

Marine Science: Secrets of the Blue Course Syllabus

What you will learn in this course

Marine Science: Secrets of the Blue

Have you ever wondered about the secrets of the deep, and how the creatures below the ocean's surface live and thrive? It is truly a new frontier of discovery, and in Marine Science, you will begin to understand a great deal more about the aquatic cycles, structures, and processes that generate and sustain life in the sea. Through the use of scientific inquiry, research, measurement, and problem solving, you will conduct various scientific procedures that will lead to an increased level of knowledge about Marine Science. You will also have the opportunity to use technology and laboratory instruments in an academic setting. By recognizing the inherent ethics and safety procedures necessary in advanced experiments, you will become progressively more confident in your abilities as a capable marine scientist.

Unit 1: About the Earth

You may have heard that the earth's surface is about 70 percent water, which means there is over twice as much water as there is land covering the globe. In this unit, you will go beneath the surface to learn about how the earth and its oceans were created, how the structure of the earth impacts everything from the shape of the continents to tsunamis, and how the scientific method is applied to marine science.

What will you learn in this unit?

- Define marine science.
- Describe the development of oceans.
- Explain different movements in plate tectonics and their results.
- Discuss the scientific method.
- Differentiate between a hypothesis and a theory.

Unit 2: Water and the Environment

Water is a unique and important resource on our planet. In this unit, you will discover the properties that make water so different from the other natural elements. Water's composition allows it to retain and release heat, playing a vital role in shaping the temperature of the air and land around it. You will explore how the world's oceans work with the wind and the atmosphere to define the climate on this planet we all share.

What will you learn in this unit?

- Describe the distinct qualities of water.
- Summarize the conditions that lead to climate change around lakes and oceans.
- Discuss the role of water currents and wind in shaping climate.

- Identify the sources of watersheds and the factors that influence them.
- Differentiate between a science and pseudoscience.

Unit 3: Tides

Tides are an essential part of ocean life. You'll explore the causes of tides and why some tides rise higher than others. Tides also shape the land and water around them. In some cases, they erode sunny beaches, and in others, they form the brackish water of estuaries. Not only do tides define the organisms that inhabit the waters, but they also play a significant role in shaping the environment.

What will you learn in this unit?

- Discuss oceanic and freshwater processes, such as tides and currents.
- Describe changes in ecosystems resulting from environmental shifts.
- Differentiate among freshwater, brackish, and saltwater ecosystems.
- Identify the biotic and abiotic elements of an ecosystem.
- Recognize the role of carbon and nutrient cycles in an aquatic environment.

Unit 4: Water and Weather

Every year, about 200 people are killed in floods in the United States. Floods are just one of the many ways in which key elements of the atmosphere, such as temperature and water, create severe weather patterns. This unit will explore the ways water, particularly ocean water, interacts with the atmosphere to create certain weather patterns and habitats for ocean life.

What will you learn in this unit?

- Identify the levels of the earth's atmosphere.
- Explain the causes of severe weather.
- Describe the behavior of gases in the ocean.
- Discuss the significance of the water and carbon cycles.
- Cite evidence of climate change in the ocean.

Unit 5: Energy in the Ocean

Energy moves around the ocean in waves, and waves are subject to the laws of fluid dynamics. This set of laws defines how energy moves in and out of the water. Many factors determine the impact of energy on fluids, including the nature of the fluid or gas and the basic principles of physics, such as the law of conservation of energy. Waves are also shaped by their interactions with the environment and each other. So even when the seas look calm, there is a lot of action going on in the ocean.

What will you learn in this unit?

- Discuss the basic principles of fluid dynamics.

- Understand the role of hydrostatic pressure.
- Explain the law of conservation of energy.
- Identify the measurable properties of waves.
- Recognize the impact of wave interactions.

Marine Science Midterm Exam

- Review information acquired and mastered from this course up to this point.
- Take a course exam based on material from the first five units in this course (Note: You will be able to open this exam only one time.)

