

(rev. 01/07)

Biology 2420 Introduction to Microbiology**Objectives for Unit 1**

This first unit covers chapters 1 - 6. See your course syllabus for details of lecture schedule and carefully note the day of your first exam. Note also that an outside assignment for this unit was assigned and it covers material that we will not discuss very much in class. This is not exclusive and is intended as a study guide to help you focus. Other materials covered in the lecture may not be on this sheet.

1. At the end of Chapter 1, the student will
 - a. Be able to define microorganism
 - b. List the 5 subgroups of microorganisms
 - c. Be able to state the contributions of the following persons to the development of microbiology
Van leeuwenhoek,
Jenner,
Lister,
Ehrlich,
Koch,
Iwanowski
Fleming,
Pasteur,
Redi,
Salk,
Avery, MCarthy, Macleod,
Watson and Crick,
Jacob and Monod
 - d. Understand the significance of refuting spontaneous generation to the development of the germ theory of disease
 - e. Be able to state Koch's postulates

At the completion of the "Taxonomy" section of this chapter, the students will

1. List the seven major divisions in scientific nomenclature: Kingdom, Phylum, Class, Order, Family, Genus, Species (major scheme of taxonomy)
2. Be able to name the 5 major kingdoms of living things and have a general knowledge of the content of each kingdom
3. Know who Carolous Linneaus was as well as be able to define binomial nomenclature, and taxonomy
4. Understand and be able to discuss the significance of Bergey's Manual as well as the three criteria for classification of bacteria using Bergey's manual
5. Be able, using the information provided by the instructor, list the major classifications of bacteria, giving an example of each.

2. At the completion of chapters 2 including the lecture and handouts, the student will
(REMEMBER THIS CHAPTER IS SELF STUDY – SEE NOTES AND BOOK)

- a. Be able to define the following:
 - Atom
 - element
 - electron
 - molecule
 - Solution
 - ionization
 - acid
 - base
 - anabolism
 - catabolism
 - ph scale
 - chemical bond
 - oxidation
 - reduction
- b. Be able to list and describe the functional groups found on organic molecules
- c. Be able to name the four main families of biochemical compounds, listing the major building blocks for each, giving a simple description of the structure of each, describing the synthesis reactions to form the macromolecules, and providing examples of each.

Describe the manner in which enzymes work, as well as explain the necessity of enzymes for cellular metabolism. (shape determines function)

Describe in detail how the properties of life reside in cells. Explain the “cell theory”. List and understand the processes that define “Life”.

3. At the end of chapter 3,
 - a. List and explain the 5 “I’s” of culturing microbes in the laboratory.
 - a. Be able to list the properties of light
 - b. Understand the principles of microscopy: how magnification, contrast, and resolution are achieved.
 - c. Describe the total magnification of each of the common objectives
 - d. Differentiate between bright field, dark field, and fluorescence microscopes
 - e. Describe how the transmission and scanning electron microscopes work
 - f. Using chapter 3, lecture notes, and lab manual, define the following and understand their relationship or importance to the study of microbiology
 - Pure culture
 - isolation
 - aseptic technique

inoculation
 smear
 stain
 Agar medium
 Specialty media types

- g. Describe and illustrate how microbial preparations are made to view microbes with a microscope
 - i. Wet mounts
 - ii. Simple stains
 - iii. Differential stains
 - iv. Negative stains
 - v. Specialty stains (endospore, capsule, etc.)

4. Upon completion of chapter 4, **The Prokaryotes**

- a. Be able to outline the differences between prokaryotes and eukaryotes
- b. Know the function (and in some cases, the structure) of the following prokaryotic cell structures
 Flagella,
 cell wall,
 endospore,
 pili (fimbriae),
 cytoplasmic membrane,
 bacterial chromosome,
 glycocalyx,
 cytoplasm,
 nucleoid,
 capsule
 ribosomes
- c. Be able to describe the difference between the Gram positive and Gram negative cell wall, as well as discuss why this is important to medical microbiology. Be able to explain in detail how a Gram stain is prepared and the function of each reagent used in the process.
- d. Describe and illustrate the different prokaryote cell shapes (cell morphology)

5. At the end of Chapter 5, Eukaryotes,

- a. Know the functions of the following Eukaryotic cell structures
 Organelles
 flagella and cilia
 endoplasmic reticulum
 golgi complex
 cytoplasmic membrane
 cell wall
 nucleus

ribosomes
mitochondria

- b. Be able to compare and contrast the structures and their functions of the prokaryote and eukaryote cells. (again, I know, it's important)
- c. List and/or illustrate the steps in the cell division cycle in eukaryotes (pg. 126)
- d. Survey of the Eukaryote microbes (Taxonomy)

Eukaryotic microorganisms, Helminths, and Arthropod vectors

1. Fungi - at the completion of this study, the student will
 - A. Be familiar with the morphology of the fungi:
 1. unicellular; yeasts
 2. multicellular; mycelium – hyphae
 3. dimorphic
 - B. Be familiar with the basic characteristics of fungi:
 1. nutrition
 2. distribution
 3. economic importance
 4. medical importance
 - C. Know the major phyla discussed in class, along with a brief description of each, as well as an example:
 1. Zygomycetes
 2. Ascomycetes
 3. Basidiomycetes
 4. Deuteromycetes
 - D. Be able to explain the methods of asexual and sexual reproduction in Fungi (see page 134 and 135) Life cycle of Rhizopus, and different kinds of asexual spores (Sporangiospores and Conidiospores)
2. Protozoa: At the completion of this study, the student will be able to define the following:
 - A. Trophozoite
 - B. Cyst
 - C. Schizogony
 - D. Know the four major classifications of Protozoans and give a brief descriptions of each with specific examples (Flagellates, Sarcodinans, Ciliates, Sporozoans)
 - E. Be able to describe the general morphology and simple life cycles of Protozoans (pg. 141)

3. Parasitic Helminths: at the completion of this study, the student will be able to

A. Describe the characteristics of the two classes of flatworms Cestodes and Trematodes

1. The student will be able to illustrate the life cycle of a tapeworm
2. Know and describe an example of a typical Tapeworm (*Taenia* spp.)
3. Know and describe an example of a typical Trematode (Fluke – *Schistosoma*)

B. Nematode: Describe the major characteristics of the roundworms, describing in general terms the life cycles (we will go into more detail when we get to the specific diseases)

1. describe the Pinworm and how it is acquired and spread
2. illustrate the Hookworm and how it is acquired (Larva in soil)

4. Arthropod vectors: at the completion of this section, the student will:

1. Recognize the most medically important arthropods: ticks, mites, mosquitoes, flies, lice, fleas, and bugs
2. Be able to describe just what a vector is

6. **(This may be moved to unit 2) Chapter 6 - Viruses:** At the completion of this chapter, the student will

A. Recognize the criteria for classifications of viruses (Morphology)

B. Be able to describe the general structure of the viruses:
Envelope, capsid, capsomere, and core or genome

C. Be able to define the following:

1. Lysis
2. Lysogeny
3. Bacteriophage
4. Tissue culture
5. Latency
6. Oncogenic
7. Viroid
8. Prion

D. Be able to list and describe the steps in the multiplication of animal viruses

E. Know the differences in DNA and RNA viruses

F. Know the characteristics of retroviruses and influenza viruses

G. Review: Tables on page 162 and 164 to know a general overview of medically important viruses

7. Chapter 11 – The control of Microbes – review your Outside Assignment #1, and know the material