Dynamic Planet

ScioVirtual Lesson 3, 10/31

Quick review of last week's worksheet

Kahoot to review last week's topics!

Moving on to today's lab!

But first...a review of density!

Density is the degree of compactness of a substance; how much mass is in a given volume

Today we're making density columns!

The density columns will end up looking very similar to the structure of the ocean! Here are the needed materials; try to find them all!

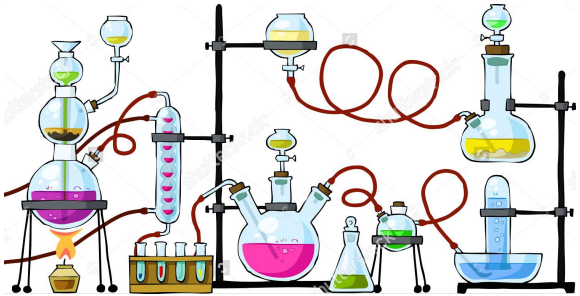
- Some type of clear container (empty plastic water bottles and tall cups work fine)
- Food coloring (optional)
- Any of the following liquids: honey, corn syrup, maple syrup, whole milk, dish soap, water, vegetable oil, rubbing alcohol, lamp oil
- Some small, solid objects, such as beads (optional)
- Please ask your parents if you need help finding materials!



Procedures

Follow the lab procedures carefully to get the best results!

- Add food coloring to any clear liquids so we can see them more clearly
- Start adding the liquids into your container! Go in this order: honey, corn syrup, maple syrup, whole milk, dish soap, water, vegetable oil, rubbing alcohol, lamp oil
- Take your time pouring, and try to pour into the center of the container
- Some of the more runny liquids, like water, vegetable oil, and alcohol, may need to be poured against the side of the container
- When your density column is complete and has settled into its layers, gently drop in your solids to see where they end up!



Procedures video



Why does this work?

Why do the liquids form layers instead of mixing together?

- The answer is density! All of the liquids used in this lab had different densities
- The more dense something is, the more mass it has, and therefore the “heavier” it is. This is why denser liquids will sink to the bottom of our density column, while less dense liquids will float on top. Same goes for all the solid objects we dropped into the density column
- This is very similar to the structure of the ocean! Because the density of ocean water increases with depth, it allows layers to form based on density!

Material	Density (g/cm^3)
Honey	1.42
Pancake Syrup	1.37
Light Corn Syrup	1.33
Dish Soap	1.06
Milk	1.03
Water	1.00
Ice Cube	0.92
Vegetable Oil	0.92
Baby Oil	0.83

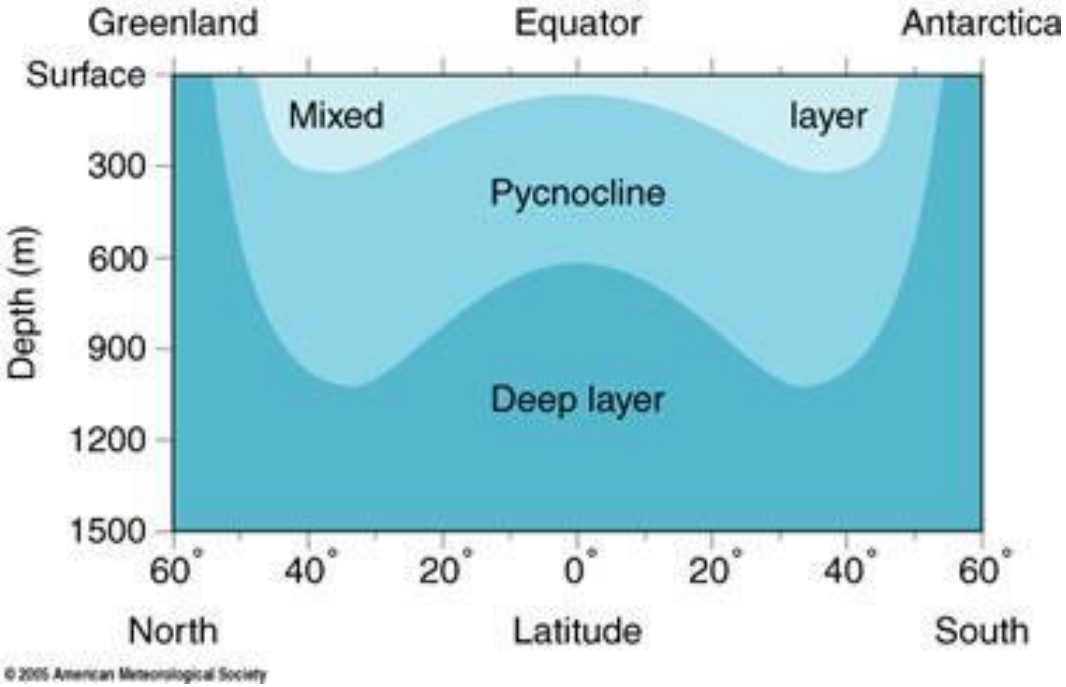
Today’s lesson: ocean structure

Ocean structure

There are generally two ways we structure the ocean: by layers, and by zones. Let's talk about the ocean's three-layer structure

