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U.S. GEOLOGICAL SURVEY

# Science Challenge Questions and Answers

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## Summary

Science Challenge is a collection of 196 questions and answers addressing Earth and Planetary Science topics. Questions cover science disciplines such as volcanoes, earthquakes, hydrology, biology, minerals and cartography. It is intended for general audiences. An audio-CD version of this report is available as U.S. Geological Survey Open File Report 98-507-B, and is for sale from:

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- 1) What is the age of planet Earth?  
Earth is over 4 1/2 billion years old. This age was determined by radiometric dating that uses the decay of elements with long half-life isotopes, like uranium-lead and potassium-argon.
- 2) At what rate is the San Andreas fault moving in California?  
The San Andreas fault is slipping at a rate of approximately 2 inches per year causing Los Angeles to move towards San Francisco. Scientists project that Los Angeles will be a suburb of San Francisco in approximately 15 million years.
- 3) What is the largest volcano in our solar system?  
Olympus Mons on Mars is the largest volcano yet found in our solar system. It is nearly 400 miles wide and rises 16 miles into the thin Martian atmosphere. The base of Olympus Mons would almost cover the entire State of Arizona.
- 4) What is the largest volcano on Earth?  
Mauna Loa volcano in Hawaii is the largest volcano on Earth, both in terms of volume and height above its base. Mauna Loa consists of about 19,000 cubic miles of lava and rises more than 50,000 feet above its base. Because of its massive size, the volcano has depressed the ocean floor about 5 miles.
- 5) Do earthquakes occur in the central portion of the United States?  
Yes, some of the most powerful earthquakes in United States history occurred along the New Madrid fault in the Mississippi Valley in 1811-1812. The effects of shaking from these magnitude 8+ earthquakes caused church bells to ring in Boston, Massachusetts nearly, 1,000 miles away.
- 6) At what depth do most earthquakes occur?  
Most earthquakes occur at depths of less than 50 miles from the Earth's surface.
- 7) Where do some of the deepest earthquakes occur?  
The deepest earthquakes typically occur at plate boundaries where the Earth's crust is being subducted into the Earth's mantle. These occur as deep as 400 miles below the surface.
- 8) Where are the oldest rocks on Earth found: on land or on the ocean floor?  
On land. Since the ocean floor is being continually regenerated as the continental plates move across the Earth's surface, the oldest rocks on the ocean floor are less than 300 million years. In contrast, the oldest continental rocks are 4,500 million years old.
- 9) What is the surface temperature of Venus?  
The temperature of Venus is nearly 900 degrees Fahrenheit, hot enough to melt most spacecraft materials and destroy their electronics.
- 10) When two full moons occur in any calendar month, what is the second full moon called?  
A blue moon. Blue moons occur in approximately 30 percent of all years, with two blue moons occurring in nearly 4 percent of these years. This will be the case in 1999 when a blue moon will occur in both January and March.
- 11) What is the largest planet in our solar system?  
Jupiter; it is not only the largest planet, but is also heavier than all the other planets and satellite moons in our solar system combined.

- 12) What phenomenon formed the Grand Canyon in Arizona?  
The 277 mile-long Grand Canyon is a product of water erosion over the last 5 to 7 million years.
- 13) Are the rock formations in the Grand Canyon older at the top or bottom of the canyon?  
At the bottom. On average, the rocks at the bottom of the canyon are 570 million years old, whereas those near the top are 245 million years old. However, some crystalline rocks at the bottom are nearly 1.8 billion years old.
- 14) Are there any naturally occurring dams along the Colorado River?  
No; however, within the last 1 million years, at least 13 separate volcanic lava flows from several volcanoes in the western Grand Canyon area formed natural dams along the Colorado River, some as high as 2,300 feet. All were eventually removed through erosion by the Colorado River.
- 15) What is the largest canyon found in our solar system?  
Valles Marineris, on the planet Mars. This huge canyon extends for about 3,000 miles. If placed on the United States, Valles Marineris would stretch from New York City, New York, to Los Angeles, California, and is much deeper than the Grand Canyon.
- 16) Which planet has a greater surface gravitational force, Earth or Mars?  
Earth; the gravity on Mars is only 38 percent of that found on Earth at sea level. A 100 pound person on Earth would weigh only 38 pounds on Mars.
- 17) Where and when did the deadliest recorded earthquake occur?  
The world's deadliest recorded earthquake occurred in 1557 in central China. It struck a region where most people lived in caves carved from soft rock. These dwellings collapsed during the earthquake, killing an estimated 830,000 people. In 1976 another deadly earthquake struck in Tangshan, China, where more than 250,000 people were killed.
- 18) Where and when did the largest earthquake occur in the twentieth century?  
The 1960 Chilean earthquake, which occurred off the coast of South America. It had a magnitude of 9.6 and broke a fault over 1,000 miles long.
- 19) Which earthquake was more catastrophic the Kobe, Japan or the Northridge, California earthquake?  
The Kobe, Japan earthquake which had a magnitude of 6.8 and was responsible for 5,530 deaths, 37,000 injuries, and over \$100 billion in economic loss. The 1994 Northridge, California earthquake had a magnitude of 6.7 was responsible for approximately 60 deaths, 9,000 injuries, and over \$40 billion in damage.
- 20) What is the nation's premier earthquake research agency?  
The U.S. Geological Survey which has the most extensive seismic monitoring and response system in the Nation. The USGS works with numerous universities to advance our understanding of the cause and effects of earthquakes and with emergency response agencies in the interest of public safety and hazards mitigation.
- 21) What is the distance from the surface of Earth to its center?  
The distance from the surface of the Earth to its center is 3,700 miles. The thickness of the ocean lithosphere or the relatively solid skin of the earth under oceans is only 41 miles, which in relative terms is much thinner than the skin of an apple.

