Unit 5: Metabolic Processing Systems

Content Area: **Science**
Course(s):
Time Period: **Marking Period 1**
Length: **3-4 weeks**
Status: **Published**

Summary

In the final unit, an investigation into metabolism, which includes all the processes by which the body synthesizes new materials for growth & repair in addition to producing energy, is conducted. Metabolic processes are supported by numerous other systems that provide the raw materials and remove waste continuously. Raw materials consist of oxygen, water, and nutrients. The respiratory system is responsible for bringing in oxygen while water and nutrients are made available to cells via the digestive system. Both the digestive system and the urinary system work together to rid the body of unnecessary waste products that cannot be used by the body as an energy source.

Revised: July 2024

Essential Questions/Enduring Understandings

Essential Questions

- How do the six processes of digestion prepare food for our cells?
- Why are the organs of the digestive system specialized and in what way?
- How does the digestive system work in conjunction with the respiratory and urinary systems to rid the body of metabolic waste?
- What structural features are present in the urinary system, particularly in the kidneys?

Enduring Understandings

- Waste removal from the body is important and requires three different body systems to work together to aid in the creation and removal of waste.
- There are different structural features and components of each system and they each play a role in the overall functioning and success of metabolic processes.

Objectives

- Students will be skilled at identifying and differentiating between the types of metabolism.
- Students will be skilled at relating the intake of oxygen to the production of energy.

- Students will know the role of each organ in the digestive system and how they aid in the maintenance

of homeostasis.
- Students will know how long digestion takes place depending on what type of food is ingested.
- Students will know how our cells receive the necessary energy to grow and develop.
- Students will know how waste is created and removed from the body.
- Students will know how blood is cleaned through the subunits of our kidneys.
- Students will know how the urinary system helps balance pH and maintain the body's fluid composition

Learning Plan

- Preview the essential questions and connect them to the learning throughout the unit.
- Discussion on the sequencing and events of breathing.
- Introduction to key concepts via direct instruction with Google slides and infographics.
- Distinguish the difference between respiration and cellular respiration.
- Depict and describe how the respiratory system is a pathway that carries materials to the lungs.
- Describe how the lungs bring oxygen to cells and remove carbon dioxide.
- Discuss how the cardiovascular system helps with the transportation of materials needed from these systems around the body.
- Discussion and definition of the six processes of digestion.
- Explain how the urinary system filters the blood and functions to remove waste materials.
- Describe how the urinary system maintains an acid-base balance in the body.

Assessment

Formative

- Do Now questions
- Small group discussion participation
- Large group discussion participation
- Individual student questions and responses
- Independent tasks
- Labeling key structural features of the lungs, kidneys, and digestive system
- Define key processes and vocabulary (filtration, absorption, secretion, etc.)
- Creation of a flow chart denoting the six processes of digestion

Summative

- Research and present on the effects of smoking
- Quizzes
    - Analyze and label kidney structures
    - Identify the function of accessory organs in the digestive system
    - Structural features of lungs
- Unit test

Benchmark

- Final exam

Alternative

- Open note exam
- Group project identifying the different types of metabolism and how metabolic waste is removed

Materials

- Hole's Essentials of Human Anatomy and Physiology, High School 2nd Edition by Charles J. Welsh
- Google slides
- Lab materials & models
    - Skeleton model
    - Skull model
    - Brain model
    - Model of the upper body
    - Model of the digestive system
    - Anatomical poster of body systems
- core book list

Standards

9.2.12.CAP	Career Awareness and Planning
L.SS.11–12.1	Demonstrate command of the system and structure of the English language when writing or speaking.
9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
9.4.12.CT	Critical Thinking and Problem-solving
9.2.12.CAP.5	Assess and modify a personal plan to support current interests and post-secondary plans.
LS1.A	Structure and Function
	Systems of specialized cells within organisms help them perform the essential functions of life.
	All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.
	Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and

	connections of components to reveal its function and/or solve a problem.
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
LS1.A	Structure and Function
	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.
	Feedback (negative or positive) can stabilize or destabilize a system.
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.
LS1.C	Organization for Matter and Energy Flow in Organisms
	The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.
	As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.
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.
	As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.
	As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.

Integrated Accommodations and Modifications

https://docs.google.com/spreadsheets/d/11cEQxerWEHQEjIbnMkdf8AsemQLmsrMS6VdGmBFYliU/edit?usp=sharing