Oceanography An Invitation to Marine Science 9th edition Garrison Test Bank

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Chapter 02 - A History of Marine Science

True / False

1. Phoenician sailors were more skilled then Greek sailors, so they ventured beyond the sight of land for trade on a regular basis.

a. True

b. False

ANSWER: False

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-1 - Describe the history and purposes of early voyaging and its role in marine science.

OTHER: Bloom's: Remember

NOTES: Both the Greeks and the Phoenicians stayed within the sight of land despite their skills at sea.

2. The fall of the Library of Alexandria can be attributed to growing tensions between Hypatia and early Christian Romans.

a. True

b. False

ANSWER: True

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-2 - Identify the contributions of those at the Library of Alexandria to early ocean exploration.

OTHER: Bloom's: Remember

NOTES: Though it weathered the dissolution of Alexander's empire, the Library of Alexandria did not survive the subsequent period of Roman rule. The last librarian was Hypatia, the first notable woman mathematician, philosopher, and scientist. In Alexandria, she was a symbol of science and knowledge, concepts the early Christians identified with pagan practices. The mission of the library, as personified by the last librarian, antagonized the governors and citizens of the city of Alexandria. After years of rising tensions, in 415 c.e., a mob brutally murdered Hypatia and burned the library with all its contents. Most of the community of scholars dispersed, and Alexandria ceased to be a center of learning in the ancient world.

3. Hipparchus developed our present grid system of longitude and latitude.

a. True

b. False

ANSWER: True

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-2 - Identify the contributions of those at the Library of Alexandria to early ocean exploration.

OTHER: Bloom's: Remember

NOTES: Although, Eratosthenes invented latitude and longitude, systems of imaginary lines dividing the surface of Earth, Hipparchus invented our present regular grid of latitude and longitude

4. Longitudinal lines run parallel to the equator.

a. True

b. False

ANSWER: False

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

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LEARNING OBJECTIVES: OCEA.GARR.16.2-1-2 - Identify the contributions of those at the Library of Alexandria to early ocean exploration.
OTHER: Bloom's: Remember
NOTES: Latitude lines are drawn parallel to the equator and to each other while longitude lines run from pole to pole.

5. The Polynesian colonies used a system of shells and bamboo to represent island positions for navigation.
   a. True
   b. False
ANSWER: True
REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration
LEARNING OBJECTIVES: OCEA.GARR.16.2-1-3 - Compare and contrast the seafaring explorations of the Polynesians, Vikings, and Chinese during the Dark Ages.
OTHER: Bloom's: Remember
NOTES: The Polynesian navigators used shells attached to a bamboo grid to represent the positions of their islands. Modern representations can be seen in Micronesian stick charts.

6. The Norwegian Vikings began looking westward after French, Irish, and British strengthened their defenses against their raids.
   a. True
   b. False
ANSWER: True
REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration
LEARNING OBJECTIVES: OCEA.GARR.16.2-1-3 - Compare and contrast the seafaring explorations of the Polynesians, Vikings, and Chinese during the Dark Ages.
OTHER: Bloom's: Remember
NOTES: The Vikings discovered and established colonies in Iceland and Greenland as they moved west. Once these areas were colonized, they eventually discovered parts of North America.

7. Christopher Columbus believed during his lifetime that he had discovered the New World.
   a. True
   b. False
ANSWER: False
REFERENCES: 2-2 The Age of European Discovery
LEARNING OBJECTIVES: OCEA.GARR.16.2-2-2 - Demonstrate how inaccuracies in the estimate of Earth's size affected the explorations of Columbus and Magellan.
OTHER: Bloom's: Remember
NOTES: Columbus made three more trips to the New World but went to his grave believing that he had found islands off the coast of Asia. He never saw the mainland of North America and never realized the size and configuration of the continents whose future he had so profoundly changed.

8. The return of the Magellan expedition to Spain in 1522 marked the end of the European Age of Discovery.
   a. True
   b. False
ANSWER: True

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REFERENCES: 2-2 The Age of European Discovery
LEARNING OBJECTIVES: OCEA.GARR.16.2-2-2 - Demonstrate how inaccuracies in the estimate of Earth's size affected the explorations of Columbus and Magellan.
OTHER: Bloom's: Remember
NOTES: The return of the Magellan expedition to Spain in 1522 marked the end of the European Age of Discovery. An unpleasant era of exploitation of the human and natural resources of the Americas followed.

9. Captain James Cook returned to England after his final expedition in 1779 and recorded a 50-volume set of reports of his scientific findings.
a. True
b. False
ANSWER: False
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-1 - Summarize the voyages of Captain James Cook, and explain why he is considered the first marine scientist.
OTHER: Bloom's: Remember
NOTES: Captain James Cook was killed in the Hawai'ian Islands during his last expedition in 1779.

