2018 Mississippi College- and Career-Readiness Standards for Science				
Book: Essentials of Oceanography, 13e, ©2020				
Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
MAQ.1 Water Properties and Quality	Water is essential to all life on earth. The chemical and physical properties of water allow for all essential processes with biota. Analysis of water quality indicates ecosystem health and balance. Recycling of water throughout the biosphere allows for replenishment of fresh water, but contaminations by human activities are hindering the total amount of potable fresh water.	MAQ.1 Students will develop an understanding of the unique physical and chemical properties of water and how those properties shape life on earth.	MAQ.1.1 Characterize the physical and chemical properties of water, including specific heat, surface temperature, universal solvent, and hydrogen bonding between water molecules (i.e., cohesion/adhesion/capillary action).	**Partial coverage:** The text does not cover adhesion and capillary action. Chapter 5: Water and Seawater 5.1: Why Does Water Have Such Unusual Chemical Properties? Pages 140-141 Concept Check 5.1: Q 4 Page 141 5.2: What Important Physical Properties Does Water Possess? Pages 142-149 Concept Check 5.2: Q 2, Q 4 Page 149
			MAQ.1.2 Describe the role of water within biological systems (e.g., provides the medium necessary to allow for life processes such as protein synthesis, enzymatic reactions, and passive transport).	**Partial coverage:** The text does not cover the role of water in protein synthesis and enzymatic reactions in biological systems in general. The citation below is for the processes of Diffusion and Osmosis specifically in marine animals.

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				Chapter 12: Marine Life and the Marine Environment 12.4: How Are Marine Organisms Adapted to the Physical Conditions of the Ocean Diffusion Osmosis Page 398-399
			MAQ.1.3 Diagram, utilizing digital or physical models, the water cycle and how it relates to the total amount of fresh water available to living things at any given time.	**Partial coverage:** The text does not explain the link between the water cycle and the total amount of fresh water available to living things. Chapter 5: Water and Seawater 5.4: Why Does Seawater Salinity Vary Processes Affecting Seawater Salinity The Hydrologic Cycle Pages 155-156
			MAQ.1.4 Collect, analyze, and communicate quantitative data that includes dissolved oxygen, pH,	**Partial coverage:** The text does not cover measurement of all the

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			temperature, salinity, mineral content, nitrogen compounds, and turbidity from an aquatic environment (i.e., hydrometer, refractometer, Secchi disk, and chemical test kits).	characteristics or the tools listed in the objective. Chapter 5: Water and Seawater 5.3 Why is Seawater Salty? Determining Salinity Page 151 Chapter 13: Biological Productivity and Energy Transfer 13.1 What is Primary Productivity? The Color of Objects Page 416
			MAQ.1.5 Research, analyze, and communicate current technology and career opportunities available to collect this data on a global scale using CTD, buoy data, or satellites.	The text does not include content to cover this objective.
			MAQ.1.6 Enrichment: Use an engineering design process to reduce the effects of pollution in aquatic ecosystems (e.g., microplastics, garbage patches, oil spills, and eutrophication). Students will	**Partial coverage:** The text does not require students to use engineering design processes to design, develop and test their solutions. The citation below is for an ideation and feasibility exercise related to

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
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			design a proposed solution based on current research and/or observations, and develop a model in order to test their design. Data from experimentation will be analyzed, organized graphically, and communicated to classmates to determine the effectiveness of the proposed solution.*	reducing marine pollution due to sewage. Chapter 11: Marine Pollution Essential Concepts Review: Marine Pollution Active Learning Exercise: Working with another student in class, discuss what we should do with sewage sludge if we can't dump it into the ocean. What are the most feasible options? Page 380
MAQ.2 Fluid Dynamics	Fluid dynamics include properties and features of waves, currents, and tides. Each of these is vital for uniformity of temperature and chemical balance within ecosystems. Physical changes can be attributed to the movement of water, including shoreline	MAQ.2 Students will develop an understanding of the principles of fluid dynamics as it relates to both salt and freshwater systems.	MAQ.2.1 Characterize wave features and wave properties, including wavelength, period, wave speed, breakers, and constructive waves and their effects on shoreline communities (e.g., headlands, embayments, shoreline erosion, and deposition).	Chapter 8: Waves and Water Dynamics 8.2: What Characteristics Do Waves Possess? Pages 252-255 8.3: How Do Wind-Generated Waves Develop? Pages 257-263

