

Geologic time: Analyzing the rock and fossil record



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ⇨ المناهج الإماراتية ⇨ الصف الثامن ⇨ علوم ⇨ الفصل الأول ⇨ ملفات متنوعة ⇨ الملف

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ملفات اكتب للمعلم اكتب للطالب | اختبارات الكترونية | اختبارات | حلول | عروض بوربوينت | أوراق عمل
منهج انجليزي | ملخصات وتقارير | مذكرات وبنوك | الامتحان النهائي | للمدرس

المزيد من مادة
علوم:

إعداد: Adel Rania

التواصل الاجتماعي بحسب الصف الثامن



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف الثامن والمادة علوم في الفصل الأول

المناخ - بريدج

1

انتقال الطاقة الحرارية - بريدج

2

أنسابير - standards of measurement

3

ملزمة مهمة لمنهج انسابير تحتوي على شرح دروس الفصل كامل بالإضافة الى تمارين بعد كل درس

4

ملزمة مفيدة

5



Geologic time

Analyzing the rock and fossil record



التاريخ

12/9/2026



المعلمة

Rania Adel



الصف

الثامن
أنسباير



المادة

science



افهم



اكتشف



استكشف

<https://almanahj.com/ae>



2023

Reading Earth's Diary: Analyzing the Rock & Fossil Records



Field Note

- Earth's history stretches back 4.6 billion years.
- No human was there to record it. So, how do we know what happened?
- The Mission: Learn to read the clues left behind in the rocks, fossils, and ocean floor.

The Golden Rule: Uniformitarianism

The Present



Key Concept

James Hutton (Late 1700s): Realized that everyday processes (like erosion) take massive amounts of time to carve canyons, proving Earth is incredibly old.

The Past



Definition Box

Principle of Uniformitarianism: The geologic processes occurring today are similar to those that occurred in the past.

Key Takeaway: The present is the key to the past.

Two Ways to Tell Time: Relative vs. Absolute Age

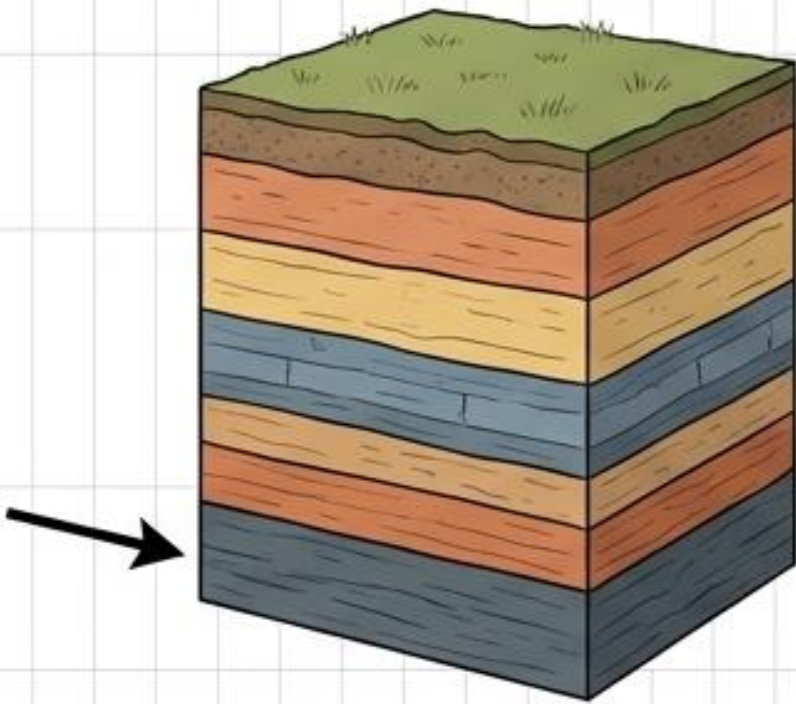


	Relative Age	Absolute Age
Definition	The age of rocks and geologic features compared with other rocks and features nearby.	The actual age of the events or rocks (measured in years).
Everyday Analogy	I am older than my little brother.	I am exactly 14 years old.
Scientific Use	Organizing the order of geologic events.	Putting a specific date on the timeline.

