

Microbiology 205 Exam 1 study guide

Chapters 1: History of Microbiology

1. Learn the main contributions (and contributors) to the field of microbiology, immunology (vaccine), important infectious diseases in history, and chemotherapy by several scientists covered in class. What type of nomenclature is utilized to write and discuss bacteria?
2. What are the types of microorganisms are studied in microbiology?
3. What are the contributions of R. Hooke and van Leeuwenhoek to the field of microbiology?
4. What is abiogenesis (spontaneous generation)?
5. What experiments/scientists disproved spontaneous generation?
6. What is the Germ Theory of Disease? What were its benefits/drawbacks?
7. What are Koch's postulates?
8. What are other contributions of Pasteur, Jenner, Lady Montagu to the field of microbiology?
9. Why are bacteria or the study of microbes important? – just something to ponder – there are many reasons.
10. What are the six main types of microorganisms?
11. What are the three domains of microorganisms? How do they differ? How are they the same?
12. When is nomenclature helpful in classifying microorganism? How is the genus of bacteria written? Species? What is wrong with the following? *S. Aureus*

Chapter 3. Methods for studying microbiology

1. You should know the basic parts of the light microscope. You should be able to understand the metric units (micro and millimeters) used in microbiology. Be able to convert from millimeters to micrometers – or any other metric unit – this is simple math. (not covered in class but you will be asked)
2. Know the limits of resolution of the light microscope. What is magnification, resolution? What are the properties of light?
3. Know the different kinds of microscopy that were discussed in class and know what each form brings to the table – ie – what would you use each technique for? What are the major differences between these techniques?
4. Why do we use stains in light microscopy? What problem are we trying to overcome in using stains? What is a positive stain? Negative?
5. You need to understand what types of media are used and why we use one media source (eg agar versus broth, solid versus liquid). You also need to understand selective and differential media. Focus on the examples covered in class. Tables 3.3 and 3.4 are helpful! What is meant by a complex or enriched agar? What is meant by a synthetic agar? Non-synthetic or complex? Can media be both selective and differential? Why or Why not?
6. Why is agar used in culture media?
7. You must know the difference between simple and differential staining.
8. Be able to describe the Gram's staining and the acid fast staining procedures.
9. What groups of organisms are recognized by the above staining procedures?

Chapter 4. Prokaryotic Profiles

1. You should be able to compare and understand the basic differences between prokaryotic and eukaryotic cells (in combination with Chapter 5). This includes the internal and external structures of both types of microorganisms.
2. You should be familiar with typical size and shape of bacteria. Describe the basic cell arrangements among bacteria

3. What is the main function of prokaryote and eukaryote flagella and pili? Describe monotrichous? Lophotrichous? Amphitrichous? Peritrichous?
4. What is chemotaxis?
5. Describe Glycocalyx. What are the 2 varieties it comes in? What is the function of each? Give examples of microorganisms for each of the two varieties.
6. Know the differences between Gram positive and negative cells. Know the *functional* importance of these differences.
7. What do antibiotics such as penicillin attack in bacterial cells? Why is this selective for bacteria?
8. What is the peptidoglycan? What is it made of? Is there a difference between Gram positive and Gram negative peptidoglycan?
9. What are the structural units of the cell wall? Describe the “linkage” in the cell wall of Gram negative vs. Gram Positive. If you had an antibiotic that attacked the cell wall linkage (i.e. penicillin) which would it be more effective against Gram positive or Gram negative? Why?
10. What is the most external structure of Gram negative bacteria? What is the major component of this structure? What can cause in humans if released?
11. What is the periplasmic space? Is this a feature of Gram positive or Gram negative bacteria?
12. What is the difference between Gram positive, Gram negative and Acid Fast bacteria? What is the main component of this difference (between Gram bacteria and Acid Fast)? Give an example of Acid fast bacteria and a disease that it causes.
13. What is the evolutionary advantage of spore formation in bacteria?
14. Describe what is unique about the cell wall of the bacterial genus, *Mycoplasma*.
15. What enzyme damages and eventually destroys the peptidoglycan layer of bacterial cell walls. Where might we find this enzyme?
16. How is the flagellum in eukaryotes different from that found in prokaryotes (learned in Chap 5)?
17. Regarding the endosymbiotic theory, that says our mitochondria are actually ancient bacteria, what does this theory try to explain? What evidence supports this theory?

Chapter 5. Eukaryotic microorganisms

1. List the differences between prokaryotic and eukaryotic organisms in terms of genetic material, ribosomes, organelles, cilia and flagella.
2. What are the 5 main categories of eukaryotic pathogens discussed in class? How are they different from one another? Do they have any interesting ways to reproduce?
3. Are there specific examples of these eukaryotic diseases that are found in Arizona?
4. What are the main types of protozoal pathogens discussed in class? Why are they interesting? What separates them from the other pathogens?
5. **T or F** Fungi is an obligate parasite. Explain why or why not.
6. Give some examples of pathogenic and non pathogenic fungi.
7. Describe the morphology of fungus.
8. Understand the extent of Malaria as discussed in class.
9. Why is malaria infections so hard to treat?
10. What are the 3 main types of Helminthes? How do most of them cause disease?
11. How do arthropods cause disease?
12. List the differences between prokaryotic and eukaryotic organisms in terms of genetic material, ribosomes, organelles, cilia and flagella.

Chapter 7: Microbial growth

1. Understand the reason that we describe the growth of bacteria as “exponential growth”.
2. Know the phases of microbial growth. Know the terms that are used to define microbial growth.

3. What are the two ways in which we can “plate” bacteria in order to determine the population size of live organisms? How does a microbiologist define whether a microorganism is alive or not?
4. How do we calculate the population size of a bacterial culture by a colony forming unit (CFU) assay? In this context, understand the concept of a “dilution factor and serial dilution”. What is the dilution factor when we make a 1:9 dilution?
5. Be able to demonstrate how one would calculate the colony forming units per ml using the assay from 4 above.
6. What are the other ways by which we can determine directly or indirectly the population size of a microbial culture? In particular, understand what “absorbance” or “turbidity” measurements are. How is the “Petroff Hausser” chamber is used – this is the slide for light microscopy? Advantage and a disadvantage of these techniques?
7. Understand how physical factors (temperature, pH, osmotic pressure, etc) affect bacterial growth.
8. What about the ecological factors of microbial growth? What are the 3 main ways organisms can interact? Does this impact disease?
9. What do we mean by the terms psychrophiles, mesophiles, and thermophiles? What determines the temperature extremes beyond which cells can no longer function no matter how much time we allow those cells to adapt to the temperature extremes by evolution.
10. What is the difference between bacteria that are obligate aerobes, obligate anaerobes, and facultative anaerobes?
11. What effect do variations in the pH of the environment have on the ability of enzymes within a cell to function?
12. Know the main differences in the transport mechanisms. For example, which ones require energy? Is one ‘specific’ for the immune system?
13. What is a barophile? Where would they be found?
14. What is a halophile? Where would they be found?
15. Compare and contrast a Heterotroph and an Autotroph.
16. What is the difference between Active and Passive transport?
17. Name two type of passive transport and explain how they work.
18. Give an example of Active transport and why it requires ATP.