

# Catasauqua Area School District Planned Course of Study

**Course Title:** Marine Biology

**Grade Level(s):** 10-12

**Text:** No text, Multiple Resources

## Course Description

The goal of the Marine Biology course is to give students a broad overall understanding of marine ecology, taxonomy, and diversity. This course is designed to give students an appreciation and understanding of marine biology. Students will learn about the diverse groups of marine organisms, variety of ecosystems, and current events in today's oceans, such as overfishing and ocean acidification. Through lecture, readings, projects, labs, and discussions students will learn about the diversity of ocean environments and how the organisms that live there are adapted to survive. The class will stress hands-on learning with labs, projects, and demonstrations. Students will come out of the class with an understanding of current events regarding the ocean and its overall health. Students will gain knowledge of how the environment plays a significant role in the survival and lifestyle of the organisms that live there.

## Essential Questions

- Why is it important to study marine biology?
- What characteristics place an organism in specific phylogenies?
- What are the structures, functions, and behaviors of a marine organism?
- How do the structures of organisms enable life's functions?
- How do organisms obtain and use the energy they need to live and grow?
- How and why do organisms interact with their environment and what are the effects of these interactions?
- How do organisms live, grow, respond to their environment, and reproduce?
- How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?
- What mechanisms promote changes in organisms?
- What adaptations exist in marine organisms due to their habitat?

- How does energy flow in a marine environment?
- How and why is Earth constantly changing?
- How does the position of the Earth, Moon, and Sun affect the tides?
- How are waves used to transfer energy?
- What resources are provided by the ocean?
- What impact do human activities have on the marine environment?
- How can humans reduce their impact on the marine environment?
- How do Earth's processes and human activities affect each other?
- What is the responsibility of humans for other living things on Earth?

### **Competencies**

- Explain the role that scientific investigations play in the search for scientific understanding of the sea
- Apply the basic principles of biology to marine organisms
- Explain how intertidal organisms meet the physical demands of their environment
- Classify marine prokaryotes, protists, fungi, and plants
- Classify the major invertebrate phyla of marine animals
- Summarize the characteristics and adaptations of marine invertebrates
- Classify the major vertebrate phyla of marine animals
- Summarize the characteristics and adaptations of marine vertebrates
- Identify the resources that humans use from the ocean
- Explain the impact of humans on the marine environment

## Course Syllabus

Course Content	Tentative Timeframe	Assessment Anchors	State Standards
Introduction to Marine Biology <ul style="list-style-type: none"> <li>● Marine Biology vs Oceanography</li> <li>● Areas of Study</li> <li>● History and Current State of Marine Biology</li> <li>● The Scientific Method</li> </ul>	5 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	3.3.10.A1 3.3.10.A3 3.3.12.A1 3.3.12.A2 3.3.12.A3 3.3.12.A6 4.1.10.A 4.1.12.A 4.5.10.D 4.1.10.E 4.2.10.B 4.2.12.B 4.5.12.A 4.5.10.C 4.5.12.C
Marine Environments <ul style="list-style-type: none"> <li>● Marine Zones</li> <li>● Coral Reefs</li> <li>● Estuaries</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B 4.2.12.C 4.3.12.A 4.5.12.B 4.1.5.C
Plankton <ul style="list-style-type: none"> <li>● Energy in the ocean</li> <li>● Autotrophs</li> <li>● Heterotrophs</li> <li>● Phytoplankton</li> <li>● Zooplankton</li> <li>● Holoplankton</li> <li>● Meroplankton</li> <li>● Red Tides</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	3.3.10.A 4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C

