

# Oceans

**Grade Level:** 6th Grade  
**Written by:** Melissa O'Shaughnessy and Susan Anthony of Newark, DE  
**Length of Unit:** Twelve lessons

## I. ABSTRACT

This unit will focus on *Oceans*, a 6th grade unit in the *Core Knowledge Sequence*. Students will learn about the subdivisions of the world ocean, subsurface land features, the ocean-bottom, composition of seawater, currents, tides, waves, and marine life. There will be activities that are based on the science process skills. These activities will include observing, classifying, measuring, inferring, predicting, representing data, and experimenting. Additionally, the unit culminates with a squid dissection and a research project on marine life.

## II. OVERVIEW

### A. Concept Objectives

1. The students will understand the configuration and the subdivisions of the world ocean.
2. The students will understand the features that comprise the ocean floor and the characteristics of the ocean bottom.
3. The students will understand the chemistry of ocean water.
4. The students will understand the motions of the ocean: currents, waves, and tides.
5. The students will understand the various characteristics of marine life and the cause/effect relationship between living things and their environment.

### B. Content from the *Core Knowledge Sequence*

1. World Ocean (pg. 152)
2. Features of the Ocean Floor (pg. 152)
3. Ocean Water Chemistry (pg. 152)
4. Ocean Currents, Tides, and Waves (pg. 153)
5. Ocean Ecology (pg. 153)

### C. Skill Objectives

1. The students will name and locate the world's oceans using schematic representation.
2. The students will identify the characteristics of the ocean floor.
3. The students will analyze the properties and elements of seawater.
4. The students will identify the source of a wave's energy and its effect on the water.
5. The students will draw, label, and model the parts of a wave.
6. The students will distinguish between the different types of tides.
7. The students will recognize the relationship between the sun, moon, and tides by creating a paper replica.
8. The students will compare and contrast different kinds of currents.
9. The students will identify the characteristics of the water column and how they determine life zones.
10. The students will classify marine life based on its location in the water column and identify the factors that determine this location.
11. The students will create an ocean food chain that includes producers, consumers, and decomposers.
12. The students will select and use appropriate tools, technology, and mathematical techniques to gather, analyze, and interpret data. (DSS 6.304)
13. The students will design and conduct simple scientific investigations. (DSS 6.302)
14. The students will develop descriptions, explanations, predictions, and models based on

evidence.(DSS 6.305)

15. The students will form logical explanations about the cause and effect relationship in an investigation.(DSS 6.306)

### III. BACKGROUND KNOWLEDGE

#### A. For Teachers

1. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters*. New Jersey: Prentice Hall, 2000. ISBN: 0-13-434484-7
2. VanCleave, J. *OCEANS for Every Kid: Easy Activities that Make Learning Science Fun*. USA: John Wiley & Sons, 1995 ISBN: 0-471-12454-0
3. *The Dorling Kindersley Science Encyclopedia*. New York: Dorling Kindersley INC, 1993 ISBN 1-56458-328-7

#### B. For Students

1. *Core Knowledge Sequence- Grade 5, Classifying Living Things*
2. Delaware State Standards- Grade 5, Interaction Between Living Things and their Environment

### IV. RESOURCES

- A. Bill Nye the Science Guy *Teacher's Guide*
- B. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters*
- C. Sterling, M. E. *Thematic Unit: Oceans*
- D. VanCleave, J. *OCEANS for Every Kid: Easy Activities that Make Learning Science Fun*
- E. VanCleave, J. *EARTH SCIENCE for Every Kid: 101 Easy Experiments that Really Work*
- F. Willemsen, J. *EarthWise: Earth's Oceans*
- G. Wu, N. *Planet Earth: Life in the Oceans*
- H. Eyewitness Video: *Oceans* (optional)
- H. Eyewitness Video: *Seashore* (optional)
- I. National Geographic Video: *Killer Wave: Power of the Tsunami*
- J. National Geographic Video: *Nature's Fury*
- K. Nature Video Library: *The Octopus Show* (optional)

### V. LESSONS

#### Lesson One: Ocean Subdivisions (Two 45 minute periods)

##### A. Daily Objectives

1. Concept Objectives
  - a. The students will understand the configuration and the subdivisions of the world ocean.
2. Lesson Content
  - a. World Ocean
3. Skill Objectives
  - a. The students will name and locate the world's oceans using schematic representation.
  - b. The students will develop descriptions, explanations, predictions, and models based on evidence

##### B. Materials

1. Appendix A: Observation Question Sheet (one per student)
2. Blank World Map (one per student)
3. Appendix B: Rubric for World Map
4. Mini-globes (one for every two students)

5. Wall maps and atlases
6. Colored markers (one pack per student)
7. Colored pencils (one pack per student)
8. Sand
9. Salt
10. Water
11. One 100 mL beaker
12. 8 or 9 inch round balloons in light colors or pale blue (one per student)
13. Fine tip black markers (one per student)
14. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters (one per student)*

C. *Key Vocabulary*

1. Continent- one of the seven great landmasses of the Earth
2. Hemisphere- a region of the Earth either north or south of the equator
3. Ocean- the entire body of salt water that covers about three-fourths of the Earth's surface
4. Southern Ocean- the ocean bordering Antarctica and extending 60 degrees latitude; the International Hydrographic Organization recognized this fifth ocean in the spring of 2000

D. *Procedure/Activities*

*(Day One)*

1. Begin class with questions and discussion about the key vocabulary words and record student responses on the board. Examples questions:
  - a. What is a continent?
  - b. Name characteristics of an ocean.
  - c. Where is the Northern Hemisphere? Southern Hemisphere?
2. Give students mini-globes. Pass out Observation Question Sheet (Appendix A). Students are to make observations to answer the questions on the worksheet.
3. Review the answers to the questions on the worksheet.
4. Pass out a copy of a blank world map to all students. Students will use atlases, mini-globes, and the wall maps to label and color the continents and oceans.
5. Students will include a compass rose on their maps. This map will be completed as homework if not finished in class.

*(Day Two)*

1. Review yesterday's lesson with an About/Point strategy. The students will get into groups of three and in their science journal they will write the following:
  - a. Yesterday's lesson was ABOUT...(groups will answer with one sentence)
  - b. And the important POINTS were...(groups will list 4-5 sentences)
2. Have students predict the percentage of how much of the world is ocean and how much of the world is made up of continents.
3. Record predictions on the board.
4. Do a teacher demonstration to simulate the land/water distribution on Earth.
  - a. Pour 29 grams of sand into a 100 mL beaker.
  - b. Then pour 71 mL of water into the same beaker.
  - c. Pass beaker around so students can visually see the distribution of water and land.
5. Balloon Activity from Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters (page 16)*
  - a. Have each student blow up a large light colored balloon and tie it at the end.

- b. Have the students envision the balloon as a globe. Using a black marker, have each student draw the equator onto the balloon and then draw the shapes of the continents as if the Earth was in fact the size of the balloon.
  - c. The students will label the continents and oceans.
  - d. Have the students compare the balloon "globe" to the mini-globes and compare the amount of ocean to amount of land on each.
- E. *Assessment/Evaluation*
- 1. Use rubric in Appendix B to grade student maps.

**Lesson Two: Ocean Floor Features** (Three 45 minute periods)

A. *Daily Objectives*

- 1. Concept Objectives
  - a. The students will understand the features that comprise the ocean floor and the characteristics of the ocean bottom.
- 2. Lesson Content
  - a. Features of the Ocean Floor
- 3. Skill Objectives
  - a. The students will identify the characteristics of the ocean floor.
  - b. The students will develop descriptions, explanations, predictions, and models based on evidence
  - c. The students will select and use appropriate tools, technology, and mathematical techniques to gather, analyze, and interpret data

B. *Materials*

- 1. Appendix C: Did You Know Facts Sheet (one per student)
- 2. Student bookbags with supplies
- 3. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters* (one per student)
- 4. Mini-globes (one for every two students)
- 5. Relief map of ocean floor
- 6. Overhead projector
- 7. Overhead transparency of outline of the ocean floor
- 8. String
- 9. Two identical chairs with backs 30 inches tall
- 10. Ruler
- 11. Scissors
- 12. Black marking pen
- 13. Four or more books
- 14. Stool
- 15. Large plastic bowl
- 16. Washer
- 17. Sample of ooze
- 18. Aerial pictures of the ocean floor
- 19. VanCleave, J. *OCEANS for Every Kid: Easy Activities that Make Learning Science Fun* (pages 57-62)
- 20. Appendix D: Rubric for Mapping the Ocean Floor (Student Graph)
- 21. Wall map
- 22. Graph paper (one piece per student)

C. *Key Vocabulary*

- 1. Abysal plain- a smooth, nearly flat region of the ocean floor
- 2. Continental shelf- a gently sloping shallow area of the ocean floor that extends

- outward from the edge of the continent
3. Continental slope- a steep incline leading down from the edge of the continental shelf
  4. Echo Time- the time it takes sound waves to travel to an object, be reflected, and return to the sonar device
  5. Guyot- a seamount with a flat top
  6. Mid-Atlantic ridge- part of the gigantic, underwater mountain chain in the Atlantic Ocean
  7. Mid-Ocean ridge- the continuous range of mountains on the ocean floor that winds around the Earth
  8. Oceanic ridge- mountain ranges from each ocean connecting to form a gigantic mountain system
  9. Ooze deposits- sediments consisting of dust particles from space, volcanic ash, dust blown seaward by winds, and sediments that drift down to the abyss from the upper levels of the ocean
  10. Seamount- underwater mountain
  11. Sonar- a method or device used to determine ocean depth or distances
  12. Trench- a deep canyon in the ocean floor

D. *Procedure/Activities*  
(Day One)

1. To stimulate interest, begin class with Did You Know Facts (Appendix C). Be sure to emphasize fact #10.
2. Lead students in a discussion starting with the question, "How do we know about the ocean floor?". Help lead students to the conclusion that knowledge is gained from satellite photographs, submersibles, and sonar.
3. Show aerial pictures of the ocean floor.
4. Read pages 150-152 in the text. Relate text to the picture.
5. Draw a picture of the ocean bottom on the board and then call on the students to label the parts. Next have the students draw this model in their science journals.
6. To conclude class, have the students write a paragraph about the following question: "What would the Earth look like if all the oceans dried up?".