The 5 Principles of Relative-Age Dating (Part 1)

Field Sketch

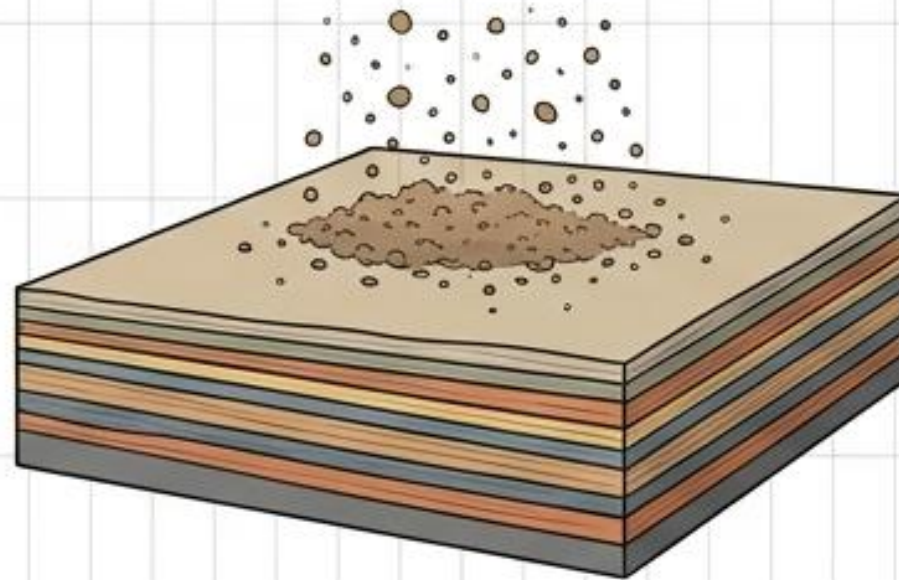
1. Superposition



In undisturbed rock layers, the oldest rocks are on the bottom.

Field Sketch

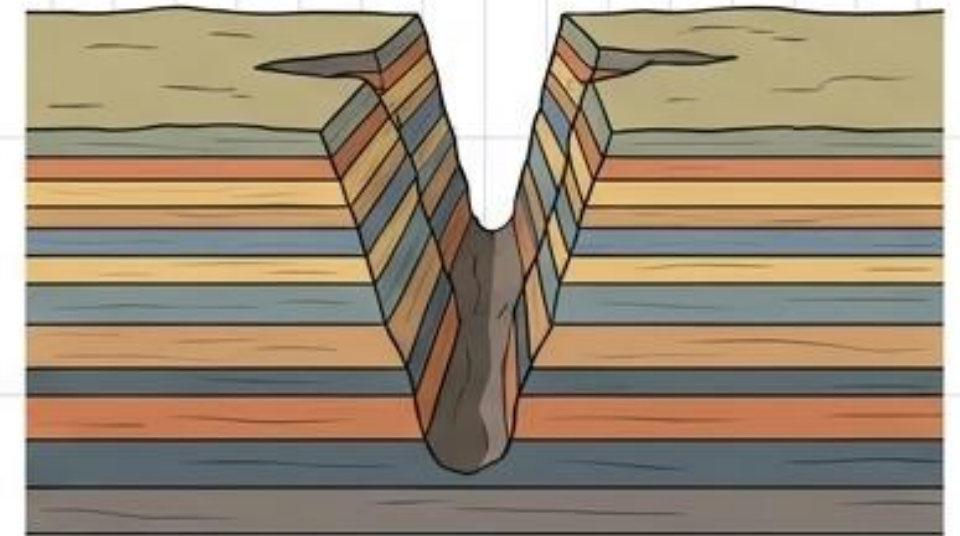
2. Original Horizontality



Most rock-forming materials are deposited in horizontal layers.