- 22) How were the Hawaiian Islands formed?  
The Hawaiian Islands are the tops of gigantic volcanoes that formed above a hot spot in the Earth's interior. As the volcanoes grew, they were carried away from the hot spot as the Pacific Plate moves northwestward at about 3 1/2 inches per year. The fixed hot spot is currently beneath the southeastern part of the Big Island of Hawaii.
- 23) How much lava has been erupted by Kilauea Volcano during its most recent, long eruption?  
Between 1983 and 1997, the volcano erupted 2.1 billion cubic yards of lava. During peak eruption rates, the volcano erupted more than 3/4 million cubic yards of lava daily, enough to fill 75,000 dump trucks, at a rate of nearly one every second.
- 24) What is Earth's highest mountain totally above sea level?  
At 29,028 feet above sea level, Mt. Everest, a peak in the Nepal-Tibet section of the Himalayas, is the world's tallest mountain.
- 25) Which planet is larger, Saturn or Jupiter?  
Jupiter. While Saturn is almost the size of Jupiter, it has only 1/3 the mass and it would float on water.
- 26) What is the single longest river in the world?  
The Nile River in Africa at 4,160 miles in length.
- 27) What is the largest reservoir in the United States?  
Lake Mead, located on the Arizona-Nevada border, is the largest United States reservoir with a volume of 29,000,000 acre feet. However, Lake Powell, located in the state of Utah, is the longest reservoir with a length of 186 miles.
- 28) What is the highest point above sea level in the United States?  
Mt. McKinley, Alaska, at 20,320 feet above sea level.
- 29) Where is the lowest point in the United States?  
Bad Water in Death Valley, California, at 282 feet below sea level.
- 30) What are the most eastern, western, southern and northern points in the United States?  
The westernmost point is West Point of Amatignak Island, Alaska.  
The northernmost point is Point Barrow, Alaska.  
The southernmost point is the southern tip of the island of Hawaii.  
The easternmost point is Pochnoi Point, Semisopchnoi, Alaska, because it lies east of the 180 degree longitude.
- 31) Where is the geographic center of the United States?  
The geographic center of the contiguous lower 48 United States is near Lebanon, in Smith County, Kansas.  
The geographic center of the continental 49 United States is near Castle Rock, in Butte County, South Dakota.  
The geographic center of the 50 states is west of Castle Rock, in Butte County, South Dakota.
- 32) Is the San Andreas fault a single, continuous fault?  
No, the San Andreas fault is actually a fault zone rather than a single fault. Movement may occur along any of the many fault surfaces along the zone at any time. The San Andreas fault system is more than 800 miles long, and in some spots is as much as 10 miles deep.

- 33) How large was the 1989 Loma Prieta, California earthquake?  
The 1989 Loma Prieta earthquake was a magnitude of 7.1 and was responsible for 62 deaths and 3,757 injuries. Over 3,000 people were left homeless, and damage was estimated at \$6 billion.
- 34) What is the major public water source in Arizona, ground or surface water?  
Ground water. More than 95 percent of the ground-water withdrawn in the State is from alluvial aquifers in Basin and Range valleys.
- 35) Where can the public obtain information, maps and products on Earth resources?  
The USGS maintains an extensive product line of maps and other earth science products. They can be obtained by calling 1-800-USA-MAPS (1-800-872-6277).
- 36) Which States have the smallest number of earthquakes in the United States?  
Florida and North Dakota.
- 37) Which State has the longest coastline: Texas, California, Michigan, or Florida?  
Michigan's Great Lakes coast totals 3,288 miles, more coastline than any state but Alaska.
- 38) Are there more than one type of landslide?  
Yes, different kinds of landslides are caused by different kinds of rainfall, materials, and movement. Intense rainfall over a short period of time may trigger shallow, fast-moving mud and debris flows. Slow, steady rainfall over a long period of time may trigger deeper, slow-moving landslides.
- 39) How much damage do landslides in the United States cause in a single year?  
Every year as much as \$2 billion in landslide damage occurs. In a record-breaking San Francisco region storm of January, 1982, approximately 18,000 debris flows were triggered during a single night. Property damage was over \$66 million, and 25 people were killed.
- 40) What are debris flows?  
Debris flows are like fast-moving mud avalanches that have been clocked at speeds in excess of 100 miles per hour.
- 41) Where can the public obtain information on the physical and cultural features in the United States?  
From the Geographic Names Information System maintained by the USGS.
- 42) Does the planet Uranus rotate in the same direction as Earth?  
No, it rotates in the opposite direction. It was knocked on its side, most likely from a massive collision while it was still forming, and its axis of rotation points 98 degrees away from its orbit around the Sun.
- 43) Can rocks float?  
Some volcanic rocks can float. The violent separation of gas from lava produces a "frothy" rock called pumice. Some pumice is so light, because of the many gas bubbles, that it floats on water.
- 44) How many active volcanoes are located in the State of Alaska?  
Alaska has more than 40 historically active volcanoes.