(Day Two)

1. Begin class by giving each group of two students a mini-globe. Display a relief map of the ocean floor. Point out the Mid-Ocean ridge, Mid-Atlantic ridge, and Oceanic ridge. Students will locate these features on the mini-globes.
2. Put a transparency of the outline of the ocean floor onto the overhead projector. The students will come up to the overhead and label the parts of the ocean bottom on the transparency.
3. The students, working in pairs, will use objects from their book bags to construct the ocean floor. They must include the continental shelf, continental slope, abyssal plain, a seamount, an island, and a trench. Then one student from each group will rotate to another group(s) and identify the ocean floor features. When this is completed, reverse the process and have the other student rotate to the groups.
4. Show students a bag of ooze. Explain to the students that this material makes up the ocean floor. Begin discussion with this question: "What creates this sediment?".
5. Take students into the hallway and have them walk .3 miles to represent the depth

of the sediment on the ocean bottom.

6. The students will write the definitions of the vocabulary words for homework.

*(Day Three)*

1. This activity is taken from VanCleave, J. *OCEANS for Every Kid: Easy Activities that Make Learning Science Fun* (pages 57-62).

2. Using the information on sonar (pg. 57), illustrate Echo Time by having the students walk from a starting point to "the ocean floor" and bounce back. Use the following formula:  $\text{depth} = (\text{speed of sound} \times \text{echo time}) / 2$ .

3. Direct student attention to a model of the ocean floor that the teacher has constructed on the floor in the front of the room. Using the activity on pages 59-61, the teacher will direct students in the mapping of the side view of the ocean floor.

4. Once measurements have been attained by mapping the ocean floor, have the students use these measurements to graph the features of the ocean floor (page 62).

E. *Assessment/Evaluation*

1. Use rubric in Appendix D to grade the graphs of the ocean floor.

### **Lesson Three: Ocean Water Chemistry** (Two 45 minute periods)

A. *Daily Objectives*

1. Concept Objectives

a. The students will understand the chemistry of ocean water.

2. Lesson Content

a. Ocean Water Chemistry

3. Skill Objectives

a. The students will analyze the properties and elements of seawater.

b. The students will develop descriptions, explanations, predictions, and models based on evidence

c. The students will select and use appropriate tools, technology, and mathematical techniques to gather, analyze, and interpret data

d. The students will form logical explanations about the cause and effect relationship in an investigation

e. The students will design and conduct simple scientific investigations

B. *Materials*

1. Appendix E: Salt Distribution Graph (one per student)

2. VanCleave, J. *OCEANS for Every Kid: Easy Activities that Make Learning Science Fun* (pages 121-128)

3. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters* (one per student)

4. Sterling, M. E. *Thematic Unit: Oceans* (page 15)

5. Appendix F: Salinity Variations Sheet (one per student)

6. Worksheet, "A Salty Solution", from *Thematic Unit: Oceans* (one per student)

7. Appendix G: Salt Water Take Home Lab Sheet (one per student)

8. 15 Graduated cylinders (one per pair)

9. Two large beakers (1L)

10. Colored markers/pencils (one package per student)

11. Medium eggs (two eggs for every two students)

12. Salt (enough for experiment and for all students to have a small sample)

13. 500 mL beakers (two for every two students)

14. Measuring spoons for mL

15. Bowls (one for every two students)
- C. *Key Vocabulary*
1. Salinity- the total amount of dissolved salts in a water sample.
  2. NaCl- sodium chloride; table salt.
- D. *Procedure/Activities*
- (Day One)
1. Begin class by passing out a bowl of salt to every two students. Have the students make observation of the salt. The students will record their observations on the "A Salty Solution" worksheet. The students will share their observations with the class (This is good time to review properties with students as well).
  2. Define salinity. The students will record the definition in their science journal.
  3. Do a teacher demonstration of salinity.
    - a. Measure out one liter of water into a large beaker.
    - b. Measure 35 grams of salt and pour into the beaker with the water.
    - c. Show the beaker to the students so they be able to observe the proportion of salt to water in the ocean.
  4. The teacher will lead a discussion of salts that make up the salinity of the ocean. Refer to the textbook and have the students read the sections on pages 127-129. Be sure to emphasize the following ideas:
    - a. NaCl = Sodium Chloride
    - b. Salinity varies based on conditions
    - c. Salinity affects properties of water
  5. Pass out Salt Distribution Graph (Appendix E) The students will label and color the pie chart of the salt distribution in the ocean. This will be completed as homework if not finished in class.
- (Day Two)
1. Begin class with the question "How does the ocean get its salt?"
  2. Share cool facts about salt with the class. This is found in Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters (page 128-Teacher Edition)*
  3. Show the students pictures of the Dead Sea. Have the students observe the salinity of these waters.
  4. The students will conduct an experiment to demonstrate the effect salinity has on the ability of an egg to float.
    - a. The students will first predict the effect higher salinity has compared to lower salinity. The students will put their predictions and observations in their science journal.
    - b. Students will measure out 500 mL of water in beaker A.
    - c. Have the students pour 1 1/2 teaspoons of salt into beaker A and then place one egg into beaker A. This represents normal salinity.
    - d. Students will measure out 500 mL of water in beaker B
    - e. Have the students pour 4 tablespoons of salt into beaker B and then place one egg into beaker B. This represents the salinity in the Dead Sea.
    - f. Students will make observations of both eggs.
  5. Pass out the Salinity Variations sheet (Appendix F) In groups of three, the students will answer the questions relating to variations of salinity. Students may refer to their textbook if it's needed. After the questions are completed, discuss the answers with the whole class.
  6. For homework, students will take home the Salt Water Take Home Lab sheet (Appendix G) In this lab they will freeze fresh and salt water. Try to give the

students a few nights to complete this assignment.

*Assessment/Evaluation*

1. The students will turn in a completed lab sheet (Appendix G)

**Lesson Four: Ocean Test #1** (One 45 minute period)

A. *Daily Objectives*

1. Concept Objectives
  - a. The students will understand the configuration and the subdivisions of the world ocean.
  - b. The students will understand the features that comprise the ocean floor and the characteristics of the ocean bottom.
  - c. The students will understand the chemistry of ocean water.
2. Lesson Content
  - a. World Ocean
  - b. Features of the Ocean Floor
  - c. Ocean Water Chemistry
3. Skill Objectives
  - a. The students will name and locate the world oceans.
  - b. The students will identify the characteristics of the ocean floor.
  - c. The students will explain the effect salinity has on the ocean.

B. *Materials*

1. Appendix H: Ocean Test #1(one per student)
2. Appendix I: Ocean Test #1 Answer Key

C. *Vocabulary*

None

D. *Procedure/Activities*

1. Pass out copies of Ocean Test #1 (Appendix H) to students.
2. The students may read the Current Science magazine when they finish the test.

E. *Assessment/Evaluation*

1. Use answer key in Appendix I to grade the test.

**Lesson Five: Ocean Water Waves** (Three 45 minute periods)

A. *Daily Objectives*

1. Concept Objectives
  - a. The students will understand the the motion of the ocean: currents, waves, and tides.
2. Lesson Content
  - a. Ocean Currents, Tides, and Waves
3. Skill Objectives
  - a. The students will identify the source of a wave's energy and its effect on the water.
  - b. The students will draw, label, and model the parts of a wave.
  - c. The students will develop descriptions, explanations, predictions, and models based on evidence
  - d. The students will design and conduct simple scientific investigations

B. *Materials*

1. VanCleave, J. *EARTH SCIENCE for Every Kid: 101 Easy Experiments that Really Work*
2. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters* (one per student)

3. Marbles (six for every two students)
4. 24" string (one piece for every two students)
5. Rulers (one for every two students)
6. 20 metal washers (one inch in size)
7. Large aquarium
8. 4 corks
9. Styrofoam trays (one per student)
10. White paint
11. Sharpened pencil
12. Small paint roller (art size-one for every two students)
13. Dark blue card stock(cut to the size of the styrofoam tray-one per student)
14. National Geographic Video: *Killer Wave: Power of the Tsunami*
15. National Geographic Video: *Nature's Fury*

