UNIT 9 LEARNING OBJECTIVES

See the Bio 183 Unit 9 website.

UNIT 9 ACTIVITIES

Step 1: Read Chapter 3 in your textbook (Marine Biology, 9th ed., by Castro and Huber) and answer the questions in these worksheets. For hints or to double-check your answers, go to the Biology 183 website.

Step 2: For lab points, do the textbook lab activity entitled “Exploring Ocean Currents.” There are worksheets for this activity later in this packet. Directions are on the Biology 183 website. This lab may be completed at home and does NOT require Internet access. When you have completed the lab activity, take your results to the front desk in the Biology Learning Center to receive lab points.

Step 3: For lab points, do the lab activity entitled “Density, Temperature, and Salinity.” This lab must be completed at the Biology Learning Center. When you have completed the lab activity, take your results to the front desk in the Biology Learning Center to receive lab points.

Step 4: Optional Extra Credit Assignment: For up to 10 extra credit points, do the extra credit assignment “Our Changing Planet.” The worksheets for this extra credit assignment can be downloaded from the Unit 9 web page. When you have completed this assignment, you can turn it in via D2L’s Dropbox or turn in the worksheets at the front desk of the Biology Learning Center. You instructor will grade them and return them in a few days.

Step 5: Optional: Learn more about the Coriolis effect by visiting the website linked to the Unit 9 web page.

Step 6: Prepare for the Unit 9 exam. The exam will consist of 40 multiple-choice questions. Thirty-two questions will be “factual” in nature (to assess whether you learned the facts in this unit). Some of these 32 questions may come from material you learned during your lab activities. To prepare for the 32 “factual” questions, try the multiple-choice practice quiz for Unit 9. Go to the Biology 183 website for the link to this practice quiz. The answers are at the end of the practice quiz.
Five questions will assess your deeper understanding of the themes and concepts of the material in this unit (to assess whether you have "synthesized" the information, not just memorized the facts). The critical thinking questions at the end of your worksheets will help you study for these 5 questions. The last 3 questions will be geography-related questions.

Step 7: Come in to the Biology Learning Center to take your Unit 9 exam. The exam will consist of 40 multiple-choice questions.

Step 1: Textbook Worksheets

The Waters of the Ocean: The Unique Nature of Pure Water

1. Define atom.

2. Define element.

3. Define molecule.

4. Describe hydrogen bonds in water molecules. (Fig. 3.1)

5. Describe the three phases of water. (Fig. 3.3)
   1. 
   2. 
   3.
6. What is heat capacity? How does the heat capacity of water affect the marine environment?

7. Why is water called the universal solvent? (Fig. 3.5)

8. What are ions?

The Waters of the Ocean: Seawater

9. What are the sources of the salts dissolved in sea water? (Fig. 3.6)

10. What is salinity? What is the typical salinity of sea water?

11. What are the seven most abundant ions in sea water? (Table 3.1)

1  
2  
3  
4  
5  
6  
7
12. What is the rule of constant proportions? How does it relate to seawater salinity?

13. Describe how evaporation and precipitation affect salinity.

14. How do salinity and temperature affect density of sea water?

15. Describe the range of temperature and salinity in the ocean.

16. Describe how temperature data are collected in the ocean.
17. Describe a typical temperature profile in the ocean. Define the term thermocline. (Fig. 3.8)

18. Describe the pattern of sea surface temperature in the ocean. (Fig. 3.10)

19. List the three most important dissolved gases in the ocean.
   1
   2
   3

20. How does temperature affect dissolved gases?

21. What are the factors that affect the transparency of sea water? What are the biological implications of reduced transparency?

22. Describe how sunlight is filtered out with depth in sea water. (Fig. 3.11)
23. Define pressure and describe how it changes with depth in the ocean. (Fig. 3.14)

24. How does pressure limit the depth range of marine organisms (and scientific instruments, too)?

Ocean Circulation: Surface Circulation

25. What is the Coriolis effect? How does it affect large-scale winds and currents? (Fig. 3.16)

26. How does solar energy create wind in our atmosphere? (Fig. 3.17)

27. Describe the major wind patterns on the earth. (Fig. 3.18 and 3.20)
28. How do large-scale winds create surface ocean currents?

