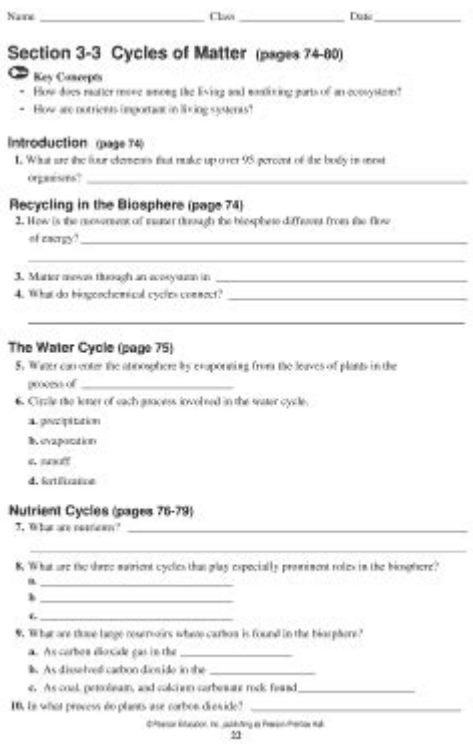
Section 3 3 Cycles Of Matter Answer Key



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Section 3-3 Cycles of Matter (pages 74-80)

Key Concepts

- How does matter move among the living and nonliving parts of an ecosystem?
- How are nutrients important in living systems?

Introduction (page 74)

1. What are the four elements that make up over 95 percent of the body in most organisms? _____

Recycling in the Biosphere (page 74)

2. How is the movement of matter through the biosphere different from the flow of energy? _____

3. Matter moves through an ecosystem in _____

4. What do biogeochemical cycles connect? _____

The Water Cycle (page 75)

5. Water can enter the atmosphere by evaporating from the leaves of plants in the process of _____

6. Circle the letter of each process involved in the water cycle.

a. precipitation
b. evaporation
c. runoff
d. fertilization

Nutrient Cycles (pages 76-79)

7. What are nutrients? _____

8. What are the three nutrient cycles that play especially prominent roles in the biosphere?

a. _____
b. _____
c. _____

9. What are three large reservoirs where carbon is found in the biosphere?

a. As carbon dioxide gas in the _____
b. As dissolved carbon dioxide in the _____
c. As coal, petroleum, and calcium carbonate rock found _____

10. In what process do plants use carbon dioxide? _____

Section 3: Cycles of Matter Answer Key

Understanding the cycles of matter is crucial for grasping how ecosystems function and how energy flows through the environment. This section delves into the various cycles that sustain life on Earth, including the water cycle, carbon cycle, nitrogen cycle, and phosphorus cycle. Each of these cycles contributes to the overall balance and health of ecosystems and highlights the interconnectedness of living organisms and their environment.

Overview of Matter Cycles

Matter cycles refer to the natural processes that recycle essential elements and compounds through the environment, making them available to living organisms. Unlike energy, which flows through ecosystems and is eventually lost as heat, matter is recycled continuously. The primary cycles of matter include:

1. Water Cycle
2. Carbon Cycle
3. Nitrogen Cycle
4. Phosphorus Cycle

Understanding these cycles is fundamental for studies in ecology, conservation, and environmental science. Each cycle involves various processes that allow matter to move from one form to another and from one reservoir to another.

The Water Cycle

The water cycle, also known as the hydrological cycle, is the continuous movement of water within the Earth and atmosphere. It plays a vital role in regulating climate and supporting life.

Processes Involved in the Water Cycle

1. Evaporation: The process where liquid water turns into vapor due to heat from the sun.
2. Transpiration: The release of water vapor from plants into the atmosphere.
3. Condensation: Water vapor cools and changes back into liquid droplets, forming clouds.
4. Precipitation: Water falls back to Earth in the form of rain, snow, sleet, or hail.
5. Infiltration: Water soaks into the ground, replenishing groundwater supplies.
6. Runoff: Water that flows over the land and returns to oceans, rivers, and lakes.

The Importance of the Water Cycle

- Supports Life: All living organisms need water to survive; it is essential for metabolic processes.
- Climate Regulation: The water cycle helps regulate temperature and weather patterns.

- Ecosystem Health: It supports various habitats and maintains the health of aquatic environments.

The Carbon Cycle

The carbon cycle is the process through which carbon atoms are recycled in the environment. Carbon is a fundamental building block of life, found in organic molecules, fossil fuels, and the atmosphere.

Key Components of the Carbon Cycle

1. Photosynthesis: Plants absorb carbon dioxide from the atmosphere and convert it into glucose using sunlight.
2. Respiration: Organisms break down glucose and release carbon dioxide back into the atmosphere.
3. Decomposition: Dead organisms are broken down by decomposers, returning carbon to the soil and atmosphere.
4. Combustion: Burning fossil fuels releases stored carbon into the atmosphere as carbon dioxide.
5. Ocean Absorption: Oceans absorb carbon dioxide, which can lead to ocean acidification.