C. *Vocabulary*

1. Crest- the highest point of a wave
2. Frequency- the number of waves that pass a specific point in a given period of time
3. Trough- the lowest point of a wave
4. Wave- the movement of water through a body of water
5. Wave height- the vertical distance from the crest of a wave to the trough
6. Wavelength- the horizontal distance between two wave crests

D. *Procedure/Activities*

*(Day One)*

1. Put the students into groups of three and have them brainstorm the question "What causes waves?" Call on each group to give an answer. Record the answers on the board. Conclude that waves are caused by energy. Pose the question, "Where does this energy come from?" Conclude that the energy comes from the wind.
2. Define the term wave. Have the students put the definition in their science journals. Discuss with the class how the energy moves through the water causing waves.
3. Have the students model "The Wave". Let them observe that the energy moves but not the students.
4. This activity is taken from VanCleave, J. *EARTH SCIENCE for Every Kid: 101 Easy Experiments that Really Work (page 192)*
  - a. Put the students in groups of two and have them open their science book to the middle and keep open on the table top.
  - b. The students will place 5 marbles tightly together in the middle of the groove.
  - c. Place a 6th marble about 3 cm away from the other marbles.
  - d. Push the marble forward so it hits the other marbles.
  - e. Have the students make observations of the energy flow and movement. Compare this to the forward movement of wave energy.
5. Draw and label the parts of a wave on the board for the students. The students will then draw and label a wave in their science journal.
6. Give each pair of students a string about 24 inches long. The students will set up waves using the string. The students will then measure the wave height and wavelength. The students will repeat the process by changing the frequency of the waves each time.

(Day Two)

1. Begin the lesson with a Concept Mapping activity. On the board post the word "Wave". Draw lines out from the word. Have the students come to the board one at a time to write a word they associate with a wave. The students will then explain why they chose that word. Example:
  - a. wind
  - b. crest
  - c. energy
2. This activity is taken from Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters (page 116)* This activity will illustrate the idea that water molecules tend to move up and down in a circular motion.
  - a. Fill an aquarium 2/3 with water
  - b. Attach enough washers to each cork so the corks will float at various levels in the water: 3cm, 9cm, 12cm, 15cm, and so on from the bottom.
  - c. By moving your hand up and down in the water, have the students observe what happens to each cork.
  - d. Increase the height of the waves. Have the students answer the question "How does increasing the height of the wave affect the motion of each cork?" Have them notice the bottom cork hardly moves at all.
3. Through discussion, relate this idea of circular motion (particle motion) to real life experiences at the ocean (for students who vacation at the ocean). In the fun of jumping waves, students experience circular motion (particle motion).
4. Show video segments of tsunamis and hurricanes to students to illustrate how extreme wind and energy affects the ocean and how major flooding can be the result of this occurrence.

(Day Three)

1. The students will work on an art project in class. They will make a print of an ocean wave. The students will use the "The Breaking Wave of Kanagawa" print from the Japanese artist Hokusai as their inspiration.
2. Using a sharpened pencil, the students will create a design similar to the one in the print and "punch" the design into a styrofoam tray.
3. Using the small roller, roll the white paint onto the tray. Press the tray paint side down onto the card stock. Lift the tray carefully off of the card stock.

E. *Assessment/Evaluation*

1. The teacher will examine the students' wave measurements.

**Lesson Six: Ocean Water Tides** (Four 45 minute periods)

A. *Daily Objectives*

1. Concept Objectives
  - a. The students will understand the the motion of the ocean: currents, waves, and tides.
2. Lesson Content
  - a. Ocean Currents, Tides, and Waves
3. Skill Objectives
  - a. The students will distinguish between the different types of tides.
  - b. The students will recognize the relationship between the sun, moon, and tides by creating a paper replica.
  - c. The students will select and use appropriate tools, technology, and mathematical techniques to gather, analyze, and interpret data.

- d. The students will form logical explanations about the cause and effect relationship in an investigation.
- e. The students will develop descriptions, explanations, predictions, and models based on evidence

B. *Materials*

1. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters* (one per student)
2. Overhead projector
3. Overhead transparency of tide times from daily newspaper
4. Overhead transparency of graph for tide times
5. Overhead transparency of monthly tide times (#14 from teacher resource book)
6. Appendix J: Rubric for High/Low Tide Graph
7. Appendix K: Monthly Tide Worksheet (one per student)
8. Chart paper (one piece for every three students)
9. Colored markers (one pack per student)
10. Board magnets
11. Construction paper (two pieces per student)
12. Pre-labeled graph paper (one piece per student)

C. *Key Vocabulary*

1. Neap tide- a tide with the least difference between low and high tide that occurs when the sun and moon pull at right angles to each other
2. Spring tide- a tide with the greatest difference between high and low tide that occur when the sun and the moon are aligned in a line with the Earth
3. Tides- the daily rise and fall of Earth's waters on shores

D. *Procedure/Activities*

*(Day One)*

1. Put the students in groups of three. Have each group brainstorm and complete a KWL chart about tides. Use chart paper and markers to make three columns. Head the columns: What We Know, What We Want To Learn, and What We Have Learned. The students will complete columns one and two.
2. Have each group of students share the charts with the class and post them in the classroom.
3. Through discussion based on student knowledge, the teacher will emphasize key points:
  - a. Stress definition of tides and where tides occur.
  - b. There are two high and two low tides a day. These are called daily tides.
  - c. The importance of the knowledge of the daily tides and how they affect fisherman, boaters, etc.
4. Put up a transparency of the tide times from daily newspapers onto the overhead projector. Show the students where information about tides can be found.

*(Day Two)*

1. Begin class by having students write a GIST statement based on day one's lesson. Students will summarize key points of day one's lesson in 20 words or less. Have the students share their summaries with the class.
2. The students will receive a High/Low tide time sheet for a certain month and location (this sheet is accessed from the internet)
3. Give the students a copy of pre-labeled graph paper which includes the numbered axes. The students will label the appropriate variables, include a title, and a key.
4. The students will create a line graph. The high tides will be in blue and the low tides will be in red.

5. The teacher will use an overhead transparency of the graph to begin graphing with the class.
6. The students will finish the graph for homework.

*(Day Three)*

1. To begin class, the teacher will write the words "TIDES" and "WAVES" on the board. The teacher will have strips of chart paper with facts about waves and tides. The students will be called on to come to the board and place a fact under the correct heading. Use magnets to hold the strips of paper on the board.  
Examples:
  - a. Tides - occur on schedule
  - b. Waves- the movement of energy
  - c. Tides- the movement of water
2. Using Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters* (pages 122-126), the teacher will do a Directed Reading Activity to learn the cause of tides, monthly tides, and more information on daily tides.
3. Through a question and answer session, cover the following concepts:
  - a. There are daily and monthly tides
  - b. The moon causes daily tides
  - c. The interaction of the sun, moon, and Earth causes monthly tides
4. Reinforce book content by drawing a picture of the moon and Earth with the bulge of the waters facing the moon. The second bulge is away from the moon. (Refer to page 123 in the text)
5. Show a picture on the overhead of the monthly tide cycle. (#14 teacher resource book) Use this to explain spring and neap tides.
6. The students will create a T chart with the headings of SPRING and NEAP TIDES in their science journals.
7. The teacher will post facts about spring and neap tides on the board. The students will place the facts in the appropriate column. The students can use pages 124-125 in their textbook as a reference. Examples:
  - a. The Earth, moon, and sun align in a straight line.
  - b. The Earth, moon, and sun align at a right angle.

*(Day Four)*

1. Refer to the T chart of the differences between spring and neap tides.
2. Using page 125 in their textbook, the students will re-examine the illustration of the spring and neap tides.
3. Pass out the Monthly Tide Worksheet (Appendix K) to each student. The students will cut out the replicas of the sun, Earth, and moon.
4. The students will place these replicas in the correct position to create a spring or neap tide. There will be two arrangements for both. The students will then color the full moon yellow and the new moon black. The Earth is to be colored blue and green and the sun is to be colored yellow.
5. The students will paste the pieces on construction paper and label the final product.

E. *Assessment/Evaluation*

1. Use rubric in Appendix J to grade the High/Low Tide Graph.

**Lesson Seven: Ocean Water Currents** (Three 45 minute periods)

A. *Daily Objectives*

1. Concept Objectives

- a. The students will understand the the motion of the ocean: currents, waves, and tides.
  2. Lesson Content
    - a. Ocean Currents, Tides, and Waves
  3. Skill Objectives
    - a. The students will compare and contrast different kinds of currents.
    - b. The students will design and conduct simple scientific investigations.
    - c. The students will form logical explanations about the cause and effect relationship in an investigation.
- B. *Materials*
1. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters* (one per student)
  2. Bill Nye the Science Guy *Teacher's Guide: 1997-1998*
  3. Overhead projector
  4. Overhead transparency of Venn Diagram
  5. Overhead transparency of Warm and Cold Currents (#16 from teacher resource book)
  6. Blank Map of the World (one per student)
  7. File folders (one per student)
  8. Compass (one per student)
  9. Medicine droppers (one per student)
  10. Small cups (one for every two students)
  11. Ice cube trays (one per class)
  12. Red food coloring
  13. Pepper
  14. Wide mouth jar (one for every two students)
  15. Scissors (one for every two students)
  16. Student pencils
  17. Appendix L: Venn Diagram (one per student)
  18. Appendix M: Ocean Currents Worksheet (one per student)
  19. Appendix N: Process of Upwelling Teacher Worksheet
- C. *Key Vocabulary*
1. Coriolis Effect- the effect of Earth's rotation on the direction of winds and currents
  2. Currents- a large stream of moving water that flows through the ocean
  3. Gulf Stream- a warm current that starts near the equator and moves in a general northward direction away from the equator
  4. Upwelling- an upward flow of cold water from the ocean depths
- D. *Procedure/Activities*  
(Day One)
1. Begin class by defining the word current. Have the students write the definition in their science journal. Tell the story of Benjamin Franklin being the first person to track the current we know as the Gulf Stream. This is found in Bill Nye the Science Guy *Teacher's Guide: 1997-1998* (page 17).
  2. Place the map of warm and cold currents on the overhead (#16 from teacher resource book)
  3. Have the students make observations of the map. Lead the students to conclude the following information:
    - a. Warm surface currents originate near the equator.
    - b. Cold surface currents originate near the poles.

