SCIENCE

Earth Science

Topics Include:

Cenozoic Era, Comparing Types of Rocks, Eclipses, Formation of Coal, Glacial Landforms, Global Heat Budget, How Minerals Form, Igneous Rocks, Waves, and More

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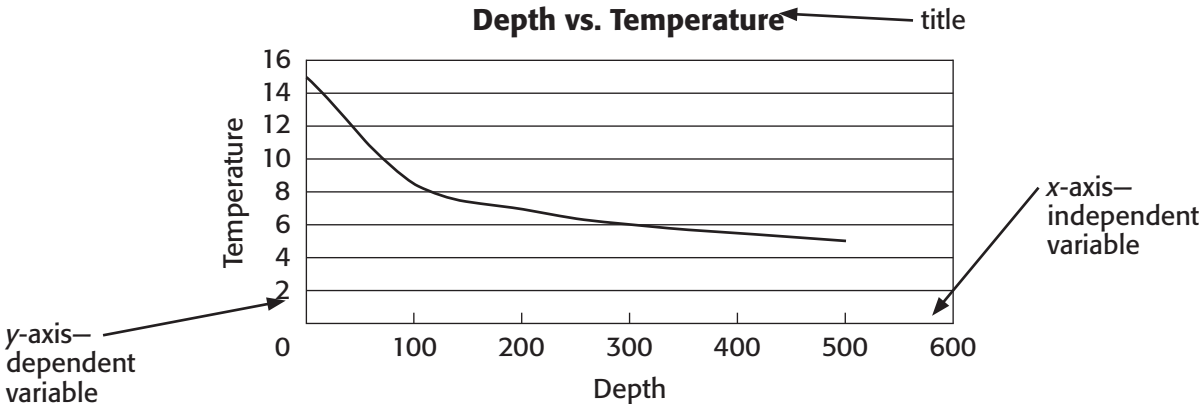
Building Process and Thinking Skills

Developing Concepts

NAME _____ DATE _____

Drawing a Graph

A graph is often used to see if a relationship exists in a set of data. You can use a graph to show how one variable changes in response to another variable changing.



The data in the table below was collected and placed in a data table.

Follow the steps below to graph the data.

Step 1 Draw an *x*-axis and a *y*-axis.

Step 2 Label the *x*-axis with the independent variable—this is the variable you change.

Step 3 Label the *y*-axis with the variable that is the dependent variable—the variable that is a result of changing a variable.

Step 4 Decide on the scale for each axis. Look at your data. Determine the range of the data for each axis. Choose a scale that has the numbers equally spaced.

Step 5 Plot each point.

Step 6 Draw a line connecting the data points.

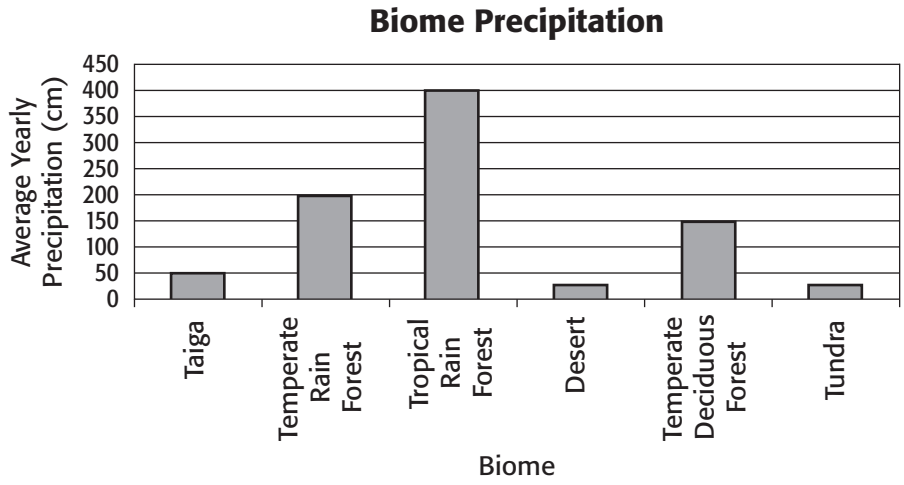
Depth (km)	Salinity (%)
0	31.22
100	33.60
200	33.94
300	34.01
400	34.07
500	34.14
600	34.20

NAME _____ DATE _____

Reading a Graph

Data collected in an experiment is often displayed on a graph. A graphical display can be an easy way to see the relationship between variables.

Use the graph to answer the following questions.



1. The graph above is a bar graph. Each bar shows the data for each category that is given along the horizontal axis. What is the relationship between length of each bar and the biomes? _____

2 Which two biomes have approximately the same amount of precipitation each year?

_____

3. In which biome will you find the highest average yearly precipitation? In which biome will you find the lowest average yearly precipitation? _____

_____

4. To read the data in a bar graph, look at the top of a bar and read across to the vertical axis. The number along the vertical axis is the value of the data point. What is the average yearly precipitation in a temperate rain forest? _____

5. What is the average yearly precipitation in the taiga? _____

6. What is the difference in average yearly precipitation between the temperate rain forest and the temperate deciduous forest? _____

NAME _____ DATE _____

Organizing Data

Before you actually conduct an experiment, you need to decide how you will record what happens during the experiment. Often you record data in a science notebook. After you have gathered your data, you need to decide on a way to organize the data to present to others that want to see what you have gathered. Your data must be organized in an orderly way. You can follow the steps below to organize the data from the following experiment.

