

Lecture #1 August 26th: A quick review

1. The cell
 - a. Enclosed units that respond to and modify the environment
 - b. They have the capacity to reproduce
 - c. Fundamental form of life
2. Purpose of understanding cells
 - a. Mystery of life's origin
 - b. Stunning diversity
 - c. Help us understand our own origin and development – sex cells
 - d. Homeostasis – Maintaining internal balance
3. Cells vary in appearance and function (ex. Nerve cell, paramecium, stem cells)
4. However, cells have many shared characteristics
 - a. Genetic information
 - b. Metabolism
 - c. Molecular chemistry
 - i. Same elements and same type of molecules
 - ii. Ex. Amino acids, carbohydrates, fatty acids
 - d. Biochemistry
 - i. Same type of catalytic reactions
 - ii. Ex. Condensation and Hydrolysis
 - e. Biomechanics
 - i. Same type of structural support units, motors, etc.
 - ii. Ex. Cytoskeleton, membrane, organelles
 - f. Molecular Biology and Genomics
 - i. Same storage, flow, and instructive use of information
 - ii. Ex. DNA, RNA
 - g. Because of all these shared characteristics we can conclude that all cells came from one origin and from there divided.
5. Cells are not just a mere collection of components
 - a. Organized systems (they have organelles and processes)
 - b. Carry out organized tasks (Metabolism)
 - c. Use environmental cues (Using sensors on the membrane)
 - d. Use information encoded in DNA (interpret information in DNA and RNA)
6. Qualities that allow life
 - a. Isolation from environment – Cell membrane
 - b. Interaction with environment – Protein sensors on membrane
 - c. Internal organization – Organelles
 - d. Food processing – Metabolism
 - e. Energy – From formation of ATP
 - f. Storage information – DNA
 - g. Read and interpret information – RNA and Proteins
7. Cell classifications – Prokaryotes and Eukaryotes

Differences	Prokaryotes	Eukaryotes
Membrane bound organelles	No (free floating)	Yes
Circular DNA	Yes	No (Chromatid)
Cell Cycle	Different in each	Mitosis
Chromatid	No	Yes
DNA Location	Cytoplasm	Nucleus
Size	Very small	Much larger than Prokaryotes

8. Prokaryote general organization

- a. Membrane
- b. Cell wall
- c. Flagella
- d. Nucleoid
- e. Everything located in the cytosol

9. Two Domains of Prokaryotes

- a. Bacteria - mostly mesophiles with some thermophiles
- b. Archae - Many thermophiles and extremophiles. Eukaryotes diverged from archae

10. Eukaryotes general organization

- a. Animal - Membrane bound organelles in cytosol, nucleus at center, flagellum, no cell wall, and mitochondria
- b. Plant - Same characteristics of animals cells, but also include a cell wall and chloroplasts

11. Organelles

- a. Nucleus - Contains DNA, double membranes
- b. Mitochondria - Inside is matrix, double membrane
- c. Chloroplasts - Contains chlorophyll, double membrane
- d. Endoplasmic Reticulum - If it has ribosomes then it is the rough ER and is where proteins are being synthesized for export
- e. Lysosomes and Peroxisomes - transport of molecules
- f. Plasma membrane - separates cell from the environment