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| Unit Title: **Life on the Cellular Level (Six Week Unit)** | |
| **Big Idea/Conceptual Lens**  **Interrelationships** | **Focus of Study**   1. The formation of life from a single cell through adaptations 2. The difference between prokaryotes and eukaryotic organisms and their importance to more complex organisms. 3. The importance of maintaining Homeostasis for living organisms and how simple and complex organisms are successful in doing this. 4. The importance of stem cells and how they differentiate 5. Structure and Function of macromolecules in daily life 6. Discussion of the importance of how certain biological molecules are important to survival.   -such as DNA, proteins (Enzymes) and so forth  7. Analyze the relationship between biochemical processes (photosynthesis and cellular respiration) and how what is produced is used in the cell. |
| **Standards & Clarifying Objectives**   * 1. **Understand the relationship between the structures and functions of cells and their organelles.**   1.1.1 Summarize the structure and function of organelles in eukaryotic cells (including the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell.  1.1.2 Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity.  1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multi-cellular organisms.   * 1. **Analyze the cell as a living system.**   1.2.1 Explain how homeostasis is maintained in the cell and within an organism in various environments (including temperature and pH)  1.2.3 Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms).  3**.1 Explain how traits are determined by the structure and function of DNA**  3.1.1 Explain the double-stranded, complementary nature of DNA as related to its function in the cell.  **4.1 Understand how biological molecules are essential to the survival of living organisms**  4.1.1 Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms.  4.1.3 Explain how enzymes act as catalysts for biological reactions.  **4.2 Analyze the relationships between biochemical processes and energy use in the cell.**  4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.  4.2.2 Explain ways that organisms use released energy for maintaining homeostasis (active transport). | **Enduring Understandings**   1. All living organisms require the four organic molecules to maintain their existence. 2. All cells come from a common origin. 3. All living organisms have DNA. 4. Stem cells are the basic unit before they differentiate into specialized cells. 5. Specialized cells have specific functions. 6. Life at the cellular level is broken into prokaryotic and eukaryotic organisms. 7. All life must maintain Homoeostasis in all environments. 8. Enzymes act as the catalysts for reactions that happen in biological molecules. |
| **Essential Concepts and Critical Content**   1. *Understand the difference between prokaryotic and eukaryotic cells.* 2. *Understand the function of the following organelles, and be able to elaborate on how the structure of the organelle helps it to perform that function.*    1. *Cell Wall*    2. *Plasma Membrane*    3. *Nucleus*    4. *Chloroplasts*    5. *Mitochondria*    6. *Ribosomes*    7. *Vacuoles* 3. *How do the organelles listed above interact with one another to help the cell perform properly? How these organelles interact to carry out functions such as energy production and use, transport of molecules, disposal of waste, and synthesis of new molecules.* 4. *Why are stem cells so important?* *Where can you find stem cells?* 5. *What are specialized cells?* *How do the instructions that are found in DNA help the cell to become specialized?* 6. *Elaborate on the Functions for the following specialized cells:*    1. *Red blood cells*    2. *White blood cells*    3. *Nerve cells*    4. *Sperm cells*    5. *Muscle cells*    6. *Xylem*    7. *Phloem* 7. *How is homeostasis maintained in a cell and within an organism in various environments? (such as amount of water, pH, glucose levels and temperature.)* 8. *Why do cells use buffers?