			4.2.12.A 4.2.12.B 4.2.12.C 4.3.12.A 4.5.12.B 4.1.5.C
<b>Porifera</b> <ul style="list-style-type: none"> <li>● Sponge Diversity</li> <li>● Body Structure</li> <li>● Sponge Cells</li> <li>● Body Forms</li> <li>● Sponge Classes</li> <li>● Reproduction</li> <li>● Importance and Significance</li> <li>● Species Spotlights</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B 4.2.12.C 4.3.12.A 4.5.12.B 4.1.5.C
<b>Cnidaria and Ctenophora</b> <ul style="list-style-type: none"> <li>● Cnidaria Habitat and Distribution</li> <li>● Body Structure</li> <li>● Body Forms</li> <li>● Reproduction</li> <li>● Feeding and Digestion</li> <li>● Cnidarian Classes</li> <li>● Importance and Significance</li> <li>● Coral Reefs</li> <li>● Phylum Ctenophora Characteristics</li> <li>● Species Spotlights</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B 4.2.12.C 4.3.12.A 4.5.12.B 4.1.5.C
<b>Mollusca</b> <ul style="list-style-type: none"> <li>● Classification</li> <li>● Body Structure</li> <li>● Organ Systems</li> <li>● Reproduction</li> <li>● Mollusca Classes</li> <li>● Feeding</li> <li>● Importance and Significance</li> <li>● Species Spotlights</li> <li>● Invasive Species</li> <li>● Squid Dissection</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B

			4.2.12.C 4.3.12.A 4.5.12.B 4.1.5.C
<b>Arthropoda</b> <ul style="list-style-type: none"> <li>● Classification</li> <li>● Body Structure</li> <li>● Organ Systems</li> <li>● Reproduction</li> <li>● Arthropoda Classes</li> <li>● Feeding</li> <li>● Importance and Significance</li> <li>● Species Spotlights</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B 4.2.12.C 4.3.12.A 4.5.12.B 4.1.5.C
<b>Echinodermata</b> <ul style="list-style-type: none"> <li>● Classification</li> <li>● Body Structure</li> <li>● Body Systems</li> <li>● Feeding and Digestion</li> <li>● Reproduction</li> <li>● Echinodermata Classes</li> <li>● Importance and Significance</li> <li>● Dangers of Echinoderms</li> <li>● Species Spotlights</li> <li>● Sea Star Specimen Exploration</li> <li>● Marine Invertebrates Project</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B 4.2.12.C 4.3.12.A 4.5.12.B 4.1.5.C
<b>Fishes</b> <ul style="list-style-type: none"> <li>● Classification</li> <li>● Early Fishes</li> <li>● Fish Evolution</li> <li>● Adaptations of Fish</li> <li>● Body Structure</li> <li>● Body Systems</li> <li>● Classes of Fish</li> <li>● Reproduction</li> <li>● Importance and Significance</li> <li>● Species Spotlights</li> <li>● Dogfish Dissection</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	3.3.10.D 4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B 4.2.12.C

			4.3.12.A 4.5.12.B 4.1.5.C
<b>Marine Mammals</b> <ul style="list-style-type: none"> <li>● Classification</li> <li>● Biology and Natural History</li> <li>● Evolution of Whales</li> <li>● General Characteristics</li> <li>● Habitat and Distribution</li> <li>● Diving Adaptations</li> <li>● Feeding</li> <li>● Importance and Significance</li> <li>● Echolocation</li> <li>● Whaling</li> <li>● Bycatch</li> <li>● Conservation of Marine Mammals</li> <li>● Cetacean Dichotomous Key</li> <li>● Species Spotlights</li> </ul>	9 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4 BIO.B.3.2.1 BIO.B.3.3.1	4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B 4.2.12.C 4.3.12.A 4.5.12.B 4.1.5.C 3.1.B.C1 3.1.B.C2
<b>Marine Birds</b> <ul style="list-style-type: none"> <li>● Classification</li> <li>● General Characteristics</li> <li>● Adaptations of Marine Birds</li> <li>● Body Structure</li> <li>● Feather Anatomy</li> <li>● Habitat and Distribution</li> <li>● Feeding</li> <li>● Importance and Significance</li> <li>● Species Spotlights</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B 4.2.12.C 4.3.12.A 4.5.12.B 4.1.5.C
<b>Marine Reptiles</b> <ul style="list-style-type: none"> <li>● Classification</li> <li>● General Characteristics</li> <li>● Body Structure</li> <li>● Habitat and Distribution</li> <li>● Feeding</li> <li>● Importance and Significance</li> <li>● Species Spotlights</li> </ul>	7 days	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.5 BIO.B.4.2.3 BIO.B.4.2.4	4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.2.10.A 4.2.10.B 4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B 4.1.12.A 4.1.12.C 4.2.12.A 4.2.12.B 4.2.12.C

