

- Oceanographers study the ocean
- Technology (equipment) allows us to study the ocean.
- SONAR: uses sound waves
- Satellites
- Submersibles
- Deep-sea thermometers
- Sample bottles collect ocean water
- Current meters measure speed and direction
- Deep sea cameras
- Sediment corers and grab bring up sediment
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- **Sound travels through water at a speed of 4,800 ft per second.**
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- How SONAR WORKS:
Ocean depth (feet) = Time Elapsed (seconds) / 2 X 4,800 feet/second
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- Time elapsed included the transmitting of the sound or "ping" and receiving of the echo. Half of this time, the sound is traveling to the ocean floor and the other half of the time, the echo is returning to the ship.
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- For example: 12,000 ft = 5 sec / 2 x 4,800 ft/sec
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- Subsurface Topography -Features of the Ocean Bottom
- Valleys, plains, and mountains are found on land. The bottom of the ocean has these too!!!
Learn the following, be able to draw, and label these on a diagram (page 167 workbook).
- Continental Shelf
- Continental Slope
- Seamounts (guyots)
- Abyssal Plain
- Mid-Ocean Ridge
- Trench
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The continental shelf is actually the underwater edge of the continent; the ocean is shallow and rarely more than 180m or 590ft deep

- The continental shelf is covered with gravel, sand, clay, and shells.

The Continental Slope: Beyond the continental shelf, the ocean becomes deeper very quickly, as the edge of the continent drops off sharply to the bottom of the ocean. This is an incline (a steep slope).

- There are deep canyons (some deeper and wider than the grand canyon) believed to have been carved out by underwater currents and gravity flow of mud-laden water down slope.

The Abyssal Plain:

- The abyssal plain is relatively flat
- The ocean floor is covered in a soft fine ooze, or mud made of volcanic dust and the remains of tiny marine organisms.
- Rich deposits of minerals and metals such as copper, zinc, silver, gold in sediments surrounding volcanic seamounts or underwater volcanoes.
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The Mid-ocean Ridge:

- Continuous mountain range that winds around Earth passing through all oceans
- 8,000m long (looks like seams on a baseball)
- Longest mountain range in the world
- The Mid Atlantic Ridge is a tremendous mountain chain about 220 miles wide and 10,000 ft high.
- The Mid Atlantic Ridge joins similar chain that runs through the Indian Ocean and joins chains that run through the Pacific Ocean.
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- Divergent plate boundary where seafloor spreading is occurring. New oceanic crust is made as magma comes up in the ocean floor. Usually the magma forms "pillow lava" (looks like toothpaste). The type of rock that is made here is basalt. Remember oceanic crust is denser than continental crust.
- As new crust is made it pushes the older crust over to the side at a rate of about 5 cm a year. Remember another name for this area is a Rift Valley. The newer crust is nearer the midocean ridge and older crust is farther out on both sides. This is because seafloor spreading has occurred. The Mid Atlantic Ridge is a type of Rift Valley.

Underwater Volcanoes: seamounts or guyots, islands

- Underwater mountains caused by volcanoes.
- Some are tall enough to break the ocean's surface as islands!
- Some are islands that have been weathered and eroded down, some have not reached the surface yet.
- Hawaii, Caribbean Islands are examples.

Trench:

- Steep sided canyon in the ocean floor
- Marianas Trench in the Pacific is 11km deeper (Deeper than Mt. Everest is tall)

Convergent plate boundary: remember two plates coming together one subducts (subduction zone) below the other, Pushing from behind comes from seafloor spreading at mid-ocean ridge

Oceanic-Oceanic - trench and island arc (volcanic arc) will be formed.

Oceanic-Continental - trench and volcanoes on the continent (volcanic mountain range) will be formed. **Density Oceanic Plate > Density Continental Plate**

Remember the denser plate subducts under the less denser plate. Oceanic plate always subducts below the continental plate. When two oceanic plates come towards each other, the one with more density will subduct below the less denser oceanic plate.

Homework: Complete workbook pages 166-167

Oceans Chapter 11 Notes and Study guide

Volume the amount of space something takes up	Mass the amount of matter inside something
Liquid volume is measured in mL (milliliter) or L (liter)	Small amounts of mass are measured in grams (g)
Solid volume is measured in cm^3 or m^3	Larger amounts of mass are measured in kilograms (kg)
1000 mL = 1 L	1000 g = 1 kg

1. The oceans from largest to smallest

- Pacific Ocean
- Atlantic Ocean
- Indian Ocean
- Southern Ocean (formerly Antarctic Ocean)
- Arctic Ocean

2. Billions of years ago, low areas on Earth called basins filled with water to form oceans. In addition to water, oceans contain dissolved salts. Many of them come from rivers that empty into the ocean

3. Saltwater contains:

- Salts (ions of salts) Na^+ and Cl^- of salt NaCl (sodium chloride) = Halite
- Minerals
- Metals (gold, lead, mercury, copper)
- Gases (carbon dioxide, oxygen, nitrogen)

4. One kilogram (kg) of ocean water contains 35 grams of salt
1L = 1kg water

That means there are 35 grams of salt per liter of water (1000 mL)
35 parts salt per 1000 parts seawater = 35/1000
****This is an average

5. The measure of the amount of salt in seawater is called salinity.
The two most common ions in ocean water sodium and chloride, combine to form halite or table salt (NaCl).

6. How did the ocean get salty?

Underwater Volcanic eruptions put chemicals into the water.
runoff from rain passing over rocks and soil on land brings minerals and salts into the rivers that flow to the sea.

In other words: from weathering and erosion of rocks!!!!

CRCT question 1,2 &3

1. Ocean water differs from freshwater in that it has
 - A. a higher temperature.
 - B. a lower temperature.
 - C. a higher concentration of sodium chloride.**
 - D. a higher concentration of silicon dioxide.

2. The salts in the sea come from
 - A. weathering and erosion of rocks.**
 - B. acid rain.
 - C. particles falling from space.
 - D. organisms that live in the sea.

3. Oceans contain many dissolved elements like calcium, sodium, and chlorine and these elements plus others combine to form the salts in the oceans. Which of the following sources is a major source of calcium and sodium in oceans?
 - A. gases from active volcanoes
 - B. weathering and erosion of rocks**
 - C. pollutants from industrial wastes
 - D. acid rain caused by air pollution

7. How does the salinity vary in the ocean?

Less salinity: mouths of rivers, near surface due to freshwater precipitation

More salinity due to evaporation (Red Sea, Mediterranean Sea)

There is more evaporation in warm tropical areas of the ocean (Mediterranean Sea).

Average Ocean Salinity Ranges from

34 - 37 ppt (parts per thousand) salt to water

Red sea 41 ppt

CRCT question 4

- Tropical seas have a high rate of evaporation. Because of this, the water in tropical seas will have higher:
 - A. wave crests.
 - B. amounts of algae.
 - C. daily temperatures.
 - D. salt concentrations.**
- Answer D. Salt concentrations

8. Salt water has a lower freezing point than freshwater. This is why we add salt to bridges and roads during ice storms. Salt water freezes at $< 32^\circ\text{F}$ or $< 0^\circ\text{C}$

Why- because salt acts as an antifreeze and interferes with the formation of ice crystals.

Salt water	Freshwater
> Greater than	< Less than
Cold water	Warm water
> Greater than	< Less than

Oceans
Powerpoint Pg 1