

Earth's Structure

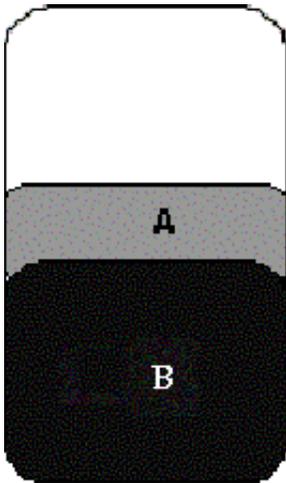
1 Use this data to answer the question.

Substance	Density
Oil	.8 g/mL
Water	1.0 g/mL
Plastic	.9 g/cm ³
Rock	4.2 g/cm ³
Aluminum	2.3 g/cm ³

Where would a substance with a mass of 14 g and a volume of 20 mL float?

- (A) At the bottom
- (B) In the middle
- (C) At the top
- (D) Below the water

2 Use this beaker with two liquids in it to answer the question.



What can you assume about liquid A?

- (A) It is thinner than liquid B
- (B) It is thicker than liquid B
- (C) It is less dense than liquid B
- (D) It is denser than liquid B

- 11** Gold panning separates gold flakes from stream gravel by shaking the mixture in a pan and scraping the gravel layers off. Why are the tiny gold particles found on the bottom on the pan?
- (A) They are larger than the gravel
 - (B) They are denser than the gravel
 - (C) They are brighter in color than the gravel
 - (D) They are harder to find than the gravel
- 12** Melinda works at a water treatment plant. She wants to find out whether particle size affects the way particles settle in water. Can Melinda use scientific methods to answer her question?
- (A) No. It is not possible to know why particles settle in water the way they do.
 - (B) No. Only scientists can use real scientific methods.
 - (C) Yes. Any time someone asks a question they are doing science.
 - (D) Yes. Science is a way of knowing that many people use, not just scientists.
- 13** Where would the smallest particles of rock be found in a streambed?
- (A) In the strongest current
 - (B) In the weakest current
 - (C) Near the middle
 - (D) At the beginning
- 14** A liquid has a density of 1g/mL. If you have 50 mL of the liquid, what would its mass be?
- (A) 25 g
 - (B) 50 g
 - (C) 75 g
 - (D) 100 g

- 15 Pat is given the following items: a rock, sand, water, and metal bar. Pat calculates the density of each object. The results are shown below.

Rock = 3.2 g/mL

Sand = 1.9g/mL

Water = 1.0g/mL

Metal bar = 6.5g/mL

Pat then puts all of the items into a jar and shakes it up. Pat lets the jar settle for 5 minutes. What would be the expected order of the items going from the top of the container to the bottom?

- (A) Rock, sand, water, metal
- (B) Metal, rock, sand, water
- (C) Water, sand, rock, metal
- (D) Sand, metal, water, rock

- 16 An egg sinks in pure water but floats in salt water. What do you know about the density of the egg?

- (A) It is more dense than pure water but less dense than salt water.
- (B) It is less dense than pure water and less dense than salt water.
- (C) It is more dense than pure water and more dense than salt water.
- (D) It is less dense than pure water but more dense than salt water.

- 17 Put the following items into a test tube, shake it up, and predict the outcome of your investigation. Earth materials: air, gravel, water, sand and gold dust.

- (A) From bottom to top: gravel, gold dust, sand, water, air
- (B) From bottom to top: gold dust, gravel, sand, water, air
- (C) From top to bottom: air, water, gold dust, sand, gravel
- (D) From bottom to top: water mixed in with layered gravel, sand, and gold dust, with air above the mixture

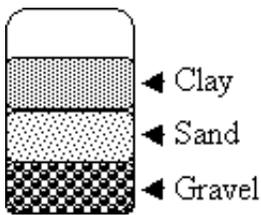
- 18 A student shakes a jar with a mixture of sand types. Instead of mixing, the sand grains separate into layers. Why?

