

Ocean Life

Grade Level: 6th Grade Science

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Length of Unit: Four lessons (approximately two weeks (10 days), one day = 60 minutes)

I. ABSTRACT

This unit focuses on the *Core Knowledge Sequence* 6th grade topic of Oceans. Students will learn about the salinity of ocean water, life zones in the ocean, the classification of marine life and ocean food chains. Students will be doing a variety of activities including class discussions, group work, hands-on experiments and taking a field trip.

II. OVERVIEW

A. Concept Objectives (Colorado Science Standard - CSS)

1. Students will understand the processes of scientific investigation. (CSS 1)
2. Students will understand that science involves a particular way of knowing and understanding common connections among scientific disciplines. (CSS 6)
3. Students will understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. (CSS3)

B. Content from the *Core Knowledge Sequence*

1. Oceans – Science: Grade 6 (page 153)
 - a. Marine Life
 - i. Composition of seawater: dilute solution of salts that come from weathering and erosion of continental rocks.
 - a) Sodium chloride is the main salt.
 - b) Elements needed for life, such as carbon and phosphorus, exist in relatively weak concentration and limit the amount of ocean life.
 - ii. Life zones are determined by the depth to which light can penetrate making photosynthesis possible, and by the availability of nutrients.
 - a) The bottom (benthic zone) extends from sunlit continental shelf to dark sparsely populated depths. Shallow lighted water extending over continental shelf contains 90% of marine species.
 - b) Pelagic zone: water in deep oceans
 - iii. Classification of marine life
 - a) Bottom-living (benthic) such as kelp and mollusks
 - b) Free-swimming (nekton) such as fish and whales
 - c) Small drifting plants and animals (plankton), which are the dominant life and food source in the ocean
 - iv. The basis for most marine life is phytoplankton (plant-plankton), which carry on photosynthesis near surface; contrast zooplankton (animal-plankton).
 - v. Most deepwater life depends on rain of organic matter from above. The densest concentration of marine life is found in surface waters, such as those off Chile, where nutrient-rich water wells up to the bright surface.

- C. Skill Objectives (Colorado Science Standard – CSS) (Colorado Science Grade Level Expectation – CSGLE)
1. Students will interpret and evaluate data in order to form conclusions. (CSGLE 1f)
 2. Students will use a model to understand a process. (CSGLE 6f)
 3. Students will describe how an environment’s ability to provide food, water, space and essential nutrients determines carrying capacity. (CSGLE 3.1e)
 4. Students will comprehend interrelationships of matter and energy in living systems. (CSS 3.2)
 5. Students will explore bio-diversity in ecosystems. (CSGLE 6.3c)
 6. Students will know that energy entering ecosystems as sunlight is transferred by producers into energy and then transferred up the food chain. (CSGLE 6.3d)
 7. Students will categorize organisms according to their roles in food chains and food webs. (CSGLE 6.3e)
 8. Students will describe the importance of plant and animal adaptations. (CSGLE 3.1b)
 9. Students will create food chains and food webs. (CSGLE 3.1c)

III. BACKGROUND KNOWLEDGE

- A. For Teachers
1. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth’s Waters*. New Jersey: Prentice Hall, 2000 (Teacher’s Edition) ISBN: 0-13-434565-7
 2. Ganeri, Anita *The Oceans Atlas*. USA: Dorling Kindersley, Inc. 1994 ISBN: 1-56458-475-5
 3. Rodgers, Howell, Smith, Clarke and Henderson *The Usborne Internet-Linked Science Encyclopedia*. England: Usborne Publishing, Ltd. 2000 ISBN: 0-7460-3833-X
- B. For Students
1. Students should have past knowledge of the following from the *Core Knowledge Sequence*:
 - a. Living Things and Their Environments: Oceans and Undersea Life from Science: Grade 1 (page 37)
 - b. Cycles in Nature: The Water Cycle from Science: Grade 2 (page 59)
 - c. Chemistry: Properties of Matter from Science: Grade 4 (page 104)
 - d. Geology: The Earth’s Layers from Science: Grade 4 (page 105)

IV. RESOURCES

- A. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth’s Waters*. New Jersey: Prentice Hall, 2000 (Teaching Resources) ISBN: 0-13-434940-7 (Lesson Two)
- B. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth’s Waters*. New Jersey: Prentice Hall, 2000 (Student’s Edition) ISBN: 0-13-434484-7 (Lesson Two and Three)
- C. Fredricks, Anthony D. *Exploring the Oceans: Science Activities for Kids*. Colorado: Fulcrum Publishing, 1998. ISBN: 1-55591-379-2 (Lesson Four)
- D. VanCleave, J. *Oceans for Every Kid: Easy Activities that Make Learning Science Fun*. USA: John Wiley & Sons, 1995 ISBN: 0-471-12454-0 (Lesson One and Three)

V. LESSONS

Lesson One: The Composition of Seawater (approximately two 60-minute class periods)

A. Daily Objectives

1. Concept Objectives
 - a. Students will understand the processes of scientific investigation. (CSS 1)
 - b. Students will understand that science involves a particular way of knowing and understanding common connections among scientific disciplines. (CSS 6)
2. Lesson Content
 - a. Oceans: Composition of Seawater - Science: Grade 6 (*Core Knowledge Sequence* page 153)
3. Skill Objectives
 - a. Students will interpret and evaluate data in order to form conclusions. (CSGLE 1f)
 - b. Students will use a model to understand a process. (CSGLE 6f)

B. Materials

1. Paper and pencil for each student
2. Handout, Appendix A: Salinity Notes (one copy per student)
3. Two wide-mouth jars
4. Tap water
5. Two uncooked eggs
6. Salt
7. Handout, Appendix B: Composition of Seawater Quiz (one copy per student)
8. Answer Key, Appendix C: Composition of Seawater Quiz

C. Key Vocabulary

1. Salinity – the total amount of dissolved salts in water
2. Sodium Chloride – the main salt found in ocean water

D. Procedures/Activities

1. Review what students know about the Earth's oceans and the properties of ocean water. Ask students the following questions:
 - a. Why is salt put on icy sidewalks and roads? (The salt melts the ice.)
 - b. Which do you think freezes at a lower temperature, salt water or fresh water? (salt water)
2. Guide students in concluding that the salt in the ocean water interferes with the formation of ice, making the ocean water freeze at a lower temperature than fresh water.
3. Demonstrate how salinity directly affects the density of water by filling two jars with tap water. Add three teaspoons of salt to one jar. Stir it until it dissolves. Do not add anything to the second jar of water.
4. Place a whole, uncooked egg in each jar. Have the class observe what happens to each egg. (The egg in the salt water will float; the egg in the fresh water will sink.)
5. Have students answer the following question:
 - a. What does this demonstration tell you about the difference between salt water and fresh water? (Salt water is denser than fresh water.)
6. Hand out Appendix A: Salinity Notes to read through and discuss as a class.
7. Have students consider the following facts about Earth's waters:
 - a. There are an estimated 4.5 trillion metric tons of salt dissolved in Earth's oceans and seas. If this salt was spread out over Earth's surface, it would bury a 15-story building.

