Geography Class 09

UTILITY OF ASSIGNMENTS (9:12 AM):

- Class assignments are to be written daily without fail.
- In the course of our preparation, we are not going to get to a phase later where we will be having too much time to clear all the backlog tasks.
- Pending assignments can get undoable very soon.
- We must not aim for perfection in writing answers at this point in our preparation.
- We need to gradually improve our answer writing, one answer at a time.
- The evaluator of your answers knows about the topic at hand, and he/she would appreciate it if you convey what you know in as least words as possible.
- Answer writing is not about writing more content, or going into technical depths.
- We must focus on properly covering every aspect of the question briefly, and that too in the given time and space limits.
- We are not supposed to over-focus on any single aspect of the question.
- **For example-** If we are to write an answer on the "Evolution of the Earth" we cannot devote too much time to the de-gassing process only.
- We are not expected to cover each and every aspect for a 10-marker, and we must not try doing it.
- We are not going to get more than 7.5 minutes for any question, and any extra time in a subtle question is subtracting the time available for the next questions.
- After reading the question, making a mental map of the contents to be written is a better approach than just beginning to write the answer after reading the question.

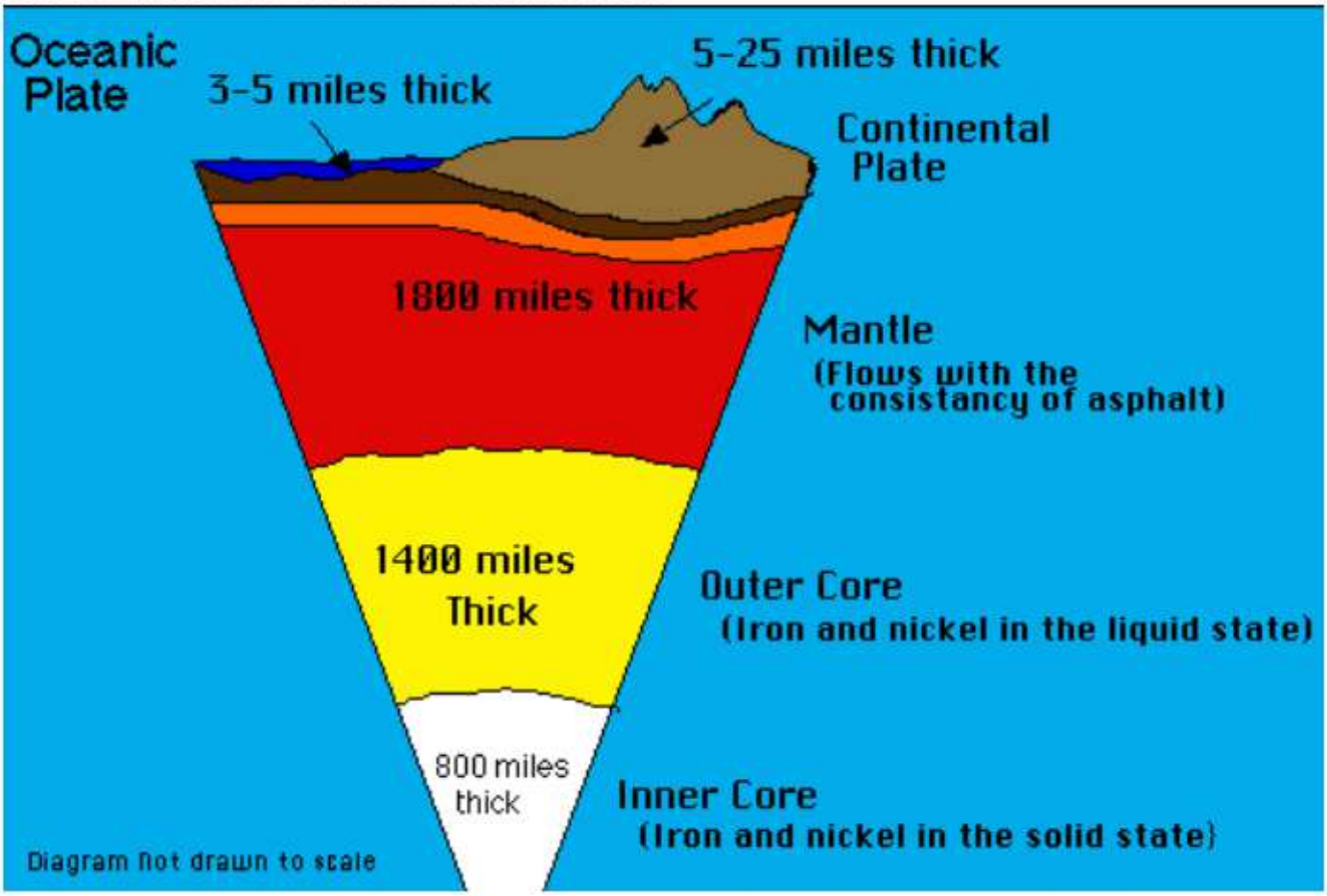
Revision of the previous class:

- The last ice age was in the **Pleistocene Epoch.**
- **Hadean Eon** saw the early evolution of the earth- early atmosphere, and hydrosphere.
- **Archaean Eon** saw the evolution of life as blue-green algae
- **Proterozoic Eon** saw the coming up of soft-bodied marine multicellular organisms.
- **The Ordovician Period** of the **Paleozoic era** saw the evolution of the first vertebrates which were primitive fish.
- **The Silurian Period** saw the evolution of life on the surface of the land.
- **The Devonian Period** saw the rise of amphibians.
- **The Carboniferous Period** saw the rise of the first reptiles.
- **The Permian Period** saw the reptiles dominate and replace the amphibians.
- **The Triassic period** of the **Mesozoic era** saw the diversification of reptiles.
- We are currently living in the **Holocene Epoch.**
- There have been demands to consider the time post-Industrial Revolution as **Anthropocene.**
- This is to denote the detrimental effects of human activities on nature.
- The continental crust has continents over it & the Oceanic crust has oceans above it.
- Continental Crust and Oceanic crust are next to each other, and no one floats above the other.

DIFFERENCES BETWEEN CONTINENTAL & OCEANIC CRUST (9:40 AM):

Continental Crust	Oceanic Crust
This is thicker(40-50 km). The continental crust is thicker near mountains	This is thinner (8-10 km).
This is lighter and less dense.	This is heavier and more dense.
Rocks are brighter in color	Rocks are darker in color
The rocks are older in age. The oldest rocks found are 4 billion years old	Rocks are younger in age. The oldest rocks are only 150 million years old
The components are made up of lighter elements like Silica & aluminum. So the continental crust is also called the **Sial** layer.	The components are made up of heavier elements like Silica & Magnesium. So the continental crust is also called the **Sima** layer.