- (A) The grains are different colors
- (B) The grains have different shapes
- (C) The grains have different densities
- (D) The jar has a round shape

- 19 A beach is composed of particles of sand of the same size. Why doesn't the beach have materials of all sizes? The particles have
- (A) come from the same place
 - (B) come to the beach at the same time
 - (C) been found in underwater canyons
 - (D) been sorted by size and density

- 20 In winter, a layer of cold air settles in the valleys and warmer air is often found higher in the mountains. What might account for this condition?
- (A) There is more warm air than cold air
 - (B) There is more cold air than warm air
 - (C) Cold air is less dense than warm air
 - (D) Cold air is denser than warm air

- 21 A group of students designed an experiment to test the effect of density on the sorting of Earth materials. They added particles of various sizes: sand, gravel and clay. They were mixed in a jar and water was added. They shook the mixture and then let it settle. The jar looked like this when they were done:



Their conclusion was "Gravel is the most dense because it sank to the bottom first. Sand is less dense than gravel and clay is least dense."

How good is the group's conclusion?

- (A) very good, it is supported by their data
 - (B) good, it is supported by some of their data
 - (C) fair, it is a possibility
 - (D) poor, they did not measure density
- 22 In an experiment, students shook jars of water with soil and rock in them. What does the shaking model in nature?
- (A) A lake environment
 - (B) A stream environment
 - (C) Living things in an environment
 - (D) A rainstorm

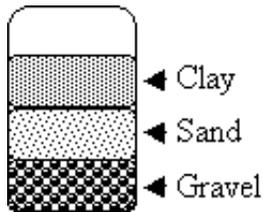
- 23 Which question would help a student learn more about the behavior of materials in a mixture?
- (A) Does lake water rise in warm winters?
 - (B) How do rocks and minerals form?
 - (C) Why are grains of beach sand alike?
 - (D) How is a living thing organized?
- 24 A liquid is found to have a volume of 75 mL in a graduated cylinder. When placed on a balance, the liquid and graduated cylinder has a mass of 125 g. The empty graduated cylinder has a mass of 50 g. What is the density of the liquid?
- (A) .1 g/mL
 - (B) 1 g/mL
 - (C) 2.2 g/mL
 - (D) 22 g/mL
- 25 Sand with particles of the same size was gently shaken in a jar to see if layers would form. What variable was being tested?
- (A) particle size
 - (B) particle density
 - (C) particle color
 - (D) particle type
- 26 How has technology helped earth scientists measure the density of various kinds of rocks?
- (A) Lasers help see into rocks and detect the most dense ones.
 - (B) Seismic waves reflect off of more dense rocks differently than less dense rocks.
 - (C) Sonar is used to identify the density of certain metamorphic rocks.
 - (D) Simple observations allow us to determine if rocks are sedimentary, igneous or metamorphic.

- 27 Use the data in the table below to answer the following question. When mixed, shaken, and left to settle, what would be the order of the substances starting from the bottom and going up?

Substance	Density
Oil	0.8 g/mL
Water	1.0 g/mL
Plastic	0.9 g/mL
Aluminum	2.7 g/mL
Rock	4.2 g/mL

- (A) rock, aluminum, plastic, water, oil
(B) rock, aluminum, water, plastic, oil
(C) rock, plastic, oil, water, aluminum
(D) rock, oil, aluminum, plastic, water
- 28 In the spring, rivers in Utah are often brown in color. A sample of the water shows it contains very small particles of silt. Why is silt suspended in the water?
- (A) Silt is brown in color
(B) The water is moving rapidly
(C) Silt is small with low density
(D) Water has a high density
- 29 Salad dressing separates into two layers. Oil is on the top and vinegar is on the bottom. When will the vinegar be on the top layer?
- (A) When there is more oil than vinegar
(B) When there is more vinegar than oil
(C) When they are added in different order
(D) Never, under normal conditions
- 30 Water has a density of 1 g/mL. What density might a typical rock be?
- (A) .005 g/cm³
(B) .5 g/cm³
(C) 5 g/cm³
(D) 50 g/cm³

