Unit 11

Process 4

Method

JEM/ENG
Mesleki Yabancı Dil

(Professional English)

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Jeoloji Mühendisliği Bölümü

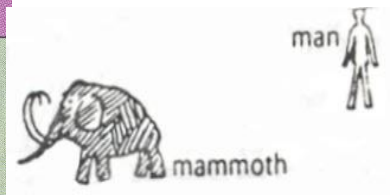
TAG

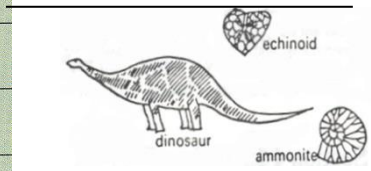
Process 4 - Medhod

Look at this table:

The geological time table

Eon	Era	Period	Epoch		DISTINCTIVE PLANTS AND ANIMALS
Phanerozoic Eon (*Phaneros* = "evident"; *Zoon* = "life")	Cenozoic Era	Quaternary	Recent or Holocene		Humans
			Pleistocene	2	
		Tertiary — Neogene	Pliocene		"Age of Mammals" — Mammals develop and become dominant
			Miocene	5	
				24	
		Tertiary — Paleogene	Oligocene		
			Eocene	37	
			Paleocene	58	Extinction of dinosaurs and many other species
				66	
	Mesozoic Era	Cretaceous			"Age of Reptiles" — First flowering plants, greatest development of dinosaurs
				144	
		Jurassic			First birds and mammals, abundant dinosaurs
				208	
		Triassic			First dinosaurs
				245	
	Paleozoic Era	Permian			"Age of Amphibians" — Extinction of trilobites and many other marine animals
				286	
		Carboniferous — Pennsylvanian			Great coal forests; abundant insects, first reptiles
				320	
		Carboniferous — Mississippian			Large primitive trees
				360	
		Devonian			"Age of Fishes" — First amphibians
				408	
		Silurian			First land plant fossils
				438	
		Ordovician			"Age of Marine Invertebrates" — First fish
				505	
		Cambrian			First organisms with shells, trilobites dominant
				538	
	Proterozoic	Sometimes collectively called Precambrian			First multicelled organisms
				2500	
	Archean				First one-celled organisms
				3800	Approximate age of oldest rocks
				4600±	Origin of the Earth





Make correct sentences from this table:

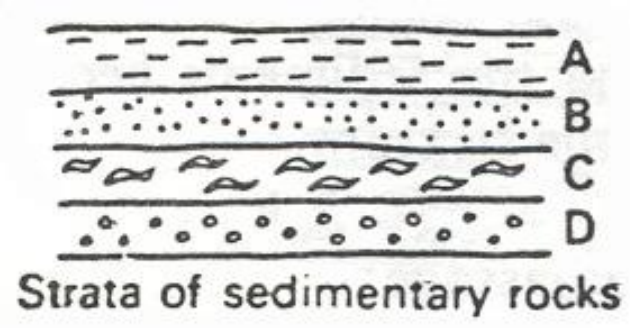
A An	trilobite ammonite dinosaur mammoth amphibian echinoid coral	is a fossil which	is associated with can be found in may be found in	Cambrian Jurassic Permian Cretaceous Devonian Tertiary	strata

Look at this example:

If a Devonian stratum is examined, a coral fossil may be found.

Now write five sentences like this using the information in the geologic time scale.

Look at this diagram:



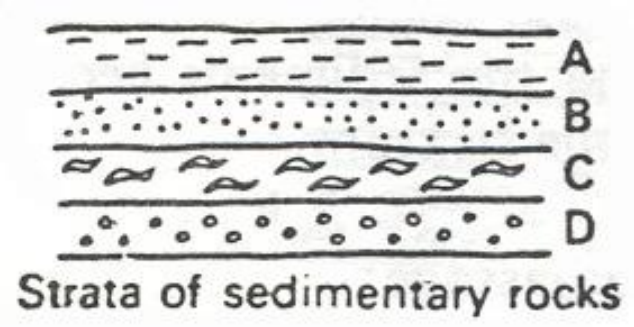
Strata of sedimentary rocks

Example:

If stratum A contains *ammonite fossils* and stratum B contains *coral fossils*, **what can be determined about the strata?**

If stratum A contains ammonite fossils and stratum B contains coral fossils, then stratum A is Triassic and stratum B is Devonian.