* 9. *How is active and passive transport different and where would you find these two types of transport being used?* 10. *How are Diffusion and Osmosis different and when would a cell using them?* 11. *Describe the structure of the plasma membrane and explain the importance of each part in the transport of materials from one side to the other side?* 12. *How would a plant cell respond in the following solutions; isotonic solution, hypertonic solution, and hypotonic solution?* 13. *How would an animal cell respond in the following solutions; isotonic solution, hypertonic solution, and hypotonic solution?* 14. How do the following structures assist unicellular organisms in their survival for life; contractile vacuoles, cilia, flagella, pseudopods, and eyespot 15. What is the difference between chemotaxis and phototaxis? 16. *Compare the structure and function of the following organic molecules and know the function of the specific types in parenthesis.*     1. *Carbohydrates (glucose, cellulose, starch, glycogen)*     2. *Proteins (insulin, enzymes, hemoglobin)*     3. *Lipids (phospholipids, steroids)*     4. *Nucleic Acids (DNA, RNA)* 17. *What does a catalyst do for a cell?* 18. *What determines the function of a protein?* 19. *Define activation energy.* 20. *How do the pH and the temperature affect enzyme function?* 21. *What is the purpose for the process of photosynthesis? Where does it take place?* 22. *How do the following factors affect the rate of photosynthesis? A temperature b. light, c. amount of water* 23. *What is the purpose for the process of cellular respiration? Where does it take place?* 24. *What is the importance of ATP in a living cell?* 25. *How do the following factors affect the rate of cellular respiration? a.pH b. water c. light d. Temperature* 26. *How do the two process listed above (photosynthesis and cellular respiration) work together?* 27. *What are the two processes that fall under anaerobic respiration? Explain each of those processes. How does anaerobic and aerobic compare in the production of ATP?* 28. *Why is energy production by organisms vital for maintaining homeostasis and how is it necessary for life on earth?* 29. What is DNA and explain the structure, base pairing and what holds it all together? 30. What are the advantages and disadvantages for the overproduction of proteins at incorrect times of the cell cycle? 31. What are the disadvantages for the underproduction of proteins at the incorrect times of the cell cycles? | **Processes, Strategies and Skills**  **Skills**   1. Active Listening 2. Note Taking Strategies 3. Group Discussion 4. Organize, Represent and Interpret Data 5. Comparison, Contrast 6. Laboratory Safety 7. Scientific Method 8. Writing Laboratory Report s   [**Strategies**](file:///C:\Users\Michelle.Chadwick\AppData\Local\Microsoft\Windows\Temporary%20Internet%20Files\Content.Outlook\7I463YXZ\Processes_and_Skills_Chart_2-20-14.docx)   1. Think Pair Share 2. Kindling 3. Think of a time –Perspectives 4. Give one Get one 5. Mapping 6. Experiments |
| **Essential Questions**   1. How are the types of cells that are present today directly related to how life actually originated? 2. How are the instructions that can be found in DNA help the cell to become specialized? 3. What is the importance of stem cells to the differentiation of life? 4. How do different organisms maintain homeostasis in different environments? 5. How do plant and animal cells respond when they are placed in different solute concentrations and what adaptations have they acquired to overcome these obstacles? 6. What major role do the organic molecules have in the survival of living organisms? 