			4.3.12.A 4.5.12.B 4.1.5.C
<p>Oceanography</p> <ul style="list-style-type: none"> <li>● Ocean Exploration</li> <li>● Ocean Geology</li> <li>● Properties of Water</li> <li>● Waves and Tides</li> <li>● Climate</li> </ul>	7 days	BIO.B.4.1.2 BIO.B.4.2.2.	3.3.10.A1 3.3.10.A3 3.3.12.A1 3.3.12.A2 3.3.12.A3 3.3.12.A6 4.1.10.A 4.1.12.A 4.5.10.D 4.1.10.E 4.2.10.B 4.2.12.B 4.5.12.A 4.5.10.C 4.5.12.C

### Teaching Strategies Utilized

Discussions  
Specimen Investigations  
Direct Instruction  
Dissections  
Web Quests  
Projects and Presentations  
Demonstrations  
Laboratory Experiences  
Group Assignments  
Modeling  
Guided Practice  
Videos  
Simulations

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<b>Objectives</b>	<b>Level of Ach.</b>	<b>Suggested Learning Activities</b>	<b>Forms of Assessment</b>	<b>Assess. Anchor</b>	<b>PA Stand.</b>
<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1 BIO.B.4.1.2	3.3.10.A1 3.3.10.A3
<b>Introduction to Marine Biology</b>		Videos	Exit Tickets	BIO.B.4.2.1 BIO.B.4.2.2	3.3.12.A1 3.3.12.A2
Investigate how scientists collect, analyze, and use data using the scientific method	AP	Demonstrations	Quizzes	BIO.B.4.2.5 BIO.B.4.2.3	3.3.12.A3 3.3.12.A6
Design an experiment using the scientific method	AP	Reading Assignments	Tests	BIO.B.4.2.4	4.1.10.A 4.1.12.A
Compare and contrast marine biology and oceanography	K	Discussions	Projects		4.5.10.D 4.1.10.E
Identify the areas of study within marine biology	K	Guided Practice	Lab Reports		4.2.10.B 4.2.12.B
Explain the importance of the study of marine biology	K	Modeling	Classwork		4.5.12.A 4.5.10.C
Evaluate the technology used to study life in the ocean	K	Simulations	Performance Tasks		4.5.12.C
		Group Assignments	Homework		
		Individual Assignments			
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs					
<b>Interdisciplinary Relationships</b>					
Biology- review of scientific method, the study of life, and areas of study Literature- readings of the history of Oceanography and Marine Biology Technology- tools used to study life in the ocean History- history of Oceanography and Marine Biology 21st Century Skills= critical thinking, problem solving, creativity, communication, and collaboration					

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<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1	4.1.10.A
<b>Marine Environments</b>		Videos	Exit Tickets	BIO.B.4.1.2	4.1.10.B
Describe and label the major marine zones	AP	Demonstrations	Quizzes	BIO.B.4.2.1	4.1.10.C
Identify adaptations of organisms in each of the marine zones	K	Reading Assignments	Tests	BIO.B.4.2.2	4.1.10.E
Discuss the physical characteristics of the three different tidal environments	M	Discussions	Projects	BIO.B.4.2.5	4.2.10.A
Investigate the conditions necessary for reef growth	K	Guided Practice	Lab Reports	BIO.B.4.2.3	4.2.10.B
Describe each type of coral reef and their characteristics	AP	Modeling	Classwork	BIO.B.4.2.4	4.2.10.C
		Simulations	Performance Tasks		4.3.10.B
		Group Assignments	Homework		4.5.10.D
		Individual Assignments			4.5.10.B
					4.1.12.A
					4.1.12.C
					4.2.12.A
					4.2.12.B
					4.2.12.C
					4.3.12.A
					4.5.12.B
					4.1.5.C
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs					
<b>Interdisciplinary Relationships</b>					
Earth Science- features of seafloor, limestone Biology- adaptations of organisms in marine zones Chemistry- calcium carbonate in coral reefs Geography- locations of marine zones, estuaries, and coral reefs throughout the world 21st Century Skills= critical thinking, problem solving, creativity, communication, and collaboration					