- b. In one small part of the Red Sea, the salinity was recorded to be 270 parts per thousand, or almost eight times as salty as most ocean water.
 - c. More than 150 km out to sea from the mouth of the Amazon River, the ocean water is still fresh, not salty.
 - d. A few lakes are as salty as, or even saltier, than oceans, including the Great Salt Lake in Utah and the Dead Sea in Israel.
- E. *Assessment/Evaluation*
- 1. Students are to complete Composition of Seawater Quiz (Appendix B) for a grade. Use Answer Key (Appendix C) to correct.

Lesson Two: Ocean Zones (approximately one 60-minute class period)

- A. *Daily Objectives*
- 1. Concept Objectives
 - a. Students will understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. (CSS3)
 - 2. Lesson Content
 - a. Oceans: Life Zones - Science: Grade 6 (*Core Knowledge Sequence* page 153)
 - 3. Skill Objectives
 - a. Students will describe how an environment's ability to provide food, water, space and essential nutrients determines carrying capacity. (CSGLE 3.1e)
 - b. Students will comprehend interrelationships of matter and energy in living systems. (CSS 3.2)
- B. *Materials*
- 1. Paper and pencil for each student
 - 2. Handout, "The Neritic Zone and Open Ocean" from Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters*. (Teaching Resources) (one copy per student)
 - 3. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters*, (Student's Edition)
 - 4. Handout, Appendix D: Ocean Zones (one copy per student)
- C. *Key Vocabulary*
- 1. Benthic Zone – the ocean bottom
 - 2. Intertidal Zone – the area that stretches from the highest high-tide line on land out to the point on the continental shelf exposed by the lowest low-tide.
 - 3. Neritic Zone – the part of the ocean that extends from the low-tide line out to the edge of the continental shelf
 - 4. Open Ocean – the area of the ocean beyond the edge of the continental shelf
 - 5. Pelagic Zone – the water in deep oceans
- D. *Procedures/Activities*
- 1. Using the Prentice-Hall text, students will read background information on ocean zones beginning on page 156 and continuing through page 162.
Note to teachers: If this text is not available, any reliable source on the ocean zones may be substituted.
 - 2. Have the students set up a two-column table for recording their predictions, with the headings *Similarities* and *Differences* at the top of the table and *Neritic Zone* and *Open Ocean* in the left column. As they read the section, students can cross out any predictions they discover to be incorrect and add other similarities and differences.

3. Distribute copies of Appendix D: Ocean Zones. Walk students through the handout explaining about ocean zones and correlations between them.
 4. Students will then complete the handout “The Neritic Zone and Open Ocean” from Prentice-Hall Teaching Resources, pages 136-137 as homework.
- E. *Assessment/Evaluation*
1. Completed Prentice-Hall handout “The Neritic Zone and Open Oceans” will be turned in for a grade.

Lesson Three: Classification of Marine Life (approximately three 60-minute class periods)

A. *Daily Objectives*

1. Concept Objectives
 - a. Students will understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. (CSS3)
 - b. Students will understand that science involves a particular way of knowing and understanding common connections among scientific disciplines. (CSS 6)
2. Lesson Content
 - a. Oceans: Classification of Marine Life - Science: Grade 6 (*Core Knowledge Sequence* page 153)
3. Skill Objectives
 - a. Students will describe the importance of plant and animal adaptations. (CSGLE 3.1b)
 - b. Students will explore bio-diversity in ecosystems. (CSGLE 6.3c)

B. *Materials*

1. Paper and pencil for each student
2. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth’s Waters* (Student’s Edition)
3. Handout, Appendix E: Classification of Marine Life (one copy per student)
4. Handout, Appendix F: Interpreting Graphs (one copy per student)
5. Rubric, Appendix G: Marine Life Scenes
6. Construction paper or heavy drawing paper
7. Books and resources containing pictures of marine life
8. Crayons, colored pencils, markers or other accessible coloring supplies

C. *Key Vocabulary*

1. Benthos - organisms that inhabit the ocean floors (such as kelp and mollusks)
2. Bioluminescence - the process by which living organisms produce light
3. Nekton – free-swimming animals that can move throughout the water (such as fish and whales)
4. Phytoplankton - plantlike plankton capable of producing food by photosynthesis
5. Plankton – tiny algae and animals that float in the water and are carried by waves and currents (are the dominant life and food source in the ocean)
6. Zooplankton - the animal form of plankton

D. *Procedures/Activities*

1. Using the Prentice-Hall text, students will read background information on ocean zones beginning on page 156 and continuing through page 162.
Note to teachers: If this text is not available, any reliable source on the ocean zones may be substituted.
2. Guide students through the creation of a concept map. Each student will draw a concept map to show the three main types of marine organisms described in their reading, their characteristics, and examples.

3. Distribute copies of Appendix E: Classification of Marine Life. Walk students through the handout explaining about types of ocean life and their environments. Relate this information to the information discussed earlier in the unit on ocean zones (Appendix D).
 4. Students will then complete the activity, Interpreting Graphs (Appendix F) during class.
 5. Finally, students will be creating “Marine Life Scenes” during class applying their knowledge of underwater ocean life using pictures from various books and resources available of types of marine life. Students are to follow the directions below to create an ocean life scene with marine animals and plants placed at appropriate ocean depths - similar to the one found in the “Classification of Marine Life” handout (Appendix E). Encourage students to be creative but accurate.
 - a. Review the ocean zones from Lesson Two with students, discussing the location of marine life and why certain ocean zones only contain certain types of marine organisms.
 - b. Students are to draw a scene in the ocean that includes at least five marine organisms for each of the ocean zones. They need to incorporate color into their scenes once they have completed drawing.
- E. *Assessment/Evaluation*
1. Concept maps and “Interpreting Graphs” handout (Appendix F) will be collected for a grade.
 2. Use rubric (Appendix G) to grade students’ Marine Life Scenes.