Look at this diagram:



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Now answer these questions:

a) If stratum C is Cambrian, what can be found?

b) If stratum C contains simple fossils, what can be determined?

c) If stratum C is Cambrian, what could stratum D be?

d) If fossil evidence is used, how can the age of stratum D be determined?

Reading Passage:

We know that the Earth is very old. It is about 4.6 billion years old. The evidence of Earth's age comes from its rocks. Geologists developed the geologic time scale. This time scale was developed gradually, mostly in Europe, over the eighteenth and nineteenth centuries. The geological time scale is used by scientists to describe the timing and relationships between events that have occurred during the history of Earth.

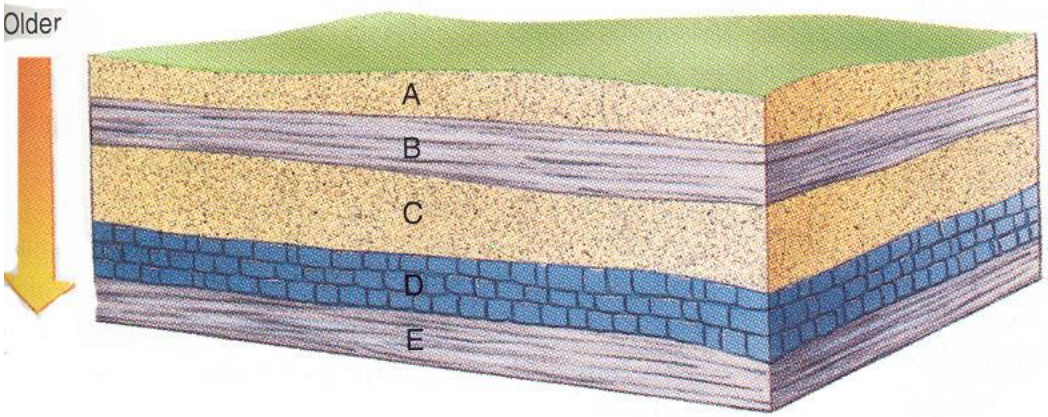
The rocks that are exposed at Earth's surface are all different ages. Some are quite young and others are quite old. Most of the rocks exposed at the surface of the Earth are sedimentary. Sedimentary rocks are formed particle by particle and bed by bed, and the layers are piled one on top of the other.

Rock layers are also called strata, and stratigraphy is the science of strata. Stratigraphy deals with all the characteristics of layered rocks; it includes the study of how these rocks relate to time.

To tell the age of these rocks, geologists study the fossils these rocks contain. Geologists who study fossils are called paleontologists.

Fossils are fundamental to the geologic time scale. Fossils provide important evidence to help determine what happened in Earth history and when it happened. Fossils are the recognizable remains, such as bones, shells, or leaves, or other evidence, such as tracks, burrows, or impressions, of past life on Earth.

