

GMS 6038 Bacterial Genetics and Physiology

Preparatory Questions

You should be able to answer these questions by the end of the first week of class, based on your previous education and/or looking over the PDF/PowerPoint linked to the course web page:

<http://www.mgm.ufl.edu/~gulig/bacgen/handouts/basic-bacteriology.pdf>.

There will be an opportunity for clarification in class and out of class. This is not a homework assignment that needs to be turned in, but I can promise you that I will be asking these questions in some manner, either orally or in writing (pop quiz), at some point during the course (not Monday!)

1. A. In a sentence or two at most for each, what is the most unique/identifying structural characteristic of the cell walls for gram-positive, gram-negative, acid fast, and wall-less bacteria?

B. List the unique chemical components of each cell wall type.
2. How do gram-negative bacteria manage to grow quickly in spite of their unique cell wall/membrane structure?
3. What are the structure-function relationships for lipopolysaccharide, including the breadth of structural forms of LPS found among different bacteria?
4. Which antibiotics affect peptidoglycan synthesis, and what is their mechanism of action? What is the end result to a cell treated with these antibiotics?
5. Do all bacteria make capsules? What is the general composition of capsules?
6. What are the differences in general structure and function between flagella, pili/fimbriae, and fibrillar layers?
7. Which bacterial types make spores? What is their significance to anyone who works with bacteria?
8. What are the functions of the cytoplasmic/inner membrane?
9. Which antibiotics affect DNA supercoiling, and how do they work?
10. What are the different options that bacteria have for their need and/or tolerance for oxygen? How does this impact use of bacteria in the lab?

11. What is unique about folic acid metabolism in bacteria and how do antibiotics affect folic acid metabolism?
12. What is the structure/function relationship of the bacterial RNA polymerase? What antibiotics interfere with RNA polymerase and how?
13. Which antibiotics affect protein synthesis?
14. What is meant by co-transcription-translation, and why can bacteria do this?
15. Describe the principal components of the general secretion (Sec) pathway and how this works. How are cytoplasmic membrane proteins handled differently compared with truly secreted proteins?
16. A. How many generations does it take for bacteria to increase 100-fold? You should be able to calculate this exactly as well as using a quick estimate.
B. If a bacterial culture grows from 1,000 CFU to 1,000,000 CFU over a period of 3 hours, what is the doubling time? What is the growth rate?
17. What is the difference between fastidious versus simple bacteria in terms of growth requirements?
18. What are the major structural elements of the bacterial genome?
19. What are the three mechanisms of genetic exchange among bacteria? What is the general mechanism of each (i.e., what components/factors are required/involved)?
20. What are the differences between generalized transduction, specialized transduction, and lysogenic conversion?
21. What are the three states for plasmids to be able to be moved by conjugation? What determines this state for any given plasmid?
22. What is meant by F+, F-, and Hfr?
23. What are the structure-function relationships of insertion sequences and transposons?
24. What is the difference between phase variation and antigenic variation in terms of effect on gene expression as well as the molecular genetic mechanism of action?
25. Why are lactose, arabinose, and tryptophan the three basic paradigms of bacterial gene expression regulation? What are the principal components, and how do they work together to change gene expression?