Lesson Four: Ocean Food Webs (approximately two 60-minute class periods)

- A. *Daily Objectives*
1. Concept Objectives
 - a. Students will understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. (CSS3)
 - b. Students will understand that science involves a particular way of knowing and understanding common connections among scientific disciplines. (CSS 6)
 2. Lesson Content
 - a. Oceans: Food Webs - Science: Grade 6 (*Core Knowledge Sequence* page 153)
 3. Skill Objectives
 - a. Students will know that energy entering ecosystems as sunlight is transferred by producers into energy and then transferred up the food chain. (CSGLE 6.3d)
 - b. Students will categorize organisms according to their roles in food chains and food webs. (CSGLE 6.3e)
 - c. Students will create food chains and food webs. (CSGLE 3.1c)
- B. *Materials*
1. Pencil and paper for students
 2. Visual aid, Appendix H: Marine Food Web
 3. Fredricks, Anthony D. *Exploring the Oceans: Science Activities for Kids*
 4. Index cards
 5. Yarn
 6. Single hole paper punch
 7. Rubric, Appendix I: Marine Food Web

- C. *Key Vocabulary*
1. Consumers – organisms that cannot produce their own food and must eat other organisms
 2. Food chain – a series of organisms linked together in the order in which they feed on each other
 3. Food web – the feeding relationship in a habitat
 4. Producers – organisms, specifically plants, capable of producing food from nonliving matter
- D. *Procedures/Activities*
1. Using Fredricks, *Exploring the Oceans: Science Activities for Kids*, lead students in a discussion about food chains and food webs found in Earth’s oceans. Read pages 8-9 of the text aloud to the class and show an illustration of what a food chain is.
Note to teachers: If this book is not available, any reliable source on the food chains and food webs may be substituted.
 2. Next, show the students Appendix H: Marine Food Web and discuss the many different food chains found within it.
 3. Using the activity “All Tied Together” beginning on page 9, instruct the students on how to create their individual marine food web.
 4. Use the following directions to create an marine food web:
 - a. Use the diagram on page 10 as an example, which illustrates a marine food web.
 - b. Print the names of each organism in the web on an index card.
 - c. Lay the index cards out on a large flat surface (table or floor).
 - d. Lay pieces of yarn between the cards to represent the lines in the diagram.
 - e. Us the hole punch to punch the necessary holes in each card.
 - f. Tie the ends of each piece of yarn to each of the punched holes.
 5. Discuss as a class individual findings and obstacles they encountered.
 6. Assign homework problem for the students to solve. Have students identify as many types of seafood consumed in their homes or in restaurants as they can. Have them then identify the place in a food chain where these seafood sources belong, tracking the food chain backward from human consumer to primary producer.
 7. Questions to answer:
 - a. How many levels of consumption does it take to reach the human consumer?
 - b. What eats and gets eaten along the way?
- E. *Assessment/Evaluation*
1. Evaluate the food webs using the rubric in Appendix I.
 2. Collect homework food chains and assigned questions for grading.

VI. CULMINATING ACTIVITY

- A. Ocean Life Exam (Appendix J) on concepts covered throughout the previous weeks will be given at the end of the unit.
- B. Use Ocean Life Exam Teacher’s Key (Appendix K) to grade.
- C. Field trip to local Aquarium
 1. During your visit to the Aquarium your students have the opportunity to observe and explore the characteristics of living things and their environment. Your students will become aware that:
 - a. all living things can be classified based on similarities and differences

- b. living things are able to do certain things
 - c. living things have special parts that allow them to do certain things
 - d. living things have basic needs
 - e. individuals and groups of organisms interact with each other and their environment
 - f. organisms and groups of organisms that are best suited to an environment survive and reproduce.
2. Behind The Scenes Look at Aquariums – Some aquariums offer tours to classes educating students on what it takes to duplicate natural aquatic habitats. Take advantage of these programs if available. They can answer and show you:
 - a. What goes on at an Aquarium, and what has to be done to keep it running?
 - b. Learn more about this man-made environment and how it works.
 3. Student will write a one-two page paper summarizing what they observed at the aquarium and facts they learned about animal adaptations and habitats.

VII. HANDOUTS/WORKSHEETS

- A. Appendix A: Salinity Notes
- B. Appendix B: Composition of Seawater Quiz
- C. Appendix C: Composition of Seawater Quiz Answer Key
- D. Appendix D: Ocean Zones (two pages)
- E. Appendix E: Classification of Marine Life
- F. Appendix F: Interpreting Graphs (two pages)
- G. Appendix G: Rubric: Marine Life Scenes
- H. Appendix H: Marine Food Web
- I. Appendix I: Rubric: Marine Food Web
- J. Appendix J: Ocean Life Exam (two pages)
- K. Appendix K: Ocean Life Exam Answer Key

VIII. BIBLIOGRAPHY

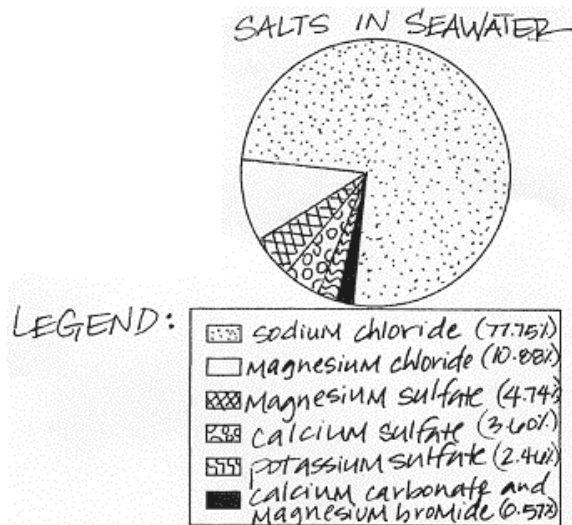
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- B. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters*. New Jersey: Prentice Hall, 2000 (Student's Edition) ISBN: 0-13-434484-7 (Lesson One)
- C. Simons, B. & Wellnitz, T.R. *Science Explorer: Earth's Waters*. New Jersey: Prentice Hall, 2000 (Teaching Resources) ISBN: 0-13-434484-7
- D. Ganeri, Anita *The Oceans Atlas*. USA: Dorling Kindersley, Inc. 1994. ISBN: 1-56458-475-5
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- G. Rodgers, Howell, Smith, Clarke and Henderson *The Usborne Internet-Linked Science Encyclopedia*. England: Usborne Publishing, Ltd. 2000 ISBN: 0-7460-3833-X
- H. Van Rose, Susanna *Eyewitness Books: Earth*. USA: Dorling Kindersley, Inc. 1994. ISBN: 0-7894-5575-7

APPENDIX A Salinity Notes

Adapted from VanCleave's *Oceans for Every Kid*, "Salty" activity

Why the ocean is salty.