Unit 6: The Ocean and Its Populations

The sun, winds, tides, and all the other elements of the ocean do more than just move water around. They also shape the environment to keep a wide variety of organisms alive. The ocean contains different layers, and each layer hosts organisms that have adapted to survive in the specific conditions of that region. Creatures in the deepest layers of the oceans are adapted to live in those depths. The populations there are just a small percentage of the ocean's residents. Identifying and documenting the species that live in the world's oceans is one of marine science's most daunting tasks.

What will you learn in this unit?

- Identify the layers of the ocean and their characteristics.
- Discuss the importance of adaptation for survival.
- Analyze the role of natural selection in evolution.
- Describe the characteristics of a population.
- Articulate the methods used to identify and monitor marine populations.

Unit 7: Populations That Thrive

Populations work together within ecosystems. An increase or decrease in one population will directly impact the neighboring organisms. If there is a decline in the seal population, it is likely to cause a decline in the killer whale population because these whales feed on the seals. This is just one way in which every species has a specific function which keeps the ecosystem in balance. These populations are also in competition with each other for the resources within the ecosystem. In many cases, populations have mutually beneficial relationships, and in others, they endanger each other. Populations also increase and decrease in natural cycles, some of which take years. These variations in population are in addition to the many natural factors that can limit or bolster population growth. All of these factors make it hard to say how many fish there are in the sea at any given moment.

What will you learn in this unit?

- Identify the role of a species within a food pyramid.
- Compare and contrast the relationship among organisms.

- Describe the trophic levels.
- Discuss the interactions and interdependence that occur in aquatic environments.
- Evaluate the factors impacting aquatic population cycles.

Unit 8: Human Interaction and the Environment

There are many factors that impact the environment, and man is one of them. One of man's biggest threats to stable and healthy aquatic systems is pollution. From industrial accidents to algae overpopulation, many causes of water pollution come from the land. Once pollutants enter the environment, they can impact all levels of the ecosystem. Therefore, if we are working towards a clean environment, we can't just focus on the problems we see in the water; our focus must be broader. Fortunately, there are a lot of regulations designed to keep clean water as a top priority.

What will you learn in this unit?

- Identify the large-scale environmental impact of human activity on marine systems.
- Evaluate how the environment and personal health are related.
- Investigate the role of humans in unbalanced ecosystems.
- Analyze the role of human activities that influence marine environments.
- Recognize the value of non-renewable resources.

Unit 9: The Past and Future of Marine Science

It is hard to say where marine science began, but the ocean has been the subject of study for thousands of years, as trade records for the Mediterranean Sea indicate. In the nineteenth century, the creatures that lived in the ocean became the subjects of scientific study, allowing marine science to emerge as its own discipline. Since then, marine scientists have explored the arctic regions and brought the ocean into our living rooms through documentaries and films. These efforts have raised international awareness of the issues threatening the ocean. These issues require global collaboration for ethical solutions if we want marine science and the ocean to have a positive future.

What will you learn in this unit?

- Describe the history of marine science.
- Identify the contributions of individuals to marine science.
- Articulate the ethical expectations in marine science.
- Recognize that scientific questions and conclusions may be influenced by social and cultural concerns.
- Distinguish between scientific and ethical questions.

Unit 10: Careers in Marine Science

Careers in marine science are found everywhere, from the ocean depths to the moon. One of marine science's most important jobs is to unlock the mysteries of the ocean and then pass this

information along so that it can inform policies and practices here on the surface. Without understanding how the ocean works, we will never be able to save its valuable resources. Fortunately, great minds all over the globe are using the scientific method to study our waterways and helping all of us live well on Earth.

What will you learn in this unit?

- Describe career options in marine science.
- Identify the function of systems thinking in aquatic environments.
- Discuss the role of technology in marine science.
- Explain how science factors into human decision making.
- Recognize that marine science requires a variety of approaches and contributions.

Marine Science Final Exam

- Review information acquired and mastered from this course up to this point.
- Take a course exam based on material from units six to ten in this course – the last five units. (Note: You will be able to open this exam only one time.)

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