Unit 1: Cellular Foundation

Content Area: **Template**
Course(s):
Time Period:
Length:
Status: **Published**

State Mandated Topics Addressed in this Unit

State Mandated Topics Addressed in this Unit	
N/A	N/A

Unit 1: Cellular Foundation

Essential Skills

- Compare and contrast prokaryotic cells and eukaryotic cells
- Define acid and base.
- Define catabolism and anabolism
- Define element atom, atomic number, and atomic mass.
- Define exergonic reaction and endergonic reaction
- Define glycolysis and name its inputs and outputs
- Define octet rule, ionic bond, covalent bond, and hydrogen bond.
- Define Photosynthesis, autotrophs, and heterotrophs
- Describe how fats and proteins participate in ATP Production
- Describe the extracellular matrix and intercellular junctions
- Describe the levels of organization among living things.
- Describe the location of the citric acid cycles and name is inputs and outputs
- Describe the location of the oxidative phosphorylation and name is inputs and outputs
- Describe the process of light dependent reactions
- Describe the process of light independent reactions
- Describe the process of scientific method.
- Describe the properties of water that re critical to maintaining life.
- Describe the structure and function of the major organelles
- Describe the structure of eukaryotic plant and animal cells.
- Describe the two types of fermentation
- Describe ways in which carbon is critical to life.

- Explain how enzymes speed up chemical reactions
- Explain the difference between potential energy and kinetic energy
- Explain why metabolically active cells are so small.
- Identify and describe the properties of life.
- Name six most common chemical elements found in living systems.
- Name the structure in the cell that carries out photosynthesis
- State the first and second law of thermodynamics
- State the range of the pH scale, and explain the pH in terms of hydrogen ion concentration.
- State the structure and function of the plasma membrane
- Summarize the cell theory.

Objectives

- Analyze and explain how cells carry out a variety of chemical transformations that allow conversion of energy from one form to another, the breakdown of molecules into smaller units, and the building of larger molecules from smaller ones
- Analyze and explain how cells carry out a variety of chemical transformations that allow conversion of energy from one form to another, the breakdown of molecules into smaller units, and the building of larger molecules from smaller ones.
- Create a model of the four major categories of organic molecules using unique characteristics and primary functions
- Demonstrate that the activities of enzymes are affected by the temperature, ionic conditions, and the pH of the surroundings
- Describe how plants capture energy by absorbing light and use it to form strong chemical bonds between the atoms of carbon-containing molecules
- Describe the relationships within multi-cellular organisms, where cells perform, which work together to maintain optimum conditions for the benefit of the whole organism
- Design independent investigations to determine the effects of changing environmental factors on photosynthesis
- Determine why each major category of organic molecule is essential to life
- Examine how the breakdown of some food molecules enables the cell to store energy in specific molecules that are used to carry out the many functions of the cell
- Explain how molecules are used to assemble larger molecules with biological activity
- Explain how the fundamental life processes of organisms depend on a variety of chemical reactions that occur in specialized areas of the organism's cells
- Identify enzymes as proteins, and determine how they catalyze biochemical reactions
- Identify the six elements most common to biological organisms
- Introduce and explain all the areas of the lab needed for working safely
- Learn how to use a compound microscope in class by doing an introductory lab with illustrations
- Model how cells are enclosed within semi-permeable membranes that regulate their interaction with their surroundings, including the transport of materials into and out of the cell.
- Model how processes are regulated both internally and externally by environments in which cells exist
- Recognize that food molecules are taken into cells and react to provide the chemical constituents

needed to synthesize other molecules, and knowing that the breakdown and synthesis are made possible by enzymes

- Recognize that food molecules are taken into cells and react to provide the chemical constituents needed to synthesize other molecules, and knowing that the breakdown and synthesis are made possible by enzymes
- Recognize that most chemical transformations are made possible by protein catalysts called enzymes
- Recognize that the chemical bonds of food molecules contain energy, which is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed
- Recognize that the process of photosynthesis as provides a vital connection between the sun and the energy needs of living systems
- Show and label the name and function of all the lab equipment to be used in a lab
- Trace the process in which nutrients are transported to cells to serve as building blocks for the synthesis of structures and as reactants for cellular respiration
- Use the scientific method and apply to an experiment that student creates

Standards

9-12.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
9-12.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
9-12.HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
9-12.HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
9-12.HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
9-12.HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
9-12.HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
9-12.HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.
9-12.HS-LS1-3.3.1	Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
9-12.HS-LS1-3.7.1	Feedback (negative or positive) can stabilize or destabilize a system.
9-12.HS-LS1-3.LS1.A.1	Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Instructional Tasks/Activities

