

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: *M. 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
 - Peritrichous – 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

Microorganisms can invade other organisms and cause disease.

History of Microbiology

1. **Black Plague** – a microbial epidemic
2. **Hooke** – "Father of Microscopy"
 - 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 Leeuwenhoek** –
 - a. Improves microscope
 - b. Sees first living organism
4. **Redi** –
 - 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. **Virchow** –
 - a. Biogenesis – cells arise from preexisting cells
6. **Pasteur** –
 - 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)
7. **Koch** –
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
8. **Ehrlich** – chemotherapy
9. **Jenner** – smallpox vaccine from cowpox
10. **Lister** – Use of disinfectant to clean surgical wounds

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.

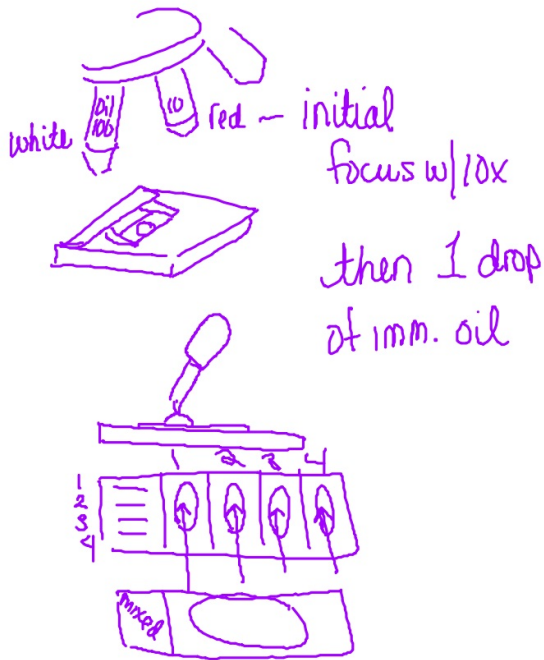
Biochemistry Review:

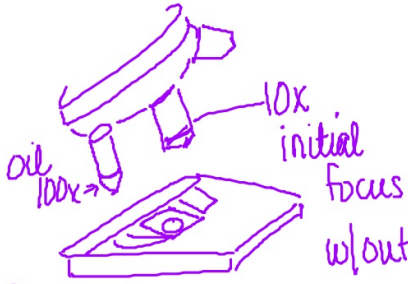
Organic Structures and functional groups

Name of group	Structure	Biological Importance
Alcohol	$R-OH$	Lipids + carbs
Aldehyde	$R-C=O$	reducing sugars
Ketone	$R-C(=O)-R'$	metabolic intermediate
Ester	$R-C(=O)-R'$	euk + bacterial plasma membrane
Ether	R_2O	archaea-plasma membrane
Carboxyl (Acid)	$R-C(=O)OH$	organic acids, lipids, proteins
Amino	$R-NH_2$	proteins + nucleic acids

Main Macromolecules:

1. Carbohydrates *Sugars + starches*
 - ① energy
 - ② Storage
 - ③ structure
 - ④ recognition
 - ⑤ genetic material
2. Lipids
 - ① structure
 - ② protection
 - ③ energy storage
 - ④ chemical messengers.
3. Proteins
 - ① energy
 - ② transport
 - ③ chemical messengers
 - ④ enzymes
 - ⑤ regulation
 - ⑥ genetic material
4. Nucleic Acids
 - ① genetic material
 - ② energy





① drop of oil
ONCE 100x
is in place
Use fine focus

(use both coarse
& fine adj)