10. Captain James Cook's first expedition in 1768 was aboard the HMS Endeavour.
a. True
b. False
ANSWER: True
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-1 - Summarize the voyages of Captain James Cook, and explain why he is considered the first marine scientist.
OTHER: Bloom's: Remember
NOTES: Captain James Cook's first expedition was aboard the HMS Endeavour that departed from Plymouth Harbor in 1768.

11. Longitude can be found using a protractor and the north polar star.
a. True
b. False
ANSWER: False
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-2 - Illustrate how ocean exploration led to improved clock accuracy.
OTHER: Bloom's: Understand
NOTES: Latitude can be determined using this method. An accurate timepiece is needed to determine longitude.

12. Although John Harrison was a cabinetmaker; he was awarded a monetary prize for building an accurate clock used to determine longitude.
a. True
b. False
ANSWER: True
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies

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LEARNING OBJECTIVES: OCEA.GARR.16.2-3-2 - Illustrate how ocean exploration led to improved clock accuracy.
OTHER: Bloom's: Remember
NOTES: In 1728, John Harrison, a Yorkshire cabinetmaker, began working on a clock that would be accurate enough to determine longitude. His radical new timepiece, called a chronometer, was governed not by a pendulum but by a spring escapement. His first version was tested at sea in 1736, and Harrison was awarded £500 as encouragement to continue his efforts. Over the next 25 years he built three more clocks, culminating in 1760 in his Number Four, perhaps the most famous timekeeper in the world.

13. The accomplishments of the United States Exploring Expedition are largely unknown with little evidence remaining of the voyages.
    a. True
    b. False
ANSWER: False
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-1 - Discuss the major factors that led to the science of oceanography.
OTHER: Bloom's: Remember
NOTES: The United States Exploring Expedition, under the leadership of Lieutenant Charles Wilkes returned with many scientific specimens and artifacts, which formed the nucleus of the collection of the newly established Smithsonian Institute in Washington, D.C. The final report for the expedition totaled 19 volumes of maps, text, and illustrations. The report is a landmark in the history of American scientific achievement.

14. The Glomar Challenger expeditions drilled deep into the seafloor and confirmed evidence for seafloor spreading and plate tectonics.
    a. True
    b. False
ANSWER: True
REFERENCES: The Glomar Challenger expeditions drilled deep into the seafloor and confirmed evidence for seafloor spreading and plate tectonics.
LEARNING OBJECTIVES: OCEA.GARR.16.2-5-2 - Discuss how world-wide scientific collaboration and field research have shaped marine science in the 20th century.
OTHER: Bloom's: Remember
NOTES: In 1968, the drilling ship Glomar Challenger was capable of drilling into the ocean bottom beneath more than 6,000 meters (20,000 feet) of water and recovering samples of seafloor sediments. These long and revealing plugs of seabed provided confirming evidence for seafloor spreading and plate tectonics.

15. Satellites can measure the height of the sea surface from 835 miles above Earth.
    a. True
    b. False
ANSWER: True
REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology
LEARNING OBJECTIVES: OCEA.GARR.16.2-5-2 - Discuss how world-wide scientific collaboration and field research have shaped marine science in the 20th century.
OTHER: Bloom's: Remember
NOTES: The TOPEX/Poseidon is a satellite orbiting 1,336 kilometers (835 miles) above Earth in an

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orbit that allows coverage of 95% of the ice-free ocean every 10 days. The satellite's TOPography EXperiment uses a positioning device that allows researchers to determine its position to within 1 centimeter (1⁄2 inch) of Earth's center. The radars aboard can then determine the height of the sea surface with unprecedented accuracy.

Multiple Choice

16. The first sea voyagers are thought to be the ____.
    a. Egyptians
    b. Cretans
    c. Greeks
    d. Vikings
    e. Polynesians

ANSWER: b
REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration
LEARNING OBJECTIVES: OCEA.GARR.16.2-1-1 - Describe the history and purposes of early voyaging and its role in marine science.
OTHER: Bloom's: Remember
NOTES: The first direct evidence we have of voyaging, traveling on the ocean for a specific purpose, comes from records of trade in the Mediterranean Sea most probably by the Cretans.

17. The term "ocean" was derived from the term okeanos, the name given by the ____ for the Atlantic Ocean.
    a. Phoenicians
    b. Vikings
    c. Greeks
    d. Cretans
    e. Polynesians

ANSWER: c
REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration
LEARNING OBJECTIVES: OCEA.GARR.16.2-1-1 - Describe the history and purposes of early voyaging and its role in marine science.
OTHER: Bloom's: Remember
NOTES: The Greeks began to explore outside the Mediterranean into the Atlantic Ocean around 900–700 b.c.e. Early Greek seafarers noticed a current running from north to south beyond Gibraltar. Believing that only rivers had currents, they decided that this great mass of water, too wide to see across, was part of an immense flowing river. The Greek name for this river was okeanos. Our word "ocean" is derived from oceanus, a Latin variant of that root. Phoenician sailors were also very much at home in this "river," but like the Greeks, they rarely ventured out of sight of land.