- 45) What role does the USGS play in affecting commercial air transportation worldwide?  
The USGS Volcano Hazards Program plays a strategic role in helping the Federal Aviation Administration determine where and when volcanic eruptions and airborne ash pose a threat to air transportation routes. USGS provides this critical scientific data to the FAA, and they utilize it to redirect air traffic away from potentially hazardous areas, thereby minimizing the potential for air disasters.
- 46) What is the most earthquake-prone State in the United States?  
Alaska is the most earthquake-prone State and one of the most seismically active regions in the world. Alaska experiences a magnitude 7 earthquake almost every year, and a magnitude 8 or greater earthquake on average every 14 years.
- 47) What role did the USGS play in the 1997 Hollywood production of the movie *Dante's Peak*?  
The digital elevation perspective model of Mt. St. Helens, Washington, produced by the USGS in Menlo Park, California, had a bit part in the movie. The model was a 100 square-foot by 35 foot-high wood and steel structure built on a sound stage in Los Angeles, California. Computer-generated gas, steam, ash, and lava were created as special effects.
- 48) What is the highest, driest, and coldest continent on Earth?  
The highest, driest, and coldest continent is Antarctica.
- 49) How deep is the Grand Canyon ?  
In some places the Grand Canyon is more than 6,000 feet deep.
- 50) When did prospecting begin in the Grand Canyon?  
The earliest prospectors began to prospect the western Grand Canyon about 1850.
- 51) Which famous Grand Canyon explorer also served as the second Director of the USGS?  
John Wesley Powell, who served as the Director of the USGS from March of 1881 until May of 1884.
- 52) What was the first USGS topographic map to be published by the USGS, and when was it published?  
The quadrangle The Mound, Louisiana, was published in 1881.
- 53) What was the first fully digital topographic map produced by the USGS?  
The Park Ridge, Illinois, quadrangle, published in 1993.
- 54) When did the USGS begin to use aerial photographs to produce their topographic maps?  
Aerial photos were first used in topographic map production in 1936.
- 55) If the total world supply of water were poured upon the land surface of the 50 states of the United States, to what average depth would the land surface be submerged?  
90 miles.
- 56) When was the last time that the volcanic mountain Mount Shasta, California, erupted?  
The last known eruption occurred approximately 200 years ago. Mount Shasta has erupted, on the average, at least once every 800 years during the last 10,000 years, and about once every 600 years during the last 4,500 years.

- 57) What is the origin of Crater Lake, Oregon?  
Crater Lake is of volcanic origin. It lies within the caldera of Mt. Mazama, a volcano of the Cascade Range that erupted 7,700 years ago. The mountain collapsed during its enormous eruption, forming a caldera.
- 58) What is the deepest lake in the United States?  
Crater Lake, Oregon. Its deep blue waters extend to 1,932 feet below the surface.
- 59) Where is the world's highest waterfall?  
The world's highest waterfall is Angel Falls in Venezuela at 3,212 feet.
- 60) What is the highest waterfall in the United States?  
The highest waterfall in the United States is Yosemite Falls, California, at 2,425 feet.
- 61) What is the world's largest desert?  
The largest desert in the world is the Sahara Desert in northern Africa. It is more than  $23 \frac{1}{3}$  times the size of southern California's Mojave Desert where Death Valley is located.
- 62) What percentage of the world's water is held in its oceans?  
Approximately 97 percent of the Earth's total water supply is contained in the oceans.
- 63) What percentage of the Earth's total water supply is drinkable, fresh water?  
Drinkable water accounts for less than 3 percent of the Earth's total supply.
- 64) Which two land masses contain the vast majority of the Earth's fresh water supply?  
Nearly 70 percent of the Earth's fresh-water supply is locked up in the icecaps of Antarctica and Greenland. The remaining fresh-water supply exists in the atmosphere, streams, lakes, or groundwater and accounts for 1 percent of the Earth's total water supply.
- 65) What is the majority water use in the State of Arizona?  
85 percent of the water use in Arizona is for growing crops in the desert. The two primary crops are cotton and alfalfa.
- 66) Which of the Earth's oceans is the largest?  
The Pacific Ocean is the largest ocean at 64,186,000 square miles. It is more than two times the size of the Atlantic Ocean. It has an average depth of 12,925 feet. The greatest known depth is 36,198 feet at the Mariana Trench.
- 67) What is the longest mountain chain on Earth?  
The Mid-Atlantic Ridge, which splits nearly the entire Atlantic Ocean north to south. Iceland is one place where this submarine mountain chain rises above the sea surface.
- 68) What is the average rainfall for the entire United States?  
About 30 inches per year, which is equivalent to 1,430 cubic miles of water.
- 69) Where is the lowest dry land place on Earth?  
The shore of the Dead Sea, located between Israel and Jordan, is 1,292 feet below sea level.
- 70) Which is larger, the Earth or Mars?  
The Earth is twice as large as Mars. However, Mars is twice as large as Earth's moon.



