

## Chapter 5 Study Guide Nutrient Cycles and Soils

### 5.1 Matter Cycles in Ecosystems

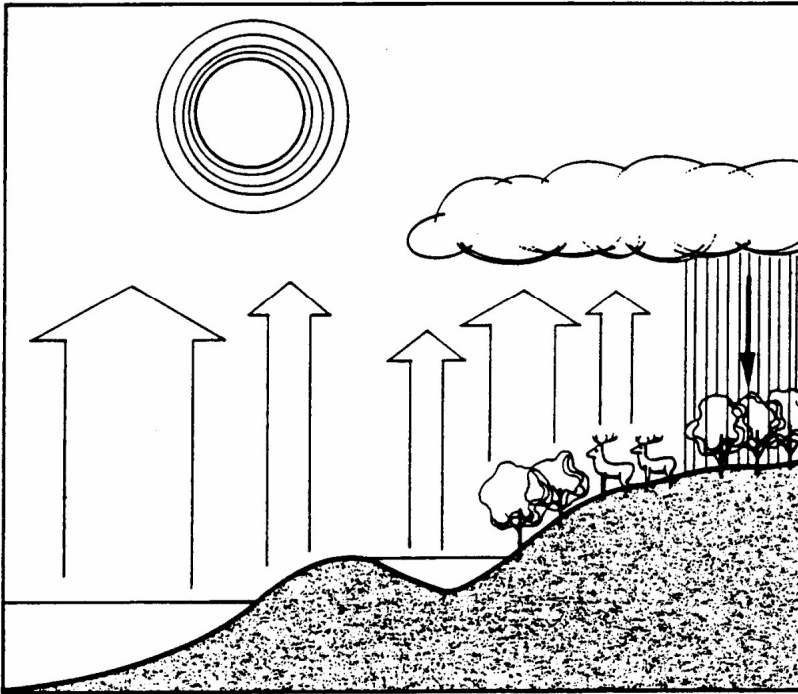
- ◆ \_\_\_\_\_ is the flow of atoms, molecules, and ions between the biotic and abiotic factors in the environment. It is also known as the \_\_\_\_\_.
- ◆ There are three major types of cycles: 1) \_\_\_\_\_ 2) \_\_\_\_\_ 3) \_\_\_\_\_
- ◆ The hydrologic cycle traces the movement of \_\_\_\_\_, while the atmospheric cycle traces the movement of the elements in \_\_\_\_\_ form and the sedimentary cycle traces the elements in \_\_\_\_\_ form.
- ◆ In the sedimentary cycle, the storehouse of the elements is the \_\_\_\_\_.
- ◆ It is possible to trace the movement of the elements by \_\_\_\_\_.

### 5.2 The Water Cycle

- ◆ For \_\_\_\_\_ ecosystems, the availability of water is among the major factors that determines \_\_\_\_\_.
- ◆ For \_\_\_\_\_ ecosystems, water is literally the matrix.
- ◆ The 7 main processes in water recycling are: 1) \_\_\_\_\_ 2) \_\_\_\_\_ 3) \_\_\_\_\_ 4) \_\_\_\_\_ 5) \_\_\_\_\_ 6) \_\_\_\_\_ 7) \_\_\_\_\_
- ◆ Which of the processes is the movement of water into the soil? \_\_\_\_\_
- ◆ Which process is the downward flow of water through soil and rock into aquifers? \_\_\_\_\_
- ◆ What two things power the water cycle? 1) \_\_\_\_\_ 2) \_\_\_\_\_
- ◆ On a global scale, compare the amount of water evaporating and transpiring and the amount falling as precipitation.
  
- ◆ The amount of water vapor in a certain mass of air is the \_\_\_\_\_. This is slightly different from \_\_\_\_\_ which is the ratio of the amount of water vapor an air mass actually contains compared to how much it can totally hold.
- ◆ Air masses are moved over long distances because of \_\_\_\_\_.
- ◆ Any water vapor that rises eventually condenses on \_\_\_\_\_, which are tiny particles, and larger water droplets form. This occurs at the \_\_\_\_\_, the temperature at which condensation occurs.
- ◆ Once the rain hits the Earth, it becomes \_\_\_\_\_, and runs into streams, rivers, and eventually back into the oceans.
- ◆ Unfortunately, surface runoff increases \_\_\_\_\_ and \_\_\_\_\_.
- ◆ How does the ocean become salty?
  
