Practice

Use the list below to complete the following statements.

abyssal	**Mid-Atlantic Ridge**
basin	**mid-ocean ridges**
continental shelf	**Pangaea**
continental slope	**plates**
East Pacific Ridge	**seamounts**
guyots	**topography**
Marianas Trench	**trenches**

1. The _____ of the ocean floor is similar to that of the landforms on Earth's continents.

2. Earth's continents were once one large, unbroken landmass called _____ .

3. The plate tectonics theory suggests that Earth's crust is separated into large pieces known as _____ .

4. The _____ is the part of the continent that is under the ocean.

5. The _____ separates the continental shelf from the ocean floor.

6. The deepest parts of the ocean floor are long, narrow cracks called _____ .

7. The largest plains on Earth are the _____ plains.

8. The _____ in the Pacific Ocean is the deepest spot on the Earth—over 10,911 meters deep.

9. The ocean _____ , or floor, begins at the bottom of the continental slope.

10. Underwater volcanic cone-shaped mountains are called _____ .

11. Flat-topped seamounts are called _____ .

12. _____ are underwater mountain ranges.

13. The mountain belt located in the Atlantic Ocean is called the _____ .

14. The mountain belt located in the Pacific Ocean is called the _____ .

Lab Activity: Seafloor Contours

Investigate:

- Construct a three-dimensional view of a *bathymetric map* by interpreting data obtained near the mouth of the Columbia River.

Materials:

- sounding data
- carbon paper
- pencil
- scissors/utility knife
- cardboard or tagboard
- glue
- colored markers

Contour Model of the Seafloor

With echosounders, oceanographers have gathered large amounts of data about the ocean floor. How can they arrange this data in a form that is useful? One technique—the *side-view bottom profile* technique—is a series of profiles made into a three-dimensional model which gives a good picture of the bottom. However, the models take a long time to make. They also take up lots of storage space. To overcome these problems, oceanographers make a special contour map. Contour maps show a three-dimensional (length, width, height) surface on a two-dimensional (length and width only) sheet of paper. These special contour maps are called *bathymetric maps*. In this lab, you will have a chance to make a bathymetric map. Study the contour map below.

Contour interval (the change in elevation between two lines) is 100 meters.

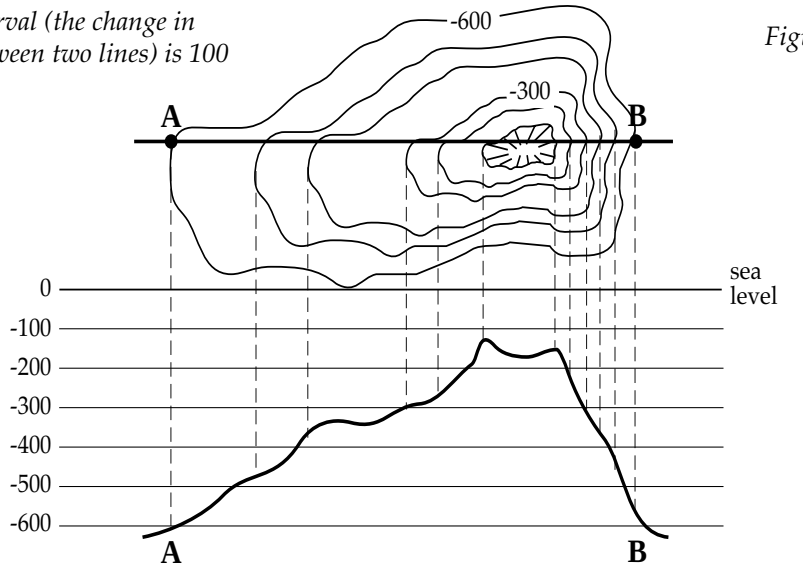


Figure 1

Figure 1 on the previous page shows how an underwater mountain is represented on a contour map. The bottom of *Figure 1* shows a *profile* of the same mountain along a line from *A* to *B*. Several rules must be followed in making a contour or bathymetric map. Study the rules below.

A. All points on a given contour line are the same height or depth.

B. Two contour lines may never cross each other.

C. A contour line never ends. Contour lines usually surround a given parcel of land.

D. If a line does not surround a parcel of land, it must disappear off the edge of the map.

Contour lines should **not** make sharp angles. They generally show smooth, regular changes. For example, if one point shows a depth of one meter and the next point shows a depth of three meters, the contour line for the depth two meters must occur between the two points.

Successive contour lines that are far apart on the map indicate a *gentle slope*. Lines that are close together indicate a *steep slope*. Lines that run together indicate a *cliff*. The illustration below shows how contour lines express *depth* and *form*.

