# Unit 4: Cell Structures, Funtion, and Energetics

**Chapters: 8, 9, & 10**

**NGSS Standards:**

- **HS-LS1-1:** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins that carry out the essential functions of life through systems of specialized cells.
- **HS-LS1-2:** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- **HS-LS1-3:** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- **HS-LS1-5:** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- **HS-LS1-6:** Explain how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form the macromolecules of life.
- **HS-LS1-7:** Use a model to demonstrate cellular respiration as a process that breaks bonds in food and oxygen molecules and the bonds in new compounds are formed by a transfer of energy.
- **HS-LS2-3:** Use data to explain the cycling of matter and flow of energy in aerobic and anaerobic conditions.
- **HS-LS2-4:** Use data to explain the cycling of matter and flow of energy among organisms in an ecosystem.
- **HS-LS2-5:** Make a model of the cycling of carbon through the biosphere, atmosphere, hydrosphere, and geosphere.
- **HS-LS4-6:** Create or revise a simulation to test a solution to reduce negative human impacts on biodiversity
- **HS-ETS1-1:** Analyze a major global challenge and identify qualitative and quantitative needs and limitations for solutions that also accommodate the needs and wants of society.
- **HS-ETS1-3:** Evaluate the effectiveness and application of solutions, and correct solutions to reduce human impact
- **HS-ESS3-4:** Evaluate a technological solution that reduces impacts of human activities on natural systems.

**Lesson Objectives:**

1. Explain the main points of the cell theory
2. Compare and contrast prokaryotic and eukaryotic cells
3. Explain the functions of the following organelles; nucleus, vacuoles, lysosomes, cytoskeleton, chloroplast, mitochondria, and cell membrane
4. Identify the organelles that contribute to protein production and transport
5. Explain the process of passive transport (including diffusion, facilitated diffusion, and osmosis)
6. Explain the process of active transport (including molecular transport, endocytosis and exocytosis)
7. Compare and contrast how unicellular organisms and multicellular organisms maintain homeostasis
8. Describe why ATP is useful for cells
9. Describe the process and formula of photosynthesis, including the transfer of energy that occurs
10. Describe the role of pigments in photosynthesis
11. Explain the function of electron carrier molecules
12. Describe the light-dependent reactions
13. Describe the light-independent reactions
14. Describe the factors that affect photosynthesis
15. Describe why organisms need food
16. Describe the process and formula of cellular respiration, including the transfer of energy that occurs
17. Describe the relationship between photosynthesis and cellular respiration
18. Describe what happens during glycolysis and the Krebs cycle
19. Explain how the electron transport chain uses high energy electrons from glycolysis and the Krebs cycle
20. Describe how much ATP cellular respiration generates
21. Describe how organisms make energy when no oxygen is available
22. Describe how the body produces ATP during the different stages of exercise

**Unit Vocabulary:**

- 3-carbon compound/G3P
- aerobic
- anaerobic
- aquaporin
- ATP
- cell
- cell membrane
- cell wall
- cellular respiration
- chloroplast
- cytoplasm
- cytoskeleton
- diffusion
- endoplasmic reticulum
- eukaryote
- facilitated diffusion
- fermentation
- Golgi apparatus
- glycolysis
- homeostasis
- hypertonic
- hypotonic
- isotonic
- Krebs cycle
- light-dependent reactions
- light-independent reactions
- lipid bilayer/phospholipid bilayer
- lysosome
- mitochondrion/mitochondria
- mitochondrial matrix
- nucleus
- organ
- organ system
- organelle
- osmosis
- photosynthesis
- prokaryote
- ribosome
- selectively permeable
- thylakoid
- tissue
- vacuole