

Chapter X - Guided Notes Answer Key

Three Most Important Concepts

- 1. Four Earth Systems Meet in Your Backyard
- 2. Slow Change and Sudden Change Both Reshape Land
- 3. Reading the Land Is an Actual Career

Main Concept Overview

- 1. **systems**
- 2. **scientists**
- 3. **years**
- 4. **measurements**
- 5. **map**

Matching Section

- 1 → D (Hydrologist — measures water stored in rivers, lakes, and underground)
- 2 → B (Geotechnical Engineer — tests soil and rock before construction)
- 3 → E (Meteorologist — tracks the atmosphere to warn families before storms)
- 4 → C (Emergency Manager — decides when to open a shelter)
- 5 → A (GIS Technician — combines data into maps used for planning)

True/False

- 1. **T** — The Did You Know box states the geosphere reaches about 6,371 km to Earth’s center.
- 2. **F** — The article treats weathering (breaking rock down) and erosion (carrying it away) as two different processes.
- 3. **T** — Concept 2 states a landslide “shows how the atmosphere, hydrosphere, and geosphere are linked within seconds.”
- 4. **F** — The article assigns rock-and-soil testing to geotechnical engineers; meteorologists track the atmosphere.
- 5. **T** — The case study states sensors “picked up a change large enough to trigger a warning” hours before the failure.

Fill in the Table

Earth System	What It Includes
Geosphere	The solid parts of Earth — rock, soil, and mountains
Hydrosphere	Streams, lakes, oceans, glaciers, puddles, and groundwater
Atmosphere	The mix of gases that make up the air
Biosphere	Living things — plants, animals, and people

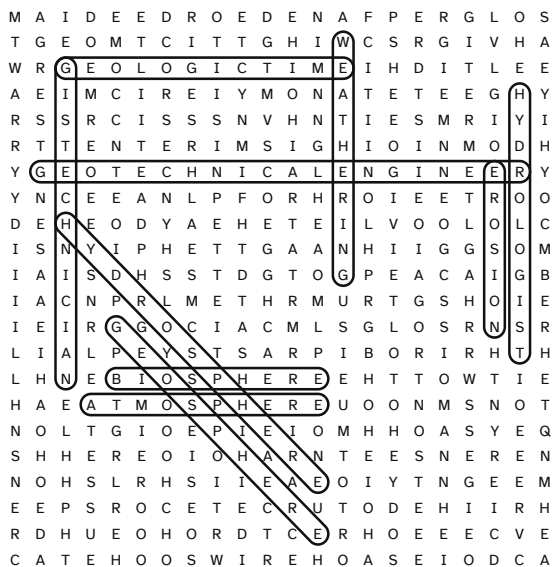
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Critical Thinking

Sample answer: A heavy storm starts in the atmosphere as rain. That water becomes part of the hydrosphere as it fills streams and soaks into the ground. If the ground (geosphere) can't absorb it fast enough, the extra water can trigger a fast-moving hazard like a landslide. Plants, animals, and people in the biosphere are affected too, since the storm can wash away soil that plants depend on or force people to evacuate.

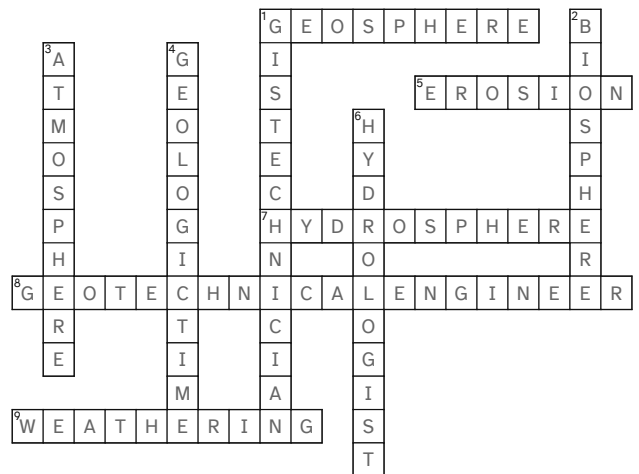
Common weak answer note: Students often describe only one system (usually just "it rains") without tracing the effect through the other three. A strong answer names all four systems and explains how one connects to the next.

What Is Earth Science? — answer key



ATMOSPHERE BIOSPHERE EROSION GEOLOGIC TIME
GEOSPHERE GEOTECHNICAL ENGINEER GIS TECHNICIAN
HYDROLOGIST HYDROSPHERE WEATHERING

What Is Earth Science? — answer key



ACROSS

- 1 Earth's solid ground and interior, reaching to the center
- 5 Movement of loose rock and soil to a different place
- 7 All water on Earth, from oceans and glaciers to groundwater and puddles
- 8 Professional who tests soil and rock before roads or buildings are built (2 words)
- 9 Slow breaking of rock into smaller pieces by wind and rain

DOWN

- 1 Worker who turns Earth-system data into maps for city planners (2 words)
- 2 Earth's layer containing every plant, animal, and person
- 3 Mix of gases surrounding Earth that people breathe
- 4 Earth's history measured in spans from thousands to millions of years (2 words)
- 6 Scientist who measures water in rivers, lakes, and underground stores

Chapter X - Reflection Questions & Data Analysis Answer Keys

What Is Earth Science?

Open-ended items — accept any response showing thoughtful engagement with article concepts.

Item 01 — CONNECT: Tap water (hydrosphere), the sidewalk (geosphere), humid air (atmosphere), and a pet outside (biosphere) all show up in one ordinary morning.