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
	development, erosion, and island formation. Climate change is influencing changes in our present fluid dynamic models.			8.4: How Do Waves Change in the Surf Zone? Pages 264-266 8.5: How Are Tsunami Created? Page 271-275 Chapter 10: Beaches, Shoreline Processes, and the Coastal Ocean 10.3: What Features are Typical of Erosional and Depositional Shores? Pages 319-324
			MAQ.2.2 Survey predictable patterns of tides (i.e., tidal period and range, diurnal, semidiurnal, mixed, spring, and neap tides) to correlate with moon phases in graphical form.	Chapter 9: Tides 9.2: How Do Tides Vary during a Monthly Tidal Cycle? Pages 293-298 Concept Check 9.2: Q 1, 2, 4 Page 298
			MAQ.2.3 Summarize principles related to currents (e.g., global wind patterns, Coriolis effect, Ekman spiral, surface, thermohaline, upwelling, downwelling, El Niño, La	Chapter 6: Air-Sea Interaction 6.3: How Does the Coriolis Effect Influence Moving Objects? Pages 181-183

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			Niña, hurricanes, Barrier Island movement).	Concept Check 6.3 Page 183 6.4: What Global Atmospheric Circulation Patterns Exist? Pages 184-187 Chapter 7: Ocean Circulation 7.2: What Creates Ocean Surface Currents and How Are They Organized? Pages 215-217 7.3: What Causes Upwelling and Downwelling? Pages 220-221 7.4: What Are the Main Surface Circulation Patterns in Each Ocean Basin? El Nino-Southern Oscillation (ENSO) Conditions ENSO Cool Phase (La Nina) Pages 231-236

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				Concept Check 7.4: Q 3 Page 236 Chapter 10: Beaches, Shoreline Processes, and the Coastal Ocean 10.3: What Features are Typical of Erosional and Depositional Shores? Barrier Islands Pages 320-323
			MAQ.2.4 Research, analyze, and communicate scientific arguments to support climate models that predict how global and regional climate change can affect Earth's systems (e.g., precipitation and temperature and their associated impacts on sea level, global ice volumes, and atmosphere and ocean composition).	Chapter 16: The Oceans and Climate Change Essential Concepts Review 16.1 Active Learning Exercise Page 566 16.4 Active Learning Exercise Page 567
			MAQ.2.5 Distinguish among lentic and lotic water systems, including water flow, seasonal overturn, and watershed mapping.	The text does not include content to cover this objective.

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
MAQ.3 Geological Features	Plate tectonics explain present geological features that can be described in different aquatic ecosystems. Natural phenomena, such as sea floor spreading, are caused by plate tectonic action. The distance from shoreline and availability of light classifies different areas of the ocean.	MAQ.3 Students will understand the principles of plate tectonics, sea floor spreading, and physical features of oceanic zones.	MAQ.3.1 Use geospatial data to analyze, explain, and communicate differences among the major geological features of specific aquatic ecosystems (e.g., plate tectonics, continental rise, continental slope, abyssal plain, trenches, sea mounts, island formation, and watersheds).	Chapter 2: Plate Tectonics and the Ocean Floor 2.2: What Additional Observations Led to the Theory of Plate Tectonics? Sea Floor Spreading and Features of Ocean Basins Worldwide Earthquakes Detecting Plate Motion with Satellites Pages 49-53 2.3: What Features Occur at Plate Boundaries? Pages 57-68 2.4: Testing the Model: Can Plate Tectonics Explain Other Features in the Ocean and on Land? Seamounts and Tablemounts Page 73
			MAQ.3.2 Develop an understanding of plate tectonics to predict certain geological features (e.g., sea	**Partial coverage:** The text does not discuss orogenesis.

