

Name \_\_\_\_\_

Date \_\_\_\_\_

## WEBQUEST: BIOGEOCHEMICAL CYCLES

For each cycle, visit the website provided. Read the paragraphs at each website and answer the questions. Label the diagrams on the worksheet.

### WHAT IS A CYCLE?

Go To → <https://www.youtube.com/watch?v=eW8Pps1WeOc>

1. What is a **cycle**?

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2. Can elements be made or destroyed?      **Yes**    **No**    [Circle your answer]

3. What is a **reservoir**?

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4. What is a **biogeochemical cycle**?

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### THE WATER CYCLE

Go To → <https://water.usgs.gov/edu/watercyclesummary.html> [COPY link then PASTE if it does not load automatically]

1. What percent of the Earth's water is stored in the oceans of the world? \_\_\_\_\_

2. Explain the difference between **evaporation** and **sublimation**. [Define/describe each.]

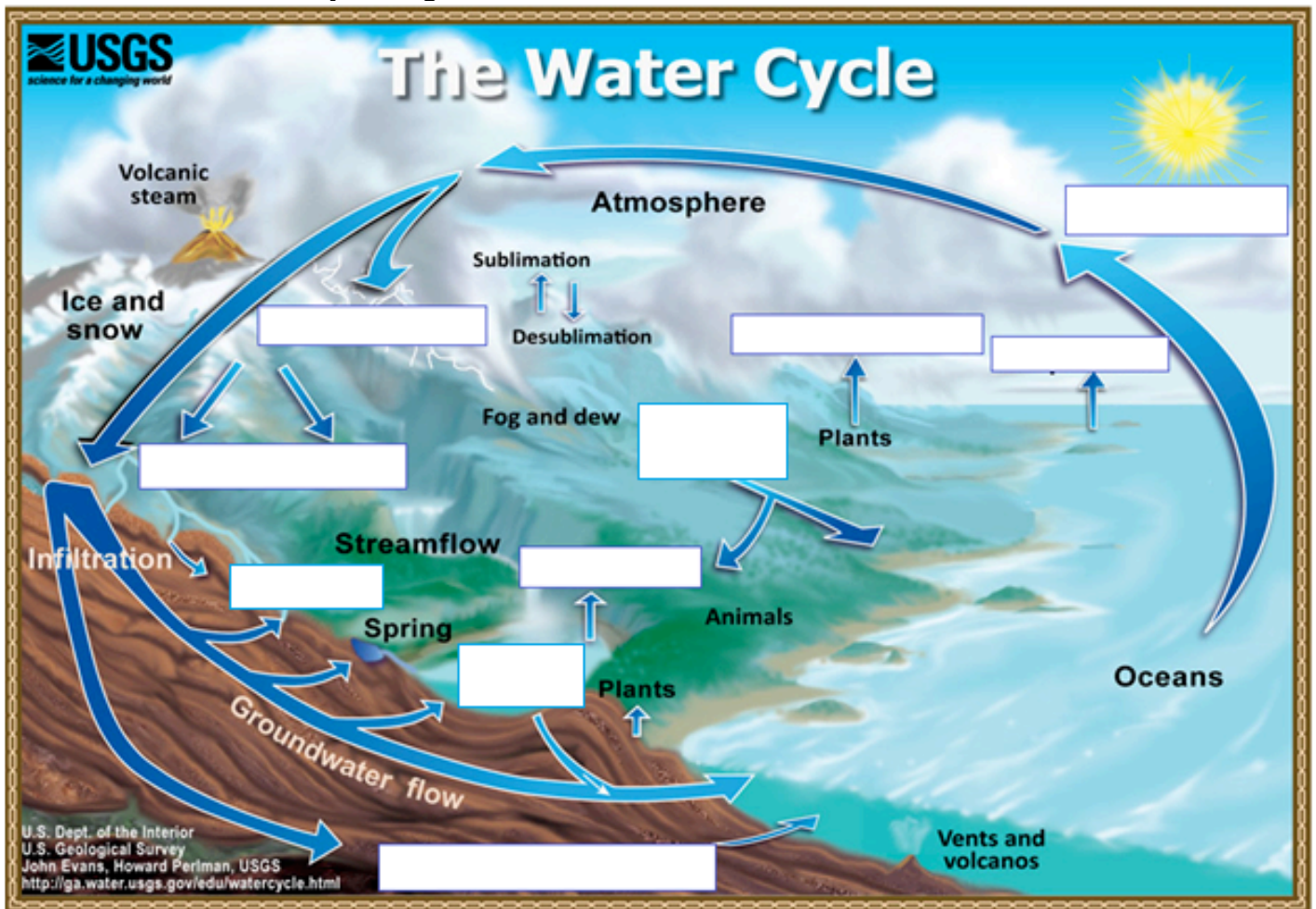
3. Click the link **evapotranspiration**. Write its definition.