Item 02 — APPLY: A slowly widening crack points to weathering or settling, not a sudden hazard — tell an adult, since slow change can still become a problem.

Item 03 — DECIDE: Pick the job that matches the local issue that matters most (e.g., a hydrologist if the area has dry summers), and explain the local reason.

Grading note: For Item 03, answers will vary by location — grade the reasoning and local connection, not which job is chosen.

What Is Earth Science?

Source: BLS Occupational Outlook Handbook (2024 wage data; 2024–2034 projections).

Independent variable: Job Title. **Dependent variables:** Median Annual Pay, Projected % Change.

- **Q1 — Correct answer:** 5% (Surveying and Mapping Technician). **Full credit requires:** correct number plus the % unit.
- **Q2 — Correct answer:** 1st Surveying and Mapping Tech (5%) → 2nd/3rd Geoscientist / Emergency Management Director, tied (3% each) → 4th Atmospheric Scientist (1%) → 5th Hydrologist (0%). **Full credit requires:** correct order; the 2nd/3rd tie may be either order.
- **Q3 — Correct answer:** Any of the five jobs is acceptable if the claim, evidence, and reasoning all point to growth %, not pay. **Full credit requires:** the claim names a job, the evidence cites its actual % from the table, and the reasoning explains why a higher % means more openings.

Common error to flag: Student bases the claim on pay (e.g., picks Geoscientist for its \$99,240 salary) instead of growth % — mark as partial credit only, since it does not answer the question asked.

Chapter X - Hypotheticals & Vocabulary Answer Keys

What Is Earth Science?

Accept other reasonable responses grounded in the article.

#1 — The Widening Crack

- A. Slow change — gradual, monthly growth over a year.
- B. Geosphere — likely weathering (breaking down) or erosion (soil washing away).
- C. Repair the gym first — a growing crack is a safety risk if ignored.

#2 — Dry Summer Budget

- A. How much water is stored underground; whether supply is low.
- B. Families could run short of water in a dry summer.
- C. Fund the hydrologist — protects the whole town, not just one area.

What Is Earth Science?

Students write definitions in their own words; accept any accurate, understanding-level definition.

Atmosphere — The mix of gases that surrounds Earth and makes up the air.

Biosphere — The layer of living things — plants, animals, and people.

Erosion — Moving broken-down rock and soil away using water, wind, or ice. (Often confused with weathering — erosion is the moving-away step.)

Geologic Time — Spans of Earth's history from thousands to millions of years.

Geosphere — Earth's solid parts — rock, soil, and mountains — down to its center.

Geotechnical Engineer — Tests soil and rock to see if the ground can safely hold a building.

GIS Technician — Combines Earth-systems data into maps used for planning.

Hydrologist — Measures how much water is stored in rivers, lakes, and underground.

Hydrosphere — All of Earth's water — oceans, lakes, streams, glaciers, and groundwater.

Weathering — Wind and rain slowly breaking rock into smaller pieces. (Often confused with erosion — weathering happens in place.)

Teacher Lecture Notes What Is Earth Science?

Concept 1: Four Earth Systems Meet in Your Backyard

Earth science starts with four overlapping systems: the geosphere (solid Earth, all the way to the core), the hydrosphere (all water, including oceans, glaciers, and groundwater, not just rivers), the atmosphere (the gas layer we breathe), and the biosphere (living things). For students, the easiest hook is their own schoolyard: a single rainstorm touches all four systems within an hour. **Common misconception:** students often picture the geosphere as just “dirt,” missing that it extends deep into the planet, which matters later when discussing plate tectonics and Earth’s interior. Reinforce that no Earth process affects only one system.

Concept 2: Slow Change and Sudden Change Both Reshape Land

Weathering breaks rock apart in place; erosion carries the pieces away. Both can take thousands to millions of years, or “geologic time.” But landslides and other hazards show the same systems acting in seconds. Students relate well to slow change they’ve seen, like a crumbling curb, and can imagine sudden change through storms. **Common misconception:** many students assume all Earth change is slow, or that fast events are unrelated to the same rock-and-water processes. Bingham Canyon is a strong example: monitoring equipment detected a slow buildup of stress before a sudden, massive failure.

Concept 3: Reading the Land Is an Actual Career

Hydrologists, geotechnical engineers, meteorologists, emergency managers, and GIS technicians all study these four systems professionally. This concept works well paired with the Data Analysis page, since students can compare real pay and job-growth numbers. **Common misconception:** students often assume Earth science careers mean only oil and mining. Use the table to show that water management, hazard planning, and mapping are just as central, and currently growing faster.

Five Cool Facts to Share

1. The geosphere reaches about 6,371 km to Earth’s center, but the world’s deepest mine only reaches about 4 km down.
2. Mount St. Helens lost about 400 meters of elevation in 1980 — roughly the height of a 100-story building.
3. The 2013 Bingham Canyon landslide is one of the largest ever recorded in North America, and ground sensors gave workers enough warning that no one was hurt.
4. Surveying and mapping technicians have the fastest projected job growth of the five careers in this chapter — about 5% from 2024 to 2034.
5. Hydrologists split their time between fieldwork, like wading into streams, and office work building computer models.

Five Discussion Questions

1. Which of the four systems do you think you interact with the most on a normal day, and why?
2. Can you think of something near your home changing slowly? What about something that could change suddenly?
3. If our town could only fund one new Earth science job, which one would you pick, and why?
4. Why did it matter that scientists were already watching the ground at Bingham Canyon before the landslide happened?
5. How might understanding Earth science help you make a decision someday, like where to live or how to prepare for a storm?