18. Which Library of Alexandria librarian was responsible for the early development of the longitude and latitude system?
    a. Hipparchus
    b. Claudius Ptolemy
    c. Hypatia
    d. Eratosthenes
    e. Pythagoreas

ANSWER: d

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REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration
LEARNING OBJECTIVES: OCEA.GARR.16.2-1-2 - Identify the contributions of those at the Library of Alexandria to early ocean exploration.
OTHER: Bloom's: Remember
NOTES: Alexandrian scholars developed the first workable charts that represented a spherical surface on a flat sheet. Eratosthenes invented latitude and longitude, systems of imaginary lines dividing the surface of Earth. Latitude lines were drawn parallel to the equator, and longitude lines ran from pole to pole.

19. Who was the first to place north at the top of charts and east on the right?
    a. Ptolemy
    b. Eratosthenes
    c. Hypatia
    d. Hipparchus
    e. Pythagoreas

ANSWER: a
REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration
LEARNING OBJECTIVES: OCEA.GARR.16.2-1-2 - Identify the contributions of those at the Library of Alexandria to early ocean exploration.
OTHER: Bloom's: Remember
NOTES: A later Egyptian–Greek, Claudius Ptolemy (90–168 c.e.), oriented charts by placing east to the right and north at the top. Ptolemy's division of degrees into minutes and seconds of arc is still used by navigators.

20. Where was the first "zero longitude" line?
    a. Athens
    b. Rome
    c. Alexandria
    d. Greenwich
    e. Syene

ANSWER: c
REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration
LEARNING OBJECTIVES: OCEA.GARR.16.2-1-2 - Identify the contributions of those at the Library of Alexandria to early ocean exploration.
OTHER: Bloom's: Remember
NOTES: Hipparchus divided Earth into an orderly grid based on 360 increments, or "degrees" (degre, "step"). The equator was a natural dividing point for the north–south (latitude) positioning grid, but there was no natural dividing point for the east–west (longitude) grid. Not surprisingly, Alexandria was arbitrarily selected as the first "zero longitude" and a regular grid was laid out east and west of that city.

21. Where is the present day "zero longitude"?
    a. Athens
    b. Rome
    c. Alexandria
    d. Greenwich

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e. Syene

ANSWER: d

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-2 - Identify the contributions of those at the Library of Alexandria to early ocean exploration.

OTHER: Bloom's: Remember

NOTES: After much political disagreement, nations agreed in 1884 that the Greenwich meridian near London would be the world's "zero longitude".

22. The Hawai'ian Islands were colonized by the ____.

a. Greeks
b. Vikings
c. Chinese
d. Polynesians
e. Norwegians

ANSWER: d

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-3 - Compare and contrast the seafaring explorations of the Polynesians, Vikings, and Chinese during the Dark Ages.

OTHER: Bloom's: Remember

NOTES: The greatest Polynesian minds were navigators, and reaching Hawai'i was their greatest achievement. Of all the islands colonized by the Polynesians, Hawai'i is farthest away, across an ocean whose guide stars were completely unknown to the southern navigators.

23. Which early voyagers were known for their pillaging and looting?

a. Romans
b. Vikings
c. Polynesians
d. Greeks
e. Chinese

ANSWER: b

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-3 - Compare and contrast the seafaring explorations of the Polynesians, Vikings, and Chinese during the Dark Ages.

OTHER: Bloom's: Remember

NOTES: Danish and Norwegian Vikings swept down the coast of Europe; they methodically pillaged Paris, robbed monasteries in Ireland, and looted Britain. The Swedish Vikings foraged as far away as Kiev and Constantinople. In 859 c.e., Vikings spent a week or so ashore in Morocco, rounding up prisoners for sale as slaves or to hold for ransom.

24. Technical innovations invented by the ____ for voyaging, included the compass, central rudder, and watertight compartment.

a. Vikings
b. Greeks
c. Chinese
d. Polynesians

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e. Norwegians

ANSWER: c

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-3 - Compare and contrast the seafaring explorations of the Polynesians, Vikings, and Chinese during the Dark Ages.

OTHER: Bloom's: Remember

NOTES: In addition to inventing the compass, the Chinese invented the central rudder, watertight compartments, and sophisticated sails on multiple masts, all of which were critically important for the successful operation of large sailing vessels.

25. What was the ultimate goal of sea voyages by the Renaissance Europeans?

a. Commerce
b. Exploration
c. Empire expansion
d. Food sources
e. Pillaging

ANSWER: a

REFERENCES: 2-2 The Age of European Discovery

LEARNING OBJECTIVES: OCEA.GARR.16.2-2-1 - Distinguish the main goal of sea-going Renaissance Europeans from those of earlier explorations during the Dark Ages.

