CHAPTER 5
THE BIOGEOCHEMICAL CYCLES
Test Prep

1) What are the reservoirs and pathways that any chemical element follows through the Earth’s system called?

2) Which processes are responsible for the destruction of the lithosphere?

3) Which cycle involves the movement of water from the surface of the Earth through the atmosphere back to the surface of the Earth?

4) The case study of Lake Washington in the Environmental Science text illustrates how phosphorous in the effluent of sewage treatment plants caused an unnatural growth of algae in the lake. Before the unnatural algae growth, what type of factor did phosphorous serve as, with respect to the growth of the algae?

5) A lake contains 30,000,000 liters of water. Three streams flow into the lake, each at a rate of 5,000 liters per hour. The lake loses 120,000 liters to evaporation each day, and 10,000 liters each hour flow out the river that drains the lake. What is the Average Residence Time of water in the lake?

6) Within any one of the biogeochemical cycles, “flux” refers to what?

7) Based on the classification in the Environmental Science textbook, iron, potassium, magnesium, and calcium are examples of what?

8) The following chemical equation describes which process:

   \[6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2\]

9) Why do some higher organisms have symbiotic relationships with nitrogen-fixing microorganisms?

10) What is the original source of energy that drives the hydrologic cycle?

11) What would be an example of a compound formed by an ionic bond (write as chemical formula)?

12) What elements are considered macronutrients?

13) While the nitrogen cycle is one of the most important biogeochemical cycles, molecular nitrogen (N\(_2\)) in the atmosphere is not a significant element for life. Why?
14) How does erosion affect the global carbon cycle?
15) The tectonic cycle refers to the creation, destruction, and recycling of what?
16) The hydrologic cycle refers to the recycling of what?
17) Fluxes of nitrogen both into and out of the atmosphere are controlled predominantly by what factor?
18) The two major pathways by which molecular nitrogen is converted to forms more useful to living organisms are?
19) An element with a gaseous phase at conditions at the surface of the Earth tends to __________ much more rapidly than an element without a gas phase.
20) The rock cycle depends on the tectonic cycle to lift earth above sea level and the _______ cycle to supply the force of erosion.
21) What is the substance with the greatest significance for the global carbonate-silicate cycle?
22) In the context of biochemical cycles, what does “flux” refer to?
23) The pathway by which carbon is transferred from living biota to the atmosphere is called what?
24) How does Phosphorus, an important nutrient, enter living plants?
25) Name one major characteristic of the biogeochemical cycles of elements that have a gaseous phase and a residence time in the atmosphere, compared with elements that do not?
26) The nitrogen cycle, one of the most important biochemical cycles, may cause environmental problems because too much nitrogen can do what?
27) Why is carbon called the “backbone” of our living environment?
28) The nitrogen cycle is one of the most important and most complex of the biogeochemical cycles. What makes nitrogen so important?
29) Assume that a lake contains 12,000,000 m$^3$ of water, the evaporation rate is 4000 m$^3$/day, and surface runoff is 4000 m$^3$/day. Calculate the average residence time of the water in the lake.