

Cycling of Matter in Ecosystems Lesson Summary, Test, and Project

Energy Flow in Ecosystems Summary

Biogeochemical Cycles

- Matter cycles through ecosystems in biogeochemical cycles
- Water Cycle:
 - Water evaporates from oceans, lakes, plants
 - Forms clouds
 - Condenses and falls as rain/snow
 - Flows over land back to oceans
 - Taken up and released by organisms
- Carbon Cycle:
 - CO₂ enters air through respiration, burning fuels
 - Plants use CO₂ in photosynthesis
 - Animals eat plants, releasing CO₂
 - Decomposers release CO₂ from dead matter
 - Carbon stored in air, water, rocks, organisms
- Nitrogen Cycle:
 - Nitrogen fixed from air by soil bacteria
 - Used by plants, passes through food chain
 - Denitrifying bacteria release nitrogen gas back to air
 - Cycle between atmosphere, soil, organisms
- Phosphorus Cycle:
 - Weathering releases phosphates from rocks into soil
 - Absorbed by plants, passed to animals that eat plants
 - Decomposers release phosphorus back into soil
 - Phosphorus moves through rocks, soil, water, organisms
- Cycles recycle vital nutrients like carbon, nitrogen, phosphorus
- Maintain adequate supplies of nutrients needed for life
- Disruption to cycles can reduce ecosystem productivity
- Human activities impact cycles by:
 - Burning fossil fuels
 - Deforestation
 - Fertilizer use
 - Waste production
- Understanding biogeochemical cycles provides insight into the functioning of ecosystems.

Cycling of Matter in Ecosystems Test

Multiple Choice

1. What cycles matter through the biotic and abiotic components of the environment?
 - a) Biogeochemical cycles
 - b) Hydrologic cycles
 - c) Nutrient cycles
 - d) Carbon cycles
2. During the water cycle, where does water vapor in the atmosphere eventually end up?
 - a) In the ocean
 - b) On land as precipitation
 - c) In plants
 - d) In the lithosphere
3. What is the main process that adds carbon to the atmosphere?
 - a) Cellular respiration
 - b) Photosynthesis
 - c) Burning of fossil fuels
 - d) Formation of oil deposits
4. How do plants increase carbon dioxide levels in the atmosphere?
 - a) Through cellular respiration
 - b) By removing vegetation
 - c) By transpiration
 - d) Through photosynthesis
5. Which gas makes up most of Earth's atmosphere?
 - a) Oxygen
 - b) Carbon dioxide
 - c) Nitrogen
 - d) Argon
6. Where do soil bacteria get most of the nitrogen they use in nitrogen fixation?
 - a) The atmosphere
 - b) Plants
 - c) Water
 - d) Rocks
7. What is released into the atmosphere by denitrifying bacteria?
 - a) Nitrogen gas
 - b) Phosphates
 - c) Ammonia
 - d) Carbon dioxide
8. What nutrient is released into soil when rocks break down by weathering?
 - a) Oxygen
 - b) Phosphorus
 - c) Hydrogen
 - d) Potassium

9. How do animals obtain phosphorus in the phosphorus cycle?
 - a) From the atmosphere
 - b) By nitrogen fixation
 - c) By eating plants
 - d) From soil bacteria
10. Which cycle is responsible for recycling carbon in the environment?
 - a) Nitrogen cycle
 - b) Water cycle
 - c) Carbon cycle
 - d) Phosphorus cycle

Matching - Match the cycle with its description.

11. ___ Nitrogen cycle
 12. ___ Carbon cycle
 13. ___ Phosphorus cycle
 14. ___ Hydrologic cycle
 15. ___ Photosynthesis
- a) Recycles phosphates in soil, rocks, water
 - b) Converts CO₂ into oxygen
 - c) Cycles nitrogen between atmosphere, soil, organisms
 - d) Cycles carbon through air, water, organisms, rocks
 - e) Cycles water from atmosphere to earth and back

Fill in the Blank

16. Matter is continuously _____ through biogeochemical cycles.
17. _____ and respiration are key processes in the carbon cycle.
18. Plants get _____ from the atmosphere and soil bacteria.
19. Runoff from _____ impacts phosphorus levels in waterways.
20. The _____, carbon, nitrogen and phosphorus cycles recycle vital nutrients.

Short Answer (5 questions)

21. How does the hydrologic cycle move water through the environment?
22. Where is carbon stored on Earth? Give at least 2 examples.
23. What roles do bacteria play in the nitrogen cycle?
24. How do nutrients like phosphorus get released from rocks into the environment?
25. Why are biogeochemical cycles important for sustaining life on Earth?

Long Answer

26. Explain the key processes and transformations that occur during the carbon cycle.
27. Compare and contrast the nitrogen and phosphorus cycles.
28. Describe how water moves through the different spheres of Earth in the hydrologic cycle and the processes involved.

Cycling of Matter in Ecosystems Test - Answer Key

Multiple Choice:

1. A
2. B
3. C
4. B
5. C
6. A
7. A
8. B
9. C
10. C

Matching:

11. C
12. D
13. A
14. E
15. B

Fill in the Blank:

16. cycled
17. Photosynthesis
18. nitrogen
19. fertilizer
20. Water

Short Answer:

21. Water evaporates, condenses into clouds, and falls as precipitation back to Earth where it flows over land and sea. It is taken up and released by organisms.
22. Carbon is stored in the atmosphere, organisms, oceans, rocks/fossil fuels, and soil.
23. Fix nitrogen from air, decompose matter releasing nitrogen.
24. Weathering and breakdown of rocks releases phosphates into soil.
25. They recycle nutrients through ecosystems needed for life processes.

Long Answer:

26. CO₂ enters air through respiration, burning fuels, volcanoes. Plants use CO₂ in photosynthesis making carbohydrates and O₂. Animals eat plants, releasing CO₂. Decomposers release CO₂ from dead matter.
27. Nitrogen cycle moves nitrogen through air, soil and living things. Phosphorus moves through rocks, soil, water and living things.
28. Water evaporates from oceans, transpires from plants, condenses into clouds and falls as rain/snow on land/sea. It flows over and under Earth's surface and is used by organisms before being released back to the environment.

Cycling of Matter in Ecosystem - Infographic Project

Objective: To depict the key processes and transformations in a biogeochemical cycle through an informative and visually appealing infographic poster. You can use whatever tools you like however, Canva is an excellent infographic maker.

Choose one of the following biogeochemical cycles to focus on:

- Water cycle
- Carbon cycle
- Nitrogen cycle
- Phosphorus cycle

Create an infographic poster that:

- Provides a title and brief overview of the cycle
- Uses diagrams, drawings, and minimal text to illustrate the:
 - Key processes
 - Movement through biotic and abiotic components
 - Transformations between states (gas, liquid, solid)
- Uses shapes, symbols, and color to make the infographic visually engaging
- Includes creative elements like logos and taglines
- Is neat, organized, and easy to understand
- Fits onto one large poster board or sheet of paper

When complete, present the infographic to the class in a brief "gallery walk" where students rotate around viewing and providing feedback on each other's posters.

This project allows creative freedom for students to demonstrate their learning visually and teach others about a biogeochemical cycle through their infographic designs. The presentation component also builds communication skills.