**Topic Review Guide**: Cells and Compartmentalization

**To Think About**: How do surface-area-to-volume ratios affect the ability of biological systems to obtain necessary resources or eliminate waste products? How is growth and dynamic homeostasis maintained by the constant movement of molecules across membranes? In what ways do eukaryotic cells’ internal membranes and organelles contribute to cell functions? How do cells communicate, transmit and receive chemical signals, and how does signal transmission within and between cells mediate gene expression and cell function?

**Watch:**

**First:** Mr. Andersen’s [“Compartmentalization” video](http://quietube6.com/v.php/http:/www.youtube.com/watch?v=2rihCCBzqMc&list=PLFCE4D99C4124A27A&index=21)

**Next:** Mr. Andersen’s [“Cell Organelles” video](http://viewpure.com/aczbMlSMr8U)

**Read:** Chapter 4, Hillis, Principles of Life (2012).

**Supplementary Resources**: Click the links below for more information to help you learn more about this lesson.

* Harvard : [The Inner Life of the Cell](http://www.youtube.com/watch?v=wJyUtbn0O5Y)
* Crash Course Biology: [Eukaryopolis—The City of Animal Cells](http://viewpure.com/cj8dDTHGJBY&list=EC3EED4C1D684D3ADF)
* Crash Course Biology: [Plant Cells](http://viewpure.com/9UvlqAVCoqY&list=EC3EED4C1D684D3ADF)
* Cells Alive!: [Interactive Cell Models](http://www.cellsalive.com/cells/3dcell.htm)
* Florida State-Molecular Expressions: [Animal Cells](http://micro.magnet.fsu.edu/cells/animalcell.html)
* Florida State-Molecular Expressions: [Bacterial Cells](http://micro.magnet.fsu.edu/cells/bacteriacell.html)
* Florida State-Molecular Expressions: [Plant Cells](http://micro.magnet.fsu.edu/cells/plantcell.html)
* The Biology Place BioCoach: [Cell Structure and Function](http://www.phschool.com/science/biology_place/biocoach/cells/intro.html)

**Listen and Look**: Here is a list of key terms and concepts you will hear about and see during these podcasts and chapter readings. Get to know them! Be able to connect them to one another using a concept map. **Don’t just simply define the terms—you must understand the relationships among and between them!**

**KEY TERMS**

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| --- | --- | --- | --- |
| Bacteria | Archaea | Eukarya | Central dogma (of life) |
| Endosymbiosis | Compartmentalization | Endomembrane system | Prokaryote |
| Eukaryote | Cell membrane | Nucleus | Nucleolus |
| Ribosomes | Mitochondria | Chloroplast | Rough endoplasmic reticulum (ER) |
| Lysosome | Peroxisome | Golgi body (apparatus) | Smooth endoplasmic reticulum (ER) |
| Vesicle | Vacuole | Cytosol (cytoplasm) | Centriole (centrosome) |
| Cytoskeleton | Microtubules | Microfilaments |  |

**Recall and Review:** Use the lecture in the videos and your textbook reading to help you answer these questions in your BILL.

1. The genetic code is universal and suggests common ancestry. **Describe** available evidence that supports this statement.
2. Metabolic pathways such as the processes involved in cellular respiration (glycolysis, Krebs Cycle) are shared by all organisms. **Describe** other cellular processes that are also shared by all life.
3. **Explain** what is meant by **compartmentalization**.  **Describe** how this aids the cell in being efficient at performing life’s functions.
4. **Explain** the reason why a large surface area to volume ratio is favorable for a cell’s survival.
5. **Describe** the evolutionary advantages eukaryotes have over prokaryotes.
6. **Compare and contrast** the cell walls of bacteria to the cell walls of plant cells. How are they similar? How do they differ?
7. The endomembrane system in eukaryote cells is a complex network of internal membranes with multiple jobs in the cell. **Describe** each of the organelles that comprise this system and **explain** the role each organelle plays in the functioning of the eukaryotic cell.
8. **Explain** the difference between microfilaments and microtubules.  **Create** an illustration that shows the structural and functional differences between them.
9. The function of each cell organelle is vital to the survival of the cell.  **Describe** what would happen to the cell if the following organelles were faulty or absent:
10. Mitochondria
11. Lysosome
12. Ribosome
13. Cytoskeleton
14. Golgi Apparatus/Golgi Body
15. **Create** a chart with a list of the cell’s organelles and some non-biological object that either their structure OR their function can be compared to.
16. **Describe** how the following extracellular structures of the eukaryotic cell allow it to communicate and interact with its external environment:
    1. Plant cell wall
    2. Extracellular matrix
17. **Illustrate** how each of the following cell junctions work to facilitate intercellular communication:
    1. Tight junctions
    2. Gap junctions
    3. Desmosomes

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| Learn More: For more information about cell structure and function, use the links below:   * [CellCraft](http://www.carolina.com/teacher-resources/Interactive/online-game-cell-structure-cellcraft-biology/tr11062.tr): a game that lets you build a cell from scratch and then attempt to keep it alive * [Unlocking the Secrets of our Cells](http://www.nobelprize.org/mediaplayer/index.php?id=1781): a documentary from the Nobel Prize Foundation about discoveries relating to the structure and function of our cells * [The Cell and Its Organelles](http://www.nobelprize.org/educational/medicine/cell/game/): a game from the Nobel Prize Foundation that tests your knowledge of cell organelles * [1974 Nobel Prize in Physiology and Medicine](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1974/): awarded for “discoveries concerning the structural and functional organization of the cell.” |