OTHER: Bloom's: Understand

NOTES: Renaissance Europeans set out to explore the world by sea. They did not undertake exploration for its own sake, however; any voyage had to have a material goal. Trade between East and West had long been dependent on arduous and insecure desert caravan routes through the central Asian and Arabian deserts.

26. Which technological innovation was used by Prince Henry the Navigator's explorers to aid in discovering new trade routes?

a. Sextant
b. Batten sails
c. Compass
d. Chronometer
e. Traverse boards

ANSWER: c

REFERENCES: 2-2 The Age of European Discovery

LEARNING OBJECTIVES: OCEA.GARR.16.2-2-1 - Distinguish the main goal of sea-going Renaissance Europeans from those of earlier explorations during the Dark Ages.

OTHER: Bloom's: Remember

NOTES: A European visionary who thought ocean exploration held the key to great wealth and successful trade was Prince Henry the Navigator, third son of the royal family of Portugal. Henry's explorers pushed south into the unknown and opened the west coast of Africa to commerce. He sent out small, maneuverable ships designed for voyages of discovery and manned by well-trained crews. For navigation, his mariners used the compass—an instrument (invented in China in the fourth century b.c.e.) that points to a magnetic pole.

27. What was the mistaken calculation made by Ptolemy that contributed to the "discovery" of the New World

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by Christopher Columbus?

a. Current movements
b. Size of the Atlantic Ocean
c. Shape of Earth
d. Longitude lines
e. Circumference of Earth

ANSWER: e
REFERENCES: 2-2 The Age of European Discovery
LEARNING OBJECTIVES: OCEA.GARR.16.2-2-2 - Demonstrate how inaccuracies in the estimate of Earth's size affected the explorations of Columbus and Magellan.
OTHER: Bloom's: Understand
NOTES: Ptolemy wrongly publicized an estimate of the size of Earth that was too small—about 70% of the true value. This error, coupled with his mistake of overestimating the size of Asia, greatly reduced the apparent width of the unknown part of the world between the Orient and Europe. More than 1,500 years later, these mistakes made it possible for Columbus to convince people he could reach Asia by sailing west.

28. What was Christopher Columbus's main goal when he first traveled across the Atlantic Ocean?

a. Discover new lands
b. Find new food sources
c. Circumnavigate the world
d. Establish a sea route to Asia
e. Find new technologies

ANSWER: d
REFERENCES: 2-2 The Age of European Discovery
LEARNING OBJECTIVES: OCEA.GARR.16.2-2-2 - Demonstrate how inaccuracies in the estimate of Earth's size affected the explorations of Columbus and Magellan.
OTHER: Bloom's: Remember
NOTES: Columbus wasn't trying to discover new lands. His intention was to pioneer a sea route to the rich and fabled lands of the East, made famous more than 200 years earlier in the overland travels of Marco Polo.

29. Whose expedition was the first to circumnavigate the globe?

a. Ferdinand Magellan
b. Christopher Columbus
c. Prince Henry the Navigator
d. James Cook
e. Matthew Maury

ANSWER: a
REFERENCES: 2-2 The Age of European Discovery
LEARNING OBJECTIVES: OCEA.GARR.16.2-2-2 - Demonstrate how inaccuracies in the estimate of Earth's size affected the explorations of Columbus and Magellan.
OTHER: Bloom's: Remember
NOTES: Ferdinand Magellan, a Portuguese explorer in service to Spain, led an expedition that was the first to circumnavigate the world. Magellan himself did not survive the voyage; only 18 out

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of 260 sailors managed to return after 3 years of dangerous travel.

30. Admiral Louis Antoine de Bougainville claimed what land for France in 1768?
    a. Northern Africa
    b. New Zealand
    c. Polynesia
    d. Caribbean Islands
    e. Canada

ANSWER: c
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-1 - Summarize the voyages of Captain James Cook, and explain why he is considered the first marine scientist.
OTHER: Bloom's: Remember
NOTES: France sent Admiral Louis Antoine de Bougainville to the South Pacific in the mid-1760s. His 1768 claim for France of what is now called French Polynesia opened the area to the powerful European nations.

31. Which country sponsored the first scientific oceanographic expedition?
    a. England
    b. Portugal
    c. Spain
    d. France
    e. China

ANSWER: a
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-1 - Summarize the voyages of Captain James Cook, and explain why he is considered the first marine scientist.
OTHER: Bloom's: Remember
NOTES: Scientific oceanography began with the departure from Plymouth Harbor in 1768 of HMS Endeavour under the capable command of James Cook of the British Royal Navy.

32. Who is considered the first marine scientist?
    a. Ferdinand Magellan
    b. Christopher Columbus
    c. Prince Henry the Navigator
    d. Matthew Maury
    e. James Cook

ANSWER: e
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-1 - Summarize the voyages of Captain James Cook, and explain why he is considered the first marine scientist.
OTHER: Bloom's: Remember
NOTES: Captain James Cook is considered the first marine scientist. He and the scientists aboard his three expeditions took samples of marine life, land plants and animals, the ocean floor, and

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geological formations; they also reported the characteristics of these samples in their logbooks and journals.