Field Sketch

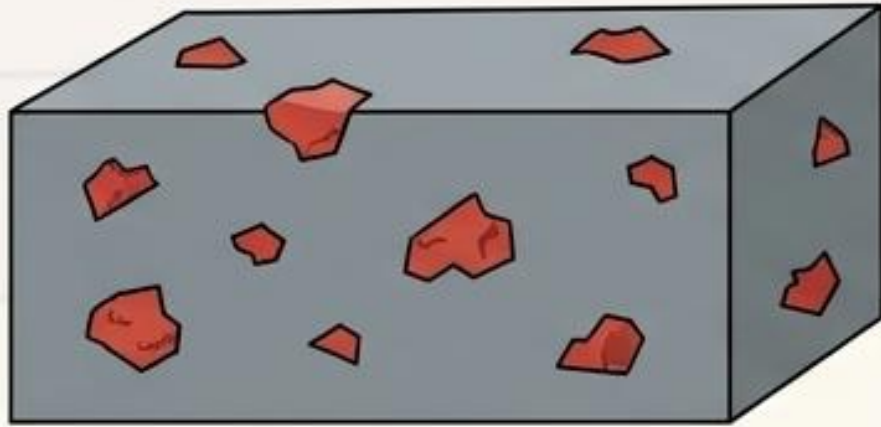
3. Lateral Continuity



Sediments are deposited in large, continuous sheets in all lateral directions.

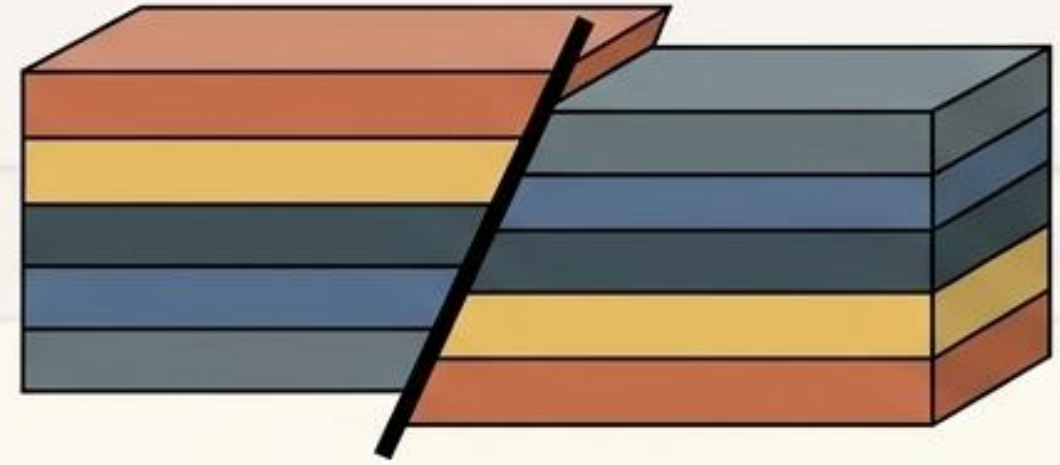
The 5 Principles of Relative-Age Dating (Part 2)

4. Inclusions



If one rock contains pieces of another rock, the rock containing the pieces is younger than the pieces.

5. Cross-Cutting Relationships



If one geologic feature cuts across another, the feature that it cuts across is older.

Quick Check



Think About It! Is feature 'M' older or younger than layer 'J'? (Hint: It cuts across!)

