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EARTH SCIENCE – UNIT 1 – CHAPTERS 18 & 19 NOTES

OCEAN MOTION & OCEANOGRAPHY

18.1 Origin of Oceans

- 4000 MYA: Volcanic activity released a lot of water vapor.
The water vapor accumulated in the atmosphere & condensed into storm clouds.
When it rained, the water filled basins (low areas on Earth).
- REMEMBER: The Earth didn't always look the same as it looks now!
- 70% of the Earth is covered with water.

18.1 Ocean Salinity

- Salinity = the amount of solids (EX: salts) dissolved in seawater
- 4 most common ions in the ocean:
 - chloride (55%)
 - sodium (31%)
 - sulfate (8%)
 - magnesium (4%)
- Salts are released from volcanic activity.
- Why is the ocean salty?

18.2 Surface Currents

SEE MAP ON PAGE 518

- Surface Current = movement of the upper portion of the ocean water, powered by wind
This produces horizontal movement of the water – not vertical movement!
PROOF: floating message bottles
- Surface currents are deflected (bounce off) by continents.
- Most west-coast currents are cold.
- Most east-coast currents are warm.

18.2 Upwelling

- Upwelling = the rising of cold water from deep in the ocean to the surface
- only occurs near a coastline
- caused by surface winds
- brings nutrient-rich waters from deep in the ocean up to the surface
- 2 effects of upwellings:
 1. brings cooler weather to these coastal areas (because the water is cold)
 2. brings a lot of fish to these coastal areas (because the water has so many nutrients)

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18.2 Density Currents

- Cold water is more dense than warm water.
- Also, high salinity water (salty water) is more dense than low salinity water (fresh water)
- Density Current = when more dense ocean water sinks under less dense ocean water.

- EX: Mediterranean Sea

- Water is warmed and rises.
- Some water evaporates, leaving salt behind.
- The water sinks because it now has a high salt content.
- The water flows into the Atlantic Ocean.

****DRAW CYCLE DIAGRAM OF THE MEDITERRANEAN DENSITY CURRENT****

- EX: Antarctica

- Water is warmed and rises.
- Water forms ice, but the ice doesn't contain any of the salt.
- The water sinks because the water that didn't freeze now has a high salt content.
- The water flows into the Atlantic and Pacific Oceans.

****DRAW CYCLE DIAGRAM OF THE ANTARCTIC DENSITY CURRENT****

18.3 Waves

- Wave = a rhythmic movement that carries energy through matter or space
EX: ocean wave, earthquake waves (P, S, surface), electromagnetic waves (sunlight)

- Crest = the top of the wave

- Trough = the bottom of the wave

- Wave Height = the distance from the crest to the trough

- Wave Length = the distance from one crest to the next crest

****SHOW DIAGRAM OF A WAVE AND LABEL CREST, TROUGH, HEIGHT & LENGTH****

- EX: Suppose you place a ball in the middle of the ocean. (This is different near the shore.)

As waves pass, the ball will move vertically (up and down).

It will NOT move horizontally (forward or backward, left or right).

Only the energy moves through the water – not the water particles themselves!

18.3 Waves Near the Shore

- Near the shore, waves change shape because they start to drag against the bottom of the ocean.
- The wavelength gets shorter and shorter as it reaches the shore.
- The top of the wave moves faster than the bottom of the wave.
- The top of the wave is not slowed down as much by the ocean floor.
- The top of the wave outruns the bottom of the wave. This is when the wave “breaks”.
- Breaker = an ocean wave that collapses and tumbles forward as it reaches the shore because the top is moving faster than the bottom

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18.3 Tides

- the periodic rise and fall of the surface level of the oceans
 - caused by a giant wave formed by the gravitational attraction between the sun, moon, and Earth
 - one tidal cycle takes 12 hours and 25 minutes
 - two tidal cycles take 24 hours and 50 minutes (just slightly longer than 1 day)
 - tidal range = the difference in ocean level between low tide and high tide
 - As the Earth rotates, the side closest to the moon gets a high tide.
 - The opposite side also gets a high tide.
 - The two sides in between those sides get a low tide.
 - Spring Tide = the sun, moon, and Earth align (makes higher high tides + lower low tides)
 - Neap Tide = the sun, moon, and Earth are at a right angle (lower high tides + higher low tides)
- **SHOW DIAGRAM OF EARTH + MOON → HIGH AND LOW TIDES****
- **SHOW DIAGRAM OF EARTH, SUN, AND MOON → SPRING AND NEAP TIDES****

19.1 Ocean Features

- Continental Shelf =
the gradually sloping end of a continent that extends out under the ocean
- Continental Slope =
the ground that extends from the edge of the continental shelf and dips steeply down to the ocean floor
- Abyssal Plain =
the flat seafloor in the deep ocean
- Mid-Ocean Ridge =
the place where new ocean floor forms
resembles an underwater mountain chain
formed when tension forces create a divergent plate boundary in the middle of the ocean
EX: Mid-Atlantic Ridge
- Trench =
a long, narrow depression (deep part) in the ocean floor
located where the thinner ocean plate slides under a thicker continental plate
occurs at an ocean-continent convergent plate boundary
EX: Peru-Chile Trench off the western coast of South America
The Nazca Plate (oceanic) slides into/under the South American Plate (continental)