Unit 4 Science 21 Metacognition Chart: Ecosystems

Unit 4 Mission to Mars Source Guide

Unit 4 Vocabulary

Lesson: SEP (Science and Engineering Practices) CCC (Cross Cutting Concepts)	Link to Activity Pages and samples Websites/Videos	Brief Overview of Important Concepts/Vocabulary
Lesson 1: Habitat on Mars SEP: • Ask Questions and define problems on the current conditions on Mars • Obtaining, Evaluating, and Communicating Information on the conditions on Mars and Earth CCC: • Patterns : similarities and differences between the living conditions on the two planets	Lesson 1 Observations Questions about Living on Mars Lesson 1 Comparing Earth and Mars Student Page AK- Lesson 1 Comparing Earth and Mars Student Page Mars Ecosystem Big Ideas Understand Ecosystems Google Doc Videos: Mars Rover Video and 360 Explore - rotate the image by dragging your mouse while the video is playing.	Vocab: Habitat Important Concepts: The habitat on Earth is very different from the habitat on Mars. Mars has a water supply that is frozen, a very cold average temperature of -81 degrees F, has different gasses that make up its atmosphere (carbon dioxide for plants but no oxygen for humans), no decomposers that are known, no plants/animals, and harmful rays that cannot be filtered through the thin atmosphere. Problems with Mars for humans: no oxygen, no accessible water supply, cold temperatures, no system to grow plants, thin atmosphere, and no decomposers to help cycle matter.

	Curious Life of a Mars Rover - 25 mins	
Lesson 2: Decomposition Investigation **SEP:** • Developing and Using Models to show how your investigation of decomposers is set up and the results. • Planning and Carrying Out Investigations to determine the best conditions for decomposition • Obtaining, Evaluating, and Communicating Information on what conditions led to better or worse decomposing conditions CCC: • Systems and System Models for the components of decomposition in open and closed systems • Energy and Matter is transported in, out and within ecosystems during decomposition	Decomposition Investigation Page 1 5S1 Decomposition Results 5S1 Decomposition Conclusions 5S2 Decomposition Results 5S2 Decomposition Conclusions Orange Team 2025 Decomposition Containers 2025 Decomposition Results **Videos:** Rotting Food Videos	**Vocab: Ecosystem, Decomposer** **Important Concepts:** Decomposers in an ecosystem take in energy from dead organisms. They break down dead organisms and enriches the soil (bringing nutrients back) to help producers grow. Decomposers break down dead organisms so they are not polluting the soil and making it difficult for plants to grow. We observed that containers that were kept closed with soil and or water decomposed more and quicker than open containers, as well as containers with uncut fruits and vegetables.

Lesson 3: Why Do We Need Food? **SEP:** • Developing and Using Models to understand how energy is transferred to us by what we eat. • Obtaining, Evaluating, and Communicating Information about how energy is passed through organisms. CCC: • Energy and Matter- How energy is passed between organisms	Caption Activity Student Page AK Caption Activity Energy Transfer Slideshow	**Vocab: Energy, Producer, Consumer** **Important Concepts:** ALL energy of an ecosystem begins with energy from the sun. Energy starts from the sun then travels to a producer (plant), and then sometimes a consumer depending on the food type. Each time energy is transferred to the next organism there is less energy than when it began with the sun.
Lesson 4: Designing a Food System to Grow Without Soil **SEP:** • Obtaining, Evaluating, and Communicating Information to understand what plants need to grow and thrive. • Constructing Explanations and Designing	Problem/Solution Chart (Grow Food on Mars) Problem/Solution Chart Sample Grow Plants on Mars Samples **Videos:** Do Plants Need Dirt? Photosynthesis Study Jam	**Important Concepts:** Plants need water, nutrients, gasses such as CO_2, sunlight and a proper air temperature to grow and thrive. We need to use what we know about Mars and Earth to engineer a system for growing plants on Mars. Hydroponics is a system for growing plants without soil. This can be part of our solution.