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<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1 BIO.B.4.1.2	4.1.10.A 4.1.10.B
<b>Plankton</b>		Videos	Exit Tickets	BIO.B.4.2.1 BIO.B.4.2.2	4.1.10.C 4.1.10.E
Describe the flow of energy and nutrients within the marine environment	K	Demonstrations	Quizzes	BIO.B.4.2.5 BIO.B.4.2.3	4.2.10.A 4.2.10.B
Discuss why energy is important to life	K	Reading Assignments	Tests	BIO.B.4.2.4	4.2.10.C 4.3.10.B
Compare autotrophs and heterotrophs	M	Laboratory Experiences	Projects		4.5.10.D 4.5.10.B
Construct the equations for photosynthesis and cellular respiration	AP	Discussions	Lab Reports		4.1.12.A 4.1.12.C
Compare and contrast phytoplankton and zooplankton	M	Guided Practice	Classwork		4.2.12.A 4.2.12.B
Compare holoplankton and meroplankton	K	Modeling	Performance Tasks		4.2.12.C 4.3.12.A 4.5.12.B
Research what causes a red tide	K	Simulations	Homework		4.1.5.C 3.3.10.A
Evaluate factors that affect plankton distribution	K	Group Assignments			
Create a marine food web	M	Individual Assignments			
Describe the concept of a trophic pyramid	K				
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs					
<b>Interdisciplinary Relationships</b>					
Biology- photosynthesis and cellular respiration Earth Science- the flow of energy through an ecosystem Chemistry-chemicals involved in photosynthesis, cellular respiration, and red tides Mathematics- surface area and volume Literature- reading articles and writing Geography- locations of red tides across the world and plankton distribution Economics- Impacts of red tides on local economies					

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<p><i>The student will be able to:</i></p> <p><b>Porifera</b></p> <p>Apply taxonomy and biological nomenclature to classify marine sponges</p> <p>Describe the body structure and skeletal makeup of a sponge.</p> <p>Use correct terminology to explain how water is moved throughout the sponge and why this is important.</p> <p>Describe the different cell types and their functions in sponges.</p> <p>Contrast the three main body forms of sponges.</p> <p>List the various ways in which sponges can reproduce or regenerate.</p> <p>Evaluate the importance and significance of sponges to humans and the health of our oceans.</p>	<p>M</p> <p>AP</p> <p>K</p> <p>K</p> <p>M</p> <p>K</p> <p>K</p>	<p>Direct Instruction</p> <p>Videos</p> <p>Demonstrations</p> <p>Reading Assignments</p> <p>Laboratory Experiences</p> <p>Discussions</p> <p>Guided Practice</p> <p>Modeling</p> <p>Dissections</p> <p>Simulations</p> <p>Projects</p> <p>Group Assignments</p> <p>Individual Assignments</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Lab Reports</p> <p>Classwork</p> <p>Performance Tasks</p> <p>Homework</p>	<p>BIO.B.4.1.1</p> <p>BIO.B.4.1.2</p> <p>BIO.B.4.2.1</p> <p>BIO.B.4.2.2</p> <p>BIO.B.4.2.5</p> <p>BIO.B.4.2.3</p> <p>BIO.B.4.2.4</p>	<p>4.1.10.A</p> <p>4.1.10.B</p> <p>4.1.10.C</p> <p>4.1.10.E</p> <p>4.2.10.A</p> <p>4.2.10.B</p> <p>4.2.10.C</p> <p>4.3.10.B</p> <p>4.5.10.D</p> <p>4.5.10.B</p> <p>4.1.12.A</p> <p>4.1.12.C</p> <p>4.2.12.A</p> <p>4.2.12.B</p> <p>4.2.12.C</p> <p>4.3.12.A</p> <p>4.5.12.B</p> <p>4.1.5.C</p>
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs, Specimens					
<b>Interdisciplinary Relationships</b>					
<p>Biology- nomenclature, adaptations, cells, reproduction</p> <p>Chemistry- water properties</p> <p>Geography- distribution of sponges throughout the world</p> <p>Economics- sponge economic importance</p> <p>Technology- virtual dissection</p> <p>21st Century Skills- critical thinking, problem solving, creativity, communication, and collaboration</p>					