33. What did Columbus and earlier European voyagers use to find latitude at sea?

a. Compass
b. Stars
c. Sextant
d. Chronometer
e. Horizon

ANSWER: b
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-2 - Illustrate how ocean exploration led to improved clock accuracy.
OTHER: Bloom's: Remember
NOTES: At night, Columbus and his European predecessors used the stars to find latitude and, as a consequence, knew their position north or south of home.

34. If there is a three hour difference between "clock" noon and "shaft" noon, how many degrees west are you from your point of origin? Assume one rotation of 360°/24 hours = 15°/hour.

a. 45°
b. 90°
c. 180°
d. 15°
e. 30°

ANSWER: a
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-2 - Illustrate how ocean exploration led to improved clock accuracy.
OTHER: Bloom's: Apply
NOTES: If "clock" noon occurs three hours before "shaft" noon, you can do some simple math to see how far west of your starting point you have come. Earth turns toward the east, making one rotation of 360° in 24 hours, so its rotation rate is 15° per hour (360°/24 hours = 15°/hour). The 3-hour difference between "clock" noon and "shaft" noon puts you 45° west of your point of origin ($3 \times 15° = 45°$).

35. Who developed the first clock accurate enough to determine longitude?

a. Benjamin Franklin
b. John Harrison
c. Matthew Maury
d. James Cook
e. Alfred Thayer Mahan

ANSWER: b
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-2 - Illustrate how ocean exploration led to improved clock accuracy.
OTHER: Bloom's: Remember
NOTES: In 1728, John Harrison, a Yorkshire cabinetmaker, began working on a clock that would be

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accurate enough to determine longitude. His radical new timepiece, called a chronometer, was governed not by a pendulum but by a spring escapement.

36. Who led an expedition with the goal to disprove the theory that Earth was hollow and could be entered through huge holes at either pole?

a. James Cook
b. Matthew Maury
c. Charles Wilkes
d. Charles Darwin
e. John Murray

ANSWER: c
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-1 - Discuss the major factors that led to the science of oceanography.
OTHER: Bloom's: Remember
NOTES: Lieutenant Charles Wilkes led a 4-year expedition with the goals of showing the flag, whale scouting, mineral gathering, charting, observing, and pure exploration. One unusual goal was to disprove a peculiar theory that Earth was hollow and could be entered through huge holes at either pole.

37. Voyages aboard the Vincennes, which explored portions of the South Pole, established the natural sciences as reputable professions in what country?

a. England
b. United States
c. France
d. Spain
e. Portugal

ANSWER: b
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-1 - Discuss the major factors that led to the science of oceanography.
OTHER: Bloom's: Remember
NOTES: The work of the scientists aboard the flagship USS Vincennes and the expedition's five other vessels helped establish the natural sciences as reputable professions in America.

38. What expedition confirmed Antarctica as a continent?

a. Challenger expedition
b. United States Exploring Expedition
c. Endeavour expedition
d. Resolution expedition
e. Discovery expedition

ANSWER: b
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-1 - Discuss the major factors that led to the science of oceanography.
OTHER: Bloom's: Remember
NOTES: The United States Exploring Expedition was launched in 1838. Wilkes's team explored and

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charted a large sector of the east Antarctic coast and made observations that confirmed the landmass as a continent.

39. Benjamin Franklin published the first chart of the _____ , which decreased the sailing time across the Atlantic.

a. North American Current
b. Baffin Island Winds
c. Labrador Current
d. Newfoundland Winds
e. Gulf Stream

ANSWER: e
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-2 - Assess the contributions of the United States Exploring Expedition, Benjamin Franklin, and Matthew Maury to the field of physical oceanography.
OTHER: Bloom's: Remember
NOTES: In 1769, Benjamin Franklin published the first chart of the Gulf Stream in the Northern Atlantic.

40. Who is considered the father of physical oceanography?

a. Charles Wilkes
b. Matthew Maury
c. James Cook
d. Charles Darwin
e. John Murray

ANSWER: b
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-2 - Assess the contributions of the United States Exploring Expedition, Benjamin Franklin, and Matthew Maury to the field of physical oceanography.
OTHER: Bloom's: Remember
NOTES: Maury, considered by many to be the father of physical oceanography, was perhaps the first person to undertake the systematic study of the ocean as a full-time occupation.

41. Who coined the term "oceanography"?

a. Maury and Franklin
b. Wilkes and Murray
c. Thomson and Darwin
d. Thomson and Murray
e. Murray and Darwin

ANSWER: d
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-3 - Describe the successes of the Challenger Expedition and its primary contribution to the science of oceanography.
OTHER: Bloom's: Remember
NOTES: Thomson and Murray coined the term "oceanography". Though the term literally implies

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only marking or charting, it has come to mean the science of the ocean.

