

DataStreme Ocean Learning Objectives

Unit 1: The Ocean's Size and Scale

- Investigate how map projection choices influence the interpretation of oceanographic data and spatial patterns.
- Identify and differentiate the five major ocean basins by geography and oceanographic criteria.
- Describe how we observe the ocean and the uses of different types of observations.
- Summarize the formation and evolution of Earth's oceans from 4.4 Bya to the present.

Unit 2: Ocean Chemistry

- Identify the physical and chemical properties of water that make it essential to Earth's systems.
- Identify the elements, compounds, and ions found in seawater and describe how they cycle through the ocean.
- Describe why the major dissolved constituents of seawater remain relatively constant despite changes in local salinity.

Unit 3: Ocean-Atmosphere interactions

- Examine the role of water in regulating and distributing energy in Earth's climate system
- Explain how unequal heating of Earth's surface creates differences in atmospheric pressure that drive global atmospheric circulation.
- Analyze how the transfer of heat and moisture through the atmosphere connects the water cycle with global wind patterns and weather systems.

Unit 4: Surface Currents

- Explain how prevailing winds, the Coriolis effect, continental boundaries, and friction combine to create the pattern of surface ocean currents.
- Predict the pathways of floating objects or marine debris within ocean gyres.
- Analyze how surface ocean currents redistribute heat around the globe and influence regional weather and climate.

Unit 5: The Global Conveyor Belt

- Evaluate relationships between salinity, temperature, and seawater density.
- Explain how deep-water formation and thermohaline circulation connect the world's ocean basins.

Unit 6: Waves

- Describe how generating forces and restoring forces produce different types of ocean waves, including wind waves, tsunamis, and tides.
- Examine how changes in water depth and variable bathymetry affect the movement of waves.
- Analyze how constructive and destructive interference affect wave height.

Unit 7: Tides

- Explain the astronomical factors that produce tides, including Earth-Moon-Sun gravitational interactions.
- Explain how tides can be mathematically modeled using partial tide components.
- Distinguish between tidal types: semidiurnal, diurnal, and mixed tides.

Unit 8: Coasts and Estuaries

- Describe the differences between active and passive continental margins and how their bathymetry affects coastal characteristics and processes.
- Classify estuaries by geologic origin and water-circulation patterns, and describe how they protect shorelines.
- Explain how coastal upwelling develops and evaluate its effects on nutrient availability, primary productivity, and fisheries.
- Interpret maps, satellite imagery, and coastal observations to explain how hurricanes interact with coastal environments and how coastal features influence storm impacts.

Unit 9: Life in the Ocean

- Classify regions of the ocean from different perspectives to gain an understanding of their physical and biological characteristics.
- Predict the dominant phytoplankton species that will bloom in a given region based on the environment's characteristics, including sunlight and nutrient availability.
- Explore the movement of energy through trophic levels using food chain and food web diagrams
- Compare two marine ecosystems by evaluating how differences in physical conditions and biological communities influence ecosystem productivity, biodiversity, and resilience.

Unit 10: Changes in the Ocean

- Describe major sources and types of marine pollution and their effects on marine ecosystems.
- Interpret maps, graphs, and other oceanographic data to identify trends in sea surface temperature, sea level, and ocean acidification.
- Analyze the link between anthropogenic greenhouse gas emissions and trends in ocean heat content, sea level, dissolved oxygen concentrations, and pH.