4. Where does the water of the Earth come from?

5. List five (5) factors that affect transpiration rate, and *briefly explain* each.
  - a)
  - b)
  - c)
  - d)
  - e)
  
6. Click on the link “**stored as freshwater**”. What percent of our freshwater supply is found in:
 

Glaciers and Ice Caps	_____
Ground water	_____
Surface water	_____
Other	_____
  
7. When it comes to surface water storage, which lake holds a majority of the Earth’s freshwater supply? \_\_\_\_\_  
  
 How much does it hold? \_\_\_\_\_
  
8. Which continent holds a vast majority of the Earth’s ice mass? \_\_\_\_\_  
  
 How much does it hold? \_\_\_\_\_
  
9. The most visible manifestation of atmospheric water are \_\_\_\_\_.
  
10. What place on Earth does sublimation happen a lot?  
\_\_\_\_\_
  
11. What process drives the water cycle? Explain your answer.

12. Label the water cycle diagram below.



## THE CARBON CYCLE

Go To → [http://www.windows2universe.org/earth/Water/co2\\_cycle.html](http://www.windows2universe.org/earth/Water/co2_cycle.html)  
[COPY link then PASTE if it does not load automatically]

1. Draw the Carbon Cycle:

2. How does carbon exist in the atmosphere?
  
3. How are fossil fuels created?
  
4. Describe **two** (2) ways that carbon enters the atmosphere.
  
5. How are the oceans involved in the carbon cycle?
  
6. How is the temperature of the Earth partly controlled by carbon?
  
7. What role do rocks have within the carbon cycle?

Go To → [https://www.windows2universe.org/earth/climate/carbon\\_cycle.html&edu=elem](https://www.windows2universe.org/earth/climate/carbon_cycle.html&edu=elem)  
to play the **carbon cycle game**. You are a carbon atom!  
[COPY link then PASTE if it does not load automatically]

8. Where are you starting within the carbon cycle?

“**Click to begin your journey**”

9. How much of the atmosphere is made of carbon dioxide (CO<sub>2</sub>)? \_\_\_\_\_

10. By how much has CO<sub>2</sub> increased in the atmosphere during the past 150 years?  
\_\_\_\_\_

As you work through this game, take some notes about where you go as a carbon atom. Make sure you visit **ALL RESERVOIRS!** Then, answer each question prompt correctly..

11. Next stop - **LAND PLANTS**

Below, list 2 things you learned about land plants as reservoir:

**True or False**

If atmospheric carbon dioxide levels continue to increase, plants will take in more CO<sub>2</sub> and grow faster.

What percent of the atmosphere is carbon dioxide? \_\_\_\_\_

12. Next stop – **SURFACE OCEAN**

Below, list 2 things you learned about the surface ocean as reservoir:

**True or False**

More carbon can dissolve in cold water than in warm water.

13. Next stop - **DEEP OCEAN**

Below, list 2 things you learned about the deep ocean as reservoir:

The deep ocean gets carbon from \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**True or False**

Ocean life can survive without carbon.

14. Next stop – **MARINE LIFE**

Below, list 2 things you learned about marine life as reservoir:

**True or False**

Carbon can't get from the deep ocean to soils on the land. There's a different type of carbon on land.

15. Next stop - **SOIL**

Below, list 2 things you learned about soil as reservoir:

**True or False**

Soil emit carbon dioxide into the atmosphere.