- 71) How was Half Dome in California's Yosemite National Park formed, and of what rock type is it composed?  
Half Dome is a 2,200 foot-high granite monolith. The sheer rock face of Half Dome is the result of glacial erosion in the Yosemite Valley approximately 250,000 years ago.
- 72) How much volcanic ash fell during the most vigorous period of the Mount St. Helens eruption?  
During the 9 hour period of most vigorous eruptive activity on May 18, 1980, more than 540 million tons of ash fell over an area of more than 22,000 square miles.
- 73) Which satellite of Saturn is nicknamed "the Death Star"?  
The satellite Mimas. Mimas is interesting geologically because it is traversed by a 130 kilometer crater that is nearly one-third the diameter of the entire satellite. This crater is also 10 kilometers deep.
- 74) In what year was the USGS established?  
The USGS was established in 1879. Clarence King served as the first Director.
- 75) Can rocks grow?  
Yes. For example, rocks called iron-manganese crusts grow on underwater mountains in oceans and seas around the world. The crusts precipitate slowly from seawater, growing about 1 millimeter in thickness every million years. Your fingernails grow much faster; about 1 millimeter every two weeks.
- 76) Where do most earthquakes and volcanic eruptions occur on Earth?  
The majority of the earthquakes and volcanic eruptions occur along plate boundaries such as the boundary between the Pacific Plate and the North American plate. One of the most active plate boundaries where earthquakes and eruptions are frequent, for example, is around the massive Pacific Plate commonly referred to as the Pacific Ring of Fire.
- 77) What is the "Ring of Fire" and where is it located?  
The Ring of Fire is a term for the area surrounding the Pacific Plate where it meets other plate boundaries. It spans the entire west coasts of South America, Mexico, and United States, moves across the Aleutian Islands of Alaska and down the eastern islands of Asia including Japan, and continues southward toward eastern Australia and New Zealand.
- 78) What was the worst oil spill in North America and where did it occur?  
The EXXON ® Valdez spill of 1989, in which the tanker EXXON ® Valdez spilled 11 million gallons of oil into western Prince William Sound, Alaska.
- 79) True or false: All the oil residues found on rocks along shorelines of western Prince William Sound came from the 1989 EXXON ® Valdez spill?  
False. Some of the residues come from oil that was spilled years earlier when the Alaska earthquake of 1964 ruptured storage tanks in the Port of Valdez.
- 80) What three countries have the greatest number of historically active volcanoes?  
The top three countries are Indonesia, Japan, and the United States in descending order of volcanic activity.

- 81) How many people worldwide will be at risk from volcanoes by the year 2000?  
USGS scientists estimate that volcanoes will pose a tangible risk to at least 500 million people by the turn of the century. This is comparable to the entire population of the world at the beginning of the seventeenth century!
- 82) Which of the following sources stores the greatest volume of fresh water worldwide: lakes? streams? or ground water?  
Groundwater comprises a 30 times greater volume than the 30,000 cubic miles of water contained in all freshwater lakes, and more than 3,000 times the 300 cubic miles of water in the world's streams at any given time.
- 83) What is the tallest, above-sea-level volcano in the world?  
Ojos del Salado in Chile, at 22,589 feet in elevation.
- 84) Are volcanoes randomly distributed on the Earth's surface?  
No, most volcanoes are concentrated on the edges of continents or above hot spots (like the Hawaiian islands).
- 85) Which inhabited island is the oldest in the Hawaiian chain?  
The oldest inhabited island is Niihau, which lies west of the island of Kauai. It's estimated to be about 5 million years old.
- 86) What percentage of the world's volcanoes have erupted in the United States over the past 10,000 years?  
About 10 percent of the more than 1,500 volcanoes that have erupted in the past 10,000 years are located in the United States. Most of these volcanoes are found in the Aleutian Islands, the Alaska Peninsula, the Hawaiian Islands, and the Cascade Range of the Pacific Northwest.
- 87) Where is the only settlement located within the Grand Canyon?  
The Havasupai Indian village, located about 2,400 feet below the rim of the canyon .
- 88) Which earthquake was larger, the 1906 San Francisco earthquake or the 1964 Anchorage, Alaska, earthquake?  
The 1964 Anchorage earthquake had a magnitude of 9.2, whereas the San Francisco earthquake was a magnitude 8.3 on the Richter scale. This difference in magnitude equates to nearly twice the amount of energy being released and accounts for why the Anchorage earthquake was felt over an area of almost 500,000 square miles.
- 89) Which earthquake was more destructive in terms of loss of life and relative damage costs, the 1906 San Francisco earthquake or the 1964 Anchorage earthquake?  
The 1906 San Francisco earthquake. It was responsible for 700 deaths versus 114 from the Anchorage earthquake. Property damage in San Francisco was also greater in relative terms due to the destructive fires.
- 90) What are the two largest categories of water usage in the United States?  
Thermoelectric power generation and irrigation.
- 91) On average, how many gallons of water does each American household use daily?  
The average American generally uses from 80-200 gallons of water each day, most of which is used to flush toilets.