42. Which expedition was the first devoted solely to marine science?

a. United States Exploring Expedition
b. Endeavour expedition
c. Challenger expedition
d. Resolution expedition
e. Discovery expedition

ANSWER: c
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-3 - Describe the successes of the Challenger Expedition and its primary contribution to the science of oceanography.
OTHER: Bloom's: Remember
NOTES: The Challenger expedition was the first large research project devoted solely to marine science. It remains history's longest continuous scientific oceanographic expedition.

43. Who allowed his ship to be trapped in the Arctic ice for nearly four years to prove that no Arctic continent existed?

a. Nansen
b. Mahan
c. Murray
d. Anderson
e. Thomson

ANSWER: a
REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology
LEARNING OBJECTIVES: OCEA.GARR.16.2-5-1 - Describe some of the advanced modern-day technologies that has advanced oceanographic discovery during the past 100 years.
OTHER: Bloom's: Remember
NOTES: Polar oceanography began with the pioneering efforts of Fridtjof Nansen. Nansen courageously allowed his specially designed ship Fram to be trapped in the Arctic ice, where he and his crew of 13 drifted with the pack for nearly 4 years (1893–1896), exploring to 85°57'N, a record for the time. The 1,650-kilometer (1,025-mile) drift of Fram proved that no Arctic continent existed.

44. The German Meteor expedition, which explored the South Atlantic, was the first to use what innovation in depth profiling?

a. Deep-sea drilling
b. Remotely operated vehicle
c. Echo sounder
d. Nuclear submarine
e. Global Positioning System

ANSWER: c
REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology
LEARNING OBJECTIVES: OCEA.GARR.16.2-5-2 - Discuss how world-wide scientific collaboration and field research have shaped marine science in the 20th century.
OTHER: Bloom's: Remember

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NOTES: In 1925, the German Meteor expedition, which crisscrossed the South Atlantic for two years, introduced modern optical and electronic equipment to oceanographic investigation. Its most important innovation was use of an echo sounder, a device that bounces sound waves off the ocean bottom, to study the depth and contour of the seafloor.

45. Which oceanographic vessel is the current ship of the Integrated Ocean Drilling Program (IODP)?
    a. JOIDES Resolution
    b. USNS Bruce C. Heezen
    c. Glomar Challenger
    d. R/V Chikyu
    e. Okeanos Explorer

ANSWER: d
REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology
LEARNING OBJECTIVES: OCEA.GARR.16.2-5-2 - Discuss how world-wide scientific collaboration and field research have shaped marine science in the 20th century.
OTHER: Bloom's: Remember
NOTES: Beginning in October 2003, deep-drilling responsibilities were passed to the Integrated Ocean Drilling Program (IODP), an international research consortium that operated a successor to JOIDES Resolution and an even larger drillship, R/V Chikyu.

Matching

Matching
a. Hypatia
b. Greek Pythagoreans
c. Mahan
d. Nautilus
e. Eratosthenes

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration
LEARNING OBJECTIVES: OCEA.GARR.16.2-1-2 - Identify the contributions of those at the Library of Alexandria to early ocean exploration.
OTHER: Bloom's: Remember

46. Determined that Earth is spherical
ANSWER: b

47. Calculated the circumference of Earth
ANSWER: e

48. The first notable woman mathematician, philosopher, and scientist
ANSWER: a

Matching
a. Hypatia
b. Greek Pythagoreans
c. Mahan
d. Nautilus

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e. Eratosthenes

REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments

LEARNING OBJECTIVES: OCEA.GARR.16.2-4-3 - Describe the successes of the Challenger Expedition and its primary contribution to the science of oceanography.

OTHER: Bloom's: Remember

49. Author of *The Influence of Sea Power upon History, 1660-1783*

ANSWER: c

Matching

a. Hypatia

b. Greek Pythagoreans

c. Mahan

d. Nautilus

e. Eratosthenes

REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology

LEARNING OBJECTIVES: OCEA.GARR.16.2-5-1 - Describe some of the advanced modern-day technologies that has advanced oceanographic discovery during the past 100 years.

OTHER: Bloom's: Remember

50. Sailed beneath the North Pole in 1958

ANSWER: d

Completion

51. The first _____, or chart makers, were probably Mediterranean traders who made routine journeys to markets.

ANSWER: cartographers

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-1 - Describe the history and purposes of early voyaging and its role in marine science.

OTHER: Bloom's: Remember

52. Lines of _____ run from pole to pole.

ANSWER: Longitude

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-2 - Identify the contributions of those at the Library of Alexandria to early ocean exploration.

OTHER: Bloom's: Remember

53. The aim of the _____ during their voyages was to display their wealth and to show kindness to people of distant places.

ANSWER: Chinese

REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration

LEARNING OBJECTIVES: OCEA.GARR.16.2-1-3 - Compare and contrast the seafaring explorations of the Polynesians, Vikings, and Chinese during the Dark Ages.