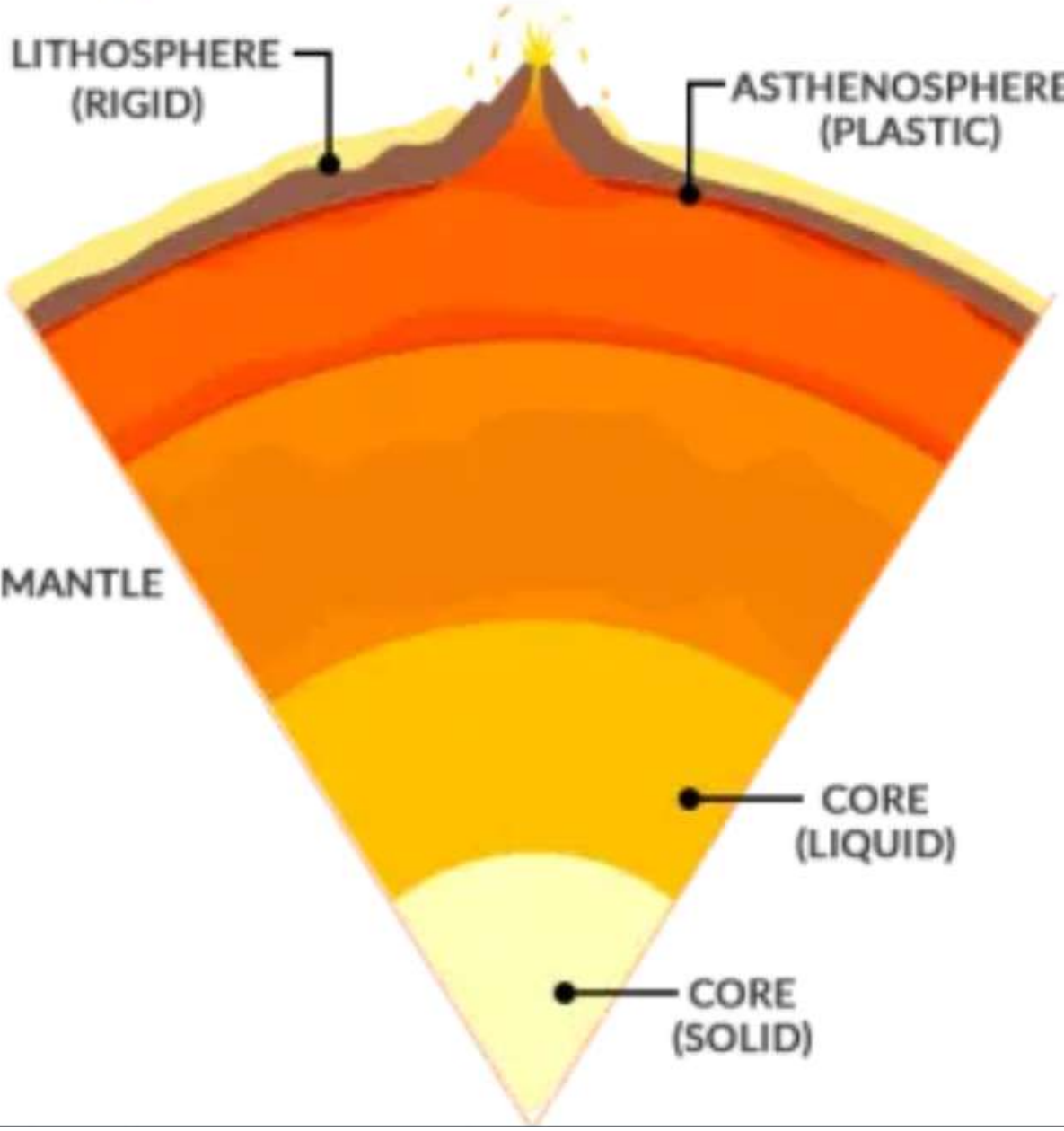
Chemical divisions of the Earth's interior:



including crust and upper mantle i.e. the crust is a component of the lithosphere.

Lithosphere:

- It is the hard outer shell of the earth, which is only around 100 km thick.
- It refers to the single unit that consists of the crust and the upper mantle.
- Chemically both the layers are different, but they exist as a single physical unit.
- The lithosphere is divided into several parts known as **plates.**