The Importance of the Carbon Cycle

- Energy Flow: The cycle is integral to the flow of energy through ecosystems, primarily through photosynthesis and respiration.
- Climate Change: An imbalance in the carbon cycle, primarily due to human activities, contributes to global warming and climate change.
- Biodiversity: The carbon cycle influences habitat availability and biodiversity.

The Nitrogen Cycle

The nitrogen cycle describes the process by which nitrogen is converted between its various chemical forms. It is essential for the production of amino acids, proteins, and nucleic acids.

Stages of the Nitrogen Cycle

1. Nitrogen Fixation: Conversion of atmospheric nitrogen (N2) into ammonia (NH3) by bacteria or through lightning.
2. Nitrification: The process where ammonia is converted into nitrites (NO2-) and then nitrates (NO3-) by bacteria.
3. Assimilation: Plants absorb nitrates and incorporate nitrogen into organic molecules.
4. Ammonification: Decomposition of organic matter leads to the release of ammonia back into the soil.
5. Denitrification: Conversion of nitrates back into nitrogen gas, returning it to the atmosphere.

The Importance of the Nitrogen Cycle

- Soil Fertility: Nitrogen is a key nutrient for plant growth; thus, the nitrogen cycle is vital for agriculture.
- Ecosystem Dynamics: The cycle affects biodiversity and the health of ecosystems.
- Air Quality: Imbalances in nitrogen levels can lead to air pollution and climate issues.

The Phosphorus Cycle

The phosphorus cycle involves the movement of phosphorus through the lithosphere, hydrosphere, and biosphere. Unlike other cycles, phosphorus does not have a gaseous phase and is primarily found in rocks and sediments.

Key Processes of the Phosphorus Cycle

1. Weathering: Phosphate rocks are broken down, releasing phosphorus into the soil and water.
2. Absorption: Plants absorb phosphate through their roots, incorporating it into organic compounds.
3. Consumption: Herbivores and carnivores obtain phosphorus by eating plants and other animals.
4. Decomposition: Decomposers break down organic matter, returning phosphorus to the soil.
5. Sedimentation: Phosphorus can settle in bodies of water, eventually forming sedimentary rocks.

The Importance of the Phosphorus Cycle

- Essential Nutrient: Phosphorus is crucial for DNA, RNA, and ATP, the energy currency of cells.
- Limiting Factor: In many ecosystems, phosphorus is a limiting nutrient that affects plant growth.
- Environmental Concerns: Excess phosphorus from fertilizers can lead to eutrophication, causing harmful algal blooms in aquatic systems.

Human Impact on Matter Cycles

Human activities have significantly altered the natural cycles of matter. Understanding these impacts is essential for developing strategies to mitigate environmental issues.

Examples of Human Impact

- Water Cycle: Urbanization and deforestation disrupt natural water flow and reduce groundwater recharge.
- Carbon Cycle: Fossil fuel combustion and deforestation increase atmospheric carbon dioxide levels, influencing climate change.
- Nitrogen Cycle: The excessive use of nitrogen-based fertilizers leads to runoff, causing water

pollution and algal blooms.

- Phosphorus Cycle: Similar to nitrogen, phosphorus runoff from agriculture contributes to eutrophication in water bodies.

Conclusion

The cycles of matter are integral to sustaining life on Earth. They demonstrate the interconnectedness of biological, geological, and atmospheric processes. By understanding these cycles, we can appreciate the importance of maintaining balance within ecosystems and the implications of human activities on natural processes. Conservation efforts and sustainable practices are essential for protecting these vital cycles and ensuring a healthy planet for future generations.

Frequently Asked Questions

What are the primary cycles of matter discussed in Section 3.3?

The primary cycles of matter discussed are the water cycle, carbon cycle, nitrogen cycle, and phosphorus cycle.

How does the water cycle contribute to the ecosystem?

The water cycle contributes to the ecosystem by regulating climate, supporting plant growth, and providing habitats for aquatic life.

What role do plants play in the carbon cycle?

Plants play a crucial role in the carbon cycle by absorbing carbon dioxide during photosynthesis and releasing oxygen.

What is nitrogen fixation and why is it important?

Nitrogen fixation is the process of converting atmospheric nitrogen into a usable form for plants, which is essential for protein synthesis and overall plant growth.

How does human activity affect the phosphorus cycle?

Human activities, such as agriculture and mining, can disrupt the phosphorus cycle by increasing runoff into waterways, leading to eutrophication and harmful algal blooms.

What are some examples of how the cycles of matter are interconnected?

The cycles of matter are interconnected; for example, plants absorb water (water cycle) and carbon dioxide (carbon cycle) to create energy, which in turn affects nutrient cycling in the soil.

What strategies can be used to mitigate the impact of human activity on these cycles?

Strategies include sustainable farming practices, reducing fossil fuel emissions, conserving water, and restoring natural habitats to maintain balance in the cycles of matter.

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