- c. Surface currents flow in a circular pattern
4. The students will brainstorm the answers to the following questions about currents:
  - a. What could cause surface currents?
  - b. Why do currents flow in a circular pattern?
  - c. What causes the currents to do this?
  - d. How does the Gulf Stream affect the climate of Great Britain and the Scandinavian countries?
5. If possible, show a segment of "The Simpson's" in which Bart learns about the Coriolis effect. Relate this to the discussion on currents.
6. To help the students understand the Coriolis effect, have the students cut a circle about 20cm in diameter out of a file folder.
7. The students will place a drop of water on top of the circle near the pencil. While the students are holding the pencil between the palms of their hands, have them twirl the pencil in a counterclockwise direction.
8. Have the students answer the question, "How does this activity demonstrate the Coriolis effect?"
9. For homework, the students will receive a blank map of the world. The students will label the oceans and then draw and color in the major ocean currents. Have the students color cold currents blue and warm currents red. The students may refer to their textbook Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters* (page 135). Have the students label the following currents on the map:
  - a. North Atlantic Drift
  - b. Peru Current
  - c. West Wind Drift
  - d. West Australian Current
  - e. South Equatorial Current
  - f. Gulf Stream

*(Day Two)*

1. Begin class with a question review of warm and cold current. The students will have their current maps in front of them and the teacher will give an answer and the students will provide the question. Example:
  - a. Answer: Peru Current, Question: What is a cold current near South America?
  - b. Answer: Gulf Stream, Question: What is the largest and most powerful surface current in the North Atlantic ocean?
2. Relate to the students that they have learned about warm and cold surface currents. Explain to them that there are also deep current.
3. Pass out the Venn Diagram (Appendix L) and the Ocean Currents Worksheet (Appendix M) to every student. On the Venn diagram, the students will label one circle "surface" and the other circle "deep". Using the textbook as a resource (pages 135-137), the students will match the phrases on the ocean current worksheet to the appropriate current on the Venn diagram.
4. The teacher will place a transparency of the Venn diagram on the overhead. The students will share their answers with the class and the teacher will write them down on the transparency. The students will place the Venn diagram in their science journals.

*(Day Three)*

1. Begin class by brainstorming with the students the following questions:

- a. Are deep currents cold water or warm water currents?
  - b. Why do cold water currents mainly flow along the ocean floor?
  2. Define upwelling and note it as a deep current. The students will write the definition in their science journal. The students will read about upwelling in their textbook (pages 137-138). The students should realize that upwelling can be caused by melting ice in polar regions and winds.
  3. The students will work in pairs to do a lab called "Current Event". This activity comes from Bill Nye the Science Guy *Teacher's Guide: 1997-1998*
  4. The teacher can prepare for the lab ahead of time by mixing some red food coloring with water. Pour the water into the six ice cube trays (one per class) and freeze.
  5. The students will fill each mason jar 1/2 full with warm water. Then have the students sprinkle pepper on top the water. The pepper will sink and represent the nutrients on the ocean floor.
  6. Have the students place a colored cube in each jar. The students will write down and draw their observations of the jar.
  7. End the lab with a question and answer session. Example questions:
    - a. How is the ice cube like a huge polar iceberg?
    - b. Why does the colored water sink to the bottom of the jar?
  8. The teacher will post on the board the sequence of events (out of order) that occur for upwelling to happen. The students will create a flow chart of the process of upwelling and its effects in their science journal using the information on the board.
- E. *Assessment/Evaluation*
1. The students will turn in a completed map of the world (Homework from Day One).

**Lesson Eight: Ocean Test #2** (One 45 minute period)

- A. *Daily Objectives*
1. Concept Objectives
    - a. The students will understand the the motion of the ocean: currents, waves, and tides.
  2. Lesson Content
    - a. Ocean Currents, Tides, and Waves
  3. Skill Objectives
    - a. The students will identify the source of a wave's energy and its effect on the water.
    - b. The students will draw, label, and model the parts of a wave.
    - c. The students will distinguish between the different types of tides.
    - d. The students will recognize the relationship between the sun, moon, and tides by creating a paper replica.
    - e. The students will compare and contrast different kinds of currents.
- B. *Materials*
1. Appendix O: Ocean Test #2(one per student)
  2. Appendix P: Ocean Test #2 Answer Key
- C. *Vocabulary*
- None
- D. *Procedure/Activities*
1. Pass out copies of Ocean Test #2 (Appendix O) to students.

2. The students may read the Current Science magazine when they finish the test.
- E. *Assessment/Evaluation*
1. Use answer key in Appendix P to grade the test.

**Lesson Nine: Ecology of the Ocean** (Two 45 minute periods)

A. *Daily Objectives*

1. Concept Objectives
  - a. The students will understand the various characteristics of marine life and the cause/effect relationship between living things and their environment.
2. Lesson Content
  - a. Ocean Ecology
3. Skill Objectives
  - a. The students will identify the characteristics of the water column and how they determine life zones.
  - b. The students will classify marine life based on its location in the water column and identify the factors that determine this location.
  - c. The students will design and conduct simple scientific investigations.
  - d. The students will form logical explanations about the cause and effect relationship in an investigation.

B. *Materials*

1. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters* (one per student)
2. VanCleave, J. *Earth Science: Easy Activities that Make Learning Science Fun*
3. Wu, N. *Planet Earth: Life in the Oceans*
4. Chart paper (one large piece for every group)
5. Colored markers (one package for every group)
6. Sticky notes

C. *Vocabulary*

1. Dark Zone- the part of the ocean that extends from about 1 km, or from the bottom of the Twilight (Transition) Zone, to the ocean floor; also called the Deep Zone.
2. Density- the measurement of how much mass of a substance is contained in a given volume.
3. Photosynthesis- the process by which plants use water, plus carbon dioxide and energy from the sun, to make food
4. Pressure- the force exerted by the weight of water pressing down on an object.
5. Salinity- the total amount of dissolved salts in a water sample.
6. Submersible-an underwater vehicle built of strong materials to resist pressure at depth.
7. Sunlight Zone- the part of the ocean that extends from the surface to about 200 meters; also called the Surface Zone.
8. Twilight Zone- the part of the ocean that extends from the bottom of the Sunlight (Surface) Zone to about 1 km; also called the Transition Zone.

D. *Procedure/Activities*

1. Using Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters*, have the students read about the Alvin on pages 10-13. As the students read, they can place a sticky note on areas of interest or write down questions they may have pertaining to the story.
2. Discuss the the Alvin reading with the students. Ask the question, "Why do we need to go to the ocean floor in a submersible like the Alvin?" Focus on the idea

that pressure is the problem. Example questions:

- a. How does scuba gear protect divers?
  - b. How far can scuba divers safely descend to in the ocean?
  - c. Why is the pressure so great?
  - d. What happens to a diver who ascends to the surface too quickly?
3. For homework, challenge the students to find a way to demonstrate that water pressure increases with depth. Have the students write out their plans.  
\*\*This may be challenging for some students. Teachers may want to do a demonstration for some classes who need more support.\*\*
4. Use VanCleave, J. *Earth Science: Easy Activities that Make Learning Science Fun (pages 202-203)* as a guide to demonstrate this in class if extra support is needed.

*(Day Two)*

1. At the beginning of class students will share their plans for showing that water pressure increases with depth.
  2. To apply the JIGSAW strategy, divide the class into groups of six. Assign two groups the Surface Zone (Sunlight Zone), two groups the Transition Zone (Twilight Zone), and two groups the Deep Zone (Dark Zone). Give each group a piece of chart paper and a marker.
  3. The teacher will have each group divide the chart paper into five rows: color and light, temperature, salinity, density, and pressure.
  4. Using page 130 in the textbook as a resource, the students will fill in their charts with the correct information for each section. The students will then share their charts with the class.
  5. Have the students predict how the conditions in each zone would affect the plant and animal life. Have the students consider the following things: amount, type, size, and characteristics.
  6. The teacher will show the students pictures of animals that live in the different zones. Use the pictures in Wu, N. *Planet Earth: Life in the Oceans* as examples. Pictures can also be taken from the internet.
- E. *Assessment/Evaluation*
1. The teacher will examine the completed chart paper of the different zones.