- 92) On average, how much water is used worldwide each day?  
About 400 billion gallons a day.
- 93) What was the most destructive volcanic eruption in the history of the United States?  
The 1980 eruption of Mount St. Helens, Washington, was the most destructive volcanic eruption. Fifty-seven people were killed by the eruption including USGS scientist Dr. David Johnston, who was at a monitoring site 5 miles from the volcano on the morning of the eruption. An estimated \$1 billion damage was caused by the eruption.
- 94) Approximately how many people lost their lives as the result of volcanic eruptions worldwide during the last 500 years?  
Scientists have estimated that at least 300,000 persons lost their lives as a result of volcanic eruptions during the last 500 years. Between 1980 and 1990, volcanic activity killed at least 26,000 people and forced nearly 450,000 to flee from their homes.
- 95) How many of Earth's volcanoes are known to have erupted in historic time?  
About 540 volcanoes on land are known. No one knows how many undersea volcanoes have erupted in historic time.
- 96) Which is the Nation's largest marine sanctuary?  
The Monterey Bay National Marine Sanctuary. It encompasses more than 5,000 square miles and has a 400-mile-long coastline, stretching from north of San Francisco to south of the Big Sur coast. Its protected resources include our Nation's most expansive kelp forests and one of North America's largest underwater canyons.
- 97) What is the newest volcano in the Hawaiian Island chain?  
Loihi Seamount, the newest submarine volcano in the Hawaiian Island chain, is forming about 20 miles off the southern coast of the Big Island of Hawaii. Loihi is still 3,180 feet below sea level and is speculated to reach the ocean's surface in the next 250,000 years.
- 98) How many volcanoes actually form the Big Island of Hawaii?  
The Big Island of Hawaii is composed of five volcanoes knitted together. They include Kohala, Mauna Kea, Hualalai, Mauna Loa, and Kilauea.
- 99) How much of the Earth's surface consists of rocks that are of volcanic origin?  
Scientists estimate that more than 3/4 of the Earth's surface is of volcanic origin--that is, rocks either erupted by volcanoes or molten rock that cooled below ground and has subsequently been exposed at the surface. Most of Earth's volcanic rocks are found on the seafloor.
- 100) Are all tsunamis high waves when they strike a coastline?  
No, contrary to many artistic images of tsunamis, most tsunamis do not result in giant breaking waves. Rather, most tsunamis come onshore as very strong and fast tides.
- 101) How much of the Earth's land surface is desert?  
Approximately one-third of the Earth's land surface is desert.

- 102) What causes earthquakes to occur?  
An earthquake is caused by the shaking of the ground due to an abrupt shift of rock along a fracture in the Earth, called a fault. Within seconds, an earthquake releases stress that has slowly accumulated within the rock, sometimes over hundreds of years. Most earthquakes are caused by slow movements deep in the Earth that push against the Earth's brittle, relatively thin outer layer, causing the rocks to break suddenly.
- 103) How much of the State of Alaska is covered by glaciers?  
28,800 square miles of Alaska, or 5 percent, is covered by glaciers.
- 104) Who was Inge Lehmann and what did she do?  
Inge Lehmann was a famous Danish seismologist and the only woman to win the Medal of the Seismological Society of America. Her most famous achievement was the discovery of the inner and outer cores of the Earth through the reflection of seismic waves off of those surfaces. She died in 1993 at the age of 105.
- 105) What is acid rain?  
Acid rain is one of the most damaging forms of pollution. It contains sulfuric acid, formed from sulfur dioxide and hydrogen in the air. These gases can come naturally from volcanoes or as a byproduct of the burning of fossil fuels such as coal and oil.
- 106) What is the largest glacier in the United States and where is it located?  
The Bering Glacier near Cordova, Alaska, is the largest glacier in the United States.
- 107) What percentage of the world's fresh water is stored as glacial ice?  
About 70 percent of all the world's fresh water is stored as glacial ice. That's equivalent to about 60 years of precipitation over the entire globe.
- 108) How much fresh water is stored in the earth?  
More than two million cubic miles of fresh water is stored in the earth, nearly 50 percent within a half mile of the surface.
- 109) What is the total water supply of the world?  
The total water supply of the world is 326 million cubic miles (1 cubic mile of water equals more than 1 trillion gallons).
- 110) What is ground water?  
Ground water is simply the subsurface water that fully saturates pores or cracks in soils and rocks.
- 111) Which type of water is less susceptible to bacterial pollution, surface water or ground water?  
Ground water is less susceptible to bacterial pollution than surface water because the soil and rocks through which ground water flows filters out most of the bacteria.
- 112) What agency produces topographic maps of the United States?  
The USGS. Topographic maps are among the most popular and versatile products sold by the USGS. Other popular USGS products include bathymetric maps, photoimages, satellite images, geologic maps, land use and land cover maps, and hydrologic maps.