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			floor spreading, paleomagnetic measurements, and orogenesis).	Chapter 2: Plate Tectonics and the Ocean Floor 2.2: What Additional Observations Led to the Theory of Plate Tectonics? Paleomagnetism Magnetic Polarity Reversals Sea Floor Spreading and Features of Ocean Basins Pages 46-51
			MAQ.3.3 Classify zones of the ocean based on distance from shorelines (i.e., intertidal, neritic, oceanic, and benthic zones), temperature, and light availability (i.e., epipelagic, mesopelagic, bathypelagic, abyssopelagic, and hadopelagic).	Chapter 12: Marine Life and the Marine Environment 12.5: What Are the Main Divisions of the Marine Environment? Pages 404-407
			MAQ.3.4 Classify zones of freshwater sources based on the velocity of current, depth, and temperature.	The text does not include content to cover this objective.
MAQ.4 Flora and Fauna	Unique flora and fauna can be found in different aquatic ecosystems. Their	MAQ.4 Students will examine characteristics of specific aquatic ecosystems and the	MAQ.4.1 Compare and contrast the unique biotic and abiotic characteristics of the following selected aquatic ecosystems:	**Partial coverage:** The text does not cover the biotic and abiotic characteristics of all the aquatic ecosystems listed in the objective.

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
	features and unique biochemistry may serve to further the human quality of life. However, human impacts and natural events have altered many of these ecosystems in different ways.	effects of human and natural phenomena on those ecosystems.	intertidal zone, wetlands/estuaries, coral reef, barrier islands, continental slope/shelf, abyss, rivers/streams/watersheds, and lakes/ponds.	Chapter 15: Animals of the Benthic Environment 15.1: What Communities Exist Along Rocky Shores? Intertidal Zonation Pages 490-494 15.3 What Communities Exist on the Shallow Offshore Ocean Floor? Coral Reefs: Organisms and Their Adaptations Pages 504-506
			MAQ.4.2 Recognize representative examples of plants and animals that would be specifically adapted to the aquatic ecosystems, and identify adaptations necessary to survive.	Chapter 14: Animals of the Pelagic Environment 14.1 How Are Marine Organisms Able to Stay Above the Ocean Floor? Pages 456-461 14.2 What Adaptations Do Pelagic Organisms Possess for Seeking Prey? Pages 462-467

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				14.3 What Adaptations Do Pelagic Organisms Possess to Avoid Becoming Prey? Pages 468-469 14.4 What Characteristics Do Marine Mammals Possess? Pages 470-485 Chapter 15: Animals of the Benthic Environment 15.3 What Communities Exist on the Shallow Offshore Ocean Floor? Coral Reefs: Organisms and Their Adaptations Pages 504-506
			MAQ.4.3 Determine the niches within trophic levels in the aquatic ecosystems by creating food webs and researching the symbiotic relationships that exist.	Chapter 13: Biological Productivity and Energy Transfer 13.4 How Are Energy and Nutrients Passed Along in Marine Ecosystems? Trophic Levels Food Chains

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				Food Webs Biomass Pyramid Pages 435-437 Essential Concepts Review 13.4 Critical Thinking Question Page 453
			MAQ.4.4 Research, analyze, and communicate the effects of urbanization and continued expansion by humans on the aquatic ecosystems' biodiversity (e.g., land use changes, erosion and sedimentation, over-fishing, invasive/exotic species, and pollution).	Chapter 11: Marine Pollution 11.2 What Marine Environmental Problems Are Associated with Petroleum Pollution? How Damaging in Oil Pollutant in the Ocean? Other Concerns About Oil in the Ocean Pages 362-364 11.3 What Marine Environmental Problems Are Associated with Non-Petroleum Chemical Pollution? Sewage Sludge Page 365 DDTs and PCBs

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				DDT and Eggshells Page 366 Bioaccumulation and Biomagnification Page 367 Other Types of Chemical Pollutants Page 369 11.4: What Marine Environmental Problems Are Associated with Non-point Source Pollution, Including Trash? Plastics as Marine Debris Plastic Nurdles in the Marine Environment Microplastics Pages 371-373 11.6: What Marine Environmental Problems Are Associated with Biological Pollution? Page 379