**Lesson Ten: Ocean Classification** (Two 45 minute periods)

A. *Daily Objectives*

1. Concept Objectives
  - a. The students will understand the various characteristics of marine life and the cause/effect relationship between living things and their environment.
2. Lesson Content
  - a. Ocean Ecology
3. Skill Objectives
  - a. The students will identify the characteristics of the water column and how they determine life zones.
  - b. The students will create an ocean food chain that includes producers, consumers, and decomposers.
  - c. The students will develop descriptions, explanations, predictions, and models based on evidence

B. *Materials*

1. Classification poster

2. Pictures of marine life
3. Magnets
4. Willemsen, J. *EarthWise: Earth's Oceans*
5. Various magazines
6. Colored markers (one package per student)
7. Scissors (one pair per student)
8. Glue (one bottle for every two students)
9. Construction paper (various colors)
10. Appendix Q: Food chain/Food web Pre-Quiz (one per student)

C. *Vocabulary*

1. Benthic- bottom-living marine life such as kelp and mollusks
2. Consumer- an organism that obtains energy by feeding on other organisms
3. Decomposer- an organism that breaks down wastes and dead organisms
4. Food chain- A series of events in which one organism eats another
5. Food web- The pattern of overlapping food chains in an ecosystem
6. Nekton- free swimming marine life such as fish and whales
7. Organism- a living thing.
8. Photosynthesis- the process by which plants use water, plus carbon dioxide and energy from the sun, to make food
9. Plankton- small or microscopic plant or animal organisms that float in bodies of water
10. Producer- an organism that can make its own food

D. *Procedure/Activities*

*(Day One)*

1. Begin class by reviewing the classification system with students (this comes from the *Core Knowledge Sequence*- Grade 5). Show the students a poster on classification and review the different levels with them. Example questions:
  - a. Which grouping is the largest?
  - b. Which grouping is the smallest?
2. Relate this review of classification to the classification of different marine life into the three different categories: bottom-living, free-swimming, and plankton.
3. The teacher will show the pictures of the marine life with magnets on the board to the students. The board will be divided into three main sections: Bottom-living, Free-swimming, and Plankton. The students will come up to the board and put the organisms into the correct column of classification. The students will explain their placement of that particular organism.
4. The students will then copy the information from the board into their science journals.

*(Day Two)*

1. Pass out the Food chain/Food web Pre-Quiz (Appendix Q) to every student. Instruct the students to think back to fifth grade and complete the quiz.
2. The teacher will go over the answers with the students as a class.
3. The students will look through different magazines for pictures of ocean animals and the students will cut them out. The students will have the option to draw the ocean animals if they choose to do so.
4. The students will create three food chains OR one food web of organisms from the ocean. Have the students label the organism producer, consumer, or decomposer. The students will glue the food chain or food web on construction paper. Have the students draw the arrows to show the transfer of energy from

one organism to the next. **\*\*Plankton might be easier to draw on the paper\*\***  
Remind the students to use a producer as the base of the food chain or food web.

E. *Assessment/Evaluation*

1. The teacher will examine the completed food chains or food webs.

**Lesson Eleven: Squid Dissection** (One 45 minute period)

A. *Daily Objectives*

1. Concept Objectives
  - a. The students will understand the various characteristics of marine life and the cause/effect relationship between living things and their environment.
2. Lesson Content
  - a. Ocean Ecology
3. Skill Objectives
  - a. The students will select and use appropriate tools, technology, and mathematical techniques to gather, analyze, and interpret data.
  - b. The students will design and conduct simple scientific investigations.

B. *Materials*

1. Squid (one for every two students)
2. Scissors (one for every two students)
3. Styrofoam trays (one for every two students)
4. Scalpels (one for every two students)
5. Magnifying glasses (one per student)
6. Non-latex gloves (one pair per student)
7. Lab aprons (one per student)
8. Goggles (one per student)
9. Large poster of squid with labeled parts
10. Overhead projector
11. Newspapers
12. Transparencies of internal and external body parts of the squid
13. Appendix R: Squid Dissection Sheet

C. *Vocabulary*

1. Chromatophores- the color spots located on the mantle; a pigment cell.
2. Dorsal- on or near the back
3. Mantle- the outer covering on the dorsal side that wraps around the squid
4. Siphon- a tube-like structure located on the ventral side of the squid under the head.
5. Ventral- the lower surface of the body of an animal

D. *Procedure/Activities*

1. Cover the tables with newspapers.
2. The students will put on the lab aprons, goggles, and gloves.
3. Pass out the lab tools: scissors, scalpels, Styrofoam trays, and squid.
4. Review safety procedures with the students.
5. Pass out Squid Dissection Sheet (Appendix R) to every student. Have the students begin the lab with the observations of the squid. To help the students with this, post the definitions of the vocabulary words on the board.
6. The students will proceed with the lab following the directions provided on the lab sheet. Parent volunteers are encouraged to come and help assist students with this lab activity.

E. *Assessment/Evaluation*

1. The students will turn in a completed lab sheet (Appendix R).

## VI. CULMINATING ACTIVITY

### Lesson Twelve: Ocean Animal Project

#### A. *Daily Objectives*

1. Concept Objectives
  - a. The students will understand the various characteristics of marine life and the cause/effect relationship between living things and their environment.
2. Lesson Content
  - a. Ocean Ecology
3. Skill Objectives
  - a. The students will select and use appropriate tools, technology, and mathematical techniques to gather, analyze, and interpret data.
  - b. The students will develop descriptions, explanations, predictions, and models based on evidence.
  - c. The students will form logical explanations about the cause and effect relationship in an investigation.
  - d. The students will classify marine life based on their location in the water column and identify the factors that determine this location.

#### B. *Materials*

1. Appendix S: Ocean Animal Project Sheet (one per student)
2. Appendix T: Rubric for Ocean Animal Project
3. Materials will vary student to student depending on the type of prop the students choose to do.

#### C. *Vocabulary*

None

#### D. *Procedures/Activities*

1. Pass out Ocean Animal Project Sheet (Appendix S) to every student. As a class, read through the directions given and discuss them.
2. Have the student fill in the appropriate dates on the project sheet.
3. Show the students examples of props and reports done by students from previous years.
4. Have the students take home the Ocean Animal Project Sheet (Appendix S) to be read and signed by the parents. This sheet is then to be returned to school.

#### E. *Assessment/Evaluation*

1. Use rubric in Appendix T to grade the projects.

#### F. *Optional Resources/Field Trips*

1. Eyewitness Video: *Oceans*
2. Eyewitness Video: *Seashore*
3. Nature Video Library: *The Octopus Show*
4. The National Aquarium in Baltimore OR The New Jersey State Aquarium (Depending on your location).
5. Children's Beach House in Lewes, Delaware. (This place can be visited directly or they have an outreach program that will come to the school and put on programs such as Creatures of the Coast, Clam Exploration, Oil Spill Recovery, and Secrets of the Sands).

## VII. HANDOUTS/WORKSHEETS

- A. Appendix A: Observation Question Sheet

- B. Appendix B: Rubric for World Map
- C. Appendix C: Did You Know Facts Sheet
- D. Appendix D: Rubric for Mapping the Ocean Floor
- E. Appendix E: Salt Distribution Graph
- F. Appendix F: Salinity Variations Sheet
- G. Appendix G: Salt Water Take Home Lab Sheet
- H. Appendix H: Ocean Test #1
- I. Appendix I: Ocean Test #1 Answer Key
- J. Appendix J: Rubric for High/Low Tide Graph
- K. Appendix K: Monthly Tide Worksheet
- L. Appendix L: Venn Diagram
- M. Appendix M: Ocean Currents Worksheet
- N. Appendix N: Process of Upwelling Teacher Worksheet
- O. Appendix O: Ocean Test #2
- P. Appendix P: Ocean Test #2 Answer Key
- Q. Appendix Q: Food chain/Food web Pre-Quiz
- R. Appendix R: Squid Dissection Sheet
- S. Appendix S: Ocean Animal Project Sheet
- T. Appendix T: Rubric for Ocean Animal Project

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### Appendix A

## Observation Question Sheet

1. Name the 7 continents?
2. Name the 4 major oceans?
3. Which ocean is the largest? Which ocean is the smallest?
4. Which continent is the largest? Which continent is the smallest?
5. Is the Arctic a continent or ocean?
6. Is Antarctica a continent or ocean?
7. Estimate the percentage of Earth that is ocean?
8. Which hemisphere has more land? Which hemisphere has more water?
9. The equator passes through \_\_\_\_\_ continents.
10. Yes or no. Is a ship able to sail all the way around the world on the world's ocean?

### Appendix B

## World Map Rubric

Title - The title reflects the purpose of the map.

1      2      3      4

Labels - Oceans and continents are accurately labeled.

1      2      3      4

Capitalization - Proper nouns are capitalized.

1      2      3      4

Spelling - Words are spelled correctly.

1      2      3      4

Neatness - Labels are easily read.

1      2      3      4

Attractive - Color is used for eye appeal.

