

Ocean History

You should be able to identify a few of the key cultures, individuals and expeditions in the history of marine science:

Phoenicians Arabs Micronesians Polynesians

Aristotle Erikson Columbus Magellan

Cook Darwin Cousteau Alvin

**Voyage of the Beagle The Wilkes Expedition The Challenger Expedition
LEO/COOL**

Be able to define and describe modern technology as used by marine scientists: **sonar, scuba, submersibles (submarines, ROV's & AUV's) and satellites**. Who is Alvin?

Ocean Geography

Be able to describe the **big bang theory** for the origin of the universe. How old is the Universe? Planet Earth?

The earth consists of three layers, the **core, mantle, and crust**.

- How do these layers differ?
- How are they arranged?
- Be able to use and define **density** in your answers: **Density = Mass/Volume**

Be familiar with the relative size and location of the four major ocean basins: **Pacific, Atlantic, Indian & Arctic**. How do these compare to the **Southern Ocean**? Why is the Southern Ocean not included with the others?

Be able to use the above terms to describe the formation of island chains along a trench (e.g. Aleutians, Marianas). How does this compare to the formation of island arcs over a hotspot (e.g. Hawaiian Islands)?

Be familiar with the range of geological and climatic changes in earth's history.

How has Plate Tectonics affected the earth's temperature? biological communities?

Be able to define and describe these regions of the ocean:

hydrothermal vent

abyssal plain

Guyot

continental shelf

trench

Mid ocean rift

continental slope

mid-ocean ridge

Volcano

Chemical and Physical Features of the World Ocean

Understand:

1. the chemical nature of pure water
2. the nature of sea water and its effects on temperature, density, light, etc.

You should be familiar with the basic ideas of chemistry as it pertains to water:

- substances are made of **atoms**
- atoms combine to make **molecules**
- water molecules are made of two hydrogen atoms and one oxygen atom (H₂O)
- water molecules have polarized electrical charges
- **the polar nature of water makes water 'sticky'**; water molecules form **hydrogen bonds** with other water molecules and with other substances

Know how much salt is in the oceans.

Learn the steps in the Hydrologic Cycle and how salt enters the oceans & why & how it is left behind when water evaporates.

Learn these numbers:

- a) Percent of water covering the earth's surface;
- b) Salinity of sea water.

Know the two elements contained in table salt & the chemical formula for salt.

Know 4 critters that take calcium out of sea water. Know 1 critter that takes silica out of sea water.

Know what coral is made of & its chemical formula.

Has the ocean always been as salty as it is now?

Know 2 places where the ocean is saltier than out in the middle of the Atlantic & where it is NOT as salty.

Be able to describe the importance of water to moderating the temperatures of individuals and the entire planet.

- Why does water have a high **heat capacity** and what does this mean?
- What role does **evaporation** play in moderating temperatures?
- What **special properties of ice** protect marine organisms?
- Water is also critical to life as a **solvent**. Explain.
What is the average salinity of seawater?

What effects salinity?

What are the two major solutes found in seawater?

Be able to describe one method for sampling water at different depths.

What is the relationship between temperature, salinity and density of seawater?

Be able to describe the effect of seawater on light (transparency) and pressure. How do these conditions vary with depth?

Physical Ocean Stuff

Be able to define and describe the relationships between the **Coriolis effect**, wind patterns and surface currents in the ocean. What are **ocean gyres**?

Which areas of the ocean tend to be warmer - eastern or western?
Explain.

What is a **wave**? Be able to describe the motion of a wave, the movement of water

particles within a wave, and why a wave **breaks** and forms **surf**. What are **tsunamis**? What was the cause of the tsunami of 2004?

What are **tides**? Explain the relative effect of the moon and sun on the tides. When do high tides occur, when do low tides occur, and how long between high tides?

What are **neap tides** and **spring tides**? How do these vary with the lunar cycle? What is **tidal range**?

The ocean is typically **stratified** into layers: **surface layer**, **intermediate layer**, and the **deep and bottom layers** (these last two are usually combined, why?). Be able to describe the physical characteristics of these layers in terms of temperature and density. Which of these layers is least stable? What is the relationship of these layers to the **photic zones** (euphotic, photic, aphotic)? Compare these layers between the tropics and temperate zones.

What is the **great ocean conveyor**? Other terms to be able to define, describe or use:

density	equatorial	gyre	El nino
trade winds	currents	mixed layer	wave length
wavelength	period	dissolved gases	Wave height
thermocline	salinity (ppt)	wave crest	Tides
		trough	