Seawater tastes salty because of the salts dissolved in it. A mixture of 1 tablespoon of table salt in 1 quart of water contains about the same amount of salt as does seawater. Sodium chloride is the chemical name for the salt known as table salt. This salt is the most abundant salt in seawater. However, there are seven common salts in seawater.



Ocean water also contains smaller amounts of other elements needed for life, such as carbon and phosphorus. These elements exist in relatively weak concentration and limit the amount of ocean life.

Salinity is the measure of the amount of salt dissolved in a liquid. The average salinity of seawater is 35 parts per thousand (35 ppt). This means that 35 units of salt are in every 1,000 units of seawater. Where there is a great deal of **evaporation** (process by which a liquid changes into a gas due to the addition of heat energy), the salinity of seawater increases. This occurs in areas of dry climate, such as the Mediterranean Sea, where the salinity is about 38 ppt. Where rivers enter the sea the salinity of seawater decreases to between 32 ppt and 35 ppt. This is because the salinity of the river water is very low and it dilutes the seawater. Other areas of low salinity are cold icy bodies of water, such as the Arctic Ocean. Usually the melting ice and low evaporation keep the salinity of icy waters lower than that of warmer ocean waters.

Although ocean waters seem to have no place to go, and rivers continually pour water into them, the water level in the ocean does not continually rise. This is because water leaves the ocean by evaporation. The water lost through evaporation eventually returns to the ocean through the process of **condensation** (the process by which a gas changes into a liquid due to a removal of heat energy). This water returns to the earth as **precipitation** (liquid or solid particles of water that form in the atmosphere and then fall to the earth's surface), such as rain, hail, sleet, or snow. As the water runs downhill over the land, it causes weathering and erosion of continental rocks. This in turn causes water to carry bits of minerals with it, including salt. Once salt gets carried from land to the ocean, it is stuck. The salt has nowhere else to go. Precipitation also falls into rivers and streams that flow over the land, bringing more water to the ocean. As long as the loss of water through evaporation equals the gain of water through precipitation, the water level in the ocean remains constant.

APPENDIX C
Composition of Seawater Quiz
Answer Key

1. List one factor that increases the salinity of seawater and one factor that decreases the salinity of seawater.

Evaporation increases salinity as well as freshwater from river and streams flowing into the ocean. Surface water freezing into ice (at the poles) and precipitation decrease salinity.

2. Explain why an egg floats in salt water but sinks in fresh water.

Salt water is denser than fresh water.

3. What is the average salinity of ocean water?

The average salinity of ocean water is 35 parts per thousand (35ppt).

4. What is the most abundant salt in seawater?

Sodium chloride is the most abundant salt in seawater.

5. Would you expect salinity to be high or low in a rainy ocean region near the mouth of a river. Why?

The salinity would be low because both precipitation and fresh water from rivers lower salinity.

