

## Study Guide for OCEA 112 Midterm 1

### General Oceanography

Define ocean. Define oceanography. What are the 4 main disciplines in oceanography?

What is the scientific method? What is the difference between a hypothesis, a theory, and a law?

What do latitude and longitude measure? How would you measure them using only a clock and a protractor?

### Origin of the solar system, Earth, and the oceans

Describe the *Big Bang*.

Explain the condensation theory of the formation of the solar system.

Where did Earth's oceans and atmosphere come from?

What was the *oxygen revolution*?

What did the Miller and Urey experiment of 1952 show? What did it *not* show?

How does radiometric age dating work?

### Plate Tectonics

What did Alfred Wegener propose? Why were his ideas rejected? What was Pangaea?

Name the layers of the earth (core, mantle, asthenosphere, etc.) How are these layers arranged?

Describe the general idea of *plate tectonics*.

What are the three ways plates can move relative to one another? Provide examples of each type of plate boundary.

What are the differences between oceanic crust and continental crust? What are they made of? Which is lighter?

Explain *isostatic equilibrium*, and how it relates to the lithosphere riding on the asthenosphere.

What generates the energy that moves the crustal plates? What is the mechanism by which the plates move?

What is the mid-ocean ridge and how is it formed?

How is a divergent plate boundary formed? Sketch the cross-section of a typical divergent boundary.

What happens when two oceanic plates collide? When two continental plates collide? When an oceanic plate collides with a continental plate? What kind of earthquakes result in each scenario? Do volcanoes appear in each scenario? What causes them? Sketch cross-sections of convergent plate boundaries, showing all pertinent features.

What is the Ring of Fire?

Explain island arcs.

Describe the Wilson Cycle of Ocean Evolution.

Explain the Hawaiian Islands. How were (are) they formed, and what do they tell us about the movement of the Pacific Plate? What is a mantle plume?

What are the direct and indirect evidence for continental drift?

What does the orientation of magnetite in a rock tell us?

Explain Darwin's theory of coral reef formation.

### Ocean Basins

What is bathymetry? Offer at least two ways to measure ocean depth.

Sketch a cross-section of an Atlantic style ocean basin and a Pacific style ocean basin. Label all the parts.

What are continental shelves? What type of crust do they have? How were they formed?

What type of crust do the deep ocean basins have?

What is meant by a *passive* continental margin and an *active* continental margin?

What are submarine canyons? How are they formed? What are turbidity currents? How do they relate to submarine canyons?

What is a black smoker? Why is it called that? What comes out of a black smoker?

Where does the water come from that emerges from a hydrothermal vent? Describe it in terms of temperature and mineral content. Draw a cross-section of a midocean ridge emphasizing the path of water that eventually emerges from the vents.

What is the abyssal plain?

What is the difference between a seamount and a guyot?

## Study Guide for OCEA 112 Midterm 1

### Sediments

- What are the 4 main categories of sediments? Which of these is the most abundant?
- What is the difference between neritic sediments and pelagic sediments?
- What are the sources of terrigenous sediment material?
- Name three ways terrigenous sediment can be transported to the sea.
- What is the source of most beach sand in San Diego County? What is the source of most clay? Why is much of the abyssal plain covered with clay? Why do the continental shelves, slopes and rises have so much sand?
- What does *lithification* mean? What does sand become in the lithification process? Clay?
- What are the two minerals that comprise most biogenous sediments?
- What is the definition of a biogenous ooze?
- What is limestone, how and where is it formed? What organisms are the biggest sources of limestone?
- What are the major organisms that give us calcareous ooze? How are calcareous oozes distributed around the world? What does a calcium carbonate rock (like limestone or chalk) tell us about the conditions under which it was formed?
- What are the major organisms that give us siliceous ooze? How are siliceous oozes distributed?
- How do most pelagic biogenous sediments reach the seafloor?
- How are hydrogenous sediments formed? Name a few examples of hydrogenous sediments. What do hydrogenous sediments tell us about the geological history of the Mediterranean Sea?
- Where do cosmogenous sediments come from? What happened 65 million years ago relating to cosmogenous sediments?

### Seawater Chemistry and Physics

- What are the 3 major subatomic particles? What are their electrical charges?
- How does a covalent bond work? How does an ionic bond work?
- Why do we say water has *polar* molecules? What remarkable attributes does water owe to its polar nature?
- What is the difference between temperature and heat? What does adding heat to an object or fluid do?
- What is meant by *heat capacity* (aka *specific heat*)? Why is water's high heat capacity so important for Earth?
- What are the latent heats of fusion and vaporization?
- Why does ice float? Why is this significant for life on earth?
- Why are so many elements dissolved in seawater?
- How is *salinity* defined? What is the average salinity of the ocean?
- What are the sources of the salts in seawater?
- Why doesn't the ocean get saltier with time? In other words, what are the *sinks* of salts in the ocean?
- What is the *principle of constant proportions*? Why does it save oceanographers time?
- What are the various ways salinity can be measured? How should it *not* be measured? What is the easiest and most popular method today?
- When a region of ocean has high salinity, what does that suggest? What is suggested by low salinity?
- Which dissolves gases more readily, warm water or cold water?
- Why does calcium carbonate dissolve at great depth and in polar regions?
- What is meant by residence time, mixing time, conservative and nonconservative constituents?
- What three things can light do when encountering an object or fluid?
- If an object is blue, what does that tell you? What if it is white? Black? What colors do green plants absorb?
- What color light is absorbed most readily by seawater? What color light transmits the farthest?
- Why are many deep-sea creatures red?
- What happens when cold salty water encounters warm fresh water? Why?
- Describe the components in the two-layer model of the ocean, in terms of temperature, salinity, and density.
- Why is the temperature structure of the ocean so stable?
- Why do people and some animals use acoustics (sound) to see in the ocean? What are the two main categories of sonar?
- Explain the concept of *diffraction*.
- What special conditions in the vertical temperature and pressure structure of the sea permit sound to travel thousands of miles?