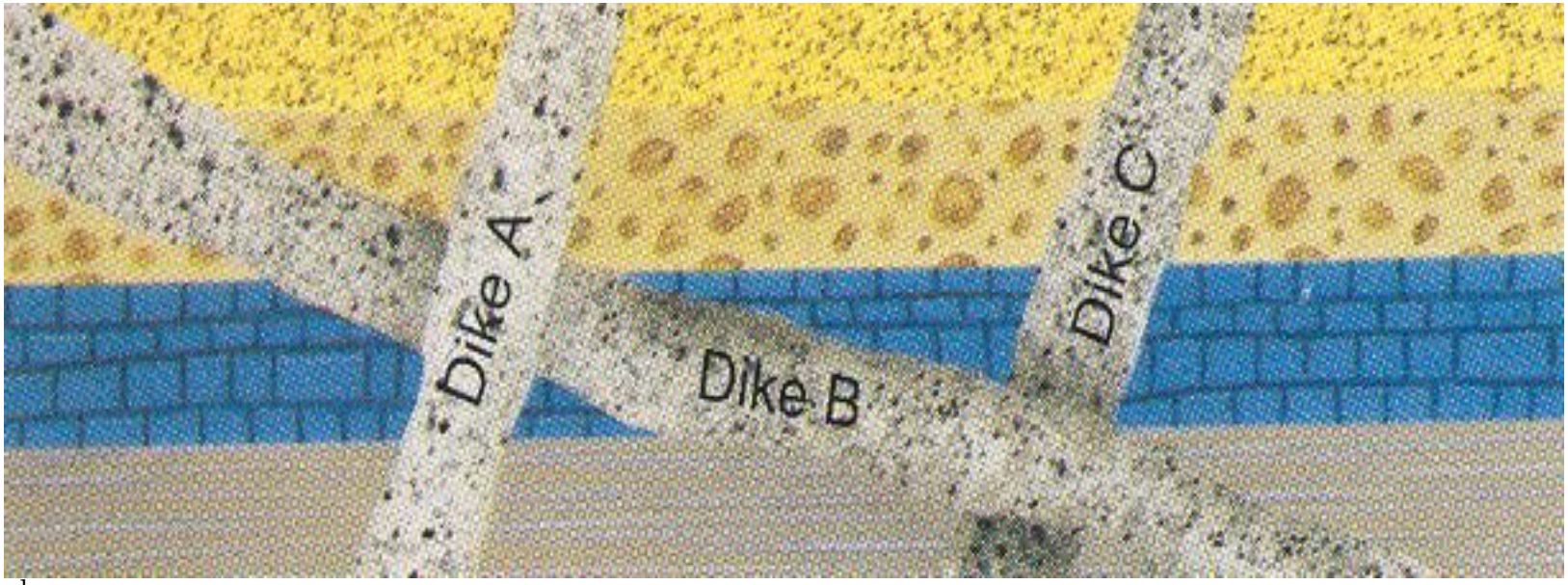
Geologists deal with two kinds of time, relative and absolute. Determinations of **relative time** are based on geologic relationships among rocks and the evolution of life forms through time. James Hutton was first scientist to understand the profound significance of relative time in geology. In determining the age of rocks, several principles can be applied. The principles which are used depend on the type of rocks and the results of earth movements.