> Temperature of water that is in a glass insulated with different materials.
> Nothing: 0 minutes: 20.0ºC 15 minutes: 13.3ºC 30 minutes: 6.7ºC 45 minutes: 0.0ºC
> Paper: 0 minutes: 20.0ºC 15 minutes: 17.2ºC 30 minutes: 14.4ºC 45 minutes: 11.4ºC
> Foam: 0 minutes: 20.0ºC 15 minutes: 18.9ºC 30 minutes: 17.8ºC 45 minutes: 16.7ºC

Creating a data table will be the easiest way to organize your data. When you create a data table to organize your data the independent variable is at the heading of the first column.

Step 1 Place the name of the independent variable in the top of the left column.

Step 2 Place the headings of the dependent variable at the top of the middle and right column.

Step 3 Enter the data for each dependent variable in its correct column.

1.	**2.**	**3.**	**4.**
5.	**6.**	**7.**	**8.**
9.	**10.**	**11.**	**12.**
13.	**14.**	**15.**	**16.**
17.	**18.**	**19.**	**20.**

NAME _____ DATE _____

Identifying Variables in an Experiment

In an experiment, you make changes in a situation and see the results. The conditions set in an experiment are known as the *variables*. A variable can be temperature, the amount of water, or amount of food given each day. In an experiment, only one factor (variable) should change. The variable that changes is known as the independent variable. The result of your experiment is the dependent variable.

The following sample experiment tests how different materials keep something warm.

- Pour 100 mL of water into each of three 150 mL glass beakers.
- Make sure that the starting temperature of the water in all three containers is 20.0°C.
- Enclose each beaker in one of the three insulating materials.
- Place each beaker in a freezer at 0°C.
- Measure the temperature in each beaker every fifteen minutes.

1. List all the factors that could be variables in the experiment. _____

_____

_____

2. Which of the factors remained the same in each of the three beakers? _____

_____

_____

3. Which factor changed? _____

4. Is this the independent or dependent variable? _____

5. You are recording the temperature every fifteen minutes. Is the temperature the independent or dependent variable? _____

6. Suppose you placed 150 mL of water at 25.0°C instead of 100 mL of water at 20.0°C. Would you be certain that the changes in temperature were an accurate measure of the insulating power of the insulating material? _____

7. List the factors in an experiment in which you want to test the heat-holding ability of different liquids. _____

_____

_____

NAME _____ DATE _____

Designing an Experiment

When a scientist asks a question, the search for the answer to that question leads to a hypothesis. To test that hypothesis, a scientist will design an experiment. When designing an experiment you need to consider the following:

- the variable being tested,
- the variable being recorded,
- other variables that need to be the same all the time during the experiment.

You are exploring how pine needles in the soil affect the water-holding ability of the soil. The experiment is set up with two identical containers, each of which has the same type and amount of soil.

Answer the following questions regarding the variables in this experiment.

1. What are the variables being tested? _____

_____

2. Which variable is easier to change? This will be the independent variable. _____

_____

3. Which variable will be the dependent variable? _____

4. List as many other variables you need to consider as you can. These variables need to be kept the same for each of the soils tested. The list is started for you—name four additional variables.

- Temperature
- Amount of food
- _____
- _____
- _____
- _____

Place the steps of the experiment in order. Write *1* in the blank next to the step that comes first, *2* in the space next to the step that comes second, and so on.

5. _____ Place each of the two cups over a container that will collect any water that drains from the cup.

6. _____ After the water stops draining, measure the amount of water in each of the containers below the foam cups.

7. _____ Pour 100 mL of water into each plastic cup.

8. _____ Poke small holes in the bottom of each foam cup. Mark a line around each cup that is 2 cm from the top.

9. _____ Pack cup *A* tightly with plain soil. Pack cup *B* with soil and pine needles.

NAME _____ DATE _____

Drawing Conclusions

Once you have recorded the results of an experiment, you must review the data to see if any patterns or relationships exist. From the patterns that exist, you can draw a conclusion, or make a statement about the relationships that exist between your variables.

The data in the table to the right shows the air temperature and air pressure recorded by a weather balloon rising over a city.

Draw a conclusion regarding the data in the table. Answer the questions by filling in the blank.

Altitude (m)	Temperature (°C)	Pressure (mb)
300	16.0	973
600	16.5	937
900	15.5	904
1,200	13.0	871
1,500	12.0	842
1,800	10.0	809
2,100	7.5	778
2,400	5.0	750
2,700	2.5	721

1. What is the air temperature at 300 m?

_____

2. What is the temperature at 900 m?

_____

3. What is the temperature at 1,800 m?

_____

4. As the weather balloon rises in the atmosphere what happens to the air temperature? _____

_____

5. What is the air pressure at 300 m?

_____

6. What is the air pressure at 900 m?

_____

7. What is the air pressure at 1,800 m? _____

8. As the weather balloon rises in the atmosphere what happens to the air pressure?

_____

9. What can you say about air pressure and air temperature with an increase in altitude?

_____

_____