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				Essential Concepts Review: Marine Pollution 11.2 Active Learning Exercise 11.3 Critical Thinking Question 11.4 Critical Thinking Question 11.4 Active Learning Exercise 11.5 Critical Thinking Question 11.6 Critical Thinking Question 11.6 Active Learning Exercise Pages 380-381 Chapter 13: Biological Productivity and Energy Transfer 13.5 What Issues Affect Marine Fisheries? Overfishing Pages 439-440 Effect of Global Climate Change on Marine Fisheries Page 450

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			MAQ.4.5 Explore the importance of species diversity to the biological resources needed by human populations, including food (e.g., aquaculture and mariculture), medicine, and natural aesthetics.	**Partial coverage:** The text does not cover in much detail the importance of species diversity with reference to the needs of humans. The citations below refer to content related to food and medicine needs. Chapter 13: Biological Productivity and Energy Transfer 13.5 What Issues Affect Marine Fisheries? World Fish Production Page 440 Seafood Choices Page 450 Chapter 15: Animals of the Benthic Environment 15.2 What Communities Exist Along Sediment-Covered Shores?

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				Students Sometimes Ask…What is the most venomous marine organism? Page 497
			MAQ.4.6 Research, analyze, and communicate the effects of natural phenomena (e.g., hurricanes, floods, drought, and sea-level rise) on the aquatic ecosystems.	The text does not cover content related to this objective. The citations below refer to critical thinking questions that are somewhat related to the objective. Chapter 12: Marine Life and the Marine Environment Essential Concepts Review 12.3 Critical Thinking Question Page 409 Chapter 16: The Oceans and Climate Change Essential Concepts Review 16.4 Critical Thinking Question Page 567
			MAQ.4.7 Research, analyze, and communicate which and in what capacity local, state, and federal	**Partial coverage:** The text makes passing references to the Clean Water Act and the Endangered Species Act and there are no

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			regulatory agencies are involved in different aquatic ecosystems, including current environmental policies already in place (e.g., the Clean Water Act and the Endangered Species Act). Research should include, but is not limited to, how humans can preserve animal diversity through the use of habitat creation and conservation, research, legislation, medical and breeding programs, and management of genetic diversity at local and global levels.	research opportunities based on these. However, the citations below list examples of other interventions by local/state/federal regulatory agencies. Chapter 10: Beaches, Shoreline Processes, and the Coastal Ocean 10.7 What Issues Face Coastal Wetlands? Serious Loss of Valuable Wetlands Page 349 (reference to the Office of Wetlands Protection) Climate Connection Process of Science 10.1 Recycling Christmas Trees to Save Louisiana's Disappearing Coast Page 350 Essential Concepts Review 10.7 Active Learning Exercise Page 353

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				Chapter 13: Biological Productivity and Energy Transfer 13.5 What Issues Affect Marine Fisheries Diving Deeper 13.2 Focus on the Environment Protecting Our Oceans: What Are Marine Protected Areas (MPAs)? Page 447 Essential Concepts Review 13.2 Active Learning Exercise 13.5 Critical Thinking Question 13.5 Active Learning Exercise Pages 452-453
			MAQ.4.8 Enrichment: Choose an environmental issue that currently exists in one of the aquatic ecosystems and use an engineering design process to propose and develop a possible solution using scientific knowledge and best management practices (BMPs). Create an environmental	Chapter 16: The Oceans and Climate Change Essential Concepts Review 16.5 Critical Thinking Question Page 567

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			action plan to include moral, legal, societal, political, and economic decisions that impact animal diversity in both the short and long term. Results from developed plans will be communicated with classmates.*	
MAQ.5 Primary Producers	Primary producers are the basis of every food web in aquatic ecosystems. While many producers are photosynthetic autotrophs, chemosynthesis is also a common form of energy conversion. Surveying shared and derived characteristics of producers demonstrates evolutionary development. Various methods are currently utilized to measure primary productivity in various ecosystems.	MAQ.5 Students will explore the biodiversity and interactions among aquatic life.	MAQ.5.1 Survey common primary producers and their roles in primary production in relation to geographical distribution within various aquatic ecosystems.	Chapter 13: Biological Productivity and Energy Transfer 13.2 What Kind of Photosynthetic Marine Organisms Exist? Pages 420-422 Photosynthetic Bacteria Page 426 13.3 How Does Regional Primary Productivity Vary? Pages 428-430 Comparing Regional Productivity Page 432 Essential Concepts Review 13.2 Critical Thinking Question 13.3 Critical Thinking Question