- 113) From how many States does the Mississippi River system drain?  
The Mississippi River System drains water from 31 States and is the source of 23 percent of the public surface water supply for the United States.
- 114) How many man-made features are identified in the USGS topographic map series?  
Almost 2 million natural and man-made features are identified.
- 115) What is the largest alpine lake in North America?  
Lake Tahoe on the California/Nevada border. It has a 105,000-acre surface, holds 39 trillion gallons of water, and is almost 1,600 feet deep.
- 116) Of what is the atmosphere of Venus composed?  
The atmosphere has clouds of sulfuric acid.
- 117) What and where is the deepest canyon in the United States?  
The deepest canyon in the United States is Hell's Canyon, formed by the Snake River along the Oregon/Idaho border. It is over 8,000 feet deep. In contrast, the Grand Canyon in Arizona is less than 6,000 feet deep.
- 118) Do you know why California has so many earthquakes, and New York doesn't?  
This is because California lies along the boundary between the Pacific and North American plates and New York is far from a plate boundary. As plate boundaries move past each other, the energy released from the frictional forces that build up cause earthquakes.
- 119) How does a submarine earthquake cause a tsunami?  
Near the earthquake's epicenter, the seafloor rises and falls, pushing all the water above it up and down. This motion produces a seawave that travels outward in all directions, commonly known as a tsunami.
- 120) How long is a Martian year in equivalent days on Earth?  
A Martian year is 687 days long, compared to 365 days on Earth.
- 121) How long is the average Martian day?  
The average day on Mars is 24 hours and 37 minutes, compared to 23 hours, 56 minutes on Earth.
- 122) Which planet has more moons, Earth or Mars?  
Mars, which has two satellites, Phobos and Deimos. The Earth has only one moon.
- 123) What is the world's deepest lake?  
Lake Baikal, located in the south central part of Siberia, is the deepest lake in the world at 5,712 feet in depth.
- 124) What is the world's largest fresh water lake?  
In addition to being the world's deepest lake, Lake Baikal is also the world's largest fresh water lake at 600 kilometers from north to south. It is reported to be 20 million years old and contains approximately 20 percent of the Earth's fresh liquid water.
- 125) What is the derivation of the word volcano?  
The word "volcano" comes from Vulcan, the Roman god of fire.

- 126) How many minerals are known to exist?  
There are approximately 4,000 known minerals, although only a couple hundred are of major importance. Approximately 50-100 new minerals are described each year.
- 127) How much material enters the Earth's atmosphere from space each year, and where does it go?  
About 1,000 million grams or about 1,000 English tons of material enters the atmosphere each year and makes its way to Earth's surface.
- 128) What percentage of the plant species found in Hawaii are endemic to the islands?  
Nearly 90 percent of the plant species found in Hawaii are endemic to that region and do not occur anywhere else in the world.
- 129) What is the world's largest island?  
Greenland is the world's largest island at 840,000 square miles.
- 130) What was Pangaea?  
Pangaea was the supercontinent that began to break up about 225 million years ago, eventually fragmenting into the continents as we know them today.
- 131) Of what materials are your teeth and bones primarily composed?  
Bones and teeth are composed primarily of the mineral apatite, as well as calcium-phosphate and fluoride.
- 132) What system is used to perform modern-day topographic surveys used in USGS map production?  
Global position system (GPS) satellites, receivers, and related computer support systems allow modern surveyors to perform field topographic surveys in minutes. These tasks used to take nineteenth-century USGS surveyors many months to complete.
- 133) Of what material were the early USGS press plates made to print topographic maps?  
The first press plates were made of stone. The next generation of press plates were made of copper.
- 134) How many USGS 7.5-minute topographic quadrangles are required to represent the lower 49 states?  
More than 54,000 7.5-minute topographic maps are required.
- 135) What type of graphics does the USGS use to produce computerized versions of the full color topographic maps?  
Digital raster graphics.
- 136) Approximately how many picture elements (pixels) are contained in the average USGS digital orthophotoquad?  
There are about 55 million picture elements (pixels) in each digital orthophotoquad.

- 137) Kilauea Volcano has been erupting lava since 1983. What are the primary effects of this eruption on the Island of Hawaii?  
Lava from the eruption of Kilauea has covered about 40 square miles of rain forest and grassland, paved 8 miles of highway, destroyed 181 homes and other structures valued at \$61 million, and added almost 600 acres of new land to the Island of Hawaii. In addition, the release of sulfur dioxide gas during the ongoing eruption has led to volcanic air pollution and acid rain on parts of the island.
- 138) When did the Hawaiian Island chain of volcanoes begin to form?  
The Hawaiian Island chain began to form more than 70 million years ago. On the Island of Hawaii, Kilauea, Mauna Loa, and Hualalai volcanoes have erupted in the past 200 years. East Maui Volcano, commonly known as Haleakala, on the island of Maui, is the only other Hawaiian volcano to have erupted since the late 1700's.
- 139) Where are most of Earth's volcanoes located?  
Most of the world's volcanoes are located on the seafloor. The most prominent topographic feature on Earth is the immense volcanic mountain chain that encircles the planet beneath the sea--the chain is more than 30,000 miles long and rises an average of 18,000 feet above the seafloor. This volcanic chain is called the mid-ocean ridge and is where Earth's plates are spreading apart as new crust is formed by volcanic activity.
- 140) What volcano produced the world's most costly eruption in terms of human fatalities?  
The eruption of Tambora volcano in Indonesia in 1815 is estimated to have killed about 90,000 people. Most of the people died from starvation after the eruption because of widespread crop destruction, and from water contamination and disease.
- 141) Which USGS geologist served as an astronaut on the Apollo 17 space mission?  
Harrison (Jack) Schmitt is the only USGS geologist to do field work on another planetary body. As a member of the Apollo 17 party, he was able to conduct field surveys on the moon.
- 142) The world's nutritional needs are provided by what number of plant species?  
Humans rely on 20 plant species to provide over 80 percent of the world's nutritional needs. Over half of our caloric intake is supplied by just three grasses: wheat, rice, and corn.
- 143) What percentage of prescriptions used in medicine today have plant origins?  
Over 25 percent of all prescription medicines today have plant origins. Native Americans once used more than 2,000 wild plants for medicinal purposes.
- 144) In what country is the only glacier at 0 degree latitude located?  
Mt. Cotopaxi in Ecuador supports the only glacier on the equator because of temperatures that drop as low as zero degrees for extended periods.
- 145) How many lightening strikes occur worldwide every second?  
On average, approximately 100 lightening strikes occur around the world every second.
- 146) How many species of eel occur worldwide?  
There are over 500 species of fresh and salt water eel on the planet.

