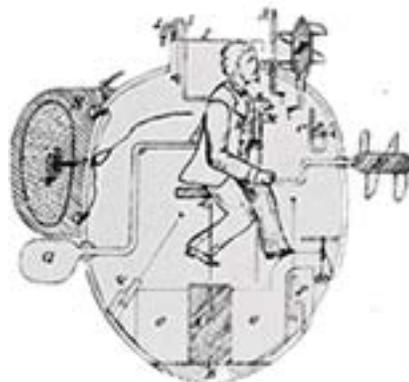


Submarines | Nonfiction Reading Test 1

Do you know the difference between a submarine and a submersible? A submarine is a watercraft that is capable of independent operation under the sea. Submarines do not require support ships because submarines can renew their air and power supplies independently. Submersibles also submerge and operate underwater, but they need the support of a larger vessel. Submersibles cannot renew their air and power supplies without support. For this reason submersibles are usually smaller and cannot spend as much time underwater as submarines.

The first documented submersible was constructed in 1620 by Cornelius Drebbel. It was powered by rowing oars underwater. Though this craft was originally designed for underwater exploration, it did not take long for inventors and makers of war to recognize the military potential of the submersible. In 1648 Bishop John Wilkins wrote, "It may be of great advantages against a Navy of enemies, who by this may be undermined in the water and blown up." Over one-hundred years later, the first military submarine was ready to be deployed.

The *Turtle* was the world's first submarine used in combat. Designed by David Bushnell in 1775, it was deployed by the Continental Army during the American Revolutionary War. Though the *Turtle* did utilize a support ship in combat, it was fully capable of renewing its air and power supplies independently; therefore, the *Turtle* is considered to have been a submarine and not a submersible. The *Turtle* was powered by hand-cranked propellers and was named as such because it resembled a turtle. It held a single person, moved about three miles per hour in calm water, and contained enough air to stay submerged for about thirty minutes. General Washington authorized an attack using the *Turtle* on a British flagship blockading New York Harbor. Sgt. Ezra Lee operated the *Turtle* and attempted to affix underwater explosives to the British ship, but he failed. The *Turtle* was later destroyed by the British. Despite this failure, the *Turtle* is still remembered as the first submarine used offensively during war.



Drawing of Bushnell's *Turtle*

Another notable submarine originally designed for war was Julius H. Kroehl's *Sub Marine Explorer*. Built between 1863 and 1866, this submarine was created for the North during the American Civil War but the war ended before it went into use. After the war it was used commercially to harvest pearls in Panamanian waters during the late 1860s. Unfortunately, the dangers of decompression sickness (a condition that occurs when divers rise to the water's surface too quickly) were not understood. While experimenting with the *Sub Marine Explorer* in 1867, Kroehl himself perished from decompression sickness. In 1869 a new engineer put the *Sub Marine Explorer* back to the task of harvesting pearls. Tragically, use of the *Sub Marine Explorer* was discontinued after the entire crew died from decompression sickness.

Submarine use increased greatly during World War I. Due to innovations in engineering, such as a dual power system using both diesel and electric sources, submarines had finally developed into effective war machines. One watercraft called the U-Boat was put to great effect by the Germans. Some argue that the U-Boat was more of a submersible, since U-Boats operated primarily on the surface using diesel engines and submerged only occasionally to attack using battery power, but the effectiveness of the U-Boat in combat is certain. During World War I more than 5,000 Allied ships were sunk by U-Boats, including the *Lusitania*, which is often cited as a reason why America entered the war.

U-Boats were again utilized extensively by the Germans during World War II. Though the U-Boats were devastating to British fleets, advances in technology such as radar and sonar reduced their overall effectiveness. Additionally, the U.S. had also developed and deployed a fleet of submarines to great effect. Though the Japanese attack on Pearl Harbor destroyed or severely damaged many of the U.S. Navy's front-line Pacific Fleet ships, U.S. submarines survived the attack and went on to cause great damage. Submarines, though only about 2 percent of the U.S. Navy, destroyed over 30 percent of the Japanese Navy. This made U.S. submarines the most effective anti-ship and anti-submarine weapon in the entire American arsenal.