APPENDIX D

Ocean Zones

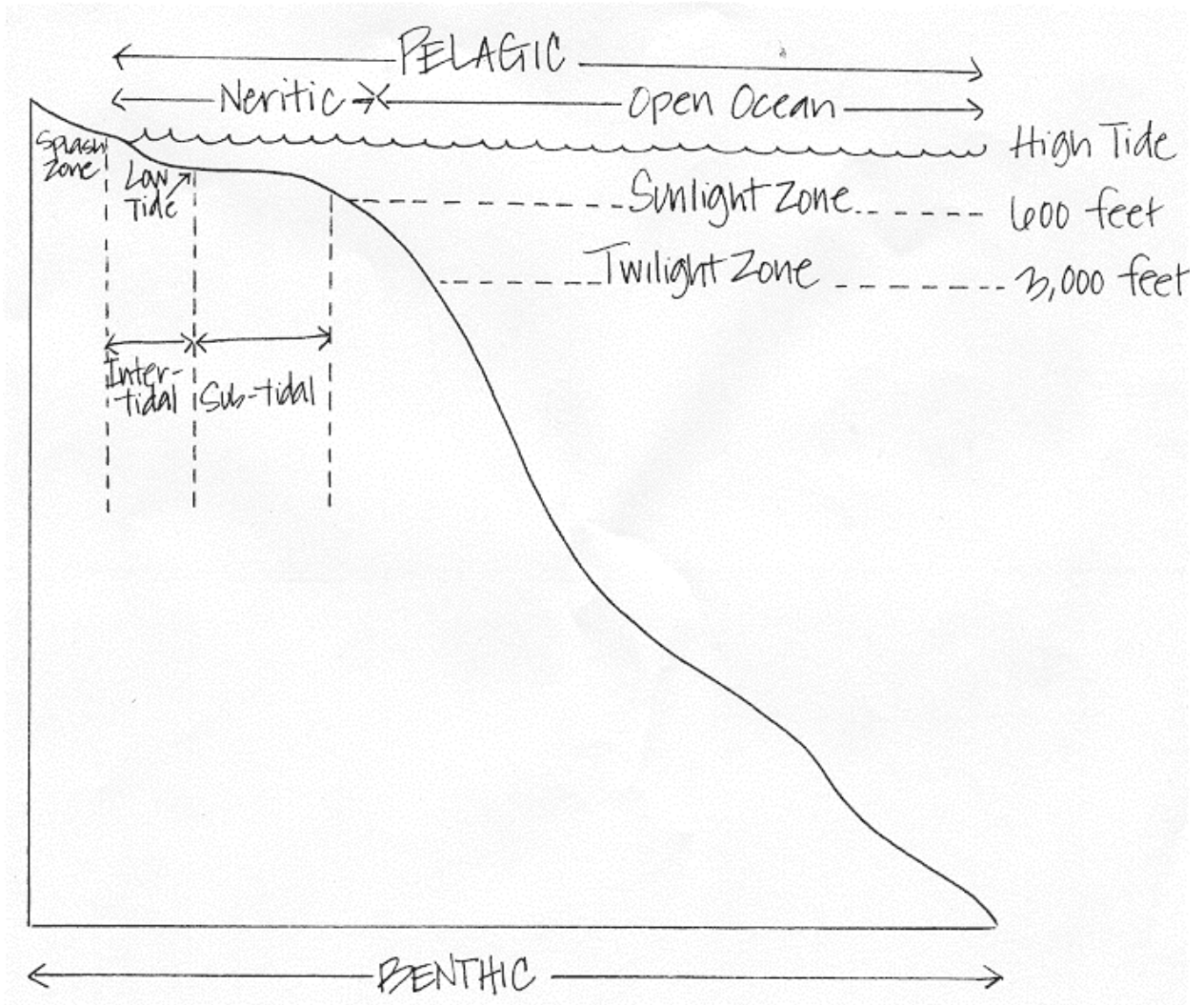
<p>I. Ocean Zones</p>	<ul style="list-style-type: none"> • Benthic Zone is the ocean bottom (ocean floor) This zone extends from the continental shelf to dark sparsely populated depths. Shallow lighted water extending over continental shelf contains 90% of marine species. • Pelagic Zone is the water in deep oceans (ocean waters)
<p>II. The main life factors</p>	<ul style="list-style-type: none"> • Three primary factors determine what kind of life lives in the ocean. They are sunlight, temperature, and pressure. • Based on these factors, the ocean is broken into three life zones called the Intertidal, Neritic, and Open Sea Zones.
<p>III. Intertidal Zone</p>	<ul style="list-style-type: none"> • This zone lies between the low and high tide lines. • Sometimes it is covered in water and sometimes it is dry. • Plants and animals that live in this zone have evolved special structures and techniques to survive in fast moving waters and changing tides.
<p>IV. Neritic Zone</p>	<ul style="list-style-type: none"> • This zone extends from the low tide line to the edge of the continental shelf. It is usually only as deep as 200m. • This zone has the richest life because it has the best conditions for life. • Light is plentiful allowing plants to thrive. • The temperature is stable and the pressure is low.
<p>V. Open Ocean</p>	<ul style="list-style-type: none"> • All of the ocean beyond the continental shelf. It is so vast and deep that it is broken into 4 very broad zones: • The Sunlit Zone is the top layer in the ocean. It is named because there is plenty of sunlight. This is the layer where most ocean currents occur. This layer is from sea level to a depth of approximately 660 feet. • The Twilight Zone represents the maximum depth to which light penetrates water. Typically, no plants grow in this zone. This zone ranges from a depth of 660 to 3,300 feet. Temperature here may go down to about 41°F. • The Dark Zone ranges from a depth of 3,300 feet to about 13,200 feet. Water pressure increases tremendously and water temperatures range from 34-36°F. • The Abyss is without light and includes some of the deepest parts of the world's oceans (more than 13,200 feet deep). Temperatures here are just above freezing and the animals that live in this region are some of the most unusual. Water pressure is tremendous, food is scarce and much of the seabed is covered with mud-like ooze.

APPENDIX D (page 2) Ocean Zones

As we have discussed, the ocean can be divided into many zones. The ocean's bottom is the **benthic zone** and the water itself (or the water column) is the **pelagic zone**.

The **neritic zone** is that part of the pelagic zone that extends from the high tide line to an ocean bottom less than 600 feet deep. Water deeper than 600 feet is called the **open ocean zone**.

These zones roughly correspond to the three other zones divided on the basis of the amount of sunlight they receive. In the **sunlit zone**, enough light penetrates to support photosynthesis. Below that lies the **twilight zone**, where very small amounts of light penetrate. Ninety percent of the space in the ocean lies in the **midnight zone**, which is entirely devoid of light.



APPENDIX E (page 1)

Classification of Marine Life

Adapted from VanCleave's *Oceans for Every Kid*, "Layered" activity

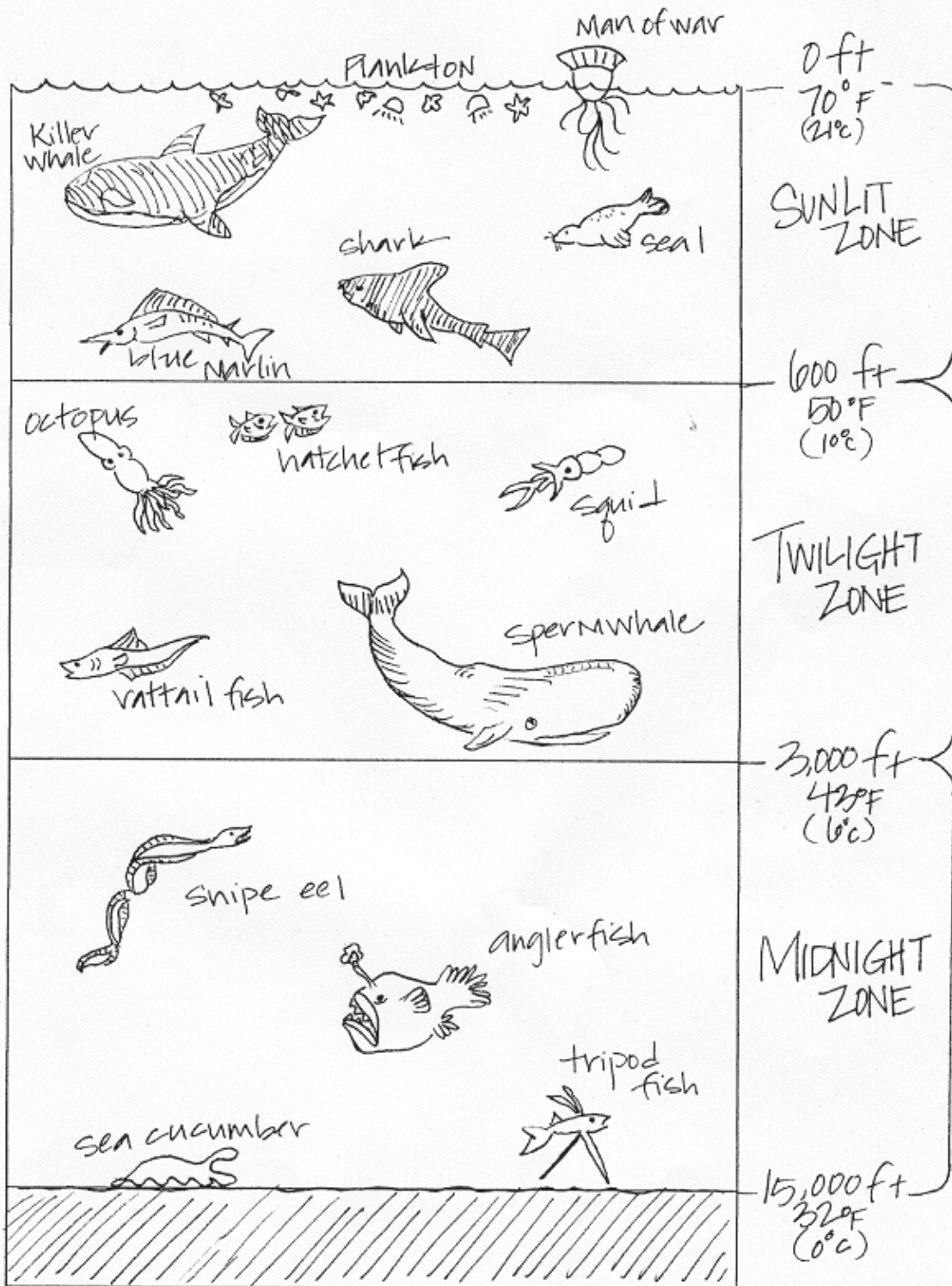
Marine organisms are classified according to their habits and the part of the ocean where they live. **Plankton** is a term for small, often microscopic organisms that drift with the current or tide at or near the ocean's surface. Most cannot move by themselves. Plantlike plankton capable of producing food by photosynthesis, such as algae, are called **phytoplankton**. The animal form of plankton, such as **krill** (small shrimp-like animals), are called **zooplankton**. Nekton are organisms in the ocean that can swim, from the smallest fish to the largest whale. **Benthos** are all creatures that live on the ocean floor, such as starfish, worms, clams and snails.