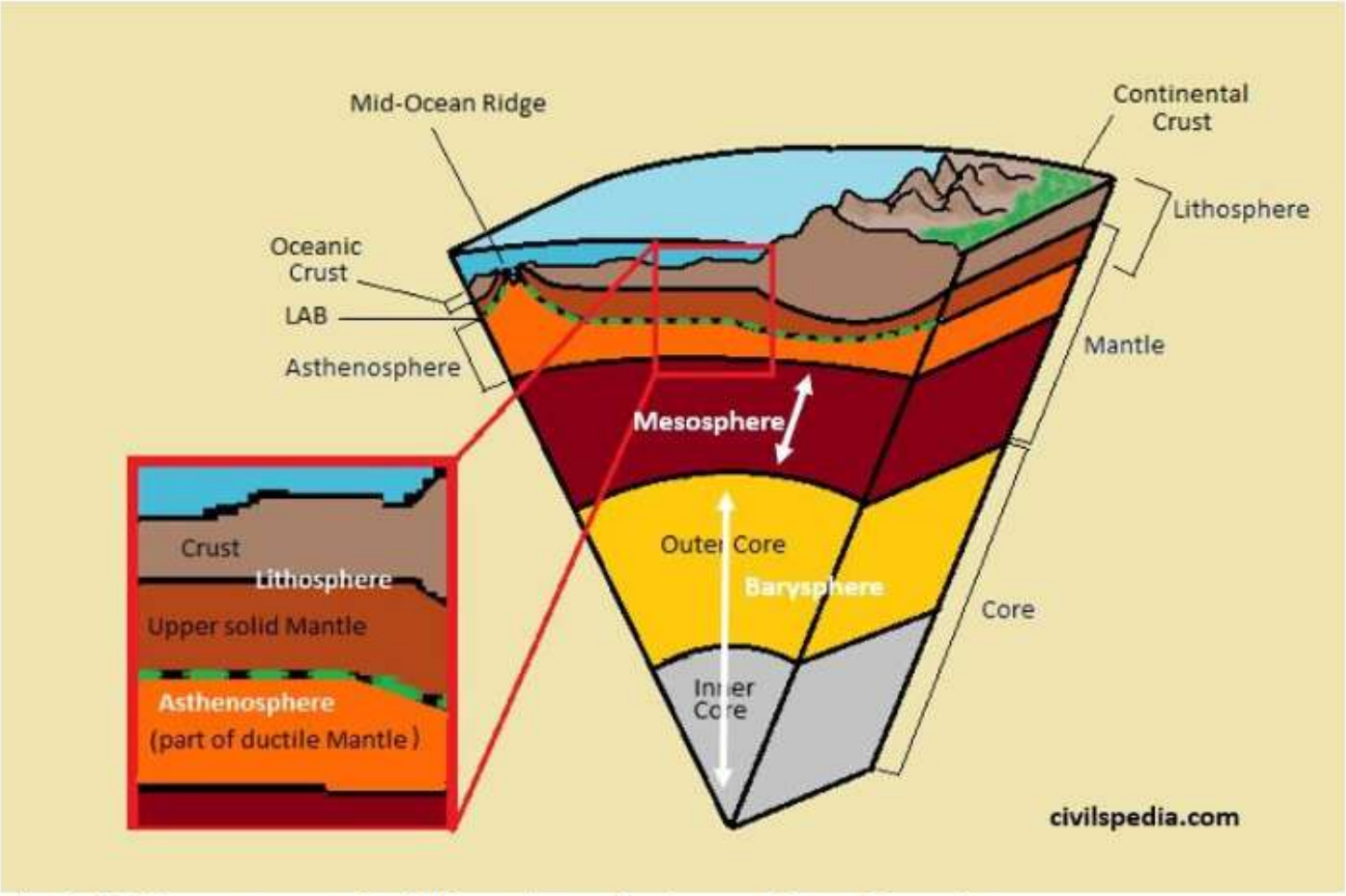
ASTHENOPSHERE (10:00 AM):

- It extends between 100-400 km.
- It is plastic in nature- a semi-solid/semi-liquid layer that undergoes deformation under pressure.
- It can be assumed as a soft cushion over which the lithosphere rests.
- It is also a part of the upper mantle.
- It is also called a **low-velocity zone** because the earthquake waves slow down in this zone.
- T earthquake waves slow down because the asthenosphere is not totally rigid.
- It is a source of **magma** to the surface.

Mesosphere:

- It