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<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1	4.1.10.A
<b>Cnidaria</b>		Videos	Exit Tickets	BIO.B.4.1.2	4.1.10.B
Apply taxonomy and biological nomenclature to classify cnidarians	AP	Demonstrations	Quizzes	BIO.B.4.2.1	4.1.10.C
Contrast the two cnidarian body forms	M	Reading Assignments	Tests	BIO.B.4.2.2	4.1.10.E
Discuss the various modes of sexual and asexual reproduction in cnidarians	K	Laboratory Experiences	Projects	BIO.B.4.2.5	4.2.10.A
Use correct terminology to explain how jellyfish and other cnidarians sting	K	Discussions	Lab Reports	BIO.B.4.2.3	4.2.10.B
Discuss characteristics of each cnidarian class and give an example of each	M	Guided Practice	Classwork	BIO.B.4.2.4	4.2.10.C
Evaluate the importance, threats, location, and types of coral reefs	K	Modeling	Performance Tasks		4.3.10.B
Contrast ctenophores and cnidarians	K	Dissections	Homework		4.5.10.D
Summarize characteristics and examples of ctenophores	K	Simulations			4.5.10.B
		Projects			4.1.12.A
		Group Assignments			4.1.12.C
		Individual Assignments			4.2.12.A
					4.2.12.B
					4.2.12.C
					4.3.12.A
					4.5.12.B
					4.1.5.C
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs, Specimens					
<b>Interdisciplinary Relationships</b>					
Biology- nomenclature, reproduction, cells, adaptations, climate change Technology- virtual dissection Chemistry- chemistry of coral reefs and climate change Geography- location and distribution of cnidarian species Social Studies- impact of threats to cnidarian species on nations throughout the world					

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<b>Objectives</b>	<b>Level of Ach.</b>	<b>Suggested Learning Activities</b>	<b>Forms of Assessment</b>	<b>Assess. Anchor</b>	<b>PA Stand.</b>
<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1 BIO.B.4.1.2	4.1.10.A 4.1.10.B
<b>Mollusca</b>		Videos	Exit Tickets	BIO.B.4.2.1 BIO.B.4.2.2	4.1.10.C 4.1.10.E
Apply taxonomy and biological nomenclature to classify mollusks	M	Demonstrations	Quizzes	BIO.B.4.2.5 BIO.B.4.2.3	4.2.10.A 4.2.10.B
Describe the major characteristics of mollusks	K	Reading Assignments	Tests	BIO.B.4.2.4	4.2.10.C 4.3.10.B
Discuss the body systems found in mollusks	K	Laboratory Experiences	Projects		4.5.10.D 4.5.10.B
Describe the three part body plan of mollusks	M	Discussions	Lab Reports		4.1.12.A 4.1.12.C
Explain the parts of a shell and how it is created	K	Guided Practice	Classwork		4.2.12.A 4.2.12.B
Compare open and closed circulatory systems in mollusks	K	Modeling	Performance Tasks		4.2.12.C 4.3.12.A 4.5.12.B
Classify mollusks based on their main characteristics and whether they have a shell or not	AP	Dissections	Homework		4.1.5.C
Discuss the unique abilities of cuttlefish and octopuses	K	Simulations			
Demonstrate knowledge of internal and external squid anatomy by performing a dissection	AP	Projects			
		Group Assignments			
		Individual Assignments			
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs, Specimens					
<b>Interdisciplinary Relationships</b>					
Biology- dissection, nomenclature, body systems, reproduction Literature- reading and writing Geography- Mollusk distribution around the world 21st Century Skills- collaboration, critical thinking, communication					

