

Ocean Zones ▪ *Section Summary*

Exploring the Ocean

Guide for Reading

- For what reason have people studied the ocean floor?
- What are the main sections of the ocean floor?
- What processes have shaped the ocean floor?

People have explored the ocean for thousands of years. Knowledge of the ocean has always been important to the people living along its coasts.

People have studied the ocean since ancient times because the ocean provides food and serves as a route for trade and travel. Modern scientists have studied the characteristics of the ocean's waters and the ocean floor.

Until recently the ocean floor was unexplored, and little was known about life in the oceans. A major advance in ocean-floor mapping was **sonar**, which stands for **sound navigation and ranging**. Sonar is a system that uses sound waves to calculate the distance to an object.

If you could travel along the ocean floor, you would see the continental shelf, the continental slope, the abyssal plain, and the mid-ocean ridge. The **continental shelf** is a gently sloping, shallow area of the ocean floor that extends outward from the edge of a continent. At a depth of about 130 meters, the slope of the ocean floor gets steeper. The steep edge of the continental shelf is called the **continental slope**. A broad area covered with thick layers of mud and silt is called the **abyssal plain**. The **mid-ocean ridge** is a continuous range of mountains that winds around Earth, much as the line of stitches winds around a baseball.

The mid-ocean ridge actually consists of two parallel chains of mountains separated by a central valley, with occasional trenches. A **trench** is a steep-sided canyon in the ocean floor. Some trenches are so deep you cannot see the bottom.

The pieces of Earth's crust, along with parts of the upper mantle, are called **plates**. Such plates move slowly on the underlying portion of the mantle. **Plate movements have shaped many of the most dramatic features of Earth, both on land and under the ocean.**

The mid-ocean ridge is located long the boundaries of plates that are moving apart, or diverging. Along the ridge, magma squeezes up through the cracks between the diverging plates. As the magma hardens along the ridge, it adds a new strip of rock to the ocean floor. Over millions of years, this process, called **seafloor spreading**, has produced the ocean floor.

Ocean Zones ▪ *Review and Reinforce*

Exploring the Ocean

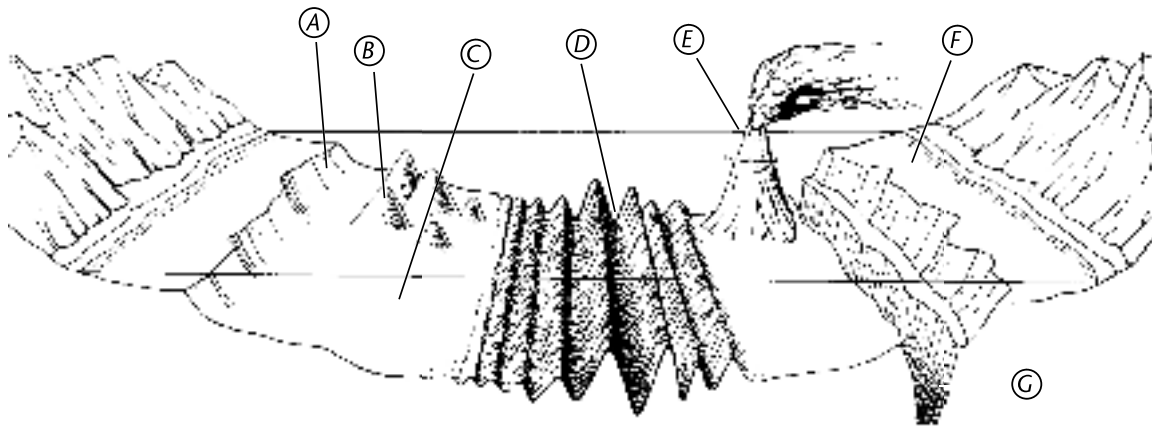
Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. What factors make it difficult to explore the ocean floor?
2. Describe the process of seafloor spreading.
3. Why doesn't Earth get larger when new rock is added to the ocean floor at the mid-ocean ridge?

Building Vocabulary

Match each letter on this diagram with one of the terms listed below. Write the letter on the line before each term. Then define each term in your own words in the spaces provided.



- _____ 4. mid-ocean ridge _____
- _____ 5. trench _____
- _____ 6. continental slope _____
- _____ 7. abyssal plain _____
- _____ 8. seamount _____
- _____ 9. continental shelf _____
- _____ 10. volcanic island _____

Ocean Motions ▪ Section Summary

Ocean Water Chemistry

Guide for Reading

- How salty is ocean water?
- How do the temperature and gas content of ocean water vary?
- How do conditions in the ocean change with depth?

Ocean water contains dissolved salts. The salt that is most common in ocean water is sodium chloride, also known as table salt. Ocean water also contains smaller amounts of magnesium, calcium, potassium, and several other substances.

The total amount of dissolved salts in a sample of water is the **salinity** of that sample. **On average, one kilogram of ocean water contains about 35 grams of salts—that is, 35 parts per thousand.** Salinity is lower near the surface, where precipitation and melting ice add fresh water to the ocean. It is also lower near the mouths of large rivers that empty large amounts of fresh water into the ocean. Salinity is higher where evaporation is high, such as in hot, dry climates. It is also higher near the poles, where surface water freezes into ice and leaves the salt behind.

The dissolved salts in ocean water give it different properties from those of fresh water. Ocean water is more dense than fresh water. Because of its greater density, ocean water has more buoyancy than fresh water. This means that it lifts, or buoys up, less dense objects floating in it.

Like temperatures on land, temperatures at the surface of the ocean vary with location and the seasons. Gases in ocean water vary as well. Two gases found in ocean water that are necessary for living things are oxygen and carbon dioxide.

The surface of the ocean absorbs energy from the sun and heats up. Because warm water is less dense than cold water, the warm water stays on the surface. Surface water is warmest near the equator and becomes colder as you travel away from the equator. Since cold water can hold more dissolved oxygen than warm water, there is more oxygen in polar waters than in tropical waters.

If you could travel from the surface of the ocean to the ocean floor, you would pass through a vertical section of the ocean called the water column. Conditions change greatly as you travel down through the water column. **Temperature decreases as you descend through the ocean.** It drops to about 4°C at 1 kilometer below the surface. Below that, the temperature stays at about 3.5°C throughout most of the ocean. **Pressure increases continuously with depth in the ocean.** This is an obstacle to underwater exploration. A diver can descend safely to only about 40 meters. To go deeper, scientists must use a **submersible**, an underwater vehicle built of strong materials that resist water pressure.

Ocean Motions ▪ *Review and Reinforce***Ocean Water Chemistry****Understanding Main Ideas**

Fill in the spaces in the table below.

The Water Column

Depth Zone	Depth Range	Average Temperature (°C)
Surface	1. _____	2. _____
3. _____	4. _____	4°C–10°C
5. _____	1 km to ocean floor	6. _____

Answer the following questions in the spaces provided or on the back of this sheet.

7. What is the average salinity of ocean water?

8. Name three factors that affect how salty the ocean is.

9. Which is more dense, ocean water or fresh water?

10. What is the most abundant salt in seawater?

11. Why is there more oxygen at the surface of the ocean than in deeper layers?

12. What prevents scuba divers from going deeper than about 40 meters below the surface?

Building Vocabulary

Fill in the space to complete each sentence.

13. A _____ is an underwater vehicle built of strong materials to resist pressure.
14. The total amount of dissolved salts in ocean water is called _____.
15. A vertical section of the ocean from the surface to the ocean floor is referred to as the _____.