Name:_____ Date:_____

Relative Age Dating: Principles & Geological Cross-Sections

Part 1: Principles Matching

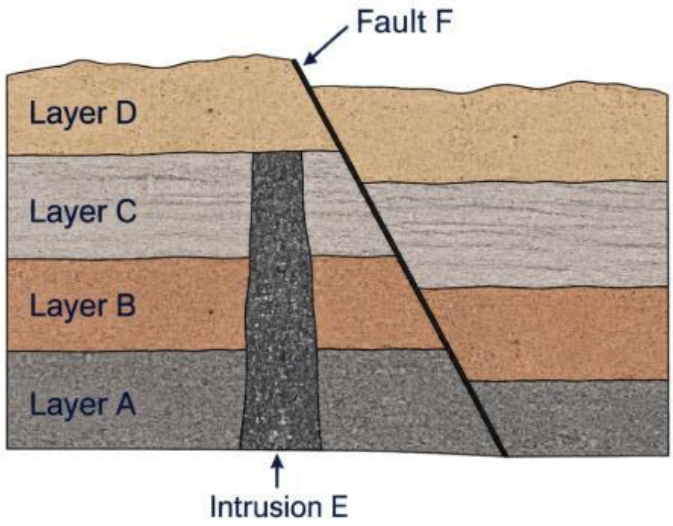
Match each geological principle to its correct scientific description. Write the matching letter in the space provided.

A. Principle of Superposition | **B.** Principle of Original Horizontality | **C.** Principle of Lateral Continuity **D.** Principle of Cross-Cutting Relationships | **E.** Principle of Inclusions | **F.** Principle of Uniformitarianism

Item	Geological Description	Letter
1.	Geological processes shaping the Earth today are essentially the same as those that operated in the deep past ("the present is the key to the past").	
2.	In undeformed sedimentary rock layers, the oldest layer lies at the bottom, and layers become progressively younger upwards.	
3.	Sediments are initially deposited in flat, horizontal layers due to gravity; tilted or folded layers were disturbed after deposition.	
4.	Sedimentary strata extend sideways in all directions until they thin out, pinch out, or terminate against the edge of a depositional basin.	
5.	Any geological feature (such as an igneous intrusion or a fault) that cuts across another rock body must be younger than the rock it cuts through.	
6.	Any rock fragment or clast found enclosed inside another rock layer must be older than the host rock that surrounds it.	

Part 2: Cross-Section Interpretation

Examine the geological cross-section diagram below. It shows four sedimentary strata (**Layer A**, **Layer B**, **Layer C**, **Layer D**), an igneous dyke intrusion (**Intrusion E**), and a tectonic fracture line (**Fault F**).



1. Which rock layer is the **oldest** sedimentary bed? State which principle proves your answer.

2. Is **Intrusion E** older or younger than **Layer C**? State the principle used.

3. Is **Intrusion E** older or younger than **Layer D**? Give one piece of observable evidence.

4. Is **Fault F** the oldest, intermediate, or youngest geological event in the entire sequence? Explain your reasoning.

5. Reconstruct the complete geological history by placing the events in chronological order, from **oldest (first)** to **youngest (most recent)**:

1 (Oldest)	2	3	4	5	6 (Youngest)

Part 3: Applied Check for Understanding

1. A geologist discovers rounded granite pebbles inside a thick bed of sandstone. Which rock formed first: the granite or the sandstone? Justify your deduction using geological principles.

2. Explain the difference between **relative age dating** and **absolute (numerical) age dating**. Why is relative dating still crucial when studying Earth history?

Answers

Part 1: Principles Matching

1. F (Principle of Uniformitarianism)

2. A (Principle of Superposition)

3. B (Principle of Original Horizontality)

4. C (Principle of Lateral Continuity)

5. D (Principle of Cross-Cutting Relationships)

6. E (Principle of Inclusions)

Part 2: Cross-Section Interpretation

1. Layer A is the oldest sedimentary layer. Proved by the Principle of Superposition (in undisturbed strata, bottom layers form first).

2. Intrusion E is younger than Layer C. Principle of Cross-Cutting Relationships (a feature that cuts through another body is younger than what it cuts).

3. Intrusion E is older than Layer D. Evidence: Intrusion E cuts through layers A, B, and C, but terminates at the base of Layer D and does not penetrate it, meaning Layer D was deposited on top after the intrusion cooled and was eroded.

4. Fault F is the youngest event. It cuts through and offsets every single feature in the sequence, including Layer D and Intrusion E.

5. Chronological order table:

1 (Oldest)	**2**	**3**	**4**	**5**	**6 (Youngest)**
Layer A	Layer B	Layer C	Intrusion E	Layer D	Fault F

Part 3: Applied Check for Understanding

1. The granite formed first. By the Principle of Inclusions, any rock fragment (inclusion) contained within a host rock must be older than the rock containing it. The granite had to exist, undergo weathering and erosion into pebbles, before being cemented into the new sandstone.

2. Relative dating determines the sequence of past events (which rock or event came before or after another) without determining exact calendar years. Absolute dating provides a specific numerical age in years (e.g. through radiometric dating). Relative dating remains essential because it establishes the structural and stratigraphic framework of rock units in the field even when datable radioactive minerals are absent.