The ocean is divided into zones according to the presence of sunlight. The top layer called the **sunlit zone**, has the most light. This is the smallest zone, but contains more than 90 percent of marine life. Since plants require sunlight to live, this is the area where plants are most productive. Organisms that live in this zone include sharks, seaweed, coral, turtles, jellyfish, tuna, herring, and whales.

The **twilight zone** starts from the bottom of the sunlit zone and extends down to about 3,000 feet below the surface. As the depth increases, the water gets darker, its temperature decreases, and its pressure increase. There is very little light entering this zone, and the light is mostly blue and violet. Green plants are not able to grow in this zone. There is less food in this area, so there is less animal life. Many animals here feed off of falling remains of dead organisms from the sunlight zone. Some swim to the sunlit zone at night to feed off nutrients there. Some animals in this zone glow in the dark, using special organs that give off light. The process by which living organisms produce light is called **bioluminescence**. Animals that typically live in this region include sponges, octopi, some types of coral, some species of whales (sperm whales), and hatchet fish.

The **midnight zone**, or also called the dark zone, extends from the bottom of the twilight zone to the ocean floor. Sometimes the deeper portion of this zone is further divided into a zone called the **Abyss**. The only light produced in this zone is bioluminescence. The greatest source of nutrients is the remains from marine life from the ocean's upper zones. There are fewer life-forms in this area because of the darkness, low temperatures, high water pressure, and scarce food supplies. The animals living here generally grow very slowly and live for a longer period of time because the speed of the body's chemical and physical activities is slow. Animals in this part of the ocean include gulper eels, anglerfish, sea spiders, sea cucumbers, brittle stars and sea lilies.

APPENDIX E (page 2)
Classification of Marine Life

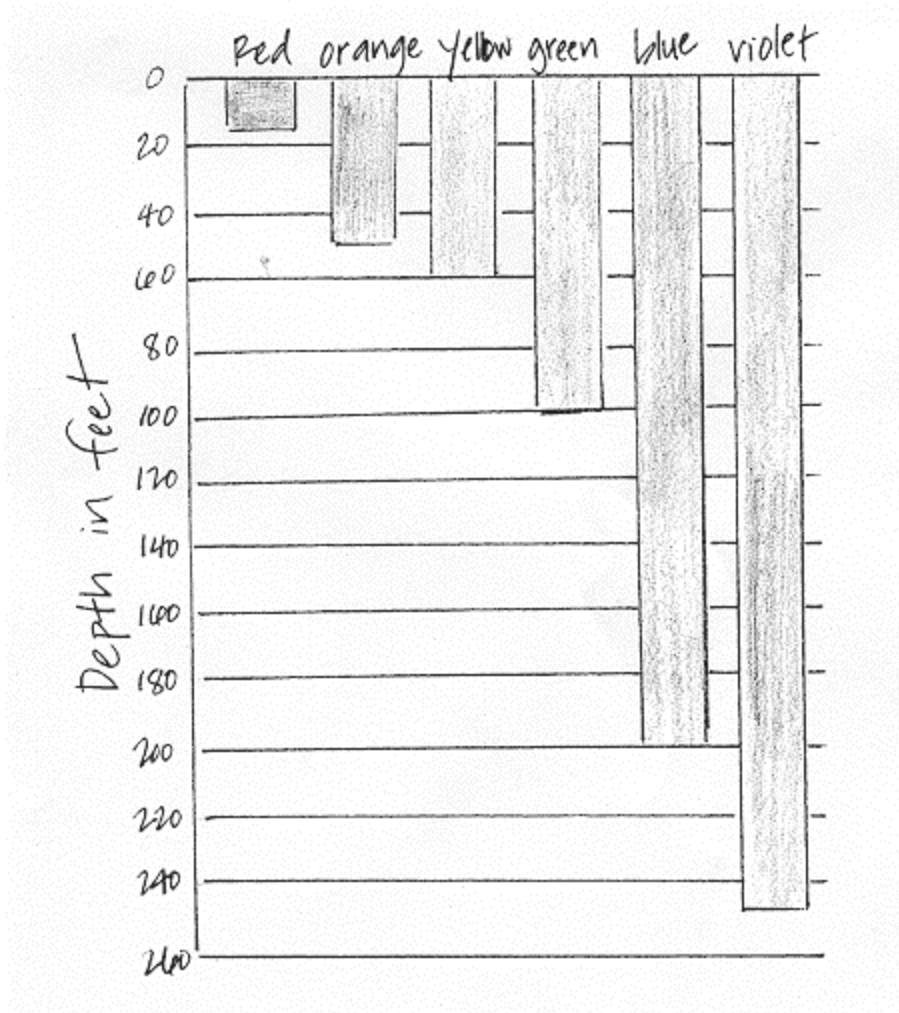


APPENDIX F (page 1) Interpreting Graphs

Adapted from VanCleave's *Oceans for Every Kid*, "Layered" activity

Sunlight is made up of many colors, and each color can travel a certain distance in seawater. This graph shows the depth where the majority of each color of light is absorbed. Use the graph to answer the following questions:

