Chapters 1 and 2 Notes:

Microbiology: the study of microscopic organisms.

Microbiology is an inclusive study of many different topics:

1. **Bacteriology:** the study of bacteria
2. **Mycology:** the study of fungi
3. **Parasitology:** the study of protozoa and parasitic worms
4. **Virology:** the study of viruses
5. **Immunology:** the study of immunity
6. **Phycology:** the study of algae
7. **Epidemiology:** the study of the causative agents of disease and their prevention.

Nomenclature of microorganisms comes from the binomial system developed by Carolus Linnaeus in which each organism has two names: genus and species. The genus name is always capitalized and species is not, both should be italicized or underlined. The grouping of organisms is based on similarities in rRNA sequence, unfortunately, as new testing techniques are developed organisms maybe moved from one genus to another or re-classified completely.

For example: *Moraxella catarrhalis* is now referred to as *Branhimella catarrhalis*

The designation of strain is sometimes added to indicate a subset within the same species, generally noted by a series of numbers, letters or additional name.

For example: *Escherichia coli 0157:H7*

Because bacteria divide through asexual reproduction they cannot be grouped based on the ability to interbreed. Prokaryotes (organisms that lack a nucleus) are simply grouped based on similar characteristics.

Prokaryotes:

1. Archaea: cells lacking peptidoglycan, live in extreme environments
   a. Methanogens: produce methane as a result of cellular respiration
   b. Halophiles: live in areas of extreme salinity
   c. Thermophiles: live in hot sulfurous water

2. Bacteria:
   a. Morphology (shape)
      -bacillus (rod)
      -coccus (sphere)
      -spiral

   b. External structures:
      -glycoalyx "sugar coat" composed of poly saccharides and polypeptides. It is very viscous and sticky.
      - Capsule: firmly attached
      - Slime layer: loosely attached

   - Flagella: long filamentous structures used for locomotion (motility)
     Possible arrangements:
     - Monotrichous – single
     - Amphitrichous – groups of flagellum at each end of the cell

- Lophotrichous – two or more at one end
- Peritichous – multiple flagella over the entire cell.

c. Motility: Taxis movement away or toward a stimulus.
- Chemotaxis – chemical stimuli
- Phototaxis – light stimuli

Classifying Characteristics:
1. Cell wall composition
2. Morphology
3. Differential staining
4. Oxygen requirements
5. Various biochemical testing results

**Scientists estimate only 1% of bacteria have been discovered.

Germ Theory of Disease - proposed by Girolamo Fracastoro in 1546, and expanded upon by Marcus von Plenciz in 1762, and developed further by Koch 1876
Microorganisms can invade other organisms and cause disease.

History of Microbiology
1. **Black Plague –** a microbial epidemic (mid 1300's)
2. **Hooke – "Father of Microscopy" (1665)**
   a. Observed cork, this observation lead to the coining of the term "cell", life's smallest structural unit
   b. Helped begin "Cell Theory"
3. **Aton Van Leeunwenhoek (1673) –**
   a. Improves microscope
   b. Sees first living organism
4. **Redi (late 1600's)–**
   a. Disproves spontaneous generation for macroscopic organisms but scientists still believe microbes can spontaneously appear
   b. Used jars and decaying meat to prove flies must have access to meat in order for maggots to appear.
5. **Linnaeus (late 1700's)** – formalized the modern system of naming organisms called binomial nomenclature
6. **Virchow (mid 1800's) –**
   a. Biogenesis – cells arise from preexisting cells
7. **Pasteur (1857)–**
   a. Disproves spontaneous generation for all organisms including microbes
   b. Swan neck flask experiment (be familiar with diagram)
   c. Studies lead to aseptic technique
   d. Discovered pasteurization and a link between microbes and animal disease (silkworm)
8. **Koch (late 1800's) –**
   Koch's Postulates
   a. Identify organism that causes disease
   b. Isolate organism (causative agent) and grow in pure culture
   c. A healthy organism is given the causative agent and they should get the disease
   d. Remove the agent from the infected host – should be the same organism as in #2
   ***one microorganism causes one disease**
9. **Ehrlich (1910) –** chemotherapy
10. **Jenner (late 1800's)–** smallpox vaccine from cowpox
11. **Lister (1867) –** Use of disinfectant to clean surgical wounds
12. **Flemming (1928) –** antibiotic penicillin

Chemistry Review:

1. **Be familiar with the elements and their symbols.**
2. **Be familiar with ionic and covalent bonding.**
3. **Be familiar with molecular weight, molar mass and solutions.**
4. **Be familiar with water and its properties.**
5. **Be familiar with the behavior and characteristics of acids, bases and salts.**

Biochemistry Review:
Organic Structures and functional groups

Name of group	Structure	Biological Importance
Alcohol		
Aldehyde		
Ketone		
Ester		
Ether		
Carboxyl (Acid)		
Amino		

Main Macromolecules:

1. **Carbohydrates**

2. **Lipids**

3. **Proteins**

4. **Nucleic Acids**

Name: _____ Block: __ Date: _____
Microbiology Chapters 1 and 2 Review

For the following description of the various microbiology fields indicate the name of the field on the line.

Parasitology	Mycology	Bioremediation
Epidemiology	Phycology	Immunology

1. Studies the biodegradation of toxic wastes. _____
2. Studies the causative agents of disease and their prevention. _____
3. Study of fungus. _____
4. Study of protozoa. _____
5. The study of immunity. _____
6. The study of algae. _____

Match the following scientists to their appropriate discovery.

___1. Robert Hooke	a. worked with chemotherapy
___2. Alexander Flemming	b. learned that cowpox could vaccinate against smallpox
___3. Edward Jenner	c. discovered "animacules"
___4. Fransesco Redi	d. developed a system of nomenclature for bacteria
___5. Paul Ehrlich	e. found that a weakened virus may be injected to work as a means of vaccination
___6. Robert Koch	f. demonstrated the error of spontaneous generation by proving maggots did not arise directly from meat
___7. Carolus Linnaeus	g. discovered penicillium
___8. Louis Pasteur	h. discovered cells by observing cork under a lens
___9. Joseph Lister	i. designed aspectic techniques for surgery
___10. Van Leeuwenhoek	j. confirmed that bacteria cause diseases

Match the following microorganisms to their descriptions.

___1. Archara	
___2. Algae	
___3. Bacteria	
___4. Fungi	
___5. Helminths	
___6. Protozoa	
___7. Viruses	