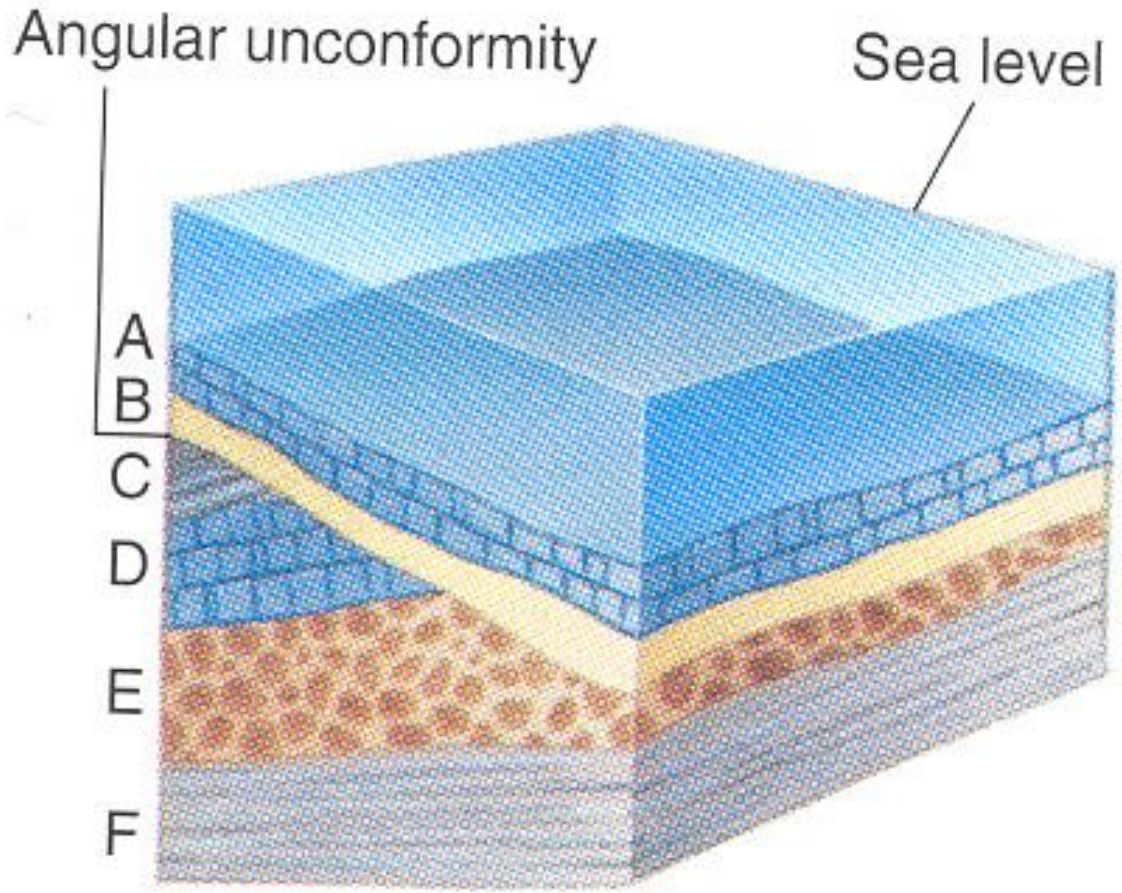
i) The principle of superposition: This principle states that sedimentary rocks become younger from bottom to top. This is because younger layers of sediment always accumulate on top of older layers. In following figure, the sedimentary layers become progressively younger in order E, D, C, B and A

ii) The principle of original horizontality: The principle of original horizontality is based on observation that sediment usually accumulates in horizontal layers. If sedimentary rocks lie at an angle, we can infer that tectonic forces tilted them after they formed. This means that layers of sediment are generally deposited in a horizontal position. Thus if we observe rock layers that are flat, they have not been disturbed and still have their original horizontality. But if they are folded or inclined at a steep angle they must have been moved into that position by crustal disturbances sometime after their deposition.