- 147) How many active volcanoes exist in Japan?  
There are more than 75 active volcanoes in Japan. One of the more recent eruptions occurred on the island of Kyushu, about 25 miles east of Nagasaki, where the Unzen Volcano awakened after a 200 year slumber to erupt a new lava dome at its summit.
- 148) What was the worst volcanic disaster to occur in Japan?  
A volcanic landslide in 1792 on Unzen volcano killed more than 15,000 people--the worst volcanic disaster in the country's history. The landslide swept into the sea and triggered a destructive tsunami that destroyed many fishing villages.
- 149) What are tsunamis and how are they caused?  
A tsunami is a large wave caused by earthquakes, submarine landslides, and, infrequently, by eruptions of island volcanoes. During a major earthquake, an enormous amount of water can be set in motion as the seafloor moves up and down. The result is a series of potentially destructive waves that can move at more than 500 miles per hour.
- 150) How is the rare plant "meadowfoam" used industrially?  
The rare plant meadowfoam from California and Oregon contains seed oils that are used as high-quality industrial lubricants.
- 151) What is the longest fault found in California?  
The San Andreas is the longest fault found in California; it extends from Point Delgado, in northern California southward to Mexico.
- 152) For what is the Richter scale used?  
The Richter scale is a numerical scale used to measure the magnitude of an earthquake. It was developed in 1935 by Charles Richter at the California Institute of Technology.
- 153) What percentage of historic fresh and saltwater tidal marshes in the San Francisco Bay estuary have been lost over the past 150 years?  
Ninety-five percent of all San Francisco Bay estuary tidal marshes have been lost to human activity.
- 154) What insect comprises 20 percent of all known animal species?  
The beetle.
- 155) Where does the richest temperate freshwater fish fauna in the world exist?  
North America has the richest temperate freshwater fish fauna. There are more fish species in Alabama than in all of Europe.
- 156) The relatives of which fish swam the world's rivers at the time the dinosaurs walked the Earth?  
The ancestors of sturgeon and paddlefishes date back to the time of the dinosaurs.
- 157) Which is the largest vertebrate family in the world?  
With more than 2,000 known species, the minnow family, Cyprinidae, is the largest vertebrate family in the world.



- 158) Are more fish species found in fresh or salt water?  
Although oceans cover three-fifths of the Earth's surface, and freshwater from lakes and rivers is much less than 1 percent of the water on Earth, there are more fish species found in fresh water. The ratio of freshwater to marine or salt water fish species is about 60:40.
- 159) What is the average life span of the Saguaro cactus that grows indigenously to the Sonoran Desert?  
The average Saguaro cactus lives 125 to 175 years in its Sonoran Desert habitat of Arizona, California, and Mexico, but its potential life span is almost three centuries.
- 160) In what way can a river be compared to a life form?  
Like all living creatures, rivers also have a life span. They are born, grow in size and age, and they can even die during the span of geological time.
- 161) Are any two rivers exactly alike?  
No, no two rivers are exactly alike. Each river is unique, even when they are the same size tributaries of a larger river. There are many examples of insects, snails, mussels, and fishes that occur only in a single river system.
- 162) What North American plant can live for thousands of years?  
The creosote bush, which grows in the Mojave, Sonoran, and Chihuahuan Deserts, has been shown by radiocarbon dating to live for at least 2,000 years. An individual plant may live as long as 10,000 years.
- 163) What percentage of our agricultural crops and wildland plants are pollinated by honey-bees?  
More than 30 percent of our crops and wild plants are pollinated by honeybees.
- 164) Which four states collectively form the ecologically rich area containing 25 percent of the terrestrial plant species of the United States and Canada?  
California, Nevada, Utah, and Arizona form this area, containing a large percentage of plant and animal species found nowhere else in the world.
- 165) Which collection of lakes and connecting channels form the largest fresh surface water system on Earth?  
The Great Lakes of Superior, Michigan, Huron, Erie, and Ontario cover 94,000 square miles and drain more than twice as much land surface. They hold an estimated 6 quadrillion gallons of water, about 20 percent of the world's fresh surface water supply, and 90 percent of the water supply of the United States.
- 166) Is the State of Louisiana losing land?  
Louisiana loses about 30 square miles of land each year to coastal erosion, subsidence, hurricanes, and other natural and human causes.
- 167) Is ice considered a mineral?  
Yes, ice is a mineral and is formally described as such in *Dana's System of Mineralogy*.
- 168) What is the softest of all minerals?  
Talc is the softest of minerals. It is commonly used to make talcum powder.
- 169) What is the hardest of all minerals?  
The diamond.