Modern submarines are now powered by a nuclear reactor. The nuclear reactor generates a tremendous amount of power and frees the submarine from the need to occasionally surface. The large amount of power generated by these reactors allows submarines to operate at high speeds for long durations. Current nuclear submarines never need to be refueled throughout their 25-year life-spans. The only factor limiting the amount of time that an advanced submarine can remain submerged is the amount of food and water that the submarine can carry. Even the Bishop John Wilkins, when he imagined the military capabilities of future submarines from 1648, could not have envisioned such an amazingly powerful watercraft.

Directions: Read each question carefully and choose the best answer. Refer to the text if necessary. Write your answer on the provided space.

1. For what purpose were submersibles originally designed? _____
 - a. Transporting passengers underwater without the threat of storms
 - b. Exploring under the sea
 - c. Smuggling weapons and outlawed materials
 - d. Attacking ships on the surface of the water

2. Why was the *Sub Marine Explorer* originally created? _____
 - a. To assist the North in the Civil War
 - b. To harvest pearls
 - c. To explore undersea
 - d. To experiment with decompression sickness

3. Which is *most likely* to limit the how long a modern submarine can remain submerged? _____
 - a. The amount of fuel in the submarine
 - b. The air supply in the submarine
 - c. The amount of food and water aboard the submarine
 - d. There is no limit to the amount of time a modern submarine can remain submerged

4. How were U-Boats powered? _____

a. Hand crank	b. Diesel
c. Battery	d. Both B & C
e. None of these	f. All of these

5. Which of the following statements best describes the *Turtle* according to the text? _____
 - a. The *Turtle* was the first submarine used during war to destroy another ship.
 - b. The *Turtle* was the first submersible used during war to attack another ship.
 - c. The *Turtle* was the first submersible used during war to destroy another ship.
 - d. The *Turtle* was the first submarine used during war to attack another ship.
 - e. The *Turtle* is the biggest and fastest watercraft in all of human history.

6. Which of the following best describes why the author *most likely* wrote this text? _____
- a. To entertain his audience with stories about submarines
 - b. To educate his readers about how submarines work
 - c. To inform his readers about the evolution of submarines
 - d. To convince his audience to purchase a submarine
7. Which is the *most likely* reason why the author wrote the **first** paragraph? _____
- a. To explain a concept that would be referenced throughout the text
 - b. To introduce the main idea of the text
 - c. To get the reader's attention with startling information
 - d. To amuse the reader with an interesting historical anecdote
8. Which does **not** describe a way in which submersibles are different from submarines? _____
- a. Submersibles are usually smaller than submarines.
 - b. Submersibles are not capable of independent operation.
 - c. Submersibles can usually spend more time underwater than submarines.
 - d. Submersibles cannot independently renew their air and power supplies.
9. Which of the following *best* describes how the text is structured in the **first paragraph**? _____
- a. Compare and Contrast
 - b. Chronological
 - c. Problem and Solution
 - d. Sequence / Process
 - e. Order of Importance
10. Which of these events happened **first**? _____
- a. The *Turtle* was destroyed.
 - b. Bishop John Wilkins recognized the military potential of submersibles.
 - c. The *Sub Marine Explorer* was used to harvest pearls.
 - d. Radar and Sonar were invented.
11. Which *most likely* explains why U.S. submarines survived the attack on Pearl Harbor? _____
- a. Because the Japanese did not value the submarines as worthy targets
 - b. Because the submarines were much smaller than all of the other boats in the U.S. Navy
 - c. Because the Japanese were targeting U.S. submersibles instead
 - d. Because the submarines were submerged and difficult to strike
12. Which of the following statements is entirely true? _____
- a. Sgt. Ezra Lee invented the *Turtle*; Cornelius Drebbel invented the first submersible;
 - b. Bishop John Wilkins invented the first submersible; David Bushnell invented the *Turtle*;
 - c. David Bushnell invented the *Turtle*; Julius H. Kroehl invented the *Sub Marine Explorer*
 - d. Julius H. Kroehl invented the *Sub Marine Explorer*; John Wilkins invented the U-Boat
13. Which of these events happened **last**? _____
- a. U.S. submarines survived the attack on Pearl Harbor.
 - b. Sgt. Ezra Lee attempted to blow up a British flagship using a submarine.
 - c. U-Boats sank the *Lusitania*.
 - d. Julius H. Kroehl's developed the *Sub Marine Explorer*
14. Which of the following would be the *best* title for this reading passage? _____
- a. How Submarines Work
 - b. A Short History of Submarines
 - c. *Turtle*: The First Combat Submarine
 - d. The Differences Between Submarines and Submersibles