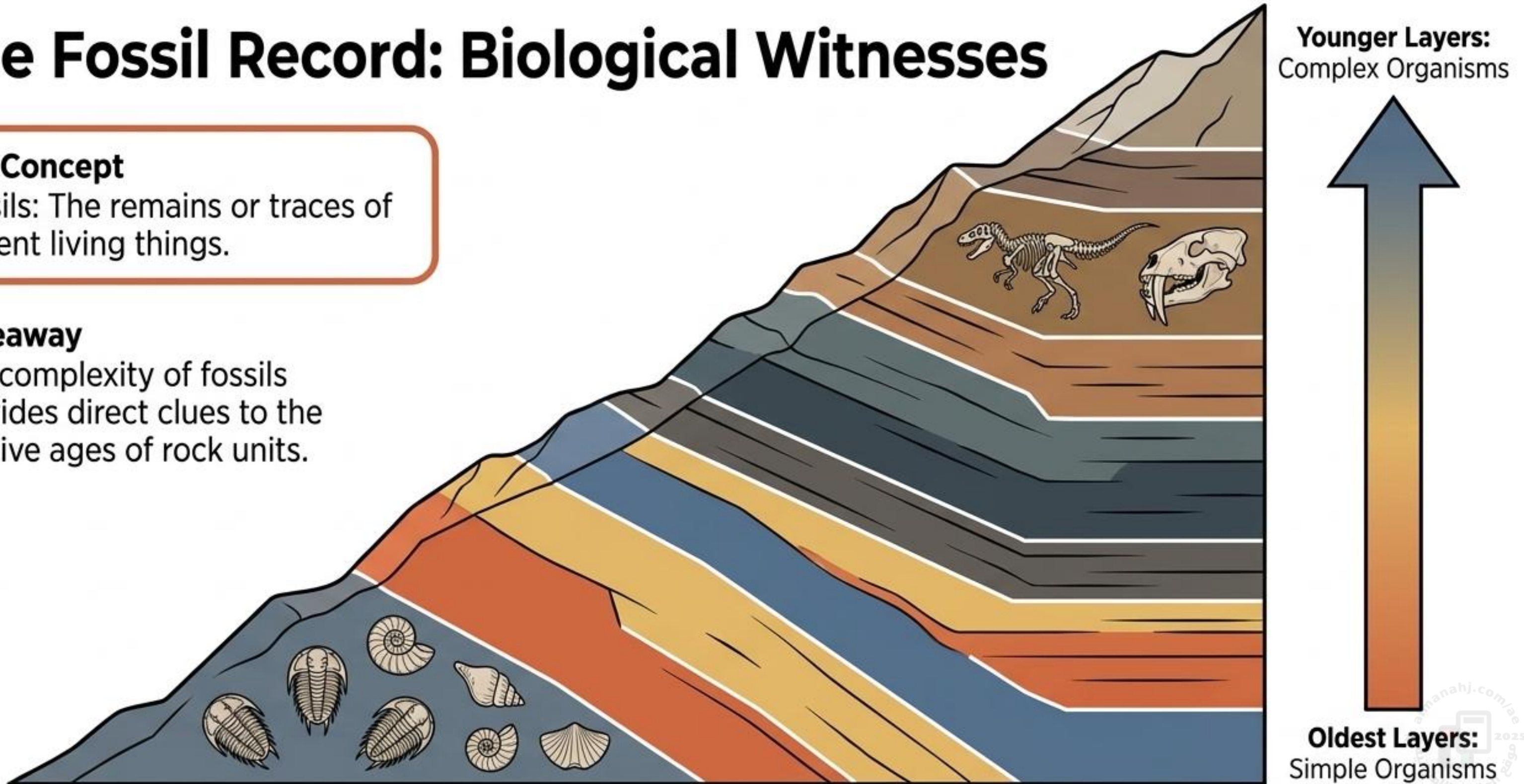
The Fossil Record: Biological Witnesses

Key Concept

Fossils: The remains or traces of ancient living things.

Takeaway

The complexity of fossils provides direct clues to the relative ages of rock units.