1. Which color of light reaches the greatest depth? _____
2. Which color(s) reach a depth of 80 feet? _____
3. To what depth are all the colors present? _____



APPENDIX F (page 2) Interpreting Graphs

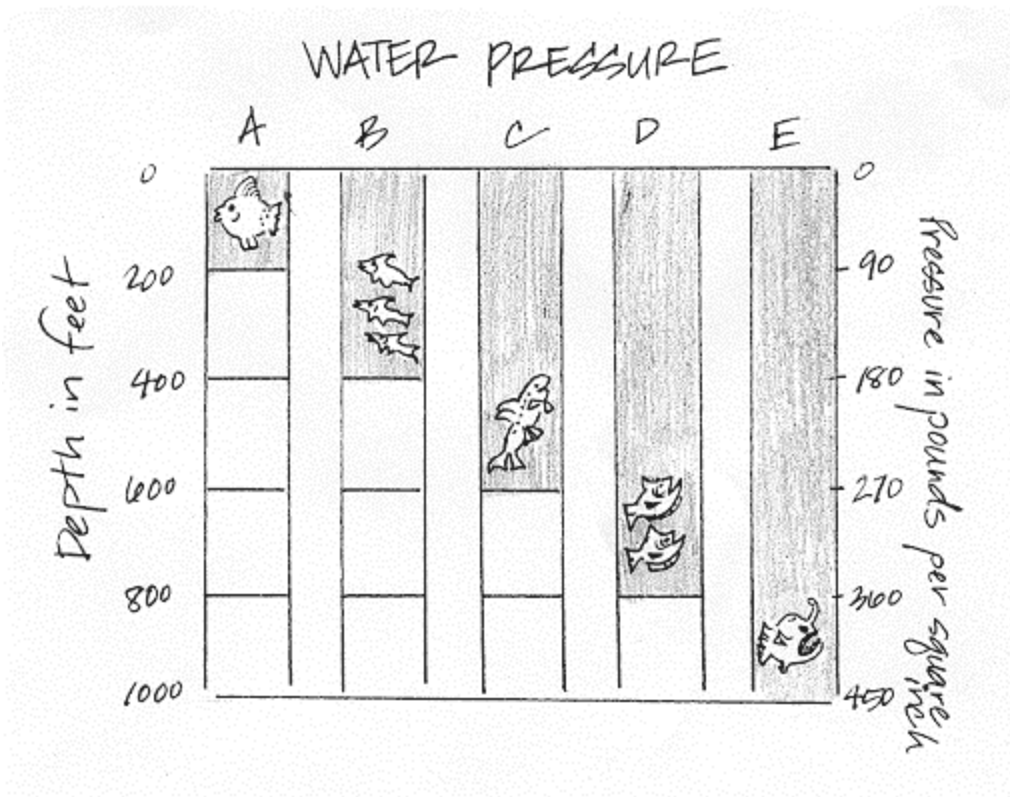
Water Pressure increases with depth.

Use the following graph to answer the following questions:

1. Which fish has the least pressure on its body? _____

2. Which fish has the most pressure on its body? _____

3. How many fish have 270 pounds per square inch or more pressure on their bodies? _____



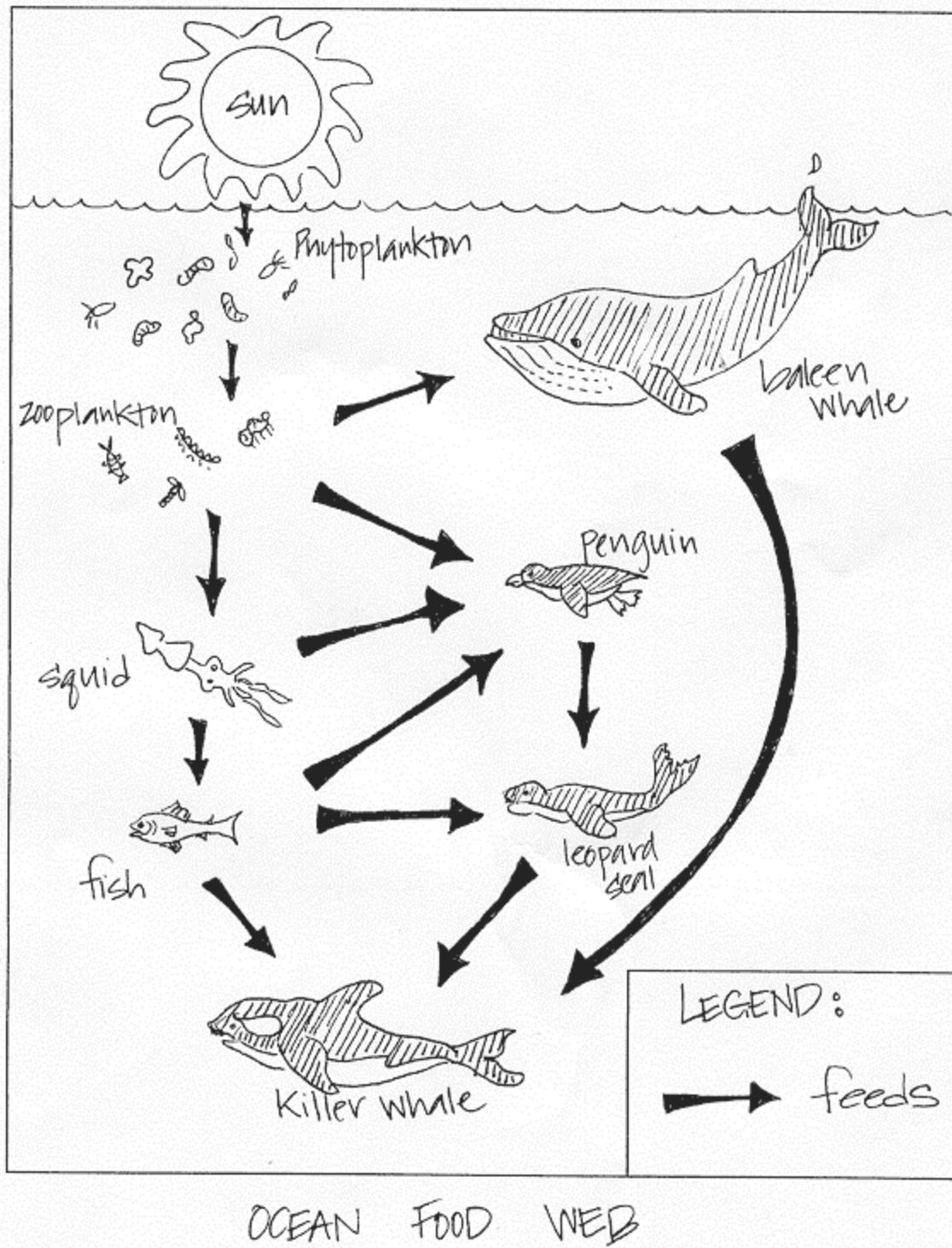
APPENDIX G
Rubric: Marine Life Scenes

	Excellent (9-10)	Good (7-8)	Fair (5-6)	Poor (0-4)
Design (organism placement)	All required organisms are present and recognizable	Most of the required organisms are present and recognizable	Few of the required organisms are present and recognizable	Many of the required organisms are absent or unrecognizable
Construction and Coloring	Scene is well drawn and ocean zones are evident	Scene is fairly well drawn and most of the zones are evident	Scene is inadequately drawn and some zones are evident	Scene is poorly drawn and few zones are evident
Individual Participation	Worked productively	Productive most of the time	Productive some of the time	Very little participation
Project Completion	Time was spent appropriately and project was successful	On task most of the time and project was fairly successful	Had a hard time staying on task and project was not successful	Did not stay on task and project was not completed

Total grade for activity: _____/40

Teacher's comments:

APPENDIX H Marine Food Web



APPENDIX I
Rubric: Marine Food Webs

Possible Points: 15 points

Student Name: _____

Lab work is rated using the numbers 1-5, with 5 being the very best and 1 being the least satisfactory.

Objectives 5 4 3 2 1

Time was spent appropriately and food web was successful					
Organism labels are legible and all cards are correctly tied					
Food web results are accurate and findings are appropriate for class discussion					

Total grade for lab work: _____ /15

Teacher's comments:

APPENDIX J (page 1)
Ocean Life Exam

Short Answer:

1. List three factors that affect where marine organisms live. _____

2. What is the zone that contains the majority of marine organisms? _____

3. What is the name for an organism that lives on the ocean floor? _____

Give two examples. _____

4. What is the name for a free swimming organism? _____

Give two examples. _____

5. What is the name for tiny organisms that are carried by the waves and currents? _____

Name the two types and tell what they are. _____

6. What is the zone from the lowest low tide to the highest high tide line called? _____

List three things organisms living here must be adapted to. _____

7. Explain why phytoplankton must remain along the surface of the ocean of the surface. _____

True or False: *If the statement is true, write true. If it is false, change the underlined word or words to make the statement true*

_____ 1. Most deepwater life depends on the rain of organic matter from above.

_____ 2. Sodium chloride is the main salt found in ocean water.

_____ 3. The area between the high and low tide line is the neritic zone.

_____ 4. Many deep sea fishes use their bioluminescence to attract prey.

_____ 5. A food chain is a series of organisms linked together in the order in which they feed on each other.

APPENDIX J (page 2) Ocean Life Exam

Word Bank: *Terms in the word bank will be used only once. Some terms may not be used at all.*

Benthos	Phytoplankton	Consumers
Bioluminescence	Zooplankton	Benthic Zone
Intertidal Zone	Nekton	Producers
Salinity	Food Web	Neretic Zone

1. Organisms that live on the ocean floor are called _____.
2. The feeding relationships between organisms within their habitat make up a _____.
3. _____ are free swimming organisms that can move throughout the water column.
4. Tiny **animals** that float in the water and are carried by waves and currents are called _____.
5. _____ is the amount of salt present in ocean water.
6. Tiny **plants** that float in the water and are carried by waves and currents are called _____.
7. The area that stretches out from the highest high tide line to the point on the continental shelf exposed by the lowest low tide line is called the _____.
8. The _____ is the ocean bottom.
9. _____ is the process by which living organisms produce light.
10. Organisms that **cannot** produce their own food and must eat other organisms are called _____.

APPENDIX K

Ocean Life Exam

Teacher's Key

Short Answer:

1. List three factors that affect where marine organisms live. sunlight, temperature and pressure
2. What is the zone that contains the majority of marine organisms? neritic zone
3. What is the name for an organism that lives on the ocean floor? benthos
Give two examples. crabs, sea stars, lobsters, sponges, sea anenomes
4. What is the name for a free swimming organism? nekton
Give two examples. octopus, squid, fish, marine mammals
5. What is the name for tiny organisms that are carried by the waves and currents? plankton
Name the two types and tell what they are. zooplankton – animal form of plankton
phytoplankton – plantlike plankton capable of producing food by photosynthesis
6. What is the zone from the lowest low tide to the highest high tide line called? intertidal zone
List three things organisms living here must be adapted to. changes in temperature and salinity, fast moving waters, alternating periods of being under water and exposed to air, pounding of waves
7. Explain why phytoplankton must remain along the surface of the ocean of the surface.
Phytoplankton are plantlike plankton capable of producing food by photosyntheses.
Sunlight is needed for the process of photosyntheses and sunlight is only able to penetrate the top layer of the ocean.

True and False:

1. True
2. True
3. False - intertidal
4. True
5. True

Word Bank:

1. Organisms that live on the ocean floor are called benthos.
2. The feeding relationships between organisms within their habitat make up a food web.
3. Nekton are free swimming organisms that can move throughout the water column.
4. Tiny animals that float in the water and are carried by waves and currents are called zooplankton.
5. Salinity is the amount of salt present in ocean water.
6. Tiny plants that float in the water and are carried by waves and currents are called phytoplankton.
7. The area that stretches out from the highest high tide line to the point on the continental shelf exposed by the lowest low tide line is called the intertidal zone.
8. The benthic zone is the ocean bottom.
9. Bioluminescence is the process by which living organisms produce light.
10. Organisms that cannot produce their own food and must eat other organisms are called consumers.