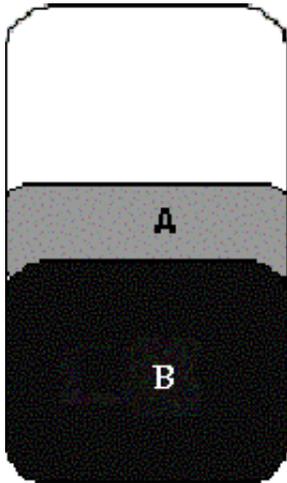
- 31 A group of students designed an experiment to test the effect of density on the sorting of Earth materials. They added particles of various sizes: sand, gravel and clay. They were mixed in a jar and water was added. They shook the mixture and then let it settle. The jar looked like this when they were done:



Their conclusion was "Gravel is the most dense because it sank to the bottom first. Sand is less dense than gravel and clay is least dense."

What variable should the experiment have controlled?

- (A) color of particles
 - (B) size of particles
 - (C) density of particles
 - (D) amount of particles
- 32 Use this beaker with two liquids in it to answer the question.



Why is liquid B on the bottom?

- (A) There is more of it
- (B) It is thicker
- (C) It is denser
- (D) It is darker in color

33 Use this data to answer the question.

Substance	Density
Oil	.8 g/mL
Water	1.0 g/mL
Plastic	.9 g/cm ³
Rock	4.2 g/cm ³
Aluminum	2.3 g/cm ³

When mixed, shaken, and left to settle, what would be the order of the substances starting from the bottom and going up?

- (A) rock, aluminum, plastic, water, oil
- (B) rock, aluminum, water, plastic, oil
- (C) rock, plastic, oil, water, aluminum
- (D) rock, oil, aluminum, plastic, water

34 A road cut reveals layers in the soil. Why does soil have layers?

- (A) It has been sorted by particle size and density
- (B) It is made from rock and other particles
- (C) It was placed in layers by humans
- (D) The layers have always been there

35 An ancient streambed was exposed when a road crew cut a new road through a canyon. Scientists want to study the streambed and are interested in the way materials were sorted in the streambed. What do scientists assume is true before they make conclusions about the streambed?

- (A) A rock sitting in a streambed will change densities as it moves downstream.
- (B) The top layer of the streambed was deposited first and is made of the more dense material.
- (C) The more dense materials were deposited before less dense materials in ancient times just as they are now.
- (D) Materials in the streambed were deposited differently in ancient times than they are now.

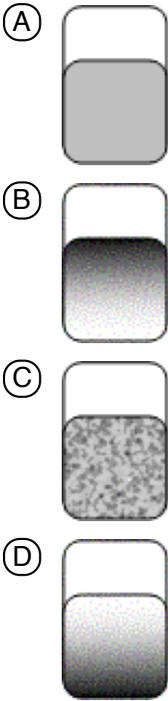
36 A rock dropped in a graduated cylinder raises the level of water from 20 to 35 mL. The rock has a mass of 45 g. What is the density of the rock?

