Micr-22 Exam 1 Study Guide   Revised Fall 2018

Test Preparation Suggestions

- □ If you need more background to address the items below, look over all of the "Check Your Understanding" and Study Questions for the relevant chapters.
- □ Be able to describe the meaning of major terms, with explanations appropriate for someone who has not taken this class.
- □ Before our exam, be able to describe and explain the following structures and ideas, respectively.
- □ Be able to place these topics in the broader context of microbiology. (For example: Why do we care about pili?)
- □ Expect a few questions from our discussions in class. It is not possible to predict what issues may arise, but they are certainly worth reviewing.
- □ Expect a few "challenge questions" which reach across multiple topics, and require your independent critical thinking. Some examples can be found at the end of textbook chapters. One strategy to prepare for these is to identify themes in the course.
- □ Stick with it! I'm counting on you to come to me with your questions.

Terms used in these guides:
Identify: Write the name.
Describe: Write a sentence.
Recognize: Given a list, be able to identify.
Distinguish: Given a list, be able to describe differences.
Explain: Write a description of why particular things happen.

Be able to...

Ongoing skills

1. Gather information regarding pathogens and assess the reliability of information sources.

Introduction (Ch. 1)

2. Properly format a species name.
3. Explain why species names are often more useful than common names.
4. Distinguish among the groups Bacteria, Archaea, and Eukarya.
5. Describe the microbiological contributions of the following individuals: Robert Hooke, Antonie van Leeuwenhoek, Rudolf Virchow (see zoonoses, *Trichinella spiralis*), Edward Jenner, Francesco Redi, Lazzaro Spallanzani (see spontaneous generation), Louis Pasteur, Robert Koch, Lady Mary Wortley Montagu, Joseph Lister, John Needham, Paul Ehrlich (1854-1915), and Alexander Fleming.
6. Discuss the following:
(a) What themes arise when comparing the behaviors of these famous individuals?
(b) What are other qualities of good scientific investigators?
(c) Are scientists fundamentally different from other people?
(d) How does the scientific method help generate new knowledge?
7. Describe the roles of microbes in natural systems and specifically in human bodily health.
8. What are three emerging infectious diseases? What are at least three general reasons that infectious diseases are still emerging?

Microscopy (Ch. 3)

9. Describe the features, uses, and limitations of these types of microscope: brightfield, darkfield, phase contrast, fluorescence, confocal, transmission electron, and scanning electron. Consider level of visible detail, living or nonliving cells, cost, and complexity.
10. Describe the purpose of various stains: simple vs. differential, Gram, acid-fast, negative, endospore, and flagella stains.
11. Connect the themes of technology and discovery. What are some examples of new technology enabling new discoveries?

Prokaryotic and Eukaryotic Cells (Ch. 4)

12. Describe major differences between prokaryotic and eukaryotic cells.
13. Be able to draw and label both cell types.
14. Describe the function of all these structures found in either/both prokaryotic and eukaryotic cells (glycocalyx, flagella, axial filaments, fimbriae, pili, cell wall, plasma membrane, cytoplasm, nucleoid, ribosomes, inclusions, endospores, cilia, and the organelles: nucleus, smooth and rough endoplasmic reticulum, Golgi complex, lysosomes, vacuoles, mitochondria, chloroplasts, peroxisomes, centrosomes, cytoskeleton).
15. How are the organelles (above) related or connected within the cell? Specifically discuss the endomembrane system.
16. Use the terms describing the shape and arrangement of prokaryotic cells (-cocci/us, -

bacilli/us, diplo-, strepto-, staphylo-, coccobacillus, tetrad, sarcinae, vibrio, spirillum, spirochete, monomorphic, pleomorphic).
17. Use the terms describing the number and position of prokaryotic flagella (atrichous, peritrichous, polar, monotrichous, lophotrichous, amphitrichous).
18. Draw, label, and describe gram-positive and gram-negative cell walls (thickness of peptidoglycan, presence or absence of: teichoic acids, outer membrane, lipopolysaccharides).
19. Describe what a gram stain is and what the different gram reactions signify. It will be helpful to know the ingredients and the relative amounts of time involved in each step.
20. List bacterial characteristics that are useful in identifying bacteria (ex: flagella, cell wall types, cell shape, cell arrangement, inclusions).
21. Distinguish among active and passive transport methods, including simple diffusion, osmosis, facilitated diffusion, and group translocation. Must the cell expend energy? Are membrane proteins involved? Why are these things done? Discuss.
22. Discuss the endosymbiotic theory, and what pieces of evidence support it.

Classification of Microorganisms (Ch. 10)
23. Describe why RNA is useful to classify domains (i.e., more useful than other cell features).
24. Describe these methods of classification and identify when they are appropriate: Morphological characters, staining, biochemical tests, serology, phage typing, flow cytometry, DNA base composition, DNA fingerprinting, PCR, and nucleic acid hybridization.
25. How do we classify viruses?
26. Are viruses alive? This idea is debated, so be able to defend your position. There is not necessarily a correct answer.
27. What is a dichotomous key?

Bacterial Groups (Ch. 11)
28. Distinguish among the four major metabolic classifications (photoautotroph, photoheterotroph, chemoautotroph, chemoheterotroph).
29. Contrast these phyla of bacteria: Proteobacteria, Firmicutes, Actinobacteria, Chlamydiae, Spirochaetes, Bacteroidetes.
30. Within Proteobacteria, be able to distinguish Alphaproteobacteria, Beta-, … Epsilon- groups. For example, be able to make an educated guess about the group of an organism (within Proteobacteria) based on the organism's characteristics. (Ex: In what group of Proteobacteria would you place an organism that

grows well in low-oxygen conditions, such as in anaerobic sewage treatment plants?)
31. Describe these non-pathogenic examples from lecture: *Bradyrhizobium japonicum*, Swiss cheese (3 spp.), *Wolbachia* spp. For what are these species known?

Eukaryotes (Ch. 12)
32. Discuss the difficulty of determining taxonomic relationships among microorganisms.
33. Identify the proper term for a mycosis based on symptoms: superficial, cutaneous, subcutaneous, or systemic.
34. Describe the relationships present in lichens.
35. Describe when some protozoa are likely to form cysts, and why this possibility matters for treatment.
36. Describe two major methods of classification of Protozoa (mode of motility vs. genetics) and the merits of each.
37. Distinguish among motility types: flagellates, amoebae, and ciliates.
38. Discuss why the slime molds are important to those studying the development of multicellularity.
39. Distinguish between platyhelminthes and nematodes, and between cestodes and trematodes within the platyhelminthes. (Hint: Use shape.)
40. Contrast definitive and intermediate hosts.
41. Discuss why arthropod vectors are often targeted for disease control.
42. Discuss why so little is known about such a large number of microorganisms.

Principles of Disease and Epidem. (Ch. 14)
43. Define epidemiological terms including: nosocomial infection, communicable vs noncommunicable disease, endemic, epidemic, pandemic, infection, pathogenesis, opportunistic infection, and prodromal period (including five stages/periods of disease: incubation, prodromal, illness, decline, convalescence).
44. What are normal microbiota and how do they impact a person's general health?
45. Describe possible relationships: mutualism, commensalism, parasitism, microbial antagonism, competitive exclusion.
46. Discuss Koch's postulates: What are they? What are they for? When are they not useful?
47. Give examples of reservoirs, and explain their relevance to disease control.
48. Describe disease transmission methods, especially vectors.
49. Interpret epidemiology graphs: Interpret axes, labels, and data; predict trends.