# Investigation 3 & 5 Study Guide

Name: _____ Date: _____

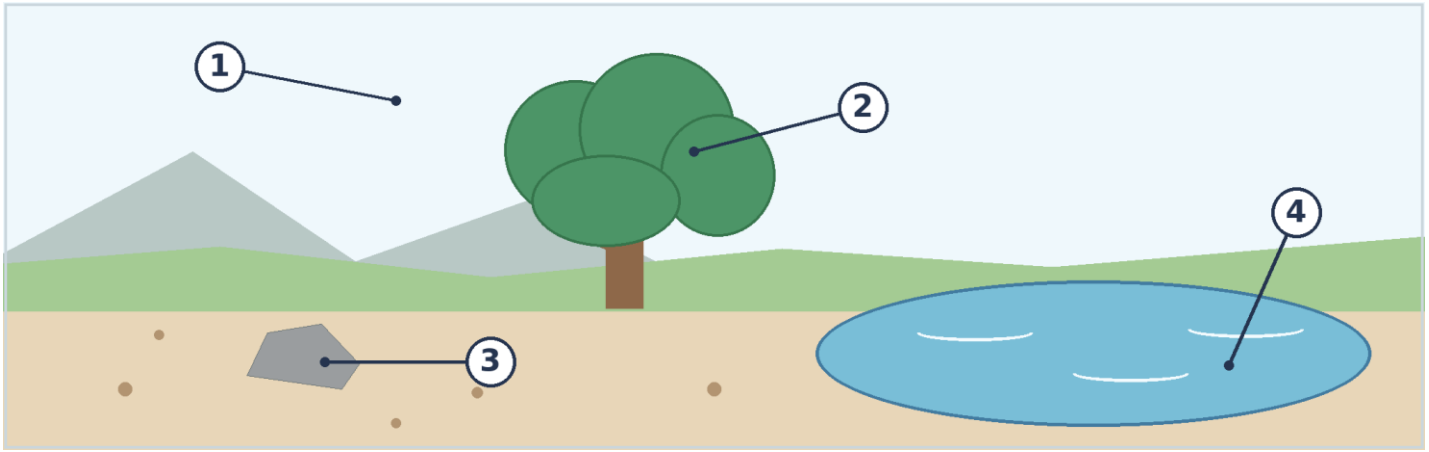
Read the review, then practice. The quiz follows these same topics and numbers.

## 1 Earth's four spheres

| | |
|---|---|
| **Atmosphere** | Air and gases around Earth |
| **Hydrosphere** | All water, including ice and water vapor |
| **Geosphere** | Rocks, soil, landforms, and Earth's interior |
| **Biosphere** | All living things, including plants and animals |

Spheres work together: wind moves sand; rain wears away rock; roots widen rock cracks; living things use air and water; water evaporates into the air.

**Use each word once: atmosphere • biosphere • geosphere • hydrosphere**




1. _____ 2. _____

3. _____ 4. _____

Circle one answer for each question.

**5.** Wind pushes sand across a beach. Which spheres interact?

A. Atmosphere and geosphere
B. Biosphere and hydrosphere
C. Biosphere and geosphere

**6.** A plant takes in water through its roots. Which spheres interact?

A. Atmosphere and geosphere
B. Biosphere and hydrosphere
C. Biosphere and geosphere

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## 2 Air and the balloon lab

**Air** is a mixture of gases, mostly nitrogen and oxygen. It has **mass** (the amount of matter) and takes up space. **Volume** is the amount of space something takes up.

**Air pressure** is the push of air on a surface. Air can move objects. Trapped air can keep water out of an upside-down cup. Air can be **compressed**, or squeezed into less space.

In our bottle-and-balloon lab, warming trapped air makes the balloon expand. Cooling it makes the balloon shrink. If no air enters or leaves, its **mass stays the same** even when its volume changes.

Circle one answer for each question.

**7.** Which statement describes air?

A. Air is only oxygen.
B. Air is only tiny liquid drops.
C. Air is a mixture of gases that has mass and takes up space.

**8.** Why can a tissue stay dry inside a cup lowered upside down into water?

A. Trapped air takes up space and keeps water away.
B. The tissue removes all the water.
C. An upside-down cup has no air in it.