OTHER: Bloom's: Remember

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54. The _____ were great voyagers who colonized many thousands of islands in the Pacific.
ANSWER: Polynesians
REFERENCES: 2-1 Understanding the Ocean Began with Voyaging for Trade and Exploration
LEARNING OBJECTIVES: OCEA.GARR.16.2-1-3 - Compare and contrast the seafaring explorations of the Polynesians, Vikings, and Chinese during the Dark Ages.
OTHER: Bloom's: Remember

55. The _____ visited North America 500 years prior to the arrival of Columbus.
ANSWER: Vikings
REFERENCES: 2-2 The Age of European Discovery
LEARNING OBJECTIVES: OCEA.GARR.16.2-2-1 - Distinguish the main goal of sea-going Renaissance Europeans from those of earlier explorations during the Dark Ages.
OTHER: Bloom's: Remember

56. _____ _____ was the first to circumnavigate the world at high latitudes.
ANSWER: James Cook
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-1 - Summarize the voyages of Captain James Cook, and explain why he is considered the first marine scientist.
OTHER: Bloom's: Remember

57. A(n) _____ is an instrument that is used to determine exact location at sea.
ANSWER: chronometer
REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies
LEARNING OBJECTIVES: OCEA.GARR.16.2-3-2 - Illustrate how ocean exploration led to improved clock accuracy.
OTHER: Bloom's: Remember

58. The _____ Institution in Washington, D.C. was established in the 19th century and houses many of the specimens and artifacts from early U.S. expeditions.
ANSWER: Smithsonian
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-1 - Discuss the major factors that led to the science of oceanography.
OTHER: Bloom's: Remember

59. _____ _____ developed sailing directions based on surface winds and currents.
ANSWER: Matthew Maury
REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-2 - Assess the contributions of the United States Exploring Expedition, Benjamin Franklin, and Matthew Maury to the field of physical oceanography.
OTHER: Bloom's: Remember

60. The _____ _____ is a 50-volume set published between 1880 and 1895 containing the extensive scientific recordings of Sir John Murray that is still used by oceanographers today.
ANSWER: Challenger Report

REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments
LEARNING OBJECTIVES: OCEA.GARR.16.2-4-4 - Debate how marine science influenced the history of the 20th

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century.

OTHER: Bloom's: Remember

61. ROVs, or _____ _____ _____, are robots used underwater to carry out programmed instructions, such as collect samples and manipulate equipment.

ANSWER: remotely operated vehicles

REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology

LEARNING OBJECTIVES: OCEA.GARR.16.2-5-1 - Describe some of the advanced modern-day technologies that has advanced oceanographic discovery during the past 100 years.

OTHER: Bloom's: Remember

62. The _____ _____ _____ is a constellation of 24 satellites in orbit 17,000 kilometers above Earth.

ANSWER: Global Positioning System

REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology

LEARNING OBJECTIVES: OCEA.GARR.16.2-5-1 - Describe some of the advanced modern-day technologies that has advanced oceanographic discovery during the past 100 years.

OTHER: Bloom's: Remember

63. NASA's _____ is a string of satellites that orbit Earth one behind the other on the same track so their collective observations may be used to build three-dimensional images of Earth's atmosphere, ocean surface, and land topography.

ANSWER: A-train

REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology

LEARNING OBJECTIVES: OCEA.GARR.16.2-5-1 - Describe some of the advanced modern-day technologies that has advanced oceanographic discovery during the past 100 years.

OTHER: Bloom's: Remember

64. The JOIDES Resolution was the second ship (1985-2003) dedicated to the Integrated Ocean _____ Program.

ANSWER: Drilling

REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology

LEARNING OBJECTIVES: OCEA.GARR.16.2-5-2 - Discuss how world-wide scientific collaboration and field research have shaped marine science in the 20th century.

OTHER: Bloom's: Remember

65. The HROV _____, the deepest-diving vehicle now in operation, reached the bottom of the world's deepest ocean trench at a depth of 10,902 meters.

ANSWER: Nereus

REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology

LEARNING OBJECTIVES: OCEA.GARR.16.2-5-2 - Discuss how world-wide scientific collaboration and field research have shaped marine science in the 20th century.

OTHER: Bloom's: Remember

Subjective Short Answer

66. Discuss how inaccuracies in the first calculation of Earth's circumference led to discovery of the New World by Columbus.

ANSWER: Eratosthenes of Cyrene was the second librarian at Alexandria and was the first to calculate

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the circumference of Earth. Though his calculation was fairly accurate it was still about 8% of the true value. Later, Ptolemy furthered the work of Eratosthenes and published an estimate of the size of Earth that was too small - about 70% of the true value. This error, coupled with his mistake of overestimating the size of Asia, greatly reduced the apparent width of the unknown part of the world between the Orient and Europe. Columbus, 1500 years later, used these estimates of the size of Earth to convince people he could reach Asia by sailing west. Columbus mistook the New World for India or Japan. He made three more trips to the New World believing he had found Asia.