- The ocean's three-layer structure is divided by density. The three layers are the mixed/surface layer, the pycnocline, and the deep layer
- Mixed layer: lowest density. Wind stirs surface waters, creating a well-mixed layer of nearly uniform density and uniform temperature. Wind-driven currents occur in the top 100 meters, and both mechanical and convective mixing occur
- Pycnocline: region with rapid increase in density with depth. Typically extends to 500-1,000 meters. Very stable, so helps suppress mixing between mixed and deep layers
- Deep layer: densest layer. Makes up around 90% of ocean volume. Consistent temperature, high salinity, and very stable due to high density and separation from mixing. Water moves slowly; in only a few places near the bottom is it fast enough to be a current

Ocean structure

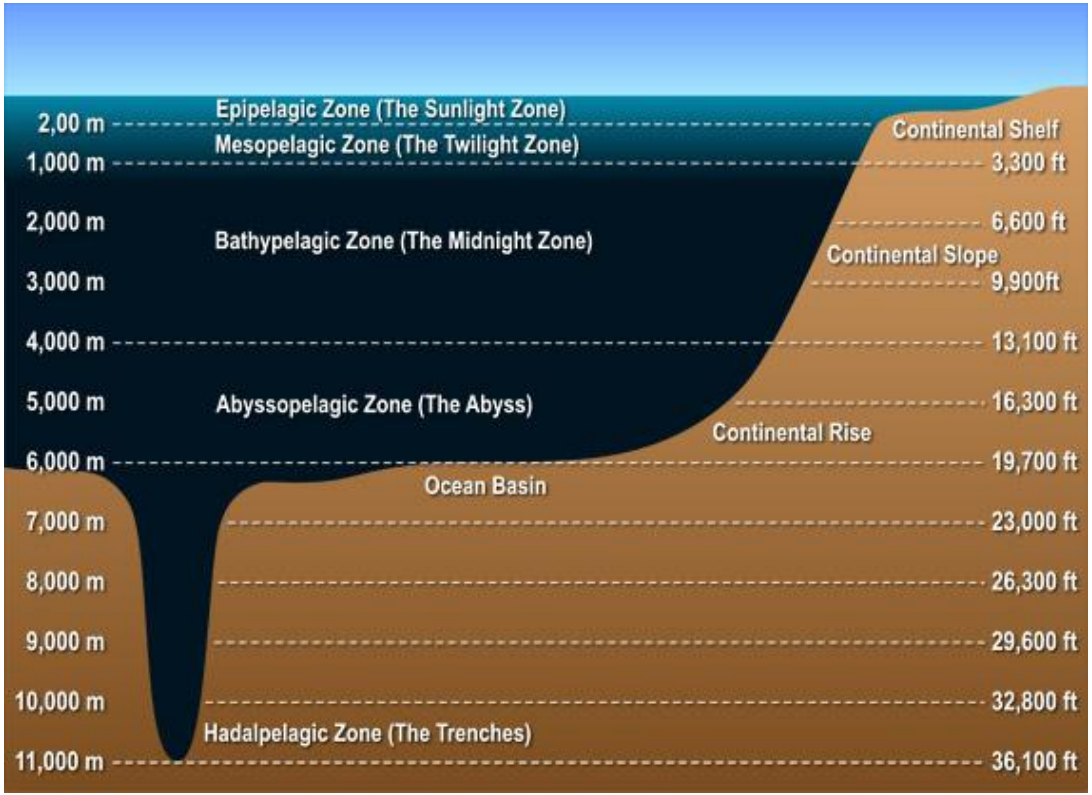


Ocean structure

Now, let's discuss the five zones of the ocean! In order from top to bottom:

- Epipelagic zone: known as the "sunlight zone" because it has the most visible sunlight; photosynthesis occurs here. Roughly equivalent to the photic zone. Wide range of temperatures occur in this zone
- Mesopelagic zone: also known as the "twilight zone" or "midwater zone". We begin seeing bioluminescent creatures here
- Bathypelagic zone: known as "midnight zone" or "dark zone". The only visible light here is produced by organisms. Most animals here are red or black due to lack of light. Pressure can reach 5,580 pounds/square inch
- Abyssopelagic zone: known as "abyssal zone" or "the abyss". No light at all; water temperatures are near freezing. Most creatures here are invertebrates like basket stars and tiny squids. Three-quarters of ocean floor lies within this zone
- Hadalpelagic zone: contains mostly deep water trenches and canyons. Temperatures are just above freezing, pressure can reach 8 tons/square inch. Invertebrates like starfish and tubeworms can thrive at this depth

Ocean structure



Overview Video



For next week...

Pretty much the same as the past few weeks!

- I'll be sending out an email with class updates for this week pretty soon! Once again, make sure both you and your parents are reading these
- As always, the recording and presentation will be posted on the Google Classroom
- I'll also be making another review worksheet covering this week's topics. I highly encourage everyone do these worksheets, because they're good practice and will help you retain information so much better!
- We will be playing a review game and taking a quiz over general ocean information next week!! This will cover all the topics from the past two meetings. I may release a short study guide for that, if everyone wants

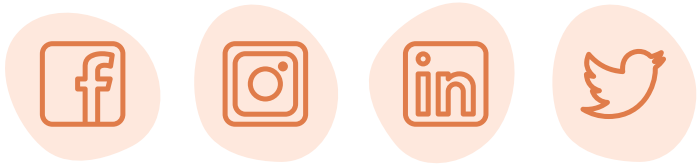
HAPPY HALLOWEEN EVERYONE!! 🎃



Thanks

Any questions?

Have a fun and safe Halloween! Be on the lookout for our next class updates email, and start preparing for next week's quiz!



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