**Notes on Section 2-2: Bacteria**

**The Bacterial Cell**

* Bacteria are nearly everywhere on Earth and in all living things
* Anton van Leeuwenhoek first discovered bacteria when looking at scrapings from his teeth under a microscope
* Bacteria are classified as organisms called prokaryotes
* **Prokaryotes** are organisms that do not have their genetic material located in a nucleus (the opposite of this are called eukaryotes)
* Each bacterial cells uses energy, grows and develops, responds to its surroundings, and reproduces
	+ Cell Shapes
		- The three basic shapes of bacteria are: spherical, rodlike and spiral

*\*\*Draw these in your notes*

* + - The shape helps identify the type of bacteria
	+ Cell Structures
		- Bacterial cells have a cell wall, cell membrane, cytoplasm and ribosomes (organelles that make proteins)
		- There is NO nucleus (the genetic material is located in the cytoplasm and looks like thick, tangled string)
		- The genetic material (DNA) controls everything the cell does
		- Bacterial cells have a **flagellum** (plural = flagella), which is a long, whip-like structure that helps the cell to move by spinning in place like a propeller

**Two Kingdoms of Bacteria**

* Archaebacteria
	+ Ancient types of bacteria (existed billions of years *before* the dinosaurs)
	+ Live in extreme environments like hot springs, places that are as acidic as lemon juice, salty waters, animal intestines, bottom of swamps and sewage
* Eubacteria
	+ Do not live in extreme environments
	+ Live everywhere else (like in and on your body)
	+ Most are harmless
	+ Some help maintain Earth’s physical conditions (like producing oxygen for the atmosphere)

**Reproduction in Bacteria**

* When all of their needs are met, bacteria can reproduce once every 20 minutes
* Growing conditions are rarely ideal for bacteria (which is a good thing!)
	+ Asexual reproduction

* + - Some bacteria reproduce by **binary fission**, which is a process in which one cell divides to form two identical cells
		- Type of **asexual reproduction**, which is a way that an organism reproduces that only involves one parent
		- Offspring (new bacteria) are *identical* to the parent
		- Offspring have the *same* genetic material (DNA) as the parent
	+ Sexual reproduction
		- A way that an organism reproduces that involves two parents who combine their genetic material to produce a new organism
		- Offspring is different from both parents
		- **Conjugation**
			* When one bacterium transfers some of its genetic material into another bacterial cell

* + - * Uses a thin, threadlike bridge that joins the two cells
			* An example of sexual reproduction in bacteria
			* Results in offspring (new bacteria) with a new combination of genetic material (DNA) that are *genetically different* from their parents

**Survival Needs**

* All bacteria have basic needs of survival: food, way to break down food to release energy and survival techniques when living conditions become difficult
* Obtaining Food
	+ Autotrophic bacteria make their own food either by
		- Capturing and using the sun’s energy as plants do

OR BY

* + - Using the energy from chemical substances in their environment
	+ Heterotrophic bacteria consume autotrophs or other heterotrophs
		- Eat a variety of foods, like milk, meat and decaying leaves on the ground
* Respiration
	+ **Respiration** is the process of breaking down food to release its energy
	+ *\*\*This is another meaning of the word “respiration” that we learned earlier in the year (exchanging gasses).*
	+ Most bacteria need oxygen to break down food
	+ Some bacteria do NOT need oxygen to break down food (oxygen is poisonous to them)
* Endospore Formation
	+ An **Endospore** is a small, rounded, thick-walled resting cell that forms inside a bacterial cell
	+ Contains the cell’s genetic material (DNA) and some of its cytoplasm
	+ Endospore can resist freezing, heating and drying and can survive for many years
	+ Forms to allow bacteria to survive harsh living conditions
	+ Are lightweight so a breeze can carry them to new places
	+ If conditions are better there, it will open up and bacterial cell can grown and multiply

**Bacteria and the Living World**

* Some bacteria can cause illness, but most bacteria are harmless or helpful to people
* Bacteria are helpful by involved in making fuel and food, environmental recycling and cleanup and the production of medicines
* Fuel
	+ Methane gas is produced from archaebacteria that died millions of years ago
	+ The bacteria lived in oxygen-free environments (like mud from swamps)
	+ This gas makes up about 20% of the Earth’s natural gas (which is used to heat homes)
* Food
	+ Bacteria are used to make cheese, yogurt, apple cider, pickles, and more
* Environmental Recycling
	+ Heterotrophic eubacteria are examples of **decomposers**, organisms that break down large chemicals in dead organisms into small chemicals
	+ “Nature’s recyclers” – returning basic chemicals to the environment for other organisms to use (ex. When bacteria break down leaves that fall to the ground)
	+ Some bacteria help plants like peanuts, peas and soybeans to convert the nitrogen in the air into a form that they can use
* Environmental Cleanup
	+ Some bacteria eat oil as their food source, and this can be used to help clean up oil spills
* Health and Medicine
	+ Some bacteria in our digestive system helps us to digest our food
	+ Other helpful bacteria in our intestines prevent harmful bacteria from growing there
	+ Scientists used bacteria to help make medicines (insulin) for people who have diabetes
	+ Started in the 1970’s