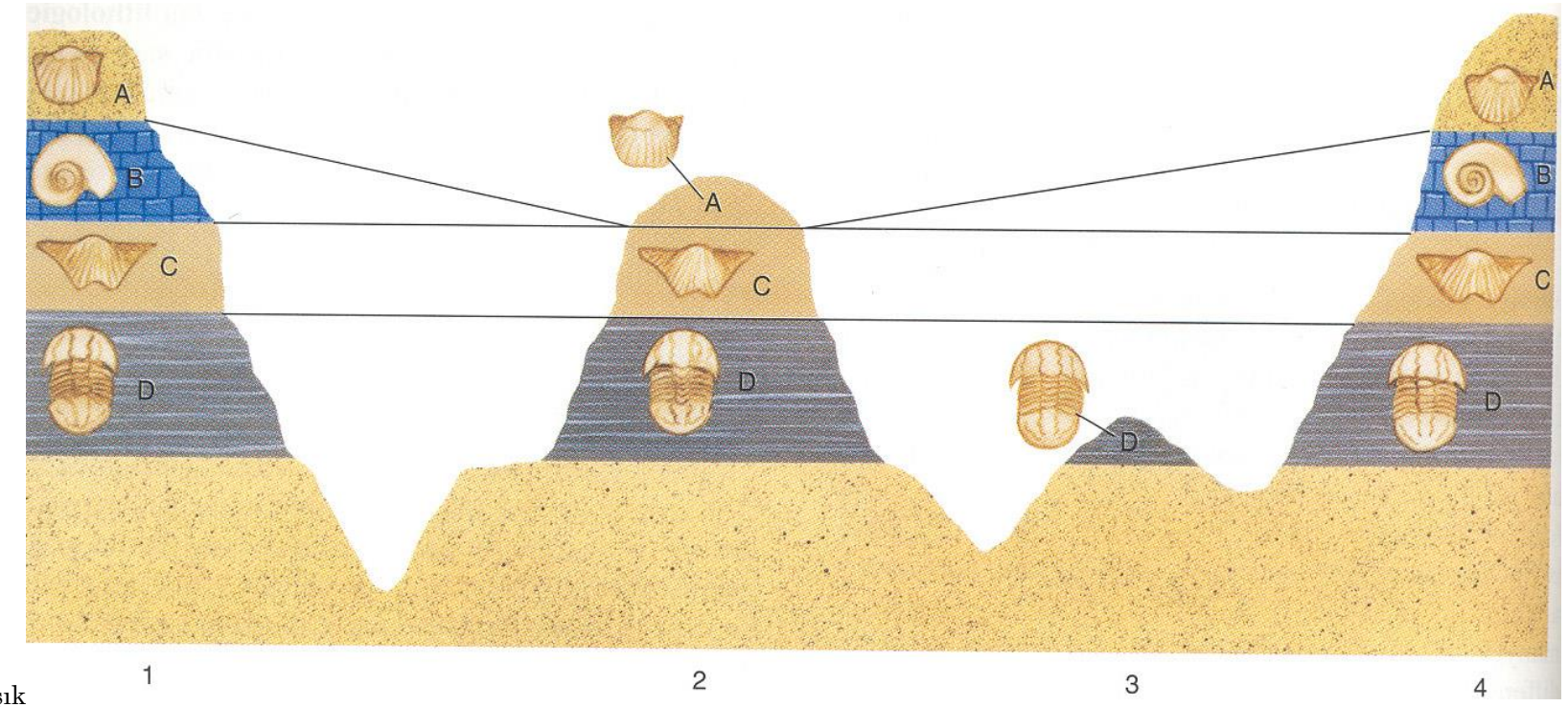
iii) The principle of cross-cutting relationships: The principle of crosscutting relationships is based on the obvious fact that a rock must first exist before anything can happen to it. Following figure shows sedimentary rocks intruded by three granite dikes. Dike B cuts dike C, and dike A cuts dike B, so dike C is older than B, and dike A is the youngest. The sedimentary rocks must be older than all of the dikes.



iv) The principle of unconformity: The sedimentary rocks are often folded and then eroded. New sedimentary rocks may then be laid down on top of them. The division between the two types is called an unconformity and it follows that the rocks below the unconformity are older than those above.