Figure 2

a side-view, or profile of an underwater mountain

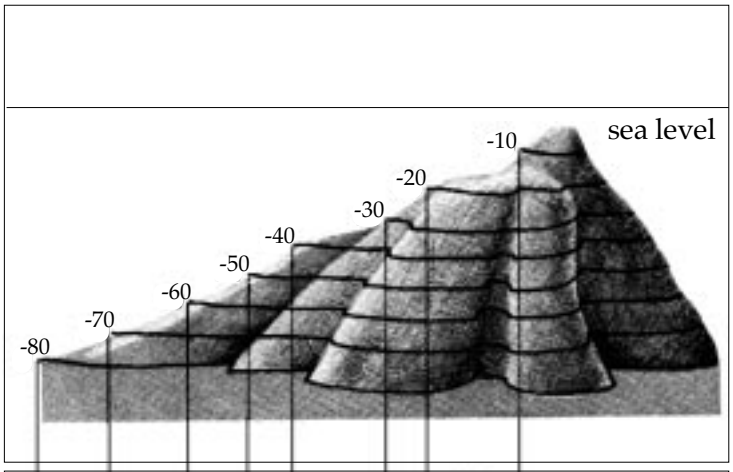


Figure 3

contour map

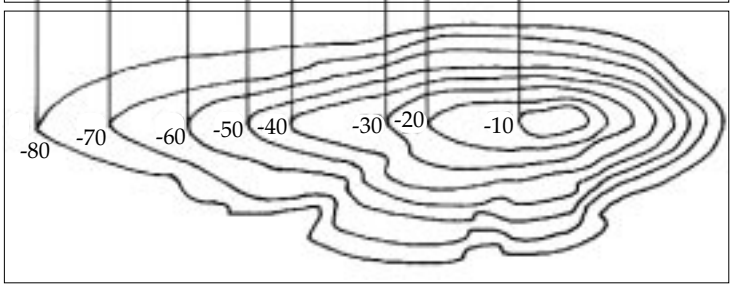


Figure 2 on the previous page also represents an underwater mountain. The contour map in *Figure 3* shows these features as if you are looking down on the area represented from a point directly above it. Labels on contour maps should include the measurements and the units used such as feet, fathoms (6 feet), or meters.

Pre-Lab Study:

Use the **lab activity text** *information on the previous pages to answer the following. Do this before you perform the lab activities on the next pages.*