1      2      3      4

Complete - Includes all requirements - 4 oceans, 7 continents, labels, compass  
rose

1      2      3      4

- 4 - Excellent
- 3 - Good
- 2 - Satisfactory
- 1 - Needs Improvement

### Appendix C Did You Know Facts

1. The longest continuous mountain range is beneath the ocean. It connects all the oceans and is 40,600 miles long (65,000 km) which is  $1\frac{1}{2}$  times the Earth's circumference.
2. The ocean floor has an average depth of 3.8 km.
3. A submersible is an underwater vehicle built of materials strong enough to resist the pressure on the ocean floor. A diver can only descend safely to about 40 meters.
4. The ocean contains enough salt to cover all the continents with a layer 500 feet thick.
5. Human blood, excluding cells and proteins, has the same general composition as sea water.
6. If the Earth's surface were smooth, with no mountain peaks or ocean basins, it would be completely covered with water to a depth of 12,000 feet.
7. The average temperature of the ocean is 38° F.
8. The deepest trench (like a valley underwater) in any ocean is the Marianas Trench which is 11 km deep while Mt. Everest (Tibet) is 9 km high and the Grand Canyon is 1.6 km deep.
9. The largest mountain in the ocean is Mauna Kea (9,750 meters). It is larger than Mt. Everest (8,850 meters).
10. It is easier for scientists to study the surface of the moon, which is 238,000 miles away, than it is to map the ocean floor.
11. Since spring 2000, the Southern Ocean has been recognized as a fifth ocean.

## **Appendix D** **Mapping the Ocean Floor**

Graph has labels: title, horizontal, and vertical axes.

1      2      3      4

Axes are numbered with correct intervals.

1      2      3      4

Coordinates are accurately graphed.

1      2      3      4

Coordinates are accurately connected to show the contour of the ocean floor.

1      2      3      4

Neatness: Labels and numbers are easily read. A ruler is used to connect the coordinates.

1      2      3      4

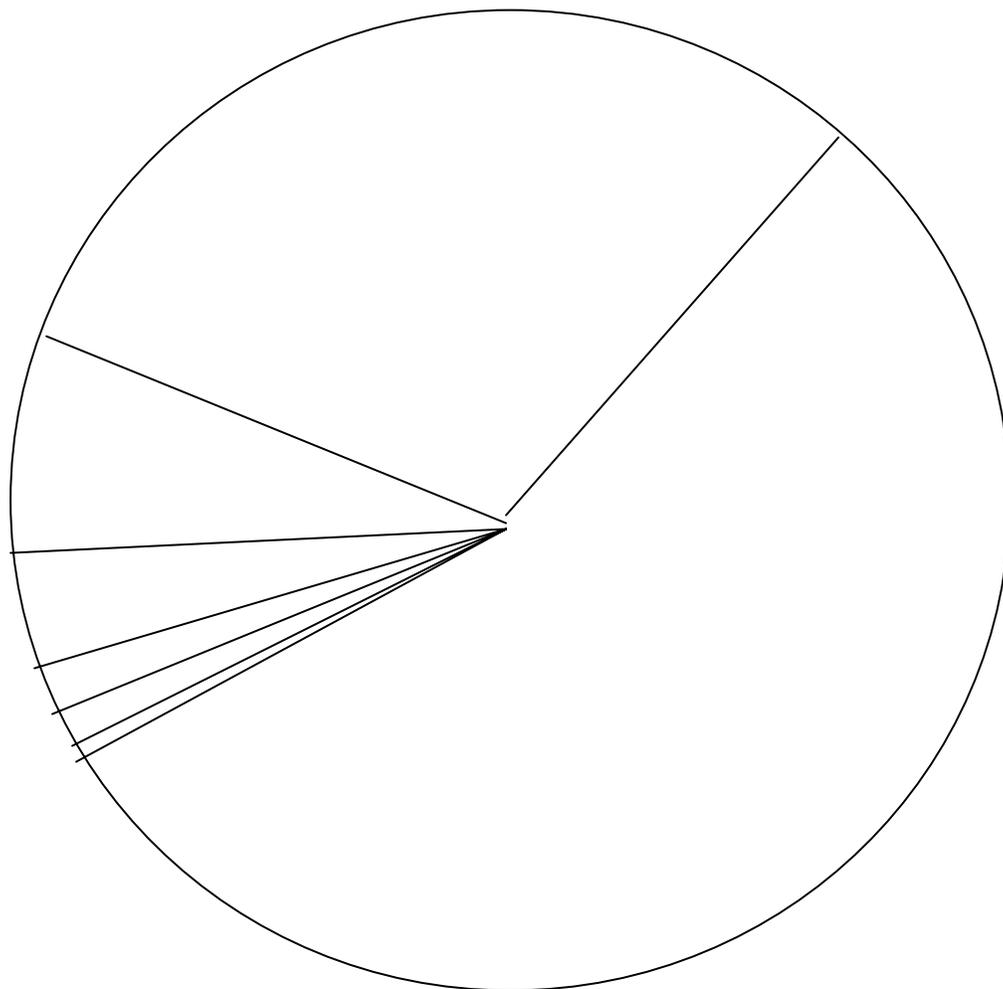
4 - Excellent

3 - Good

2 - Satisfactory

1 - Needs Improvement

## **Appendix E** **Salt Distribution Graph**



Ocean water contains many dissolved salts. When salts dissolve, they separate into particles called ions.



**Appendix F**  
**Salinity Variation Sheet**

1. Why would salinity increase where the climate is hot and dry?

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2. If it has rained or snowed frequently over an area of the ocean, how would the salinity be affected?

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3. Is the salinity higher or lower near ice? Why or why not?

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## Appendix G Salt Water Take Home Lab

Question: Will salt water or fresh water freeze first?

Hypothesis:

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Materials:    2 8oz. or larger paper or Styrofoam cups (do **not** use glass)  
                   Salt  
                   Water  
                   Teaspoons  
                   Freezer

Directions:

1. Pour 8 oz. of tepid water into each cup.
2. Add 1 teaspoon of salt to one of the cups. Stir until salt is dissolved.
3. Place both cups in freezer on the same shelf.
4. Observe every ½ hour for 3 hours.
5. Record observations on chart.

Time - Every ½ hour	Observations
Time - _____ (Placed in freezer)	
Time - _____ 1st Observation	
Time - _____ 2nd Observation	
Time - _____ 3rd Observation	

Time - Every ½ hour	Observations
Time - _____ 4th Observation	
Time - _____ 5th Observation	
Time - _____ 6th Observation	

Results: Summarize the results.

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Conclusion: Was your hypothesis correct?

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What would happen if we put 2 teaspoons of salt in 8 oz. of water?

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**Appendix H**  
**Ocean Test 1**

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Completion:**

There are four oceans: \_\_\_\_\_,  
\_\_\_\_\_, \_\_\_\_\_, and  
\_\_\_\_\_. Of these the \_\_\_\_\_  
is the largest and the \_\_\_\_\_ is the smallest. Two oceans, the  
\_\_\_\_\_ and \_\_\_\_\_ are almost the same size. Oceans make up approximately \_\_\_\_\_  
% of  
the Earth's surface.

Scientists study the ocean floor. Although difficult, they do this with  
\_\_\_\_\_ and \_\_\_\_\_. They have discovered a large mountain range that crosses all the  
oceans;  
it is called the \_\_\_\_\_.

**Match:**

- |                              |                                                                      |
|------------------------------|----------------------------------------------------------------------|
| 1. ____ Ooze                 | a. The total amount of dissolved salts in water                      |
| 2. ____ Echo Time            | b. Rock particles and organic remains of plants and animals          |
| 3. ____ Sonar                | c. The time it takes for sound to travel to the ocean floor and back |
| 4. ____ Mid - Atlantic Ridge | d. Using sound to discover the depth of the ocean floor              |
| 5. ____ Salinity             | e. The section of the oceanic ridge that is most studied             |
| 6. ____ Sodium Chloride      | f. Table salt (NaCl)                                                 |

**True and False:**

1. \_\_\_\_\_ The amount of salinity in the ocean never varies.
2. \_\_\_\_\_ Oceans waters will have a higher salinity if the climate is hot and dry.
3. \_\_\_\_\_ Where a river empties into the oceans the salinity is higher.
4. \_\_\_\_\_ Fresh water freezes before salt water.
5. \_\_\_\_\_ A fifth ocean was recognized in the year 2000.

## Appendix H

### Label The Ocean Floor:

Use the following words: trench, island, continental slope, abyssal plain, and continental shelf.

**(Teacher will draw a silhouette of the ocean floor with the above items to be labeled.)**

### Short Answer:

How does salinity affect the density of water? Give 2 examples to support this.

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## Appendix I

## Answer Key to Ocean Test 1

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Completion:

There are four oceans: Atlantic Ocean, Pacific Ocean,  
Arctic Ocean, and Indian Ocean. Of these the Pacific Ocean  
is the largest and the Arctic Ocean is the smallest. Two oceans, the Atlantic Ocean  
and Indian Ocean are almost the same size. Oceans make up approximately 71 % of  
the Earth's surface.

Scientists study the ocean floor. Although difficult, they do this with sonar or  
submersibles  
and photographs. They have discovered a large mountain range that crosses all the oceans;  
it is called the oceanic ridge.

