Name: _____ Date: _____ Skill and Practice

1D Identifying Control and Experimental Variables

Read:

An experiment is a situation set up to investigate relationships between variables. In a simple ideal experiment only one variable is changed at a time. You can assume that changes you see in other variables were caused by the one variable you changed. The variable you change is called the experimental variable. This is usually the variable that you can freely manipulate. For example, if you want to know if the mass of a toy car affects its speed down a ramp, the experimental variable is the car's mass. You can add "cargo" to change the mass of car. The variables that you keep the same are called control variables. In the toy car experiment, control variables include the angle of the ramp, photogate positions, and release technique.

Use this skill sheet to practice identifying control and experimental variables.

Example:

Alex is studying the effect of sunlight on plant growth. His hypothesis is that plants that are exposed to sunlight grow better than plants that are not exposed to sunlight. In order to test his hypothesis, he follows the following procedures. He obtains two of the same type of plant, puts them in identical pots with potting soil from the same bag. Then he puts one plant in the sunlight and the other in a dark room. He waters the plants with 200 mL of water every other day for two weeks.

Solution:

The experimental variable in the experiment is the light exposure of the plant. One plant is put in sunlight and the other is put in darkness. The control variables are the type of plant, the pot, the soil, amount of water, and the time of the experiment.

Practice:

1. Julie sees commercials for antibacterial kitchen sprays that claim to kill almost all bacteria on hard surfaces where it is sprayed. Julie asks, "How effective is antibacterial spray in preventing bacteria growth?" She sets up an experiment to study the effectiveness of an antibacterial spray product. Julie hypothesizes that the antibacterial spray will prevent most bacterial growth. In her experiment, she follows this procedure:
   a. Obtain two Petri dishes with nutrient agar.
   b. Rub a cotton swab along the surface of a desk at school. Then, carefully rub the nutrient agar with the cotton swab without breaking the gel.
   c. Repeat the same process with the other Petri dish.
   d. Spray one of the Petri dishes with an antibacterial kitchen spray.
   e. Carefully tape shut both of the Petri dishes and place them in an incubator.
   f. Check the Petri dishes and record the results once a day for one week.

   Identify the experimental variable and three control variables in the experiment.

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2. John notices that his mom waters the plants in their house every other day. He asks, “Will plants grow if they are not watered regularly?” His hypothesis is: Plants that are not watered regularly will not grow as large as plants that are watered regularly. In order to test his hypothesis, he conducts the following experiment.

   a. Obtain two healthy plants of the same variety and size.

   b. Plant each plant in the same type of pot and the same brand of potting mix.

   c. Place both plants in the same window of the house.

   d. Water one of the plants every other day with 250 mL of water.

   e. Water the other plant once a week with 250 mL of water.

   f. Measure the height of the plants once a day for one month.

   Identify the experimental variable and three control variables in the experiment.

3. Mike’s dad always buys bread with preservatives because he says it lasts longer. Mike asks, “Will bread with preservatives stay fresh longer than bread without preservatives?” He hypothesizes that bread with preservatives will not grow mold as quickly as bread without preservatives. In order to test his hypothesis, he conducts the following experiment.

   a. Obtain one slice of bread containing preservatives and one slice of bread without any preservatives.

   b. Dampen two paper towels. Fold the paper towels so that they will lay flat inside a zipper-top bag.

   c. Lay each paper towel inside a separate zipper-top bag.

   d. Place one slice of bread in each bag and seal the bags.

   e. Place bags with bread and paper towels in a dark environment for one week.

   f. Record mold growth once a day for one week.

   Identify the experimental variable and three control variables in the experiment.

4. In science class, Kathy has been studying protists. She has been learning specifically about protists called algae that live in ponds. She knows that algae thrive when there are plenty of nutrients available for them. Kathy asks, “Will water that has been treated with fertilizer have more algae than water that has not been treated with fertilizer?” Kathy’s hypothesis is: Fertilizer-treated water will have a larger population of algae after two weeks than non-fertilizer-treated water.In order to test her hypothesis, Kathy does the following experiment.

   a. Obtain a sample of algae from the teacher.

   b. Obtain two beakers with 500 mL of water in each beaker.

   c. Put one teaspoon of plant fertilizer in one of the beakers.

   d. Put an equal amount of algae sample in each of the beakers.

   e. Place the beakers in a sunny window for two weeks.

   f. Using a microscope, examine algae growth in each of the beakers every other day for the two weeks and record your results.

   Identify the experimental variable and three control variables in the experiment.