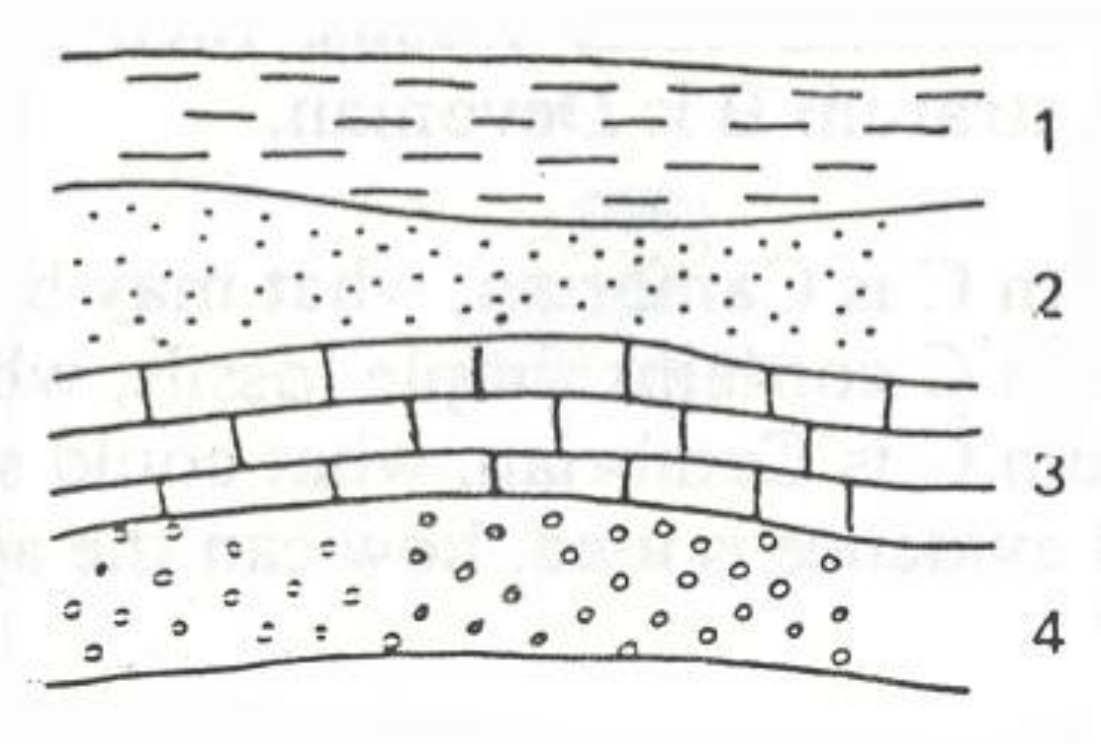
v) The principle of fossil succession: According to this principle, fossils follow each other in a definite and determiable order. By comparing fossils, deposits of the same age can be found recognised although they may be in different areas. Older rocks may be expected to contain more primitive fossils than younger rocks.



Absolute time is measured by radiometric age dating, which relies on the fact that radioactive parent isotopes decay to form daughter isotopes at a fixed, known rate as expressed by the half-life of the isotope. The cumulative effects of the radioactive decay process can be determined because the daughter isotopes accumulate in rocks and minerals.

Look at these diagrams and then say how the succession of strata can be determined.

Example:



If the principle of superposition can be applied, then stratum 2 must be older than stratum 1.

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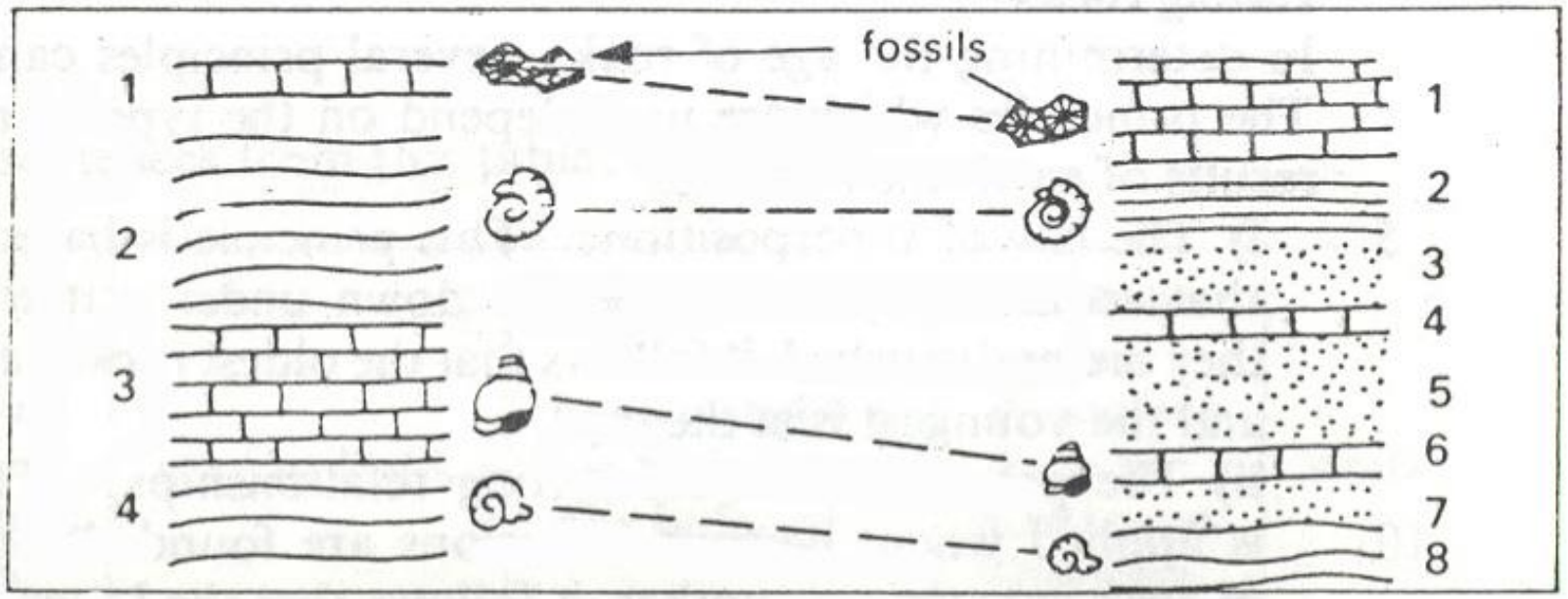