29. What is a gyre? Describe the North Atlantic gyre. (Fig. 3.21)

Ocean Circulation: Thermohaline Circulation and the Great Ocean Conveyor

30. Why is water in the ocean usually layered? (Fig. 3.22)

31. Describe the three layers of the ocean (Fig. 3.22)
   
   surface layer:

   intermediate or mixed layer:

   deep and bottom layers:
32. Why does ocean water sometimes overturn? (Fig. 3.23)

33. What is thermohaline circulation?

34. What is the Great Ocean Conveyor? (Fig. 3.25)

**Waves and Tides: Waves**

35. Describe the parts of a wave: crest, trough, height, wave length, and period. (Fig. 3.26)

![Diagram of wave parts]

36. What is the fetch?

37. What factors influence the size of waves?
38. What are seas? What are swells? What is surf?

Waves and Tides: Tides
39. What are tides?

40. Why are there tides? (Fig. 3.31)

41. Why are there tidal bulges of water on both sides of the earth, not just on the side facing the moon (or sun)? (Fig. 3.31)

42. What is centrifugal force? (Fig. 3.31)

43. How does the spin of the earth on its axis affect tides on the earth? (Fig. 3.32)
44. Why is a full tidal cycle 24 hours and 50 minutes long? (Fig. 3.32)

45. Define the term “tidal range.”

46. What is the relative strength of the sun’s influence on the earth’s tides compared to the moon’s influence?

47. Explain spring tides. (Fig. 3.33)

48. Explain neap tides. (Fig. 3.33)

49. Explain why tides vary from place to place on the earth. (Fig. 3.35)

50. Explain semidiurnal tides. (Fig. 3.34)
51. Explain mixed semidiurnal tides. (Fig. 3.34)

52. Explain diurnal tides. (Fig. 3.34)

53. What is a tide table?

Critical Thinking Questions

54. The winter of 1984-85 was particularly cold in Europe. The northern part of the Black Sea, which lies between the Ukraine, Russia, and Turkey, froze, which is rare in the normally mild climate. The Adriatic Sea, located to the east, had just as cold a winter but never froze. The Black Sea has unusually low salinity of about 18%. What would you guess about the salinity of the Adriatic Sea?

54. Just for the fun of it, someone walking along the shore in Beaufort, South Carolina, throws a bottle with a message in it into the sea. Some time later, someone in Perth, on the west coast of Australia, finds the bottle. Referring to the fold-out map in your textbook or Figure 3.20, can you trace the path the bottle probably took?
55. If you owned a seaside home and a bad storm brought heavy winds and high surf to your coastline, would you prefer it to be during a new moon or a quarter moon? Why?

56. Geographic literacy is a component of this class. You need to be able to locate and identify the following ocean regions and locations (all of which are discussed in Chapter 9) on a map of the world for your Unit 9 test and you also are responsible for all geographic terms from past units: Papua New Guinea, the Philippines, the Caribbean Sea, North America, South America, Southern Ocean, Hawaiian Islands, Aleutian Islands, Marianas Trench, Galápagos Islands, Central America, Indian Ocean, Antarctica, Africa, Pacific Ocean, Bering Sea, Arctic Ocean, Atlantic Ocean, Greenland, Sargasso Sea, Indonesia, Bahamas, Japan, Bermuda, Gulf of Mexico, Gulf of California, Alaska, New Zealand, Polar, Temperate, Subtropical, and Tropical, Australia, Mediterranean Sea, Red Sea, Black Sea, Europe, Marine Biology Laboratory, Woods Hole, Massachusetts (approximate location), and Scripps Institution of Oceanography, La Jolla, California (approximate location).

There is a foldout map at the back of your textbook to help you, plus there are maps in the BLC.