

Name \_\_\_\_\_ Date \_\_\_\_\_

### Cycling WebQuest

**Directions:** Visit the following websites and answer the related questions. Your goal is to gain a better understanding of the carbon and nitrogen cycles.

**Background:** *In biogeochemical cycles (including carbon, water and nitrogen cycles), elements are transported between the atmosphere, biosphere (living things), hydrosphere (water), and geosphere (rocks, minerals, and soils). These cycles help us remember that Earth is a complex system.*

#### Carbon Cycle:

Go to [http://www.windows.ucar.edu/tour/link=/earth/Water/co2\\_cycle.html](http://www.windows.ucar.edu/tour/link=/earth/Water/co2_cycle.html) and answer these questions:

1. Draw the carbon cycle (*on a separate piece of paper*)
2. How does carbon *exist in the atmosphere*?
3. How are *fossil fuels created*? **Explain.**
4. **Describe two 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 [http://www.windows.ucar.edu/earth/climate/carbon\\_cycle.html](http://www.windows.ucar.edu/earth/climate/carbon_cycle.html) to play the carbon cycle game. *You are a carbon atom!*

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!*

**11. Next stop =** \_\_\_\_\_  
*What did you learn?*

**12. Next stop =** \_\_\_\_\_  
*What did you learn?*

The **deep ocean** accounts for more than \_\_\_\_\_ % of the Earth’s carbon.

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

**True or False:** When plants die and decay, they bring carbon into soil.

**13. Next stop =** \_\_\_\_\_  
**What did you learn?**

14. Next stop = \_\_\_\_\_  
What did you learn?

15. Next stop = \_\_\_\_\_  
What did you learn?

When carbon enters the deep ocean, *how long does it stay there?*

\_\_\_\_\_

**True or False:** Phytoplankton are tiny plants and algae that float in the ocean and take up carbon dioxide as they grow.

**True or False:** Plants both absorb CO<sub>2</sub> from the atmosphere and release it into the atmosphere.

#### Nitrogen Cycle:

Go to <http://www.elmhurst.edu/~chm/onlcourse/chm110/outlines/nitrogencycle.html> and answer these questions.

16. What are the **two 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 compounds** that are formed when nitrogen combines with oxygen?

18. How does **nitric acid (HNO<sub>3</sub>)** form?

19. **Why** is nitric acid (HNO<sub>3</sub>) important?

Go to: <http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/N/NitrogenCycle.html> and answer these questions.

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 ( $N_2$ ) found in the air. **Why not?**
22. **In what compounds** can plants use nitrogen?
23. How do **animals get the nitrogen** they need?
24. Atmospheric nitrogen ( $N_2$ ) is pretty 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  $N_2$ .
  - a. What is *atmospheric fixation*?
  - b. What is *industrial fixation*? [*This is how artificial fertilizers are made.*]
  - c. What is *biological fixation*? (*In your answer, describe the types of plants associated with the symbiotic relationship.*)

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

25. Draw the nitrogen cycle: **On a separate piece of paper:** (*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.

26. *Why is nitrogen* needed by plants and animals?

Go to <http://www.mbgnet.net/fresh/cycle/index.htm>. Answer the following questions.

1. Define "*water cycle*".
2. *What fraction* of the Earth's surface is covered in water?
3. *What percentage* of all the Earth's water is in a form that is useable to humans and land animals?

Click on <http://www.mbgnet.net/fresh/cycle/concepts.htm>. Answer the following questions.

1. *Evaporation is the process where a liquid changes from its \_\_\_\_\_ state to a \_\_\_\_\_ state.*
2. Why is *evaporated water* so clean?
3. Condensation occurs when a \_\_\_\_\_ is changed into a \_\_\_\_\_.
4. Condensation is the opposite of \_\_\_\_\_.
5. When the \_\_\_\_\_ and \_\_\_\_\_ are right, the small droplets of water in clouds form larger droplets and precipitation occurs.
6. Define **transpiration**:
7. Define **percolation**:

Go to <http://www.mbgnet.net/fresh/cycle/cycle.htm>. Answer the following questions.

1. Using the terms "*evaporation*", "*condensation*", and "*precipitation*", explain the water cycle in your own words.
2. What factor is most important in determining whether water is a *solid, liquid, or gas*?
3. Is the amount of water on Earth *always changing or is it a constant amount*?