- ◆ Some runoff infiltrates and percolates, and is stored as \_\_\_\_\_ in \_\_\_\_\_
- ◆ Natural processes can act to purify water. Explain.
  
- ◆ List some ways in which humans are influencing the water cycle.

**DIAGRAM:**

Use the following terms to label the diagram of the water cycle below: evaporation, transpiration, condensation, precipitation, and respiration. (Some terms may be used more than once.)



**5.3 Carbon Cycle**

- ◆ The carbon cycle is based upon \_\_\_\_\_.
- ◆ \_\_\_\_\_ removes carbon dioxide from the air or water and forms glucose.
- ◆ \_\_\_\_\_ break down glucose to carbon dioxide, water, and energy.
- ◆ Carbon stored for many decades as biomass in the wood of trees cycles \_\_\_\_\_.
- ◆ Decomposers eventually recycles this carbon as carbon dioxide in the atmosphere, although \_\_\_\_\_ can speed up the process.
- ◆ Highly productive areas like \_\_\_\_\_ and \_\_\_\_\_, \_\_\_\_\_ carbon.
- ◆ Explain the formation of fossil fuels like coal.

◆ How is limestone the largest reservoir for the earth's carbon?

◆ Explain how the ocean is a carbon reservoir and the role temperature plays in carbon dioxide release.

- ◆ Even shelled organisms and corals play a role in the carbon cycle. Explain.
  
- ◆ List three ways that humans are impacting the carbon cycle.
  - #1.
  - #2.
  - #3.
  
- ◆ How is our affecting the carbon cycle causing changes in the greenhouse effect? Explain.

### 5.4 The Nitrogen Cycle

- ◆ Nitrogen is important to life because it is part of organic compounds like \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
- ◆ Typically nitrogen is in \_\_\_\_\_ and limits the rate of \_\_\_\_\_.
- ◆ This form of nitrogen cannot be absorbed by plants: \_\_\_\_\_
  
- ◆ In the process of \_\_\_\_\_, nitrogen gas is converted into ammonia, and this is typically done by \_\_\_\_\_ and \_\_\_\_\_ living in the roots of legumes.
- ◆ Plants can use the ammonium ion formed from the ammonia when it \_\_\_\_\_. But usually the ammonium ion is converted into \_\_\_\_\_ ions (toxic) and then \_\_\_\_\_ ions which plants use. This process is called \_\_\_\_\_, and is carried out by \_\_\_\_\_.
- ◆ What happens during assimilation?
  
- ◆ Explain how *ammonification* works. Who does it? What happens?
  
- ◆ *Dentirification* is a little different from ammonification. It involves \_\_\_\_\_ in the bottom sediments of lakes, swamps, etc. that convert \_\_\_\_\_ and \_\_\_\_\_ back into \_\_\_\_\_ and \_\_\_\_\_, and eventually back into \_\_\_\_\_ and \_\_\_\_\_.
- ◆ Nitrogen is often a limiting factor in plant growth because the nitrate and nitrite ions in the soil \_\_\_\_\_.
- ◆ Consider the Haber process. What was its purpose? How did it work? What product was formed?

- ◆ Humans have influenced the nitrogen cycle by emitting \_\_\_\_\_ into the atmosphere when we \_\_\_\_\_  
\_\_\_\_\_. The nitric oxide combines with the \_\_\_\_\_ in the air to form \_\_\_\_\_,  
which can react with water vapor in the air to form the harmful \_\_\_\_\_ → which can lead to the  
formation of \_\_\_\_\_.
- ◆ Nitric oxide also helps to form \_\_\_\_\_ near the ground by the formation of \_\_\_\_\_.
- ◆ Humans emit \_\_\_\_\_ into the atmosphere through the action of anaerobic bacteria  
on \_\_\_\_\_.
- ◆ What is the connection between nitrous oxide gas and global warming?
  
- ◆ How are humans removing nitrogen from the earth's crust?
  
- ◆ How are we removing nitrogen from the topsoil?
  