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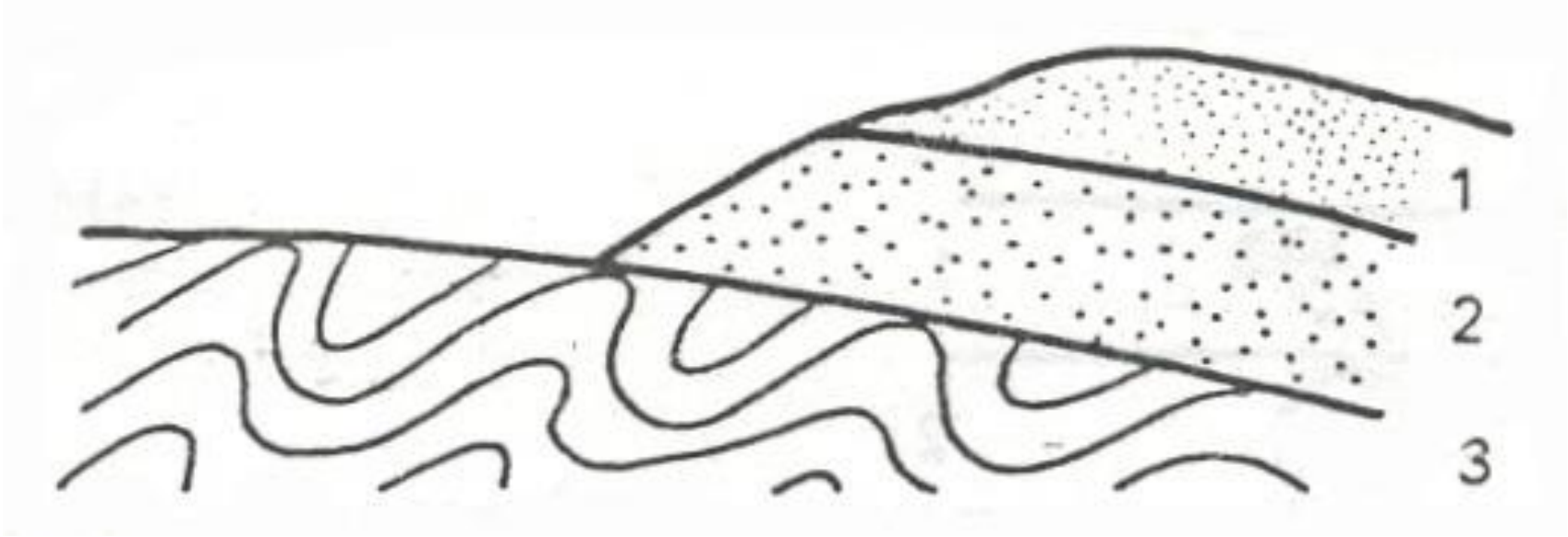