- Activity demonstrating ability to differentiate between atomic number, mass number, numbers of protons, neutrons and electrons.
- Breathing in straw activity
- Calculations of calories
- Cell Membrane Lab: Students use crafts to design a 3-D model of a cell membrane
- Comparing Plant and Animal Cells Lab: Students view various cells under a microscope in order to identify organelles, size, and function.
- Construction of 3-D Models
- CR “Racetrack Activity”
- CR Game Design · Show white light using prisms
- Data Collection
- Diffusion and Osmosis Lab: Students set up and witness the diffusion of various substance through a semi permeable membrane
- Distinguish between various bonds and how they function and be able to draw the bonds
- Draw atomic model of various atoms
- Energized e- simulation (roller coaster)
- Experimentation of active and passive transport through a semi permeable membrane
- Magna cell Lab: Students use magnetized pieces to construct a cell
- Model building
- Muscle Fatigue
- Muscle Fatigue Lab: Relationship between respiration and ATP production; charting and interpreting results.
- Notes on all skill labs
- Online Photosynthesis Simulation: Students change light wavelengths and intensity to see the effect on the rate of photosynthesis
- Organic Model Lab: Students construct organic compound model using kits
- pH Lab: Comparing unknowns to standard pH values
- pH scenario
- Photosynthesis flip book
- Photosynthesis lab
- Power point notes
- Project: Cell Newspaper
- Scavenger hunt questions in groups
- Teach aspects of Endomembrane System
- Teach Thermodynamics and Enzyme Structure and function
- Toothpickase Lab: Students use the hands (enzyme) to break toothpicks (substrate) to examine how an enzyme operates under various conditions.
- Use microscopes in a lab
- Use of Scientific Method to create experiments
- Vocabulary

- Water Olympics Lab: Students will create various hypotheses regarding different properties of water such as cohesion (ex. how many drops on a penny), adhesion, capillary action, hydrophobic properties, etc.
- Yeast Lab applying characteristics of life to their results. Using the question “Is yeast alive?” they will observe, hypothesize, experiment and analyze results to determine an answer from their results.

Assessment Procedure

- Chapter Test
- Chapter Test
- Classroom Total Participation Technique
- Classwork
- DBQ
- Essay
- Exit Ticket/Entrance Ticket/Do Now
- Homework questions
- Homework questions
- Introductory Unit Test
- Journal / Student Reflection
- Kahoot
- Laboratory Quizzes
- Laboratory Quizzes
- Other named in lesson
- Peer Review
- Performance
- Problem Correction
- Project
- Quiz
- Quiz on cellular respiration
- Quiz on classification of organisms
- Quiz on Fermentation
- Quiz on Microscope parts
- Quiz on organelles
- Quiz on Photosynthesis
- Quiz on vocabulary
- Quiz-macromolecules
- Rubric
- Skill Labs: 1. Lab Safety 2. Applying Scientific Method to own experiments 3. Using a Compound Light Microscope
- Teacher Collected Data
- Test

- Worksheet

Recommended Technology Activities

- Appropriate Content Specific Online Resource
- Chromebook
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here
- Gimkit
- GoGuardian
- Google Classroom
- Google Docs
- Google Forms
- Google Slides
- Kahoot
- MagicSchool AI
- Other- Specified in Lesson
- Quiziz
- Screencastify

Accommodations & Modifications & Differentiation

Accommodations and Modifications should be used to meet individual needs. Their IEP and 504 plans should be used in addition to the following suggestions.

Gifted and Talented

- Compare & Contrast
- Conferencing
- Debates
- Jigsaw
- Peer Partner Learning
- Problem Solving
- Structured Controversy
- Think, Pair, Share
- Tutorial Groups

Instruction/Materials

- alter format of materials (type/highlight, etc.)
- color code materials
- eliminate answers
- extended time
- extended time
- large print
- modified quiz
- modified test
- Modify Assignments as Needed
- Modify/Repeat/Model directions
- necessary assignments only
- Other (specify in plans)
- other- named in lesson
- provide assistance and cues for transitions
- provide daily assignment list
- read class materials orally
- reduce work load
- shorten assignments
- study guide/outline
- utilize multi-sensory modes to reinforce instruction

Environment

- alter physical room environment
- assign peer tutors/work buddies/note takers
- assign preferential seating
- individualized instruction/small group
- modify student schedule (Describe)
- other- please specify in plans
- provide desktop list/formula

Honors Modifications

Resources

- Resource 1
- Resource 2
- Resource 3
- Resource 4
- Resource 5