

Marine Ecology AODM

Marine Ecology students may earn up to five (5) points on one exam grade per quarter by completing the corresponding questions below. **The answers must be in complete sentences. AODM is due to www.turnitin.com by the announced date prior to the end of each quarter.** Points are awarded based on the accuracy and detail provided in the answers. Group work will not be accepted. No final grade may exceed a 100%.

The Exams

Chapter 0 – Introduction to the Marine Environment

Chapter 0 – Prehistoric Oceans

Chapter 1 – Chemical and Physical Oceanography

Chapter 2 – Plankton

Chapters 5&7 – Benthos and Meiofauna

Chapter 3 – Oceanic Nekton Part One: The Fishes

Chapter 3 – Oceanic Nekton Part Two: The Tetrapods

Chapter 4 – Deep Sea Biology

Chapters 6&8 – Intertidal Ecology, Estuaries & Salt Marshes

Chapters 9&10 – Tropical Communities and Symbiosis

Chapter 11 – Human Impact on the Sea

Chapter 0 – Introduction to the Marine Environment

1. Choose a maritime explorer who lived sometime between 1500 and 1900. Describe their travels, including at least four points of interest and two contributions to science.
2. Describe how SCUBA has changed in the years since its invention.
3. Describe two examples of how ROVs are used.
4. Explain how the locations of earthquakes are determined and give a specific example of this process.
5. How do Tsunami Warning Systems work? What are their strengths and limitations?
6. Energy is said to flow through an ecosystem, but chemicals cycle. Why is this distinction an important one to keep in mind when studying ecosystems?
7. Define the first and second law of thermodynamics. Relate them to marine food webs.
8. Choose a marine organism (other than the Spotted Eagle Ray given in your notes) and list its taxonomic identification from Kingdom down to Species.
9. Give one example of a scientific accuracy in *Finding Nemo*.
10. Give one example of a scientific inaccuracy in *Finding Nemo*.

Chapter 0 – Prehistoric Oceans

1. Choose a marine organism and describe three adaptive traits that have led to its evolutionary success.
2. Define and describe abiogenesis.
3. Identify three vestigial structures from any organism(s). Explain how each structure was needed or beneficial in the past and how it is no longer needed or beneficial.
4. Identify and describe three marine species that prospered in the “Age of Fishes”.
5. Identify and describe three marine species that prospered in the “Age of Reptiles”.
6. Identify and describe three marine species that prospered in the “Age of Mammals”.
7. Draw a timeline showing the four major eras of geological time. Place four events from the notes on this timeline.
8. Describe three life history differences between marine and terrestrial organisms.
9. Which mass extinction event was most harmful to ocean ecosystems? What caused it?
10. What is an index fossil? Give three examples of an index fossil.

Chapter 1 – Chemical and Physical Oceanography

1. Explain two methods of bathymetry and their importance to scientific research.
2. How does the wavelength of light affect its penetration into water?
3. What is a thermocline? How does it become established?
4. Describe four different causes of salinity change in oceans.
5. Explain why the Earth has not one, but two tidal bulges that are produced by the moon. In your answer, indicate where the tidal bulges are located on Earth with respect to the position of the moon.
6. What causes the size and frequency of tides to change around the world?
7. What is the ocean conveyor belt? What are the driving forces of the ocean conveyor belt?
8. Describe the physical changes that occur to a wave as it moves across shallow water to break at the shore.
9. The Gulf Stream is famous for producing rings. Explain how they form, and highlight the differences between warm and cold core rings.
10. The hydrologic cycle describes the circulation of water from the oceans into the atmosphere, and from the atmosphere to the continents and back to the ocean. Describe each step in the process, and where applicable, its effect on seawater salinity.

