

Name: _____ Date: _____

Answer Key: Geologic Deep Time Analysis for 11th Grade

Isotope geochemistry, floral succession, and faunal turnover. High-level synthesis of Earth's stratigraphic record and paleoenvironmental reconstruction.

1. The Great Oxygenation Event (GOE) approximately 2.4 billion years ago is primarily evidenced in the rock record by which geological feature?

Answer: B) Banded Iron Formations (BIFs) containing hematite and magnetite

Banded Iron Formations formed as dissolved iron in the oceans reacted with newly produced photosynthetic oxygen, precipitating out as iron oxides.

2. In the context of biostratigraphy, an ideal ____ is an organism that was geographically widespread, abundant, and existed for a short geological duration.

Answer: C) Index fossil

Index fossils are essential for correlation because their narrow temporal range allows geologists to pinpoint specific moments in the geologic time scale across different regions.

3. The use of Carbon-14 dating is an effective method for determining the absolute age of Ediacaran fauna preserved in sandstone.

Answer: B) False

Carbon-14 has a half-life of only ~5,730 years, making it useless for the Ediacaran period (over 540 million years ago); Uranium-Lead dating of nearby volcanic ash would be required instead.

4. Which transition in the fossil record best illustrates the move from gymnosperm-dominated ecosystems to the rise of flowering plants during the Cretaceous?

Answer: C) The radiation of Angiosperms and associated insect pollinators

The Cretaceous Terrestrial Revolution was defined by the rapid expansion of angiosperms, which fundamentally restructured terrestrial food webs and ecosystems.

5. The 'Signor-Lipps effect' refers to the risk of misinterpreting the fossil record due to ____, which can make a mass extinction appear more gradual than it truly was.

Answer: B) Incomplete sampling

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Because the last known fossil of a species is rarely the last individual to exist, incomplete sampling creates an artificial 'smearing' of extinction events.

6. Oxygen isotope ratios (O-18 vs O-16) found in the calcium carbonate shells of Foraminifera fossils are used by paleoclimatologists to reconstruct ancient global temperatures.

Answer: A) True

The ratio of oxygen isotopes is temperature-dependent; during colder periods, more O-16 is trapped in glacial ice, leaving oceans (and shells) enriched in O-18.

7. The Devonian Period is often referred to as the 'Age of Fishes,' but it also witnessed which critical terrestrial milestone?

Answer: B) The formation of the first complex forest ecosystems

The Devonian saw the 'afforestation' of Earth, with plants developing deep root systems and vascular tissue, significantly altering global carbon cycles.

8. Analyzing the ____ of fossilized leaves, such as those from the Ginkgo tree, allows scientists to estimate atmospheric CO₂ levels from millions of years ago.

Answer: A) Stomatal density

Plants grow fewer stomata (pores for gas exchange) when CO₂ is abundant, making fossil stomatal density a reliable proxy for ancient atmospheres.

9. What does the presence of 'dropstones' in ancient marine sedimentary layers typically indicate about the environment at that time?

Answer: C) The presence of icebergs during a glacial period

Dropstones are oversized clasts that fall from melting icebergs into fine-grained marine sediments, serving as evidence for ancient 'Snowball Earth' or glacial phases.

10. A Lagerstätte is a geological deposit that exhibits extraordinary fossil preservation, often including soft tissues that are usually lost to decay.

Answer: A) True

Significant examples like the Burgess Shale or the Solnhofen Limestone are classified as Lagerstätten because they preserve biological details like skin, feathers, and internal organs.