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<b>Objectives</b>	<b>Level of Ach.</b>	<b>Suggested Learning Activities</b>	<b>Forms of Assessment</b>	<b>Assess. Anchor</b>	<b>PA Stand.</b>
<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1 BIO.B.4.1.2	4.1.10.A 4.1.10.B
<b>Arthropoda</b>		Videos	Exit Tickets	BIO.B.4.2.1 BIO.B.4.2.2	4.1.10.C 4.1.10.E
Apply taxonomy and biological nomenclature to classify marine arthropods	M	Demonstrations	Quizzes	BIO.B.4.2.5 BIO.B.4.2.3	4.2.10.A 4.2.10.B
Explain the advantages and disadvantages of having an exoskeleton	K	Reading Assignments	Tests	BIO.B.4.2.4	4.2.10.C 4.3.10.B
Describe molting and what exoskeletons are made of	K	Laboratory Experiences	Projects		4.5.10.D 4.5.10.B
Describe the body systems and unique organs of arthropods, including digestive, nervous, respiratory, circulatory, excretory and reproductive systems	K	Discussions	Lab Reports		4.1.12.A 4.1.12.C
Compare and contrast crustaceans to terrestrial arthropods	M	Guided Practice	Classwork		4.2.12.A 4.2.12.B
Describe what characteristics led crustaceans to success	M	Modeling	Performance Tasks		4.2.12.C 4.3.12.A
Investigate the importance of marine arthropods	K	Dissections	Homework		4.5.12.B 4.1.5.C
		Simulations			
		Projects			
		Group Assignments			
		Individual Assignments			
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs, Specimens					
<b>Interdisciplinary Relationships</b>					
Biology- nomenclature, body systems, reproduction, adaptations, evolution Geography- Arthropoda distribution around the world Literature- reading and writing 21st Century Skills- collaboration, communication, and problem solving					

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<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1 BIO.B.4.1.2	4.1.10.A 4.1.10.B
<b>Echinodermata</b>		Videos	Exit Tickets	BIO.B.4.2.1 BIO.B.4.2.2	4.1.10.C 4.1.10.E
Apply taxonomy and biological nomenclature to classify echinoderms	M	Demonstrations	Quizzes	BIO.B.4.2.5	4.2.10.A
Contrast the body structure and symmetry of adult and larval echinoderms	K	Reading Assignments	Tests	BIO.B.4.2.3 BIO.B.4.2.4	4.2.10.B 4.2.10.C 4.3.10.B
Describe unique body structures and systems including the water vascular system, skeletal system, nervous system, and digestive system	K	Laboratory Experiences	Projects		4.5.10.D 4.5.10.B
Give examples of echinoderms and their major characteristics	K	Discussions	Lab Reports		4.1.12.A 4.1.12.C 4.2.12.A
Describe sexual and asexual reproduction of echinoderms	K	Guided Practice	Classwork		4.2.12.B 4.2.12.C
Explain the numerous ecological roles played by echinoderms	K	Modeling	Performance Tasks		4.3.12.A 4.5.12.B
Identify external anatomy of sea star specimens	M	Dissections	Homework		4.1.5.C
Research and create a presentation on a chosen marine invertebrate	AP	Simulations			
	K	Projects			
		Group Assignments			
		Individual Assignments			
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs, Specimens					
<b>Interdisciplinary Relationships</b>					
Biology- nomenclature, body systems, reproduction, ecology Literature- reading articles, writing, and oral presentation 21st Century Skills- critical thinking, problem solving, communication, and collaboration Geography- locations of echinoderm habitats Technology- virtual dissection, WebQuest, and creation of Google Slides presentation					

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<b>Objectives</b>	<b>Level of Ach.</b>	<b>Suggested Learning Activities</b>	<b>Forms of Assessment</b>	<b>Assess. Anchor</b>	<b>PA Stand.</b>
<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1 BIO.B.4.1.2	4.1.10.A 4.1.10.B
<b>Fishes</b>		Videos	Exit Tickets	BIO.B.4.2.1 BIO.B.4.2.2	4.1.10.C 4.1.10.E
Apply taxonomy and biological nomenclature to classify marine fishes	M	Demonstrations	Quizzes	BIO.B.4.2.5 BIO.B.4.2.3	4.2.10.A 4.2.10.B
Contrast the skeletons, scales, and reproduction of different types of fish	K	Reading Assignments	Tests	BIO.B.4.2.4	4.2.10.C 4.3.10.B 4.5.10.D 4.5.10.B
Describe the body systems and unique organs of fish, including gills, swim bladder, lipid-filled liver, operculum, olfactory bulbs, Ampullae of Lorenzini, and lateral line system	K	Laboratory Experiences	Lab Reports		4.1.12.A 4.1.12.C
Describe the circulatory system including number of heart chambers and flow of blood	K	Discussions	Classwork		4.2.12.A 4.2.12.B 4.2.12.C
Explain how fish regulate their temperature and salt concentrations	K	Guided Practice	Performance Tasks		4.3.12.A 4.5.12.B 4.1.5.C
Understand internal and external fish anatomy including labeling fins on a fish and dissection	K	Modeling	Homework		
Discuss the importance of fish and threats to fish conservation	AP	Dissections			
Perform a fish scale microscope lab using proper microscope technique	AP	Simulations			
	M	Projects			
	M	Group Assignments			
	AP	Individual Assignments			
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs					
<b>Interdisciplinary Relationships</b>					
Biology- microscopes, nomenclature, body systems, dissection Chemistry- water properties Mathematics- scale measurements and calculations Social Studies- Fishing regulations around the world and economic value					