Chapter 2 – Plankton

1. Are phytoplanktonic plants the only photosynthetic organisms present in the plankton? What noneukaryotic organisms may be important in primary production in the ocean? Discuss.
2. What is primary production? How does the term differ from photosynthesis?
3. How is primary production measured? How do gross, net, and total primary production differ?
4. Name two factors that limit primary production in marine environments, and discuss their importance.
5. Is phytoplankton production nutrient limited or limited by grazing? (Are phytoplankton populations limited by “bottom-up” or by “top-down” processes?) Explain these terms and the processes involved.
6. Why is there less seasonal variability in biomass in the nanoplankton of tropical and warm temperate waters, such as the central gyre of the North Pacific and Sargasso Sea?
7. Explain three ways in which plankton defend themselves.
8. Recent research suggests that some jellyfish species can actively swim and are not simply planktonic. What would be some advantages of this ability.
9. Why have jellyfish populations been increasing in recent decades?
10. Give two examples of species that are meroplanktonic and explain the importance of their planktonic life stage.

Chapters 5&7 – Benthos and Meiofauna

1. Why are there fewer niches available in the soft-bottom, sublittoral region than in rocky coasts?
2. How does the rocky coast encourage competition? Give two examples of this competition.
3. Compare a kelp forest with a terrestrial forest. How are they similar? How are they different?
4. Discuss examples where abiotic and biotic factors interact to structure the marine sublittoral into patches of organisms.
5. What adaptations to the interstitial environment are found most commonly? Give at least three.
6. Why do meiofaunal organisms generally not produce planktonic larvae?
7. Why is stream index an important measure for aquatic systems?
8. What is meant by the term “depositional environment” and describe the resulting biotic and abiotic conditions.
9. Explain two adaptations of fish to a benthic lifestyle.
10. Give two specific examples of benthos in *Finding Nemo* along and name their appropriate phylum.

Chapter 3 – Oceanic Nekton Part One: The Fishes

1. Discuss why nektonic animals, although possessing very different evolutionary histories, show a strong convergence in morphology.
2. Name the five major fish fins and explain the purpose of each.
3. Compare and contrast nektonic organisms with planktonic ones. Which of these groups possesses greater diversity? Why do you think this is?
4. Describe three sensory systems that are present in nekton that humans do not have.
5. Compare and contrast how sharks and rays reproduce with how bony fish reproduce. How do their reproduction strategies differ?
6. Explain the traits that make sharks and rays successful predators.
7. What is the largest fish in the world? The largest mammal? What do they have in common?
8. Describe the advantages of a meroepipelagic lifestyle.
9. Sarcopterygii are considered more ancient evolutionarily than Actinopterygii. What characteristics make this so?
10. Explain the differences in food web structure between polar, temperate and tropical waters.

Chapter 3 – Oceanic Nekton Part Two: The Tetrapods

1. Why do marine mammals usually produce only one or two offspring at a time? How can the species survive with such a low fecundity?
2. Nektonic organisms live in a three-dimensional world, but it is not uniform. Discuss how this world is structured vertically.
3. Explain the characteristics that classify an organism as a mammal. What are the challenges and adaptations to life in the sea found among marine mammals?
4. Explain the composition, structure and purpose of baleen in Mysticetes.
5. Explain how the melon works in whales, dolphins and porpoises.
6. Explain the role birds play in marine ecosystems. What adaptations to marine environments do you find in birds?
7. What characteristics distinguish an organism as a reptile? What reptiles are marine organisms?
8. Name two advantages of an appendicular swimming style.
9. Name two advantages of an undulatory swimming style.
10. How is propulsion in octopuses and squids different than fish and tetrapods?