How much carbon does the surface ocean absorb from the atmosphere each year? \_\_\_\_\_

## THE NITROGEN CYCLE

Go To → <http://chemistry.elmhurst.edu/vchembook/307nitrogen.html>

16. What are the **two** (2) conditions under which nitrogen will react with oxygen? (In other words, what is necessary for nitrogen in the air to combine with oxygen?)

17. What are the **two** (2) compounds that are formed when nitrogen combines with oxygen?

18. How does nitric acid ( $\text{HNO}_3$ ) form?

19. Why is nitric acid ( $\text{HNO}_3$ ) important?

Go To → <http://www.biology-pages.info/N/NitrogenCycle.html>

20. What percentage of the air we breathe is nitrogen?

21. Even though considerable nitrogen is available in the air, most plants do not use the nitrogen ( $\text{N}_2$ ) found in the air. Why not?

22. In what three (3) compounds can plants use nitrogen?

23. How do animals get the nitrogen they need?

24. The nitrogen molecule ( $\text{N}_2$ ) is quite inert. This means that it does not easily break apart. When molecules do not break apart easily, it is difficult (or impossible) for organisms to use them as a nutrient source. As a result, nitrogen fixation is the term used to describe the process of breaking up  $\text{N}_2$ .

a. What is atmospheric fixation?

b. What is industrial fixation? [This is how artificial fertilizers are made.]

c. What is biological fixation?

Describe the types of plants associated with the symbiotic relationships.

25. Four processes participate in the cycling of nitrogen through the biosphere. Briefly **define** and distinguish between:

*a. Decay*

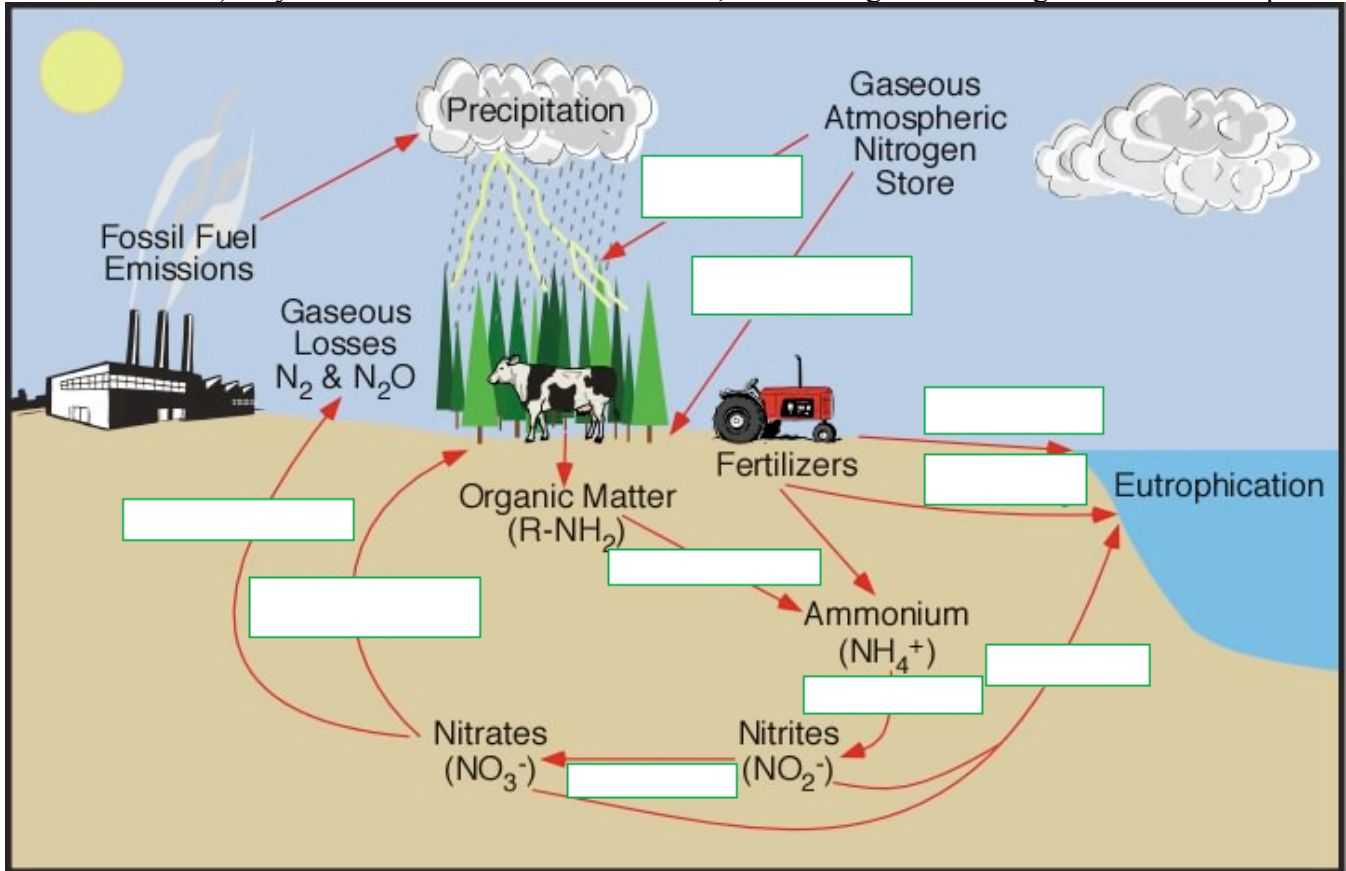
*b. Nitrification*

*c. Deitrification*

*d. Anammox (Anaerobic Ammonia Oxidation)*

Go To → <http://www.physicalgeography.net/fundamentals/9s.html> and answer these questions.

26. Label the nitrogen cycle (Figure 9s-1). (Remember there are other diagrams on the previous websites.) If you're not sure what a term means, look through the reading and links for help.



27. Why is nitrogen needed by plants and animals?

28. Explain why nitrogen is often the most limiting nutrient for plant growth even though it is abundant in the atmosphere.

29. Fill in the blanks:

- In most ecosystems nitrogen is primarily stored in living and \_\_\_\_\_.
- \_\_\_\_\_ found in the upper soil layer, chemically modify the nitrogen found in organic matter from ammonia ( $NH_3$ ) to ammonium salts ( $NH_4^+$ ).



- c) Nitrogen in the form of \_\_\_\_\_ can be absorbed onto the surfaces of clay particles in the soil.
- d) The process of \_\_\_\_\_ involves the metabolic reduction of nitrate ( $\text{NO}_3^-$ ) into nitrogen ( $\text{N}_2$ ) or nitrous oxide ( $\text{N}_2\text{O}$ ) gas.
- e) Almost all of the nitrogen found in any terrestrial ecosystem originally came from the \_\_\_\_\_. Significant amounts enter the soil in \_\_\_\_\_ or through the effects of \_\_\_\_\_.
- f) Members of the \_\_\_\_\_ (legumes) and some other kinds of plants form mutualistic symbiotic relationships with nitrogen fixing bacteria. In exchange for some nitrogen, the bacteria receive from the plants carbohydrates and special structures (nodules) in roots where they can exist in a moist environment.
- g) Scientists estimate that biological fixation globally adds approximately \_\_\_\_\_ million metric tons of nitrogen to ecosystems every year.

30. Briefly describe four (4) activities in humans that altered the Nitrogen Cycle.

- a)
- b)
- c)
- d)

**GO TO** → [http://www.epa.gov/ogwdw/kids/flash/flash\\_watercycle.html](http://www.epa.gov/ogwdw/kids/flash/flash_watercycle.html) (Choose AUTO or start with RAIN)

1. Another name for rain, snow, sleet, and hail is \_\_\_\_\_. This occurs when there is so much \_\_\_\_\_ in the \_\_\_\_\_ that it cannot hold onto it anymore.
2. Name some locations where water is stored on earth. \_\_\_\_\_
3. \_\_\_\_\_ is when water vapor comes from \_\_\_\_\_, \_\_\_\_\_, and land.
4. Which temperature causes water vapor to turn back into clouds? \_\_\_\_\_
5. What is the name for the process that forms clouds? \_\_\_\_\_