**9.** Why can air in connected syringes move the second plunger?

A. Air has no mass.
B. Air can push on objects.
C. Air changes into water.

**10.** What can happen when you gently push a syringe with its opening covered?

A. The air loses all its mass.
B. The air becomes a liquid.
C. The trapped air is squeezed into a smaller space.

**11.** How does the balloon usually change in the bottle lab?

A. It gets larger in hot water and smaller in ice water.
B. It gets smaller in hot water and larger in ice water.
C. It must stay the same size in both tubs.

**12.** A balloon grows as trapped air warms. No air enters or leaves. What happens to the air's mass?

A. It increases.
B. It stays the same.
C. It decreases.

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## 3 Earth's atmospheric layers

| | |
|---|---|
| **1 Troposphere** | Closest to Earth; where we live and most weather happens |
| **2 Stratosphere** | Above the troposphere |
| **3 Mesosphere** | Above the stratosphere |
| **4 Thermosphere** | Above the mesosphere |
| **5 Exosphere** | Outermost layer; gradually fades into space |

This list shows **order, not thickness**. The layers have very different thicknesses. Our classroom model shows the troposphere reaching about 15 km. Higher up, air gets thinner and pressure decreases.

The atmosphere supplies oxygen and helps protect life. Like an ocean, it surrounds objects and exerts pressure. An ocean is liquid water; the atmosphere is a mixture of gases.

Draw a line from each word to its meaning. Use each meaning once.

| | |
|---|---|
| 13. Troposphere • | • A. Third layer above Earth's surface |
| 14. Stratosphere • | • B. Fifth and outermost of the five layers |
| 15. Mesosphere • | • C. First layer above Earth's surface |
| 16. Thermosphere • | • D. Fourth layer above Earth's surface |
| 17. Exosphere • | • E. Second layer above Earth's surface |

**18.** As you go much higher above Earth's surface, what usually happens?

A. Air gets thinner and air pressure decreases.
B. Air gets thicker and air pressure increases.
C. Air turns into liquid water.

**19.** Why do weather scientists study the troposphere closely?

A. It is the outermost atmospheric layer.
B. It contains all of Earth's rock.
C. Most weather happens there.

**20.** How are the atmosphere and ocean alike and different?

A. Both contain only liquid water.
B. Both can exert pressure; the atmosphere is gas and the ocean is liquid.
C. Only the ocean contains matter.

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## 4 The water cycle

Liquid becomes vapor by **evaporation**; vapor becomes drops by **condensation**. Falling rain, snow, sleet, or hail is **precipitation**. Water gathering in lakes, rivers, or oceans is **collection**. Water flowing over land is **runoff**.

The **Sun** supplies energy; **gravity** pulls water down. Water vapor is invisible. Visible clouds contain tiny drops or ice crystals. **Infiltration** is water soaking into the ground; groundwater fills spaces in soil and rock.

Plants release water vapor through leaves by **transpiration**. **Freezing** turns liquid water into ice; **melting** turns ice into liquid.

About **97.5%** of Earth's water is salty and **2.5%** is fresh. Most freshwater is frozen in glaciers and ice caps. Water can take different paths and stay stored for a while. Usable freshwater is limited and needs protection.

Draw a line from each word to its meaning. Use each meaning once.

| | |
|---|---|
| 21. Evaporation • | • A. Water gathers in a lake, river, or ocean |
| 22. Condensation • | • B. Rain, snow, sleet, or hail falls from clouds |
| 23. Precipitation • | • C. Liquid water changes into water vapor |
| 24. Collection • | • D. Water flows over the land's surface |
| 25. Runoff • | • E. Water vapor changes into liquid drops |

**26.** Which pair helps move water through the water cycle?

A. Gravity supplies heat; the Sun pulls water downward.
B. The Sun provides energy; gravity pulls water downward.
C. The Sun supplies energy; gravity pulls water upward.

**27.** Where do droplets on the outside of a cold cup come from?

A. Liquid water leaking through the cup
B. Ice moving through the cup
C. Water vapor in nearby air cooling into liquid drops

**28.** Rain soaks into the ground by infiltration. Where can this groundwater be stored?

A. In tiny spaces and cracks in soil and rock
B. Only inside clouds
C. Only in giant underground lakes

**29.** Which statement about Earth's water is correct?

A. Most is freshwater; most freshwater is in rivers.
B. Most is salt water; most freshwater is frozen in glaciers and ice caps.
C. Most is salt water; most freshwater is in clouds.

**30.** Why should we protect freshwater even though water keeps cycling?

A. Every cycle instantly removes all pollution.
B. All Earth's water is easy to drink.
C. Usable freshwater is limited and can become polluted.