- ◆ Humans add excess nitrogen to aquatic systems in \_\_\_\_\_, \_\_\_\_\_,  
and \_\_\_\_\_. This addition of nutrients can cause the rapid growth  
of \_\_\_\_\_ and other water plants. This is "BAD" because they \_\_\_\_\_.
- ◆ Explain how humans are causing atmospheric deposition and what it is.

### 5.5 The Phosphorous Cycle

- ◆ What forms of phosphorous are essential to plants and animals? \_\_\_\_\_
- ◆ Why? (give 2 reasons)
  - #1.
  - #2.
- ◆ The phosphorous cycle is an example of a \_\_\_\_\_ cycle. In it P moves slowly from  
\_\_\_\_\_ on land and in \_\_\_\_\_ to  
living organisms, and then much more slowly \_\_\_\_\_.
- ◆ P can only be found in the atmosphere as \_\_\_\_\_ because it is typically  
found as \_\_\_\_\_ containing phosphate ions (\_\_\_\_\_) in terrestrial rock  
formations and ocean bottom sediments.
- ◆ What is *weathering*?



#4.

### **5-7 The Rock Cycle**

- ◆ The rock cycle involves the recycling of materials over \_\_\_\_\_.
- ◆ Igneous rock is rock formed when \_\_\_\_\_ cools and solidifies. Two examples are 1) \_\_\_\_\_ and \_\_\_\_\_.
- ◆ Igneous rock makes up the bulk of the \_\_\_\_\_.
- ◆ Sediments form from rock by 1) \_\_\_\_\_, 2) \_\_\_\_\_, and 3) \_\_\_\_\_.
- ◆ In which process would water freeze in a crack in the rock and when frozen, splits the rock because water expands during freezing? \_\_\_\_\_
- ◆ Which process involves the reaction of the rock with oxygen, carbon dioxide, or moisture? \_\_\_\_\_
- ◆ Explain how mechanical weathering speeds up chemical weathering.
  
- ◆ Sedimentary rocks form when \_\_\_\_\_ build up and \_\_\_\_\_ causes the sediment particles to bond, or “cement together.”
- ◆ Two conditions are necessary to form a metamorphic rock. The two conditions are: 1) \_\_\_\_\_ and 2) \_\_\_\_\_. An example of a metamorphic rock is \_\_\_\_\_.

### **5-8 Soils**

- ◆ Define *soil horizon*:
  
  
- ◆ A cross section of soil would be called a \_\_\_\_\_.

COMPLETE THE FOLLOWING TABLE:

Horizon	Characteristic Composition	Color
O		
A		
B		
C		

- ◆ Generally, the color \_\_\_\_\_ indicates good soil with lots of nitrogen and other nutrients, while \_\_\_\_\_ indicates poor soil.
- ◆ What is *humus*?

- ◆ Well aerated soils have plenty of \_\_\_\_\_, which is good because \_\_\_\_\_.
- ◆ As water percolates, it dissolves many nutrients and carries them to the water table. This is known as \_\_\_\_\_.
- ◆ The varying contents of soils determines the soil's \_\_\_\_\_. The four possible components that can vary in composition are: 1) \_\_\_\_\_, 2) \_\_\_\_\_, 3) \_\_\_\_\_, and 4) \_\_\_\_\_.
- ◆ \_\_\_\_\_ have equal amounts of all four components.
- ◆ Texture determines \_\_\_\_\_ → which determines \_\_\_\_\_. Porosity is also influenced by \_\_\_\_\_.
- ◆ Texture, porosity, and permeability determine three characteristics of soils, which are: 1) \_\_\_\_\_, 2) \_\_\_\_\_, and 3) \_\_\_\_\_.
- ◆ Explain the “upsides” and “downsides” of the following:

*Loams-*

*Sandy Soils-*

*Clay Soils-*

### **5-9 Soil Acidity & Plants**

- ◆ pH influences \_\_\_\_\_, so for example, at a soil pH of 5.5, plants can't absorb N & P very well.
- ◆ Adding \_\_\_\_\_ to soil can neutralize its acidic nature.
- ◆ How does acid deposition affect soils? (How does it cause poor soils? Leaching? Etc?)