- (A) 1.3 g/cm³
- (B) 2.3 g/cm³
- (C) 3.0 g/cm³
- (D) 4.5 g/cm³

- 37 A square chunk of plastic has a length of 5 cm, width of 5 cm and height of 5 cm. It has a mass of 200 g. What is its density?
- (A) .12 g/cm³
 - (B) 1.0 g/cm³
 - (C) 1.6 g/cm³
 - (D) 2.3 g/cm³
- 38 A student was given an assignment to calculate the density of a rock. Which of the following would best describe one of the needed steps to calculating the rock's density?
- (A) The student puts the rock in an empty graduated cylinder and records the measurement in milliliters
 - (B) The student puts the rock in a graduated cylinder filled with water and records the volume of the rock
 - (C) The student uses a thermometer to measure the temperature of the rock in Celsius degrees
 - (D) The student measures the length of the rock in centimeters with a metric ruler
- 39 A student collected data about the density of air. She found that .1 g of air had a volume of 100 cm³. What is the density of the air?
- (A) .001 g/cm³
 - (B) .01 g/cm³
 - (C) .1 g/cm³
 - (D) 1.0 g/cm³
- 40 A streambed contains round rocks, all about the same size. Why are there no smaller particles of sand and clay? Sand and clay
- (A) are too small to see
 - (B) are denser
 - (C) have washed away
 - (D) were never there
- 41 Water has a density of 1 gram/milliliter. There are four rocks that all have the same volume of 5 cubic centimeters. The mass for each of these rocks is given below. Which one of the four rocks will float when placed in water?
- (A) 15 grams
 - (B) 10 grams
 - (C) 6 grams
 - (D) 4 grams

- 42 During a flash flood, large boulders can be moved downstream. Why don't large boulders usually move?
- (A) They are made from very dense materials
 - (B) They are too heavy
 - (C) They are attached to the stream bottom
 - (D) They are weathered and eroded in place

- 43 Water is added to a jar with soil in it and the jar is shaken. Which drawing shows what will happen after it sits for a few minutes?



- 44 An egg sinks in water but floats in salt water. What do you know about the density of the egg?
- (A) It is more dense than water but less dense than salt water
 - (B) It is less dense than water and less dense than salt water
 - (C) It is denser than water and denser than salt water
 - (D) It is less dense than water but more dense than salt water

- 45 The development of the seismograph allows scientists to determine how fast waves travel through the core of Earth. From this, they can infer densities and states of matter of the materials inside Earth. How has this technology influenced current models of Earth's structure?
- (A) It provides evidence that the core is composed of a liquid and a solid layer.
 - (B) It shows that the crust is solid and more dense than the mantle.
 - (C) It proves that the mantle moves with convection currents.
 - (D) It gives information about temperatures and pressures at the bottom of the sea.

52 Which of the following statements best explains why earth is layered in the following order: air → water → crust → core?

- (A) Things in nature like to order themselves by color, red to the bottom and blue to the top
- (B) Things in nature like to order themselves by density, most dense to the bottom and least dense to the top
- (C) Things in nature like to order themselves by particle size, largest particles to the bottom and smallest particles to the top
- (D) Things in nature like to order themselves by temperature, hottest to the bottom and coolest to the top

53 You are given an unknown object. Its mass is 52 g and its volume is 5 mL. Your friend says that it is similar to material from the outer core of Earth. According to the data table below, what should you tell your friend?

Layer	Approximate Density	Appearance
Water	1.0 g/mL	Green
Crust	2.7-3.0 g/mL	Orange
Mantle	3.3-5.7 g/mL	Black
Outer Core	9.0-12.0 g/mL	Black
Inner Core	12.7-13.0 g/mL	Shiny

- (A) She is wrong because its density is approximately 1.4 g/mL.
- (B) She may be correct because its density is just over 10 g/mL.
- (C) She may be correct because it looks like it came from the outer core.
- (D) She is wrong because no one has weighed material from the outer core.

54 You are given the following materials and their densities and then asked to construct a model of the earth consisting of a core, mantle, crust, water, and air.

Cotton	0.2 g/mL
Glue	1.0 g/mL
clay	1.8 g/mL
Aluminum foil	2.4 g/mL
A Nickel	4.6 g/mL

Based on density, which material would be the best choice to represent the core of the Earth?

- (A) cotton
- (B) clay
- (C) aluminum foil
- (D) nickel

- 55 Which of the following statements best explains why Earth is layered in the following order:

air--water--crust--core?