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				Page 452
			MAQ.5.2 List and describe common autotrophs that may be found in particular aquatic ecosystems, including prokaryotes (e.g., Cyanobacteria and Archaebacteria), protists (e.g., diatoms, dinoflagellates, green algae, kelp, sargassum, and red algae), and plants (e.g., cord grasses, reeds, seagrasses, and mangroves).	Chapter 12: Marine Life and the Marine Environment 12.2: How Are Marine Organisms Classified? Pages 388-391 Chapter 13: Biological Productivity and Energy Transfer 13.2 What Kind of Photosynthetic Marine Organisms Exist? Pages 420-424
			MAQ.5.3 Recognize characteristics that are shared and derived using graphical representations of primary-producer evolution and develop cladograms/phylogenetic trees.	The text does not cover this objective.
			MAQ.5.4 Use dichotomous keys to identify sample producers within an aquatic ecosystem.	The text does not cover this objective.

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			MAQ.5.5 Paraphrase energy conversion processes (e.g., photosynthesis and chemosynthesis).	Chapter 13: Biological Productivity and Energy Transfer 13.4 How Are Energy and Nutrients Passed Along in Marine Ecosystems? Page 433 Chapter 15: Animals of the Benthic Environment 15.4 What Communities Exist on the Deep-Ocean Floor? Chemosynthesis SmartFigure 15.28 Comparing chemosynthesis (top panel) and photosynthesis (bottom panel) Watch SmartFigure 15.28 Comparing chemosynthesis and photosynthesis Page 516 Essential Concepts Review 15.4 Critical Thinking Question Page 523

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			MAQ.5.6 Enrichment: Research, analyze, and communicate historical and current methodologies for measuring primary productivity. Use an engineering design process to design and develop improvements to measure primary productivity (e.g., the light and dark bottle method and satellite data).*	The text does not provide students the opportunity to conduct the enrichment activity described in the objective. **Content reference** Chapter 13: Biological Productivity and Energy Transfer 13.1 What is Primary Productivity? Measurement of Primary Productivity Page 412
MAQ.6 Invertebrate Consumers	Many consumers found within aquatic ecosystems range from single-celled protozoa to multicellular invertebrates. While many of these consumers share basic morphological characteristics, derived characters demonstrate evolutionary relationships. Varied adaptations are	MAQ.6 Students will investigate characteristics of aquatic invertebrates.	MAQ.6.1 Characterize aquatic representatives of the following taxa: Protozoa (e.g., foraminiferians, radiolarians, amoeba, and paramecium), Porifera, Cnidaria, Platyhelminthes, Nematoda, Annelida, Rotifera, Mollusca, Arthropoda, Bryozoa, Brachiopoda, and Echinodermata.	**Partial coverage:** The text does not cover amoeba, paramecium, Porifera, Platyhelminthes, Nematoda, Rotifera, Bryozoa. Chapter 14: Animals of the Pelagic Environment 14.1 How Are Marine Organisms Able to Stay Above the Ocean Floor? Pages 456-461

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
	found among these organisms for successful niches within selected ecosystems.			Chapter 15: Animals of the Benthic Environment 15.2 What Communities Exist Along Sediment-Covered Shores? Sandy Beaches: Organisms and Their Adaptations Pages 498-500
			MAQ.6.2 Identify characteristics that are shared and derived using graphical representations of animal evolution (i.e., cladograms and phylogenetic trees) and develop cladograms and phylogenetic trees.	The text does not cover this objective.
			MAQ.6.3 Develop a dichotomous classification key to be used in the identification of sample aquatic invertebrates.	The text does not cover this objective.
			MAQ.6.4 Compare and contrast major body plans (e.g., asymmetry, radial, bilateral symmetry, acoelomate, pseudocoelomate, and eucoelomate).	The text does not cover this objective.