Mass Extinctions: When Witnesses Disappear

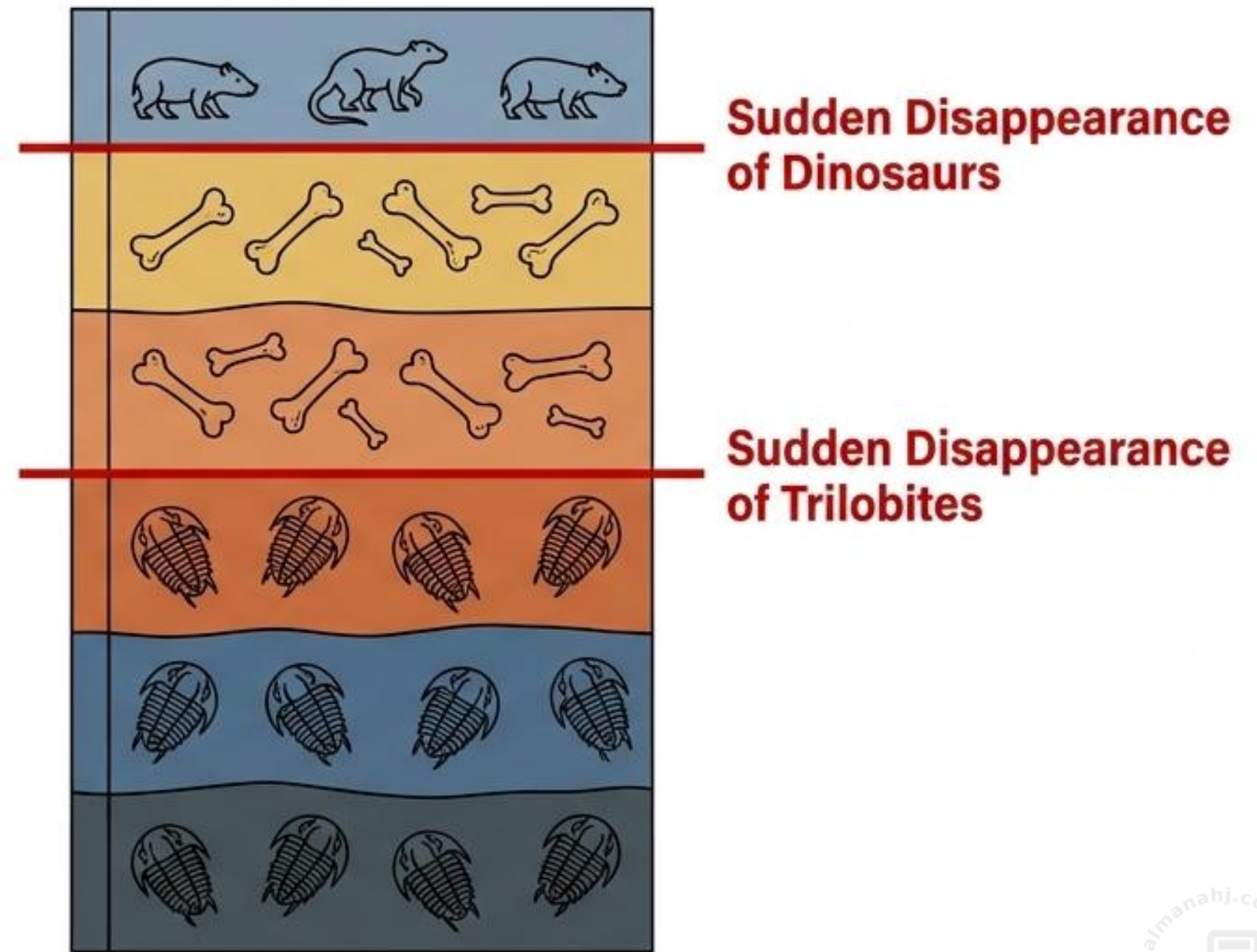
Definition Callout

Mass Extinction: Times when many species on Earth died or became extinct within a relatively short period of time.



**Detective
Clue**

Sudden disappearances of many types of fossils in a single rock layer mark the exact point in geologic time when a mass extinction occurred.



Annotated Stratigraphy Timeline

Reconstructing Ancient Environments

 **Field Note** Fossils tell us what the environment of an area was like long ago.



Real-Life Scenario

-  **Observation:** You find a fossil of an ancient coral in a dry, rocky desert.
-  **Uniformitarianism Deduction:** Coral only lives in saltwater today. Therefore, this exact spot was once a marine environment millions of years ago.

A Closer Look: Drilling Into the Past

The Clue

Deep-sea floors hold dust, minerals, and microscopic fossils in layered sediment cores.

Meet the Suspect

Foraminifera: Tiny, unicellular organisms less than the size of a grain of sand. As they grow, they incorporate oxygen from the surrounding ocean water directly into their shells.

