

Environmental Interaction

Name _____

In earth science, understanding begins with observation. Occasionally, we need to drag our eyes away from the books and just take a studied look around us. As the realm of physical geography includes all natural phenomena at Earth's surface, it will not take long to gain an appreciation of the immense complexity of natural systems occurring within eyesight every day.

Purpose: The purpose of this lab is to practice field observation, become familiar with environmental components and their interactions, and practice forming ideas for your own research.

The natural environment at Earth's surface can be subdivided into four distinct, but highly interdependent spheres: the **atmosphere** (air), **hydrosphere** (water), **lithosphere** (earth), and **biosphere** (life). Components of these spheres interact and influence each other, studying these interactions defines the fields of environmental science and ecology. In this lab, you will use observation and imagination to study progressively more complicated environmental processes.

You will start with simply observing, imagining, and naming environmental features in **Step 1**. For example: a mole rat is a component of the biosphere, plate tectonics is a process in the lithosphere, salinity is a property of the hydrosphere, and argon is a component of the atmosphere.

Next you will use imagination, knowledge, and insight on how features interact between spheres in **Step 2**. For example: an explosive volcanic eruption (lithosphere) adds fine dust to the air, which reflects sunlight causing global cooling (atmosphere), which decreases the evaporation rate from tropical oceans (hydrosphere), which decreases surface salinity and affects marine life (biosphere).

Then you move to more complicated interactions called feedback loops in **Steps 3 and 4**. In negative feedback, an initial change in one feature begins a chain of events that reverses the change. For example: if your body temperature decreases, you shiver to warm yourself, thus causing body temperature to increase to its original state. In positive feedback, the opposite occurs; an initial change in one feature begins a chain of events that exaggerates the initial change. For example: in hurricanes as wind speed increases, evaporation (their source of energy) increases, which causes the storm to strengthen and cause even higher wind speeds. Wind speed does not return to its original state, it becomes more exaggerated. **Important Point:** Positive and negative do not mean good and bad, they are used here in their mathematical sense.

Step 1: Observation of Environmental Components, Properties, and Processes.

In this exercise, we are looking for natural features only. Do **NOT** use any examples I have given and do **NOT** use humans or anything humans build or do. I will not accept any answer that includes human activity.

1. Name at least 8 features of the atmosphere that you can see or know to exist around you. This can be any atmosphere component, phenomenon, process, or property. Think of what you can see, physical components of the air, reported weather observations, and use your imagination . Do not include water in the atmosphere.

2. Name at least 8 features of the hydrosphere that you can see or know to exist around you. This can be any hydrosphere component, phenomenon, property, or process. Remember, water is in the air, on the surface and beneath the surface.

3. Name at least 8 features of the lithosphere that you can see or know to exist around you. This can be any lithosphere component, phenomenon, property, or process. Think of the landforms you see on scales large and small, visible and below the surface, and the processes that created them.

4. Name at least 8 features of the biosphere that you can see or know to exist around you. This can be any specie, interrelated group of species, or any other ecological grouping, or any biological process or property.

Step 2: Interaction

Back in the lab, talk with your lab partners and consider how these environmental components interact. Use your imagination; there are millions of plausible answers. Do **NOT** use any examples I have given and do **NOT** use humans or anything humans build or do.

5. Based on your own knowledge or logical reasoning, suggest 2 interactions between **atmosphere** features and any features from the other spheres and give your reasoning.

1. _____ affects _____
in this way _____.

2. _____ affects _____
in this way _____.

6. Based on your own knowledge or logical reasoning, suggest 2 interactions between **hydrosphere** features and any features from the other spheres and give your reasoning.

1. _____ affects _____
in this way _____.

2. _____ affects _____
in this way _____.

7. Based on your own knowledge or logical reasoning, suggest 2 interactions between **lithosphere** features and any features from the other spheres and give your reasoning.

1. _____ affects _____
in this way _____.

2. _____ affects _____
in this way _____.

8. Based on your own knowledge or logical reasoning, suggest 2 interactions between **biosphere** features and any features from the other spheres and give your reasoning.

1. _____ affects _____
in this way _____.

2. _____ affects _____
in this way _____.

Step 3: Prelude to Feedback Loops

For each of the following, think of ways that two environmental components affect each other. Your answer does not have to be scientifically correct, use your imagination! And, again, do **NOT** use humans or anything humans build or do.

Atmosphere

9a. Sunlight affects volcanoes in this way: _____

9b. Volcanoes affect sunlight in this way: _____

10a. Sky color affects hibiscus flowers in this way: _____

10b. Hibiscus flowers affects sky color in this way: _____

Hydrosphere

11a. Lake temperature affects rainforests In this way: _____

11b. Rainforests affect lake temperature in this way: _____

12a. Evaporation affects wind in this way: _____

12b. Wind affects evaporation in this way: _____

Lithosphere

13a. Sand affects rainfall in this way: _____

13b. Rainfall affects sand in this way: _____

14a. Cliffs affects bees in this way: _____

14b. Bees affect cliffs in this way: _____

Biosphere

15a. A herd of zebras affects dew drops in this way: _____

15b. Dew drops affects a herd of zebras in this way: _____

16a. Bacteria affect tornadoes in this way: _____

16b. Tornadoes affect bacteria in this way: _____

Step 4: Feedback from Interaction and Change

Now it gets more complicated. Consider feedback loops based on changes in environmental features and label them as Negative or Positive feedback. Use your imagination! In other words, there are no wrong answers as long as your ideas are based on reasoning. You can expand on the interactions you described in Step 2 if you wish. Do not use any examples I have given. Explain your reasoning! Note that a change is generally an increase or decrease in some feature of the environment. **NO HUMANS!**

Example:

An increase in lake depth causes an increase in evaporation because there is more water surface area, which then causes a decrease in lake depth because more water is lost to the atmosphere. This is an example of negative feedback.

17. Think of one possible feedback loop involving the **atmosphere** and a different sphere.

Is this feedback positive or negative? _____

18. Think of one possible feedback loop involving the **hydrosphere** and a different sphere.

Is this feedback positive or negative? _____

19. Think of one possible feedback loop involving the **lithosphere** and a different sphere.

Is this feedback positive or negative? _____

20. Think of one possible feedback loop involving the **biosphere** and a different sphere.

Is this feedback positive or negative? _____