7. How do the organic molecules interact with one another to perform the vital functions of the cell? 8. How do Enzymes affect the rate of biological reactions? | **Resources/Materials**   1. Cell Analogy \*\* 2. Safety First \*\* \*\****in POGIL Biology*** 3. Scientific Inquiry \*\* 4. Experimental Variables \*\* 5. Analyzing and Interpreting Scientific Data \*\* 6. Properties of Water (Honors)\*\* 7. Biological Molecules (Honors)\*\* 8. Prokaryotic and Eukaryotic Cells \*\* 9. Membrane Structure and Function \*\* 10. Transport in Cells \*\* 11. Photosynthesis: What’s in a Leaf? \*\* 12. Cellular Respiration \*\* 13. Enzyme Lab \*\* 14. Osmosis and Diffusion 1 (Honors) \*\* 15. How do Biological Materials Respond to Acids and Bases? (Honors Lab) 16. How do Hypertonic, Hypotonic, and Isotonic Solutions Affect the Movement of water in different cell types? (Honors lab Full) Demo for Standard 17. [How Enzymes Work](http://highered.mheducation.com/sites/0072495855/student_view0/chapter2/animation__how_enzymes_work.html) 18. [How Enzymes Work (a)](http://embed.edim.co/embed/popup?embed=%3Ciframe%20class%3D%22embedly-embed%22%20src%3D%22%2F%2Fcdn.embedly.com%2Fwidgets%2Fmedia.html%3Fsrc%3Dhttp%253A%252F%252Fwww.youtube.com%252Fembed%252FXTUm-75-PL4%253Ffeature%253Doembed%26url%3Dhttp%253A%252F%252Fwww.youtube.com%252Fwatch%253Fv%253DXTUm-75-PL4%26image%3Dhttp%253A%252F%252Fi.ytimg.com%252Fvi%252FXTUm-75-PL4%252Fhqdefault.jpg%26key%3D242ffba84156461c9117ad8ddc27c039%26type%3Dtext%252Fhtml%26schema%3Dyoutube%22%20width%3D%22470%22%20height%3D%22264.1686182669789%22%20scrolling%3D%22no%22%20frameborder%3D%220%22%20allowfullscreen%3E%3C%2Fiframe%3E) 19. [Bozeman on Enzymes](http://embed.edim.co/embed/popup?embed=%3Ciframe%20class%3D%22embedly-embed%22%20src%3D%22%2F%2Fcdn.embedly.com%2Fwidgets%2Fmedia.html%3Fsrc%3Dhttp%253A%252F%252Fwww.youtube.com%252Fembed%252Fok9esggzN18%253Ffeature%253Doembed%26url%3Dhttp%253A%252F%252Fwww.youtube.com%252Fwatch%253Fv%253Dok9esggzN18%26image%3Dhttp%253A%252F%252Fi.ytimg.com%252Fvi%252Fok9esggzN18%252Fhqdefault.jpg%26key%3D242ffba84156461c9117ad8ddc27c039%26type%3Dtext%252Fhtml%26schema%3Dyoutube%22%20width%3D%22470%22%20height%3D%22352.5%22%20scrolling%3D%22no%22%20frameborder%3D%220%22%20allowfullscreen%3E%3C%2Fiframe%3E) 20. [STEM Cell Resource](http://learn.genetics.utah.edu/) 21. [Cellular Respiration video](http://www.sumanasinc.com/webcontent/animations/content/cellularrespiration.html) 22. [Evolution of Cell Organelles](http://www.sumanasinc.com/webcontent/animations/content/organelles.html) video 23. [Photosynthesis](http://www.sumanasinc.com/webcontent/animations/content/harvestinglight.html) video (Honors) 24. [STEM Cell video](http://www.sumanasinc.com/webcontent/animations/content/stemcells.html) 25. [Molecules move Across a membrane video](http://www.sumanasinc.com/webcontent/animations/content/diffusion.html) 26. [Cellular Respiration Song](https://www.youtube.com/watch?v=3aZrkdzrd04) (Honors) 27. [Cell Video](https://www.youtube.com/watch?v=URUJD5NEXC8) (7 minutes very good) 28. [Voyage into the cell](https://www.youtube.com/watch?v=Ao9cVhwPg84) (honors) 29. [Inner life of a cell](https://www.youtube.com/watch?v=FzcTgrxMzZk) (Honors/AP) 30. [STEM Cell Video](https://www.youtube.com/watch?v=8JTw2RpDo9o) 31. [STEM Cell Beyond the headlines -TEDxTalk](https://www.youtube.com/watch?v=tD0HSFe3mrY) 32. [(Some) EXTINCTION IS (not necessarily) FOREVER: Carl Zimmer at TEDxDeExtinction](https://www.youtube.com/watch?v=Y3otq08dOyw) (Honors) 33. [The use of cloning and stem cells to resurrect life: Robert Lanza at TEDxDeExtinction](https://www.youtube.com/watch?v=gqpErbFnbiY) 34. [My Science Box](http://www.mysciencebox.org/lifetest) (Standard/Honors) Hands on Activities for all topics 35. [Connecting Cellular Respiration and Photosynthesis](https://www.ck12.org/life-science/Connecting-Cellular-Respiration-and-Photosynthesis-in-Life-Science/lesson/Connecting-Cellular-Respiration-and-Photosynthesis/?referrer=concept_details) |
| **Formative, Interim and Summative Assessments**  **Formative Assessments**  [Chicago Cyanide Murders: A Case Study in Cellular Respiration](http://www.biologycorner.com/worksheets/case_study_cellular_respiration.html)  [Scientific Method In Action: The Strange Case of BeriBeri](http://www.biologycorner.com/worksheets/scientific_method_action.html)  Laboratory Work  Think, Pair, Share  Exit and Entrance Tickets  Journals(Daily Reflections)  **Interim Assessments**  Benchmark Testing  **Summative Assessments**  Tests/Quizzes given at specific intervals throughout Unit  Laboratory Reports | |