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Date _____

VIRTUAL LAB

Briefing Document: Critters!

Intro

The Hillsdale Zoo wants to update its collection to bring in more visitors. It locates an interesting creature, *Critterius hirsutus*, that might do the trick. But these "critters" are rarely seen in captivity because they are so difficult to keep. The Zoo has asked your team of zoologists for help.

Can you determine the best conditions for this creature's enclosure?

Mission

The Problem: The Zoo's new animals require special living conditions, but you don't know exactly what they are.

Your Mission: Figure out what temperature, humidity, light, and terrain conditions the Zoo's new critters like best.

Explore

First go to the Explore Lab. Here you will find a test enclosure, two thermostats, and a colony of critters. Set the thermostats and observe how the critters behave under different temperature conditions. Your goal is to find out whether the critters prefer a hot enclosure, a warm enclosure, or a cool enclosure.

Here's how to use the Lab:

- **Critter Enclosure** The test enclosure has two chambers with separate environmental controls. Critters can move from one chamber to the other to find the environment they like best.
- **Temperature** This is the only variable you can test in the Explore Lab. Use the pull-down menu to select Hot, Warm, or Cool. Later you can test the other variables: Moisture, Light, and Terrain.
- **Critters** The animals are housed in the cylinder on the shelf until the test environments are ready. When you have chosen your environmental variables, drag the cylinder to the center of the test enclosure.
- **GO** Click GO to start the simulation.
- **Reset** Click the arrow button to start over.



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Suggested Explorations

Start by asking a testable question about the critters and temperature that you can explore in the Explore Lab.

Here's a sample question:

Do critters prefer hot temperatures or cool temperatures in the test enclosure?

Here's a procedure you could use to explore that question:

- 1. Select Hot from the Temperature menu for the left chamber.
- 2. Select Cool from the Temperature menu for the right chamber.
- 3. Bring the critters to the test chamber and click GO.
- 4. After the animals a resettled, record the number of critters on each side of the enclosure.



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Continue exploring until you know what temperature the critters seem to prefer. As you investigate, think about how to define a clear preference, and whether there might be more than one combination of temperature, moisture, terrain, and light conditions that would be comfortable for the critters.

If you do your explorations systematically and record your results carefully, you should be able to help the Zoo figure out how to take good care of its new furry friends.

Some Helpful Information

All animals need air, food, water, and shelter to survive. Each species also has a set of specific requirements that will allow each animal to grow and the overall population to flourish. The conditions that suit one animal may kill another.

The conditions that affect how well an animal survives in any given environment are called limiting factors. There are two types of limiting factors:

Biotic limiting factors are living factors that affect an animal. These factors may help the animal or harm the animal. The availability of food for the animal to eat is one biotic limiting factor. The presence of predators is another. The only biotic factor you investigate in this lab is "Grass," a living component of terrain.

Abiotic limiting factors are nonliving factors that affect an animal. Temperature, moisture, and sunlight are examples of abiotic factors. Some animals tolerate a wide range of abiotic conditions. Others have very specific requirements. For example, the boa constrictor can only survive and reproduce within a very small temperature range, while the arctic fox survives in both extreme cold and summer heat.

Plan

Now it is time to plan an experiment that will help you figure out what environmental conditions the Zoo's new critters like best.

In the Experiment Lab, you will be able to set levels for all four variables: Temperature, Moisture, Light, and Terrain.

- The settings for Temperature are: Hot, Warm, and Cool.
- The settings for Moisture are: Dry, Moderate, and Humid.
- The settings for Light are: Dim, Moderate, and Bright.
- The settings for Terrain are: Sand, Grass, and Rocks.



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If you need help writing the plan, consult the *Virtual Labs Student Guide*. Remember, you can use everything you learned in the Explore Lab, along with information in this Briefing Document and in the Plan Resources, which you will find in the Virtual Lab under "Plan."

Write your plan in your notebook. Have your teacher approve it before you go to the Experiment Lab.

Experiment

Go to the Experiment Lab and conduct your experiment. Record everything that happens at each step. You may need to make a chart to keep track of all the data. When you are finished examine your data from the trials you conducted on the computer. What logical conclusions can you draw from the information you collected? Can you determine what conditions are best for the critter? When you are finished, write a short summary of your experiment, including your results and conclusions.

Did any of your results surprise you? If so, describe them in your summary. Scientists often learn more from unexpected results than from experiments that go exactly "according to plan."

When you have finished your summary, share your plan and your conclusions with your classmates. Did you all use the same procedure? Did you get the same results? Is there more than one way to make the critters comfortable? Can you use logic to determine whether all students had reliable results? Do you think the animals' behavior in the zoo enclosure will be the same as in the test enclosure? Why or why not?

Whatever the outcome of your individual efforts, together you will have learned some things about how abiotic environmental factors affect animal behavior and how to test variables in a systematic way. And that is exactly how science gets done: by exploring, asking questions, planning, experimenting, and sharing information with other curious people - like you!