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<b>Objectives</b>	<b>Level of Ach.</b>	<b>Suggested Learning Activities</b>	<b>Forms of Assessment</b>	<b>Assess. Anchor</b>	<b>PA Stand.</b>
<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1	4.1.10.A
<b>Marine Mammals</b>		Videos	Exit Tickets	BIO.B.4.1.2	4.1.10.B
Apply taxonomy and biological nomenclature to classify marine mammals	M	Demonstrations	Quizzes	BIO.B.4.2.1	4.1.10.C
Describe the evolution of cetaceans	M	Reading Assignments	Tests	BIO.B.4.2.2	4.1.10.E
Identify the general characteristics of each taxonomic group of marine mammals -cetaceans, pinnipeds, sirenians, and marine fissipeds	K	Laboratory Experiences	Projects	BIO.B.4.2.5	4.2.10.A
Explain the diving adaptations found in cetaceans	K	Guided Practice	Lab Reports	BIO.B.4.2.3	4.2.10.B
Describe the structure and function of echolocation in cetaceans	K	Modeling	Classwork	BIO.B.4.2.4	4.2.10.C
Summarize the history of whaling	K	Projects	Performance Tasks	BIO.B.3.2.1	4.3.10.B
Develop ways to minimize the threats to marine mammals	K	Group Assignments	Homework	BIO.B.3.3.1	4.5.10.D
Explain the marine mammal conservation efforts	M	Individual Assignments			4.5.10.B
Identify cetaceans using a dichotomous key	AP				4.1.12.A
Interpret marine mammal tracking data as it pertains to migration patterns	K				4.1.12.C
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs					
<b>Interdisciplinary Relationships</b>					
Biology- nomenclature, evolution, adaptations, mDNA, dichotomous key History- history of whaling Geography- cetacean habitat and distribution worldwide, plotting marine mammal species on a map using latitude and longitude Social Studies- whaling laws					

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<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1	4.1.10.A
<b>Marine Birds</b>		Videos	Exit Tickets	BIO.B.4.1.2	4.1.10.B
Apply taxonomy and biological nomenclature to classify marine birds	M	Demonstrations	Quizzes	BIO.B.4.2.1	4.1.10.C
Identify the general characteristics found in marine birds	K	Reading Assignments	Tests	BIO.B.4.2.2	4.1.10.E
Discuss adaptations that marine birds have	K	Discussions	Lab Reports	BIO.B.4.2.5	4.2.10.A
Describe the body structure of marine birds including feather anatomy	K	Guided Practice	Classwork	BIO.B.4.2.3	4.2.10.B
Understand how marine birds hunt and feed	K	Modeling	Performance Tasks	BIO.B.4.2.4	4.2.10.C
Describe the habitat and distribution of different marine bird species	K	Simulations	Homework		4.3.10.B
Investigate the human impact on marine birds and recent conservation efforts	K	Group Assignments			4.5.10.D
Evaluate the importance and significance of maine birds	M	Individual Assignments			4.5.10.B
					4.1.12.A
					4.1.12.C
					4.2.12.A
					4.2.12.B
					4.2.12.C
					4.3.12.A
					4.5.12.B
					4.1.5.C
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs					
<b>Interdisciplinary Relationships</b>					
Biology- nomenclature, adaptations Geography- habitat and distribution of marine birds around the world 21st Century Skills- problem solving, communication and collaboration Literature- reading articles and writing					

