



1. **DESCRIPTION:** Teams will complete tasks related to physical and geological oceanography.
A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 50 minutes
CALCULATOR: Class II

2. **EVENT PARAMETERS:**
 - a. Each team may bring a binder of any size containing information in any form and from any source. Sheet protectors, lamination, tabs, and labels are permitted. If the event features a rotation through a series of laboratory stations where the participants interact with samples or displays; no material may be removed from the binder throughout the event.
 - b. Each team may bring two Class II calculators.

3. **THE COMPETITION:** Participants will be tested over the following topics in the form of an exam and/or timed stations:
 - a. Seawater properties' distributions and the processes affecting them:
 - i. Temperature (e.g. thermocline, sea surface temperature)
 - ii. Salinity (e.g. effect of water cycle, salt sources)
 - iii. Pressure & density (e.g. three-layer model, stratification, mixing)
 - iv. Other properties (e.g. nutrient concentrations, pH, chlorophyll)
 - b. Surface circulation:
 - i. Warm and cool currents
 - ii. Coriolis effect
 - iii. Surface convergence and divergence
 - iv. Western intensification
 - v. Ekman transport
 - vi. Eddies
 - c. Large-scale circulation:
 - i. Thermohaline circulation
 - ii. Global ocean energy transport
 - iii. Water masses and fronts
 - iv. Deep water formation
 - d. Waves:
 - i. Wave types (e.g. wind waves, tsunamis, storm surge) & their formation
 - ii. Wave interaction with coasts (e.g. surf, wave shoaling)
 - iii. Related properties, including but not limited to wave velocity, wave height, wavelength, period and fetch
 - e. Tides:
 - i. Diurnal/semidiurnal/mixed patterns
 - ii. Spring/neap tides
 - iii. Resonance
 - iv. Tidal currents
 - f. Coastal features and processes:
 - i. Estuaries
 - ii. Coastal erosional and depositional landforms
 - iii. Formations of coral reefs; atolls
 - iv. Longshore currents, rip currents
 - v. Coastal upwelling and downwelling
 - g. Geological oceanography:
 - i. Tectonic processes in ocean basins (e.g. seafloor spreading and associated evidence, oceanic crust composition and evolution)
 - ii. Ocean floor features (e.g. ridges, seamounts, trenches, continental rise/slope/shelf)
 - iii. Oceanic sediment (e.g. sediment types, turbidity currents/turbidites, abyssal plains)
 - h. Climate variability and change:
 - i. Atmosphere/ocean variability, limited to El Niño Southern Oscillation, Pacific Decadal Oscillation, Southern Annular Mode
 - ii. Ocean climate change effects (e.g. sea level rise, thermal expansion, coastal flooding, acidification, deoxygenation)



- iii. Oceanic tools used for research (e.g. water samples, sediment cores, seawater velocity trackers, sonar and acoustic sensing, CTD devices)
4. **SCORING:** Points will be awarded for the quality and accuracy of responses. High score wins. Ties will be broken by the accuracy and/or quality of answers to selected questions.

Recommended Resources: The Science Olympiad Store (store.soinc.org) carries a variety of resources to purchase; other resources are available on the Event Pages at soinc.org.

In partnership with the National Oceanic and Atmospheric Administration (NOAA) and the North American Association for Environmental Education (NAAEE)

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