaptation do thermophilic bacteria exhibit? **b)** What is the fundamental stress of a hypersaline environment for a bacterial cell? **c)** How can some obligate anaerobes grow in tissues (e.g., gum pockets) that are not entirely oxygen-free? **d)** Which metabolic process in the bacterial cell is particularly challenging at high pH? **[2+2+2+2]**

Q7. During an experiment in the lab, Shahid took inoculum from a refrigerated *E. coli* culture and inoculated it in the minimal nutrient medium containing glucose and lactose as carbon sources under aerated conditions at 37°C. The growth curve made from this culture is shown in the adjacent graph. Based on your knowledge of Microbiology and Biochemistry courses, identify the phases (a, b, c & d) and explain the reason behind each phase considering the utilization of the given carbon sources. **[3]**



Q8. A gram-negative bacterium that was susceptible to most common antibiotics suddenly becomes resistant to several of them. It also appears to be spreading this resistance to others of its kind. Describe the mechanism that most likely accounts for this. **[4]**

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