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<b>Objectives</b>	<b>Level of Ach.</b>	<b>Suggested Learning Activities</b>	<b>Forms of Assessment</b>	<b>Assess. Anchor</b>	<b>PA Stand.</b>
<i>The student will be able to:</i>		Direct Instruction	Warm Ups	BIO.B.4.1.1 BIO.B.4.1.2	4.1.10.A 4.1.10.B
<b>Marine Reptiles</b>		Videos	Exit Tickets	BIO.B.4.2.1 BIO.B.4.2.2	4.1.10.C 4.1.10.E
Apply taxonomy and biological nomenclature to classify marine reptiles	M	Demonstrations	Quizzes	BIO.B.4.2.5 BIO.B.4.2.3	4.2.10.A 4.2.10.B
Identify general characteristics found in the different groups of marine reptiles	K	Reading Assignments	Tests	BIO.B.4.2.4	4.2.10.C 4.3.10.B
Discuss adaptations that marine reptiles have	K	Discussions	Lab Reports		4.5.10.D 4.5.10.B
Understand how marine reptiles hunt and feed	K	Guided Practice	Classwork		4.1.12.A 4.1.12.C
Describe the habitat and distribution of different marine reptile species	K	Modeling	Performance Tasks		4.2.12.A 4.2.12.B 4.2.12.C
Investigate the human impact on marine reptiles and conservation efforts	K	Simulations	Homework		4.3.12.A 4.5.12.B 4.1.5.C
Evaluate the importance and significance of marine reptiles	M	Group Assignments Individual Assignments			
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs					
<b>Interdisciplinary Relationships</b>					
Biology- nomenclature, adaptations Geography- habitat and distribution of marine reptiles worldwide Literature- reading and writing 21st Century Skills- problem solving, communication and collaboration					

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Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	Assess. Anchor	PA Stand.
<p><i>The student will be able to:</i></p> <p><b>Oceanography</b></p> <p>Discuss the the tools used by oceanographers to study the ocean</p> <p>Apply the interrelationships of oceans to other Earth systems</p> <p>Evaluate the interaction between humans and the ocean</p> <p>Explain the formation of seafloor features and landforms</p> <p>Describe the major surface and deep currents in the ocean and explain their causes</p> <p>Investigate the roles of the sun and moon for tides</p> <p>Explain how physical and chemical properties of the ocean affect the climate in the past, present, and future</p>	<p>K</p> <p>K</p> <p>M</p> <p>AP</p> <p>M</p> <p>K</p> <p>K</p>	<p>Direct Instruction</p> <p>Videos</p> <p>Demonstrations</p> <p>Reading Assignments</p> <p>Laboratory Experiences</p> <p>Discussions</p> <p>Guided Practice</p> <p>Modeling</p> <p>Simulations</p> <p>Group Assignments</p> <p>Individual Assignments</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Lab Reports</p> <p>Classwork</p> <p>Performance Tasks</p> <p>Homework</p>	<p>BIO.B.4.1.2</p> <p>BIO.B.4.2.2</p>	<p>3.3.10.A1</p> <p>3.3.10.A3</p> <p>3.3.12.A1</p> <p>3.3.12.A2</p> <p>3.3.12.A3</p> <p>3.3.12.A6</p> <p>4.1.10.A</p> <p>4.1.12.A</p> <p>4.5.10.D</p> <p>4.1.10.E</p> <p>4.2.10.B</p> <p>4.2.12.B</p> <p>4.5.12.A</p> <p>4.5.10.C</p> <p>4.5.12.C</p>
<b>Resources/Materials</b>					
PowerPoints, Videos, Worksheets, Lab Materials, Internet Resources, Virtual Labs					
<b>Interdisciplinary Relationships</b>					
<p>Technology- tools used to study the ocean</p> <p>History- history of oceanography</p> <p>Earth Science- plate tectonics, earth systems, landforms, currents, sun, moon, and tides</p> <p>Chemistry- chemical properties of water</p> <p>Social Studies- how the ocean impacts nations around the world</p>					