### Match:

- |                                  |                                                                      |
|----------------------------------|----------------------------------------------------------------------|
| 1. <u>b</u> Ooze                 | a. The total amount of dissolved salts in water                      |
| 2. <u>c</u> Echo Time            | b. Rock particles and organic remains of plants and animals          |
| 3. <u>d</u> Sonar                | c. The time it takes for sound to travel to the ocean floor and back |
| 4. <u>e</u> Mid - Atlantic Ridge | d. Using sound to discover the depth of the ocean floor              |
| 5. <u>a</u> Salinity             | e. The section of the oceanic ridge that is most studied             |
| 6. <u>f</u> Sodium Chloride      | f. Table salt (NaCl)                                                 |

### True and False:

1. F The amount of salinity in the ocean never varies.
2. T Oceans waters will have a higher salinity if the climate is hot and dry.
3. T Where a river empties into the oceans the salinity is higher.
4. F Fresh water freezes before salt water.
5. T A fifth ocean was recognized in the year 2000.

## Appendix I

### Label The Ocean Floor:

Use the following words: trench, island, continental slope, abyssal plain, and continental shelf.

**(Teacher will draw a silhouette of the ocean floor with the above items to be labeled.)**

### Short Answer:

How does salinity affect the density of water? Give 2 examples to support this.

As the salinity increases the density increases. A good example is that people float easily in the ocean just like the egg floated in salt water.

The Dead Sea has a very high salinity. To clean the bottom of boats a person has to increase his mass by adding weights to stay under water.

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**Appendix J**  
**Rubric for Daily Tides**

Title and Label: The title and labels reflect the purpose of the graph.

1      2      3      4

Accuracy: Coordinates are accurately placed.

1      2      3      4

Coordinates are accurately connected to create 2 lines.

1      2      3      4

Neatness: Labels are easily read. A ruler is used to connect coordinates.

1      2      3      4

Color: One color is used for high tides and one color is used for low tides.

1      2      3      4

Key: A key will indicated color and tide.

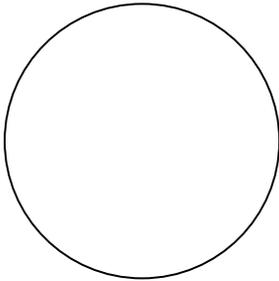
1      2      3      4

- 4 - Excellent
- 3 - Good
- 2 - Satisfactory
- 1 - Needs Improvement

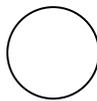
**Appendix K**  
**Monthly Tide Worksheet**

Cut out the replicas of the Sun, Moon, and Earth. Color according to directions.

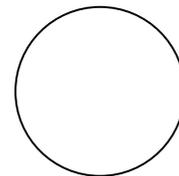
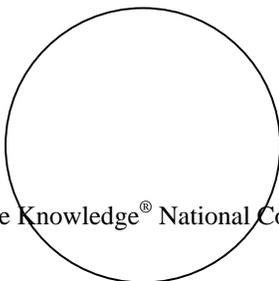
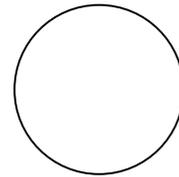
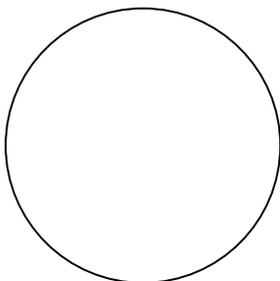
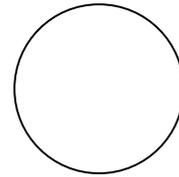
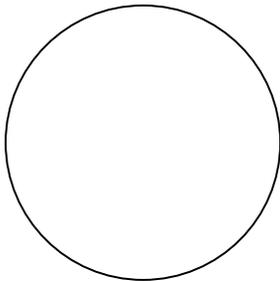
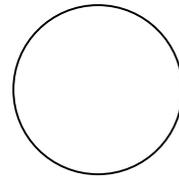
Sun



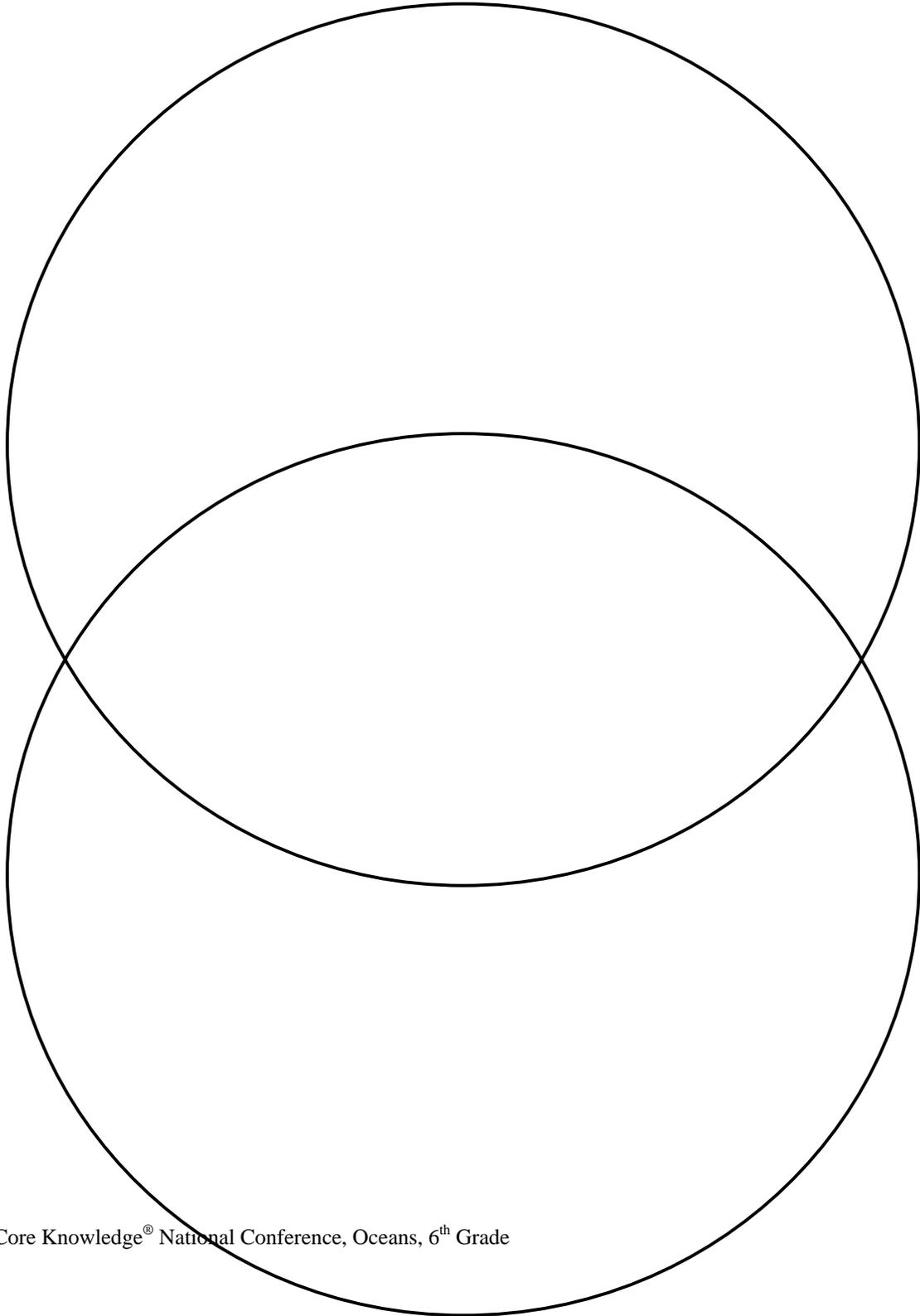
Moon



Earth



**Appendix L**  
**Currents**



## Appendix M Ocean Currents

Directions: Place each phrase of words about ocean current in the correct place on the Venn Diagram.

affected by the Coriolis effect

cold war

warm and cold water

driven by changes in density caused by temperature and salinity changes

Gulf Stream

move and mix water around the world

slower moving

faster moving

upwelling

affects the climate

driven by the winds

move in a circular pattern

begins near the poles

1000 year round trip

affect water to a depth of several hundred meters

moves along the ocean floor

## **Appendix N**

### **Process of Upwelling**

This is the sequence of events for upwelling to occur.

6. first strong winds from land blow over the ocean

6. winds flow away warm surface water

16. cold water carrying organisms and nutrients rise to take the warm water's place

1. fish feed off the nutrients

fishing crews catch the fish

**Appendix O**  
**Ocean Test 2**

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Waves**

1. A wave is defined as the movement of \_\_\_\_\_ through a body of water.

2. How do waves form?

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3. Name the parts of the wave. Label the crest, trough, wave height, and wavelength.

**(Teacher will draw a short sequence of waves.)**

4. What two factors would affect the size of a wave and why? \_\_\_\_\_

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5. How do waves change a beach? (2 answers)

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6. How is a tsunami like an everyday wave and how is it different from an everyday wave?

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**Tides**

Tides are the daily

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Daily there are \_\_\_\_\_ high and \_\_\_\_\_ low tides. They are caused by the gravity of the

\_\_\_\_\_ and \_\_\_\_\_.

1. What is the difference between high and low tides?

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2. In addition to the daily tides there are spring tides and neap tides that occur on a \_\_\_\_\_ cycle.

3. Label the following as neap tide or spring tide.

\_\_\_\_\_ The sun, moon, and Earth align in a straight line.

\_\_\_\_\_ The sun, moon, and Earth align at a right angle.

\_\_\_\_\_ Happens when there is a New Moon or Full Moon.