- 170) What mineral is composed of flexible, hair-like crystals that you can “pet”?  
The mineral okenite.
- 171) What percentage of the world’s ice is found in the Antarctic Ice Sheet?  
The Antarctic Ice Sheet holds nearly 90 percent of the world's ice and 70 percent of its fresh water. If the entire ice sheet were to melt, sea level would rise by nearly 220 feet, or the height of a 20-story building.
- 172) What is the major use of mined phosphate worldwide?  
Approximately 90 percent of the phosphate mined in the world today goes into fertilizer for production of food.
- 173) What types of features can be found on a USGS topographic map?  
A large-scale topographic map (1:24,000 scale) depicts elevation and natural and cultural features such as streams, highways and railroads, woods, schools, churches, cemeteries, campgrounds, ski lifts, and even fence lines.
- 174) Which USGS map covers a larger area, a large-scale map or a small-scale map?  
A small-scale map. For example, it would take 128 large-scale maps at 1:24,000-scale to cover the same area represented by a single small-scale map at 1:250,000.
- 175) How are mineral resources commonly used in the construction of homes?
- Electrical wiring is made of copper or aluminum.
  - Plumbing is made of alloys of copper and zinc (brass), and nickel and chrome (stainless steel).
  - Sewer pipes are made of clay or iron.
  - Sinks are made of porcelain made from clay.
  - Paint is manufactured with mineral fillers (clay and limestone) and pigments (from various minerals).
- 176) Can ice burn?  
Special types of ice called gas hydrates can burn. Gas hydrate is a frozen mixture of natural gases and water that form naturally on some deep-water parts of the world’s seafloor.
- 177) What is a common use of diatom skeletons in the food industry?  
Diatom skeletons are used to filter and clear juices such as apple juice and wines.
- 178) What are the two major gold-producing countries?  
South Africa with a production of over 5,300 metric tons and the United States with over 3,200 metric tons.
- 179) What are the two major silver-producing countries?  
Mexico with a production of over 2,200 metric tons and Peru with over 1,600 metric tons.
- 180) What are the two major copper-producing countries?  
Chile with a production of over 2,350 metric tons and the United States with 1,890 metric tons.
- 181) From what minerals is glass made?  
Silica sand and limestone.

- 182) What mineral resource is used in hazardous waste disposal?  
Clays are used in hazardous waste disposal to solidify organic waste and salt solutions and to create impermeable barriers to encase the waste.
- 183) What is a composite volcano?  
A composite volcano is a steep-sided, symmetrical cone of large dimension built around layers of lava flows, volcanic ash, and cinders that may rise as much as 8,000 feet or more above their bases. Some of the best-known composite volcanoes include Mount Fuji in Japan, Mount Cotopaxi in Ecuador, Mayon volcano in the Philippines, Mount Shasta in California, and Mount Rainier in Washington.
- 184) What is the largest freshwater fish in North America?  
The white sturgeon found in the waters of the Pacific Northwest. It can grow to a maximum length of 20 feet.
- 185) How are colors produced in fireworks?  
Mineral elements provide the colors. For example, Strontium yields deep reds, copper produces blue, sodium yields yellow, and iron filings and charcoal pieces produce gold sparks. Bright flashes and loud bangs come from aluminum powder.
- 186) What is the largest lake in North America?  
Lake Superior. Its surface area covers 31,820 square miles.
- 187) What is the largest lake in the world?  
By size and volume it is the Caspian Sea, located between southeast Europe and west Asia.
- 188) How much gold has been discovered worldwide to date?  
Over 193,000 metric tons of gold have been discovered to date. If this gold were composited together, it would fit into a cube that is 22 meters on a side.
- 189) How much silver has been discovered worldwide to date?  
Over 1,740,000 metric tons of silver have been discovered to date. If this silver were composited together, it would fit into a cube that is 55 meters on a side.
- 190) How are diatoms, microscopic single-celled plants, used in water purification?  
Because diatoms are made of extremely intricate silica shells, when packed together they form a filter that is capable of removing impurities as small as 0.1 micron from water without the use of chemicals. To put this in perspective, a micron is one millionth of a meter or one thousandth of a millimeter.
- 191) How is gold used in energy conservation?  
A microcoating of gold on glass reflects solar energy and reduces the electrical demand for air conditioning.
- 192) What mineral is used to neutralize the runoff from acid rain?  
Limestone is used to neutralize runoff from acid rain and acid drainage.
- 193) What's the highest mountain peak in the San Francisco Bay Area?  
Mount Copernicus at 4,360 feet which is adjacent to Mount Hamilton at 4,213 feet.

- 194) What is the name of the zone of earthquakes that surround the Pacific Ocean?  
The zone is called the Circum-Pacific belt; about 90 percent of the world's earthquakes occur there.
- 195) What was the largest dinosaur?  
The largest dinosaur known to date was the Memenchisaurus. It reached 23 meters in height and 12 meters in length, making it comparable in length to two large school buses and in height to a four-story building.
- 196) How old is the oldest island in the Hawaiian Island chain?  
The volcanoes of Kauai and Niihau islands at the northern end of the chain are about 5 1/2 million years old.