1. How do contour maps help oceanographers study the ocean floor?

   _____

   _____

   _____

2. What are the underwater contour maps called? _____

   _____

3. What does the contour map show in *Figure 1*? _____

4. Do contour lines end? _____

   Explain. _____

   _____

   _____

5. If the contour lines are far apart, what will this indicate? _____

   _____

6. What is indicated when contour lines are close together? _____

   _____

7. How will a contour line be drawn if the contour line does not surround a piece of land? _____

   _____

   _____

8. Describe the topography depicted in the contour map in *Figure 3*.

   _____

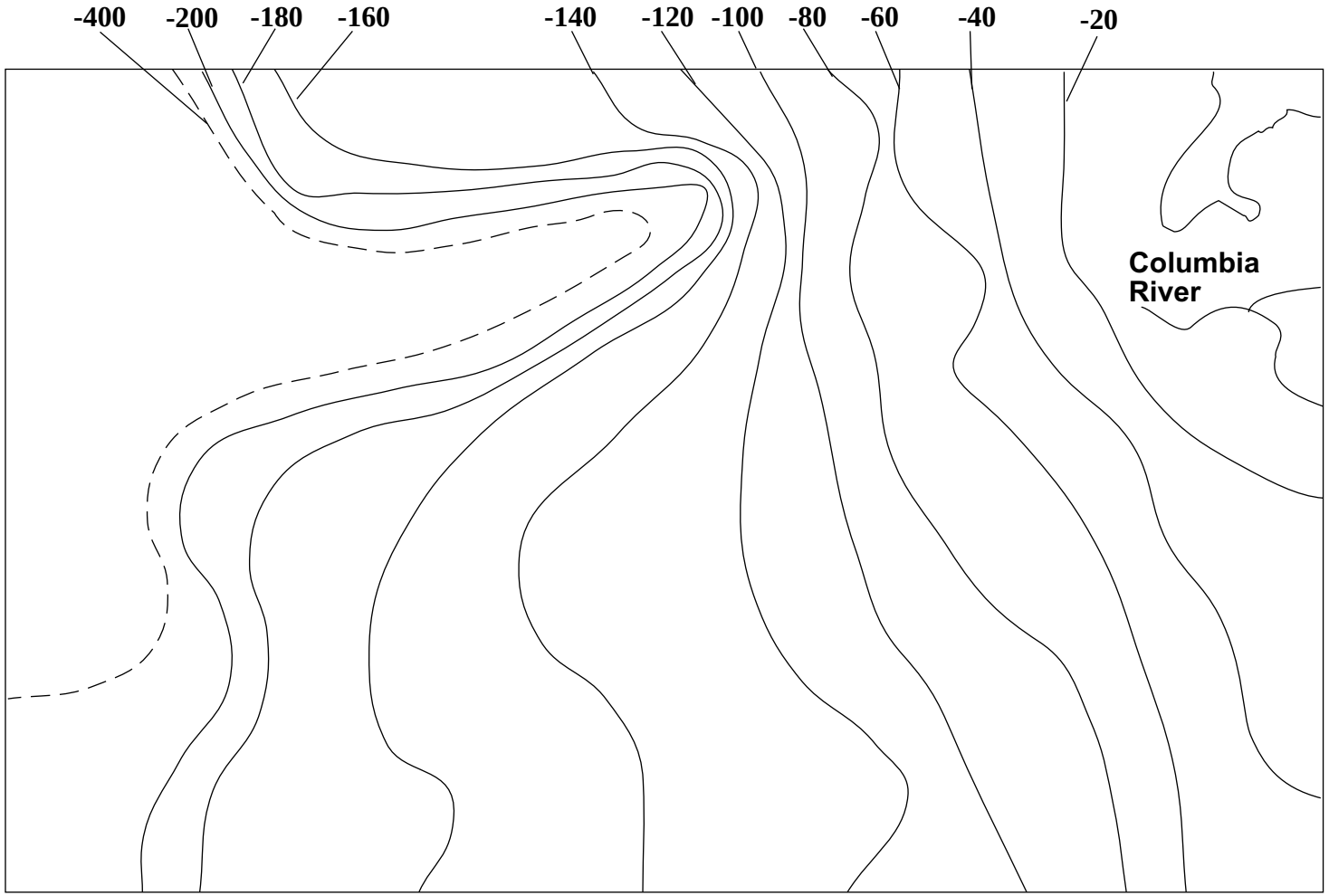
   _____

Procedure:

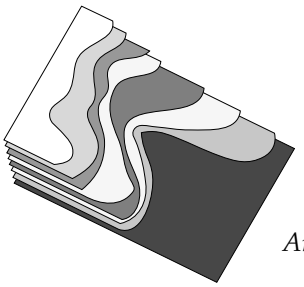
1. Obtain one piece of carbon paper and 4 or 5 pieces of cardboard. (One large-size gift box will be adequate.)
2. Place the carbon paper face **down** on the cardboard.
3. Place the contour map over the carbon paper on the cardboard and trace the -400-meter contour onto the cardboard.
4. Use scissors to cut along the contour line. Keep the larger piece of cardboard. The large piece of cardboard represents the surface of the Earth at a depth of -400 meters. Label the piece you save as *-400 meters* and set aside.
5. Repeat the tracing steps (steps 3 and 4) for each of the other contour lines on the map. Be sure to keep the *shore-side* pieces and discard the *ocean-side* pieces. Ask your teacher for assistance if you need help.
6. Place the cut-out labeled *-400 meters* over the -400-meter contour line. You will layer each cut-out contour in order of decreasing depth on top of the -400-meter cut-out (-400, -200, -180, -160, -140, -120, etc.).
7. Be sure to stagger each cut-out on top of the other so that each contour level can be seen. (See page 177 for an example of a contour cut-out.)
8. Glue each layer in place as you go along.
9. Label the following features on your three-dimensional model: *continental shelf*, *continental slope*, *submarine canyon*, and *abyssal plain*.

Study the characteristics below of the contour map on the following page:

- All measurements are in meters.
- The equal-depth points are connected with contour lines
- The contour lines begin with -20 meters, then increase to -40, -60, etc. (intervals of 20).
- The -400-meter contour line is added as a *dashed* line. The dashes show that the interval between the -200-meter line and the -400-meter line is different than the other intervals shown.



Columbia River Contour Map



An example of a contour cut-out.

Analysis:

Use your **three-dimensional model** *from the previous page to answer the following.*

1. What is the most likely cause of the *submarine canyon* on your map?

   _____

2. Compare your model with those of others in your class. Are all of the maps exactly the same? _____
3. How can you account for any differences you may have observed?

   _____

4. At about what depth does the continental shelf become the continental slope? _____
5. At about what depth does the continental slope become the abyssal plain? _____
6. On which representation of the bottom (contour map or model) is it easier for you to see the bottom shape? _____
7. Why do most ship captains use contour maps or charts rather than three-dimensional models to show bottom contours? Give two reasons. _____

   _____

Practice

Match each definition with the correct term. Write the letter on the line provided.

_____ 1. deep V-shaped valleys found along the continental slope

_____ 2. the sloping surface between the outer edge of the continental shelf and the ocean basin

_____ 3. the ocean floor at a depth of more than 4,000 meters

_____ 4. detailed charting of the features of an area; heights, depths, and shapes of the surface of an area

_____ 5. large, flat regions on the ocean floor

_____ 6. long, narrow cracks in the ocean floor; the deepest parts of the ocean

_____ 7. underwater cone-shaped volcanic mountains

_____ 8. a mountain chain that rises from the ocean basin; where seafloor spreading takes place

_____ 9. a relatively flat part of the continent covered by seawater

_____ 10. underwater volcanic mountains with flat tops

A. abyssal plains

B. basin

C. continental shelf

D. continental slope

E. guyots

F. mid-ocean ridge

G. seamounts

H. submarine canyons

I. topography

J. trenches