\_\_\_\_\_ Has high tides that are higher than normal.

\_\_\_\_\_ Occurs when high tides and low tides even out.

**Currents**

1. There are two types of surface currents, warm and cold. Explain where they originate, give an example for each, and tell how they affect climate.

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2. What is upwelling? How does upwelling benefit fish and fishermen?

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3. Why do currents move in circular patterns?

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4. In addition to surface currents there are also deep currents. Place the characteristic in the correct column.

- a. Gulf Stream
- b. affect water to a depth of several hundred feet
- c. creep slowly along the ocean floor
- d. caused by winds
- e. caused by differences in density of water
- f. affected by the Coriolis effect
- g. carry cold water from the poles back toward the equator

surface currents	deep currents

**Appendix P**  
**Answer Key to Ocean Test 2**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Waves**

1. A wave is defined as the movement of energy through a body of water.
2. How do waves form? Most waves form when winds blowing across the water's surface transmit their energy to the water
3. Name the parts of the wave. Label the crest, trough, wave height, and wavelength.

**(Teacher will draw a short sequence of waves.)**

4. What two factors would affect the size of a wave and why?

Factors that affect the size of the waves is: strength of the wind, the length of time it blows, and the distance over which the wind blows. (Student can choose two)

These factors would affect the amount of energy that could be transmitted.

5. How do waves change a beach? (2 answers)

Waves shape a beach by eroding the shore in some places and building it up in others.

6. How is a tsunami like an everyday wave and how is it different from an everyday wave?

A tsunami is like an everyday wave since both are caused by the movement of energy through the

water.

A tsunami is different from a wave since it is usually caused by an earthquake beneath the ocean floor (the energy comes from the earthquake and not the wind)

## **Tides**

Tides are the daily \_\_\_\_\_ rise and fall of Earth's waters \_\_\_\_\_.

Daily there are 2 high and 2 low tides. They are caused by the gravity of the moon and sun.

1. What is the difference between high and low tides?

A high tide occurs when the water reaches its highest point. A low tide occurs when the water reaches its lowest point.

2. In addition to the daily tides there are spring tides and neap tides that occur on a monthly cycle.

3. Label the following as neap tide or spring tide.

spring tide                      The sun, moon, and Earth align in a straight line.

neap tide                        The sun, moon, and Earth align at a right angle.

spring tide                      Happens when there is a New Moon or Full Moon.

spring tide                      Has high tides that are higher than normal.

neap tide                        Occurs when high tides and low tides even out.

## **Currents**

1. There are two types of surface currents, warm and cold. Explain where they originate, give an example for each, and tell how they affect climate.

Warm currents originate near the equator. A well-known warm current is the Gulf Stream

(Teachers will accept other answers). Warm currents bring mild and often rainy weather. Cold

\_\_\_\_\_ currents originate near the poles. A well known cold current is the West Wind Drift. (Teacher will accept other answers). Cold currents tend to bring cool, dry weather.

2. What is upwelling? How does upwelling benefit fish and fishermen?

\_\_\_\_\_ Upwelling is the upward flow of cold water from the ocean depths. Upwelling brings up tiny  
\_\_\_\_\_ ocean organisms, minerals, and other nutrients from the deep layers of the water. Fish come to  
the surface to feed and fishermen are able to catch the fish.

3. Why do currents move in circular patterns?

\_\_\_\_\_ Currents move in a circular patten due to the effect of Earth's rotation on the direction of the  
winds. This is called the Coriolis effect.

4. In addition to surface currents there are also deep currents. Place the characteristic in the correct column.

- a. Gulf Stream
- b. affects water to a depth of several hundred feet
- c. creep slowly along the ocean floor
- d. caused by winds
- e. caused by differences in density of water
- f. affected by the Coriolis effect
- g. carry cold water from the poles back toward the equator

surface currents	deep currents
a. Gulf Stream	c. creep slowly along the ocean floor
b. affect water to a depth of several hundred feet	e. caused by differences in density of water
d. caused by winds	f. affected by the Coriolis effect
f. affected by the Coriolis effect	g. carry cold water from the poles back toward the equator

**Appendix Q**  
**Food Chain / Food Web Prequiz**

1. Which is larger, a food chain or food web?

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2. What is the role of a consumer?

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3. What is the role of a producer?

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4. What is the role of a decomposer?

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5. Which type of organism has the most energy? Producer or Consumer \_\_\_\_\_

6. Grass ---- Tiger ---- Mushroom

a. Which of the above is a decomposer? \_\_\_\_\_

b. Which is a consumer? \_\_\_\_\_

c. Which is a producer? \_\_\_\_\_

## Appendix R Squid Dissection

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Observe your squid carefully. Locate the following items. Use the squid poster to help.

\_\_\_\_\_ tentacle      \_\_\_\_\_ siphon      \_\_\_\_\_ ventral side      \_\_\_\_\_ mantle  
\_\_\_\_\_ eye      \_\_\_\_\_ chromatophores      \_\_\_\_\_ dorsal side

Draw the tentacle in the box below.

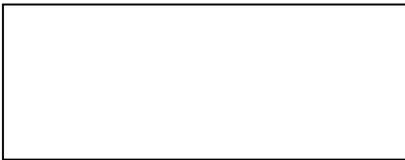


Draw the siphon in the box below.



Place your squid siphon up. Carefully cut the mantle from next to the siphon back to the posterior (back) tip. Be careful not to cut the internal organs. Pull back the mantle to view inside the squid.

Find the gills. Draw one in the box below.



Find the ink sac and remove. Do this carefully. Females will have a nidamental gland that cover the ink sac and liver. Find the gonad and intestines. In females there will be a gelatinous mass of eggs. In males this will be a whitish mass.

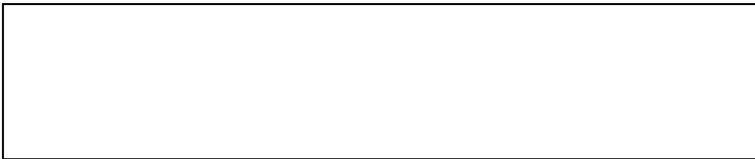
Find the heart.

## Appendix R

Locate the beak in the tentacles. Remove, save, and sketch.



Find the pen. Also remove, save, and sketch.



Remove the lens from the eye. Draw the lens in the box below.



### Microscope Activity

Observe a small piece of squid skin (mantle) under the microscope. Describe the chromatophores.

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### Fingerprint Activity

Draw or write with your squid's "pen and ink" below. You may also do squid fingerprints.

## Appendix S Ocean Animal Project

Due Date - Projects are due the week of \_\_\_\_\_. Students will receive an exact day in that week. MY DUE DATE IS \_\_\_\_\_

As part of the Ocean Unit students are writing animal reports. Props will support the reports. Each will be graded. Props can be models, mobiles, dioramas, posters, etc. If a student has a creative idea, see me to discuss it. Students will then present their reports to the class. Presentations should be done in the order of the written report. Index cards should be prepared, one for each paragraph. Information should not be read. The prop will be referred to during the presentation as a visual aid.

Reports will consist of five or more **well-developed** paragraphs and a conclusion. Below is an outline for the contents of the report. Depending on the ocean animal chosen, some suggested content may not apply. If you find some fascinating information that does not fit into any category, please add the sixth paragraph. For example, some animals may have a myth associated with them that may be interesting.

### Paragraph 1 - Introduction

- General description of animal
- Type of animal - sea mammal, fish, etc.
- Scientific name and common name
- Nickname - if there is one

### Paragraph 2

- Where it lives (habitat - zone and ocean)
- What it eats

Body shape gives important clues about where fishes live and how they move. You can include these ideas in this paragraph if applicable.

### Paragraph 3 - Adaptations

- Camouflage - coloring or texture
- Special behavior and body features
- Helpful partnerships
- How do the adaptations help the animal survive?

### Paragraph 4 - Senses of you animal

- Seeing
- Hearing
- Feeling, touch, tasting
- Smelling

### Paragraph 5 - Life Cycle

- Birth to death
- Reproduction

Conclusion

**Please sign and return the bottom portion of this paper by \_\_\_\_\_.**

-----  
**I have received and read the information about the Ocean Animal Report**

**Student Name** \_\_\_\_\_ **Period** \_\_\_\_\_

**Parent Signature** \_\_\_\_\_

## Appendix T Ocean Animal Project Rubric

Name \_\_\_\_\_

**Content:**

Par 1 Introduction and description	Yes	No
Par 2 Food/Habitat	Yes	No
Par 3 Adaptations/Behavior	Yes	No
Par 4 Senses of your animal	Yes	No
Par 5 Life Cycle	Yes	No
Par 6 (Optional)	Yes	No
Bibliography	Yes	No
Has Cover	Yes	No

**Writing:**

Paragraph organization/development	Ex	Good	Sat	NI
Sentence structure	Ex	Good	Sat	NI
Grammar/Punctuation	Ex	Good	Sat	NI
Word Choice	Ex	Good	Sat	NI
Spelling	Ex	Good	Sat	NI

Comments

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**Oral Presentation:**

Eyes	Ex	Good	Sat	NI
Posture	Ex	Good	Sat	NI
Voice	Ex	Good	Sat	NI
Content Prepared	Ex	Good	Sat	NI

Comments

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**Prop**

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