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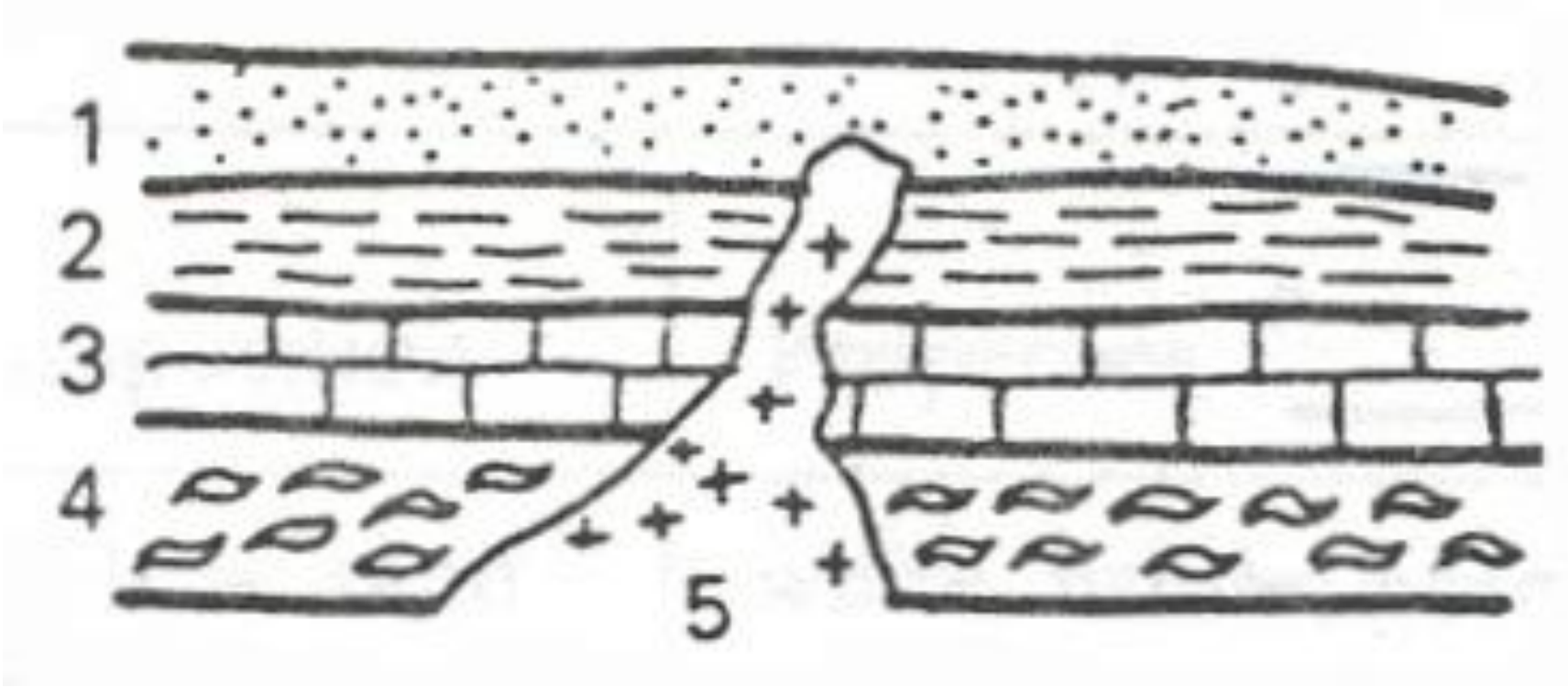

Make sentences by joining the correct half-sentences:

If an igneous intrusion cuts through a stratum	then the rocks are undisturbed.
If a range of fossils is found in a succession of strata	the sedimentary stratum must be older than the igneous intrusion.
If rocks are undisturbed	the oldest rock contains the most primitive fossils.
If fine deposits lie on coarse deposits in each stratum	the rocks below the unconformity are older than those above.
If a clear division occurs between horizontal strata and folded rocks	the oldest rock is at the bottom and the youngest is at the top.

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