The Drilling Site



The Sediment Core

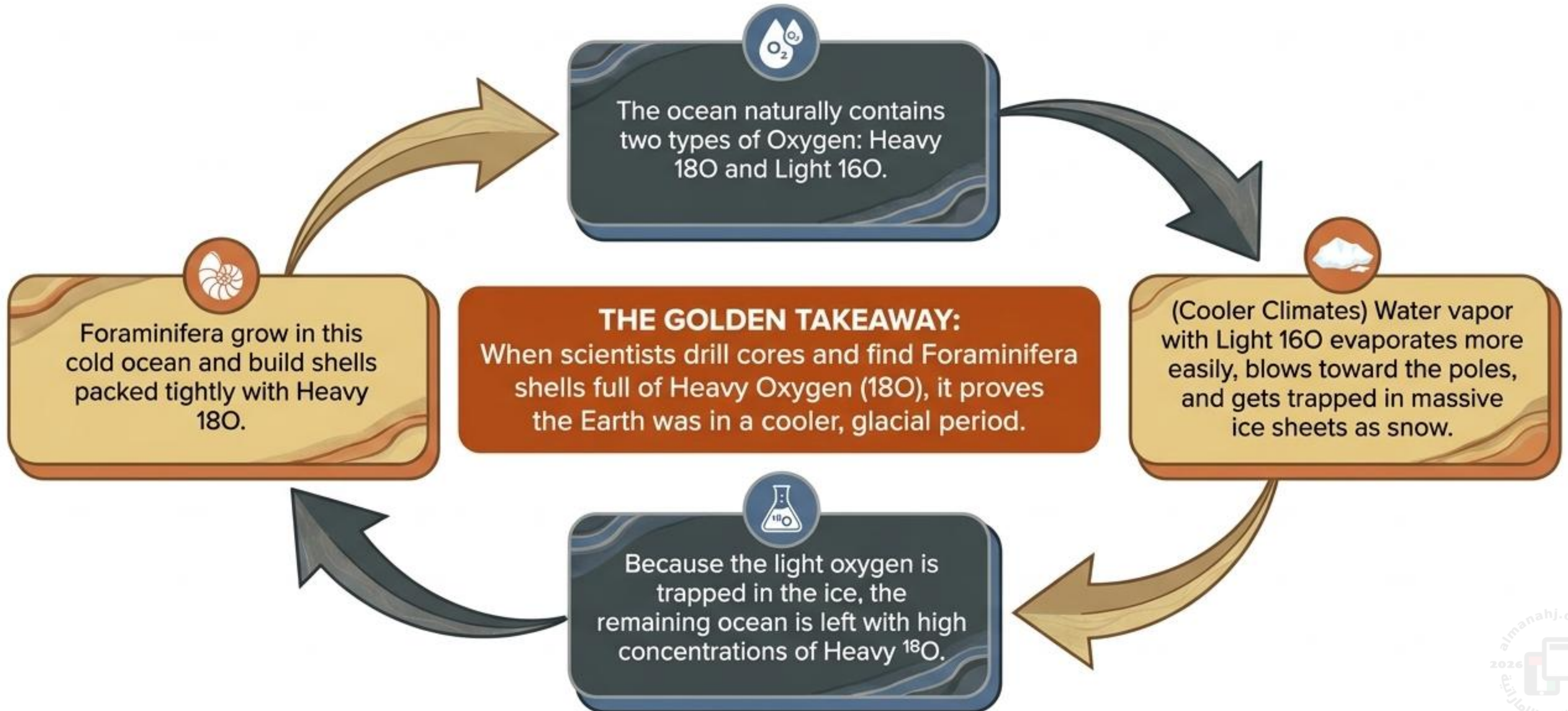


Microscopic View:
Foraminifera



Microscopic View:
Foraminifera

Isotope Forensics: Reading the Ice Ages



The Master Clue Board: Synthesizing Earth's History

Reading Earth's History

The Rock Record

Uses Relative-Age Dating (Superposition, Horizontality, Continuity, Inclusions, Cross-cutting).

Tells us the Sequence of Geologic Events.

The Fossil Record

Uses Biological Complexity, Extinctions, and Deep-Ocean Cores.

Tells us about Ancient Environments and Past Climates.

Final Thought

By combining the rock record and the fossil record, geologists can build a complete, sequential diary of the Earth!

