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 affect 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? _______________________