- (A) Things on Earth are ordered by color, red, on the bottom and blue on the top.
- (B) Things on Earth are ordered by density, most dense on the bottom.
- (C) Things on Earth are ordered by particle size, largest particles on the bottom.
- (D) Things on Earth are ordered by temperature, hottest on the bottom.

- 56 You are given the following materials and their densities and then asked to construct a model of the earth consisting of a core, mantle, crust, water, and air.

Cotton	0.2 g/mL
Glue	1.0 g/mL
clay	1.8 g/mL
Aluminum foil	2.4 g/mL
A Nickel	4.6 g/mL

Based on density, which material would be the best choice to represent the crust of the Earth?

- (A) cotton
 - (B) clay
 - (C) aluminum foil
 - (D) nickel
- 57 Why does the atmosphere of the Earth float above the planet's surface?
- (A) The atmosphere has a higher density than the planet
 - (B) The atmosphere has a lower density than the planet
 - (C) The atmosphere formed before the planet did
 - (D) The atmosphere formed after the planet did

- 58 You are given the following materials and their densities and then asked to construct a model of the Earth consisting of a core, mantle, crust, and air. Based on density, which material would be the best choice to represent the Crust of the Earth?

Cotton	0.2 g/mL
Glue	1.0 g/mL
Clay	1.8 g/mL
Aluminum foil	2.7 g/mL
A nickel	4.6 g/mL

- (A) cotton
(B) clay
(C) aluminum foil
(D) nickel
- 59 Water has a density of 1.0 g/mL. You are given a rock with a density of 2.5 g/mL. Predict what will happen to the rock when put into a container of water.
- (A) The rock will sink to the bottom of the water
(B) The rock will sink half way to the bottom of the water
(C) The rock will float on top of the water
(D) The rock will float just below the surface of the water
- 60 In the past, many people thought that Earth was hollow. Why is this model of Earth not accepted now?
- (A) Today scientists have collected data that support a layered model of Earth.
(B) The current layered model of Earth's structure has now been proven.
(C) Models of Earth's structure only last a certain amount of time and then they are replaced.
(D) Scientists have now taken samples of Earth's core and know the old model was wrong.

61 Pat is given the following items: a rock, sand, water, and metal bar. Pat calculates the density of each object. The results are shown below.

Rock = 3.2 g/mL

Sand = 1.9g/mL

Water = 1.0g/mL

Piece of metal = 6.5g/mL

Pat then puts all of the items into a jar and shakes it up. Pat lets the jar settle for 5 minutes. What would be the expected order of the items going from the top of the container to the bottom?

- (A) rock, sand, water, metal
- (B) metal, rock, sand, water
- (C) water, sand, rock, metal
- (D) sand, metal, water, rock

62 Which answer below best describes the future of models of Earth's structure?

- (A) Models will probably stay the same because scientists have learned all there is to know about the structure of Earth.
- (B) Models will probably stay the same because scientists don't like to create new models.
- (C) Models will probably change because scientists like to change things.
- (D) Models will probably change because new technology will provide better information about the structure of Earth.

63 Why does the atmosphere of the Earth float above the planet's surface?

- (A) The atmosphere has a higher density than the planet.
- (B) The atmosphere has a lower density than the planet.
- (C) The atmosphere formed before the planet did.
- (D) The atmosphere formed after the planet did.

- 64 You are given an unknown object. You find its mass to be 28g. You find its volume to be 10mL. Using the chart below, determine which layer of the Earth the object would belong to based on its density. Sample Earth density chart:

Layer	Approximate Density
Water	1.0 g/mL
Crust	2.7 – 3.0 g/mL
Mantle	3.3 – 5.7 g/mL
Outer Core	9.0-12.0 g/mL
Inner Core	12.7 – 13.0 g/mL

Which layer of the Earth would the unknown object belong to based on its density?

- (A) Crust
- (B) Mantle
- (C) Outer Core
- (D) Inner Core