Chapter 4 – Deep Sea Biology

1. How are deep-sea fishes like the Venus flytrap? Why are most deep-sea fishes float-and-wait predators?
2. Why is bioluminescence of great importance to the organism that possess it in the deep sea?
3. How is it possible that water emitted from hydrothermal vents is as hot as 400°C?
4. At what oxygen concentrations are the deep-sea waters? Why are they not zero? Why are the deep-sea waters not depleted by organisms found in these waters?
5. Explain two hypotheses that attempt to explain the relatively high species diversity of the deep-sea benthos. Discuss the relative merits of each.
6. Why are planktonic larval forms not as advantageous for benthic animals of the abyss as they are for animals of other benthic environments?
7. Why do many deep sea fish migrate to the surface at night? Why not just stay there during the day?
8. Write the chemical equation for chemosynthesis and name each compound involved.
9. Many deep sea fish are semelparous. Why is this a reasonable strategy?
10. Describe three challenges to exploring the deep sea.

Chapters 6&8 – Intertidal Ecology, Estuaries and Salt Marshes

1. Why must a researcher who is studying zonation on a sandy beach take repeated samples at many different times over the course of the study?
2. How does small scale patchiness develop? What forces are in action in developing patches in the rocky shore community?
3. What is meant by the term succession? Does succession occur in the rocky intertidal? Why or why not?
4. How do physical and biological factors interact to create zonal patterns in salt marshes?
5. Why is it that stenohaline animals are located deeper in the water column when farther up an estuary?
6. Explain the relationship between grain size and dissolved oxygen content in sediment.
7. What conditions led to the Age of Piracy?
8. Why is the North Carolina coast considered ecologically unique and a valuable resource?
9. How do man-made structures like seawalls, jetties and groins influence barrier islands?
10. Explain the difference between organisms found on the ocean side of a barrier island versus the sound side of a barrier island. What conditions led to this difference in biodiversity?

Chapters 9&10 – Tropical Communities and Symbiosis

1. Compare the primary productivity values of atoll reefs with those of open tropical oceans of the same latitude. Why do the open tropical oceans have such a low productivity? In contrast, why are the coral reefs so productive, especially in light of the fact that the waters of the coral reef are nutrient poor?
2. How are hermatypic and ahermatypic corals similar? How are they different? What accounts for the differences?
3. Coral reefs have very specific conditions that must be met in order to thrive. Explain three of these conditions and a threat to coral reefs based on each.
4. Many coral reef fishes have distinct patterns of stripes and spots. Explain the specific advantages of each pattern.
5. Examine the impact that omnivorous coral predators have on coral reefs in terms of both destruction and stabilization. Support your analysis.
6. Explore how mangrove forests have both horizontal and vertical zonation patterns. How does the tide affect both?
7. Why are mangroves forests important to the coastline of Florida?
8. Speculate on why symbiosis is such a recurring and dominant theme in marine systems.
9. Discuss more than one evolutionary scenario for the development of the cleaning symbiosis exhibited by cleaner shrimp and fish.
10. Describe the size, dimensions and location of the Great Barrier Reef. In *Finding Nemo*, would it be possible for Marlin and Dory to travel from their home on the reef to Sydney?

Chapter 11 – Human Impact on the Sea

1. What is meant by the term maximum sustainable yield? How does this relate to the biological potential of a fish species?
2. Identify two species of fish that have been severely depleted by overfishing and analyze the possibility for their populations to recover.
3. Identify one species of fish that had been severely depleted due to overfishing but has recovered.
4. Describe the concept of tragedy of the commons in terms of two different marine issues, two different terrestrial issues, and two atmospheric issues.
5. Discuss ways human efforts to increase food production on land have reduced the potential yields of food from the sea.
6. Identify two species of fish that have successful aquaculture programs. What obstacles stand in the way of more fish species being farmed?
7. Global climate change has led to increasing ocean temperatures and acidification. Explain the specific cause of each.
8. Name three specific pollutants that originate on land and affect ocean ecosystems.
9. Contrast the desire for increased offshore oil drilling in the United States with increased ecological risk, such as with the Deepwater Horizon spill of 2010. Propose two solutions for the “U.S. addiction to oil”.
10. Describe three things individuals like you can do to decrease human impact on the sea.