Solutions for growing plants without soil CCC: • Systems and System Models - understand the components and interactions of our system for growing plants without soil.	Hydroponics	
Lesson 5: Components of Ecosystem Card Sort SEP: • Developing and Using Models to show understanding of the components of an ecosystem. • Engaging in Argument from Evidence to explain the role each component has in the ecosystem. • Obtaining, Evaluating, and Communicating Information on the role of each component of an ecosystem. CCC: • Energy and Matter- How	Lesson 5 Student Pages and Materials Videos: The Central Grasslands How to Save Our Grasslands (Just watch through 2:20) Temperate Grasslands	Vocab: Energy, Producers, Consumers, Decomposers Important Concepts: Ecosystems have living (biotic) and nonliving (abiotic) components. Nonliving components include the sun, water, temperature and soil. The energy for all living organisms originates with the sun. The other non living components are necessary for organisms to live and thrive. Living components include: Producers- They make their own food through photosynthesis and provide food/energy for consumers (herbivores and omnivores). Consumers- They gain energy

energy and matter are passed between organisms		from eating producers and other consumers. They are energy sources for other consumers (omnivores and carnivores). Their eating habits also control the population of the organisms they eat. Decomposers- They break down dead plants (producers) and animals (consumers) into nutrients (matter) that are needed for future plants.
Lesson 6: Interdependent Relationships in Ecosystems SEP: • Developing and Using Models to show energy and matter transfer in ecosystems • Engaging in Argument from Evidence to show the order that energy and matter are transferred though food chains/food webs • Obtaining, Evaluating, and Communicating Information on interdependent relationships in ecosystems	Lesson 6 Food Chain Food Chain Teacher Samples Food Web Samples **Videos:** Life on the African Savannah (just watch thru 1:24) Crash Course-Food Chains Crash Course- Food Webs Study Jams- Food Webs	**Vocab: Food chain, food web, climate** **Important Concepts:** Food Chains show the order that energy travels from one organism to another. All food chains start with energy from the sun. A producer (plant) uses the sun's energy, along with water and carbon dioxide to make its own food needed for growth (photosynthesis). Next, the primary consumer (animal) gains energy when it eats the producer. After that, a secondary consumer gains energy when it eats the primary consumer. This continues until decomposers break down dead animals into nutrients that enrich the soil for future producers. Arrows show the

CCC: • Systems and System Models - understand the components of food chains/food webs and how they interact with each other.		direction that energy moves. Food Webs show the feeding/ energy transfer relationship between several food chains. Consumers vary their diets based on what is available in their habitat, so food webs show the options that consumers have for eating/gaining energy. Arrows show the direction that energy moves.
Lesson 7: Uh-Oh! SEP: • Use Models to understand Stability and Change in food webs/ecosystems • Ask Questions and define problems related to changing one thing in an ecosystem CCC: • Cause and Effect of invasive species on an ecosystem • Stability and Change in an ecosystem • Patterns in ecosystems	Lesson 7- Stability and Change video notes page Lesson 7- Just One Change This or That? Revision Slideshow Videos: Cheatgrass in Sagebrush Country	**Vocab: Stability, Change** **Important Concepts:** A healthy ecosystem has a large variety of organisms (think- food webs). Introducing a new organism can alter the balance of the ecosystem. Ex 1 : Add more primary consumers (herbivores and omnivores) and the producer (plant) population will decrease. Ex 2: Eliminate a secondary consumer (carnivores and omnivores) and the primary consumer population will increase.

Lesson 8: Where is the Matter? **SEP:** • **Developing and Using Models to explain how matter cycles between air, soil and living organisms** • **Analyzing and Interpreting Data to explain what happens to matter when it decomposes.** **CCC:** • **Energy and Matter- Matter is transported into, out of, and within systems.** • **Systems and System Models - A system can be described in terms of its components and their interactions.**	Lesson 8 Student Pages Mushroom Time Lapse Video Video- What is Matter?	**Vocab: Matter Cycle, Decomposition** **Important Concepts:** Organisms are related in food webs in which animals/consumers eat plants and other animals/consumers. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. During this, matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. The original source of matter in all food webs are the producers. In a closed system, matter may change form (liquid, solid, gas) but remains inside the closed system. In an open system, matter can leave the container due to evaporation of liquids into gas form.
Lesson 9: Let's Plan our Mars Habitat		

Test Review Materials:Unit 4 Paper Review Packet and Answer Key
Ecosystem Review Slideshow and Answer key