REFERENCES: 2-2 The Age of European Discovery

LEARNING OBJECTIVES: OCEA.GARR.16.2-2-2 - Demonstrate how inaccuracies in the estimate of Earth's size affected the explorations of Columbus and Magellan.

OTHER: Bloom's: Understand

67. Describe the events that occurred during the expeditions of Captain James Cook that contributed to scientific oceanography.

ANSWER: Cook deserves to be considered a scientist as well as an explorer because of the accuracy, thoroughness, and completeness in his descriptions. He and the scientists aboard his three expeditions took samples of marine life, land plants and animals, the ocean floor, and geological formations; they also reported the characteristics of these samples in their logbooks and journals. Cook's navigation was outstanding, and his charts of the Pacific were accurate enough to be used by the Allies in World War II invasions of the Pacific islands. He drew accurate conclusions, did not exaggerate his findings, and opened friendly diplomatic relations with many native populations. Cook recorded and successfully interpreted events in natural history, anthropology, and oceanography. Unlike many captains of his day, he cared for his men. He was a thoughtful and clear writer. This first marine scientist peacefully changed the map of the world more than any other explorer or scientist in history.

REFERENCES: 2-3 Voyaging Combined with Science to Advance Ocean Studies

LEARNING OBJECTIVES: OCEA.GARR.16.2-3-1 - Summarize the voyages of Captain James Cook, and explain why he is considered the first marine scientist.

OTHER: Bloom's: Remember

68. Outline the many different experimental samplings conducted during the Challenger expedition.

ANSWER: The Challenger expedition collected samples from the deep ocean using a steam winch and mechanical grabs and nets. They conducted 492 deep soundings with mechanical grabs and nets at 362 stations (including 133 dredgings). With each hoist, animals new to science were strewn on the deck; in all, staff biologists discovered 4,717 new species. The scientists also took salinity, temperature, and water-density measurements during these soundings. Each reading contributed to a growing picture of the physical structure of the deep ocean. They completed at least 151 open-water trawls and stored 77 samples of seawater for detailed analysis ashore. The expedition collected new information on ocean currents, meteorology, and the distribution of sediments; the locations and profiles of coral reefs were charted. Thousands of pounds of specimens were brought to British museums for study. Manganese nodules, brown lumps of mineral-rich sediments, were discovered on the seabed, sparking interest in deep-sea mining.

REFERENCES: 2-4 The First Scientific Expeditions Were Undertaken by Governments

LEARNING OBJECTIVES: OCEA.GARR.16.2-4-3 - Describe the successes of the Challenger Expedition and its primary

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contribution to the science of oceanography.

OTHER: Bloom's: Understand

69. List three of the pre-eminent oceanographic institutions in the United States; include where they are located and their academic association.

ANSWER: In the United States, the three pre-eminent oceanographic institutions are the Woods Hole Oceanographic Institution on Cape Cod, founded in 1930 (and associated with the Massachusetts Institute of Technology and the neighboring Marine Biological Laboratory, founded in 1888); the Scripps Institution of Oceanography, founded in La Jolla, California, and affiliated with the University of California in 1912, and the Lamont–Doherty Earth Observatory of Columbia University, founded in 1949.

REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology

LEARNING OBJECTIVES: OCEA.GARR.16.2-5-2 - Discuss how world-wide scientific collaboration and field research have shaped marine science in the 20th century.

OTHER: Bloom's: Remember

70. Discuss how satellites are used in oceanography.

ANSWER: Satellites have been used to collect oceanographic data since 1978. Satellites beam radar signals off the sea surface to determine wave height, variations in sea-surface contour and temperature, and other information of interest to scientists. The first of a new generation of oceanographic satellites was launched in 1992, TOPEX/Poseidon, as the project is known, is a satellite orbiting 1,336 kilometers (835 miles) above Earth in an orbit that allows coverage of 95% of the ice-free ocean every 10 days. The satellite uses a positioning device that allows researchers to determine its position to within 1 centimeter (1⁄2 inch) of Earth's center. The radars aboard can then determine the height of the sea surface with unprecedented accuracy. Other experiments in this 5-year program include sensing water vapor over the ocean, determining the precise location of ocean currents, and determining wind speed and direction. Jason-1, launched in 2001, monitors global climate interactions between the sea and the atmosphere. AQUA collects data about Earth's water cycle, including evaporation from the oceans, water vapor in the atmosphere, phytoplankton and dissolved organic matter in the oceans, and temperature.

REFERENCES: 2-5 Contemporary Oceanography Makes Use of Modern Technology

LEARNING OBJECTIVES: OCEA.GARR.16.2-5-2 - Discuss how world-wide scientific collaboration and field research have shaped marine science in the 20th century.

OTHER: Bloom's: Understand

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