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			MAQ.6.5 Explain various life cycles found among animals (e.g., polyp and medusa in cnidarians, multiple hosts and stages in the platyhelminthic life cycle, and arthropod metamorphosis).	The text does not cover this objective.
			MAQ.6.6 Dissect representative taxa (e.g., clam and squid), collect data, compare their internal and external anatomy, analyze, explain, and communicate results.	The text does not cover this objective.
			MAQ.6.7 Using key morphological and physiological adaptations found within animal taxa, assess how animals interact with their environment to determine their ecological roles.	Chapter 14: Animals of the Pelagic Environment 14.1 How Are Marine Organisms Able to Stay Above the Ocean Floor? Pages 456-461 14.2 What Adaptations Do Pelagic Organisms Possess for Seeking Prey? Pages 462-467

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Marine and Aquatic Science I & II Standards **Total Standards: 7**				
Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
				14.3 What Adaptations Do Pelagic Organisms Possess to Avoid Becoming Prey? Pages 468-469 14.4 What Characteristics Do Marine Mammals Possess? Pages 470-485 Chapter 15: Animals of the Benthic Environment 15.3 What Communities Exist on the Shallow Offshore Ocean Floor? Coral Reefs: Organisms and Their Adaptations Pages 504-506
			MAQ.6.8 Enrichment: Given a niche in a specific environment, use an engineering design process to design an animal, listing characteristics based on your knowledge of shared and derived characters, internal and external anatomy, and how the animal would	The text does not provide students the opportunity to conduct the enrichment activity described in the objective.

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			adapt morphologically and physiologically relative to its ecological role and specific environment.*	
MAQ.7 Vertebrate Consumers	Other consumers that inhabit aquatic ecosystems are found within Phylum Chordata. While many of these consumers share basic morphological characteristics, derived characteristics demonstrate evolutionary relationships. Various adaptations are found among these organisms for successful niches within selected ecosystems.	MAQ.7 Students will investigate characteristics of aquatic invertebrates.	MAQ.7.1 Characterize aquatic representatives of the following taxa: Hemichordata, Urochordata, Cephalochordata, and Vertebrata (including Agnatha, Chondrichthyes, Osteichthyes, Amphibia, Reptilia, Aves, and Mammalia).	The text does not cover this objective.
			MAQ.7.2 Identify characteristics that are shared and derived using graphical representation of animal evolution, and develop cladograms/phylogenetic trees.	The text does not cover this objective.

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			MAQ.7.3 Utilize a dichotomous key to identify select aquatic vertebrates.	The text does not cover this objective.
			MAQ.7.4 Differentiate various life cycles found among animals (e.g., egg, tadpole, and adult stages of the amphibian life cycle; leathery eggs on land in reptiles; hard-shelled eggs in Aves; placental, marsupial, or monotremes in mammals; viviparous, ovoviviparous, and oviparous animals).	The text does not cover this objective.
			MAQ.7.5 Dissect representative taxa (e.g., shark, fish); collect data; compare their internal and external anatomy; and analyze, explain, and communicate results.	The text does not cover this objective.
			MAQ.7.6 Using key morphological and physiological adaptations found within aquatic vertebrate taxa, assess how animals interact with their environment to determine their ecological roles.	The text does not cover this objective.
			MAQ.7.7 Enrichment: Given a niche in a specific environment, use an engineering design process to	The text does not cover this objective.

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Disciplinary Core Idea	**Conceptual Understanding**	**Content Standard**	**Breakout**	**Citations**
			design an animal, listing characteristics based on your knowledge of shared and derived characteristics, internal and external anatomy, and how the animal would adapt morphologically and physiologically relative to its ecological role and specific environment.*	

Objectives identified by "Enrichment:" are considered enrichment material that may be expanded upon as time permits. Engineering standards are represented in some performance objectives with specific wording that will prompt students to approach learning and exploration using the engineering process. These performance objectives are marked with an * at the end of the statement.