Case Review: Test Your Detective Skills (1/3)

1. **(MCQ)**: Which principle states that geologic processes occurring today are similar to those in the past?

- (A) Superposition (B) Uniformitarianism (C) Lateral Continuity (D) Inclusions

2. **(MCQ)**: According to the principle of superposition, where are the youngest rock layers found?

- (A) At the bottom (B) At the top (C) Cut across the middle (D) Mixed randomly

3. **(MCQ)**: What type of fossil would you expect to find in the oldest bottom layers of a rock sequence?

- (A) Complex mammals (B) Dinosaurs (C) Simple organisms like Trilobites (D) Modern birds

4. **(True/False)**: Relative-age dating allows scientists to determine the exact age of a rock in absolute years.

[True] [False]

5. **(True/False)**: Sediments are originally deposited in flat, horizontal layers.

[True] [False]

Case Review: Test Your Detective Skills (2/3)

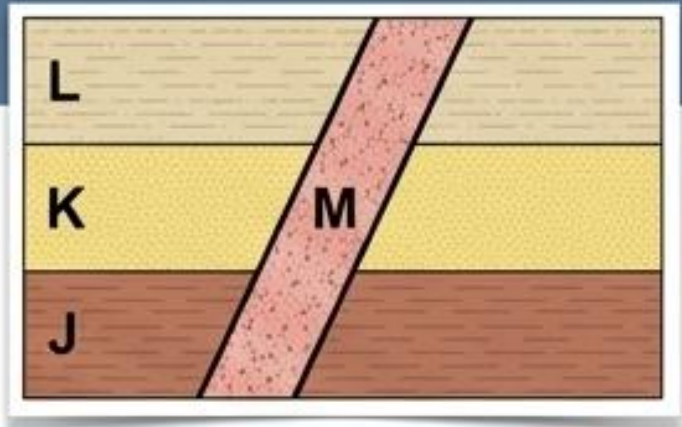
Matching (Match Principle to Definition)

- | | | |
|--------------------------------|-----|--|
| 6. Cross-Cutting Relationships | [] | [] A rock containing pieces of another rock is younger than the pieces. |
| 7. Inclusions | [] | [] Sediments form continuous sheets in all directions. |
| 8. Lateral Continuity | [] | [] A fault cutting through rock is younger than the rock it cuts. |

Short Answer

9. What does a sudden disappearance of many fossil types in a single rock layer indicate?

10. If a geologist finds fossilized marine shells in a dry mountain range, what does this tell them about the area's ancient environment?



Case Review: Test Your Detective Skills (3/3)

Question 11. (Application): Look at the sequence graphic. Horizontal layer “J” is on the bottom, “K” is in the middle, and “L” is on top. A diagonal fault “M” cuts through J and K, but not L. Order these features from oldest to youngest.

Question 12. (Application): What two relative-age principles did you use to solve Question 11?

Question 13. (Cause & Effect): During cooler glacial periods, why does the ocean become richer in Heavy Oxygen (^{18}O)?

Question 14. (Cause & Effect): How do Foraminifera act as recorders of ancient climates?

Question 15. (Critical Thinking): If a scientist drills a sediment core and finds Foraminifera shells with very low levels of Heavy Oxygen (^{18}O) and very high levels of Light Oxygen (^{16}O), what can they conclude about the Earth's climate at that time?

Answer Key

1. (B) Uniformitarianism

2. (B) At the top

3. (C) Simple organisms like Trilobites

4. False

5. True

6. Cross-Cutting matches "fault cutting through rock is younger"

7. Inclusions matches "rock containing pieces is younger"

8. Lateral Continuity matches "continuous sheets in all directions"

9. A mass extinction.

10. The area was once underwater / a marine environment.

11. J (Oldest), K, M, L (Youngest).

12. Superposition and Cross-cutting relationships.

13. Light Oxygen (^{16}O) evaporates and gets trapped in glacial ice, leaving heavy oxygen behind.

14. They absorb the oxygen isotopes present in the water into their shells as they grow.

15. The climate was warmer (interglacial); ice had melted, returning Light Oxygen (^{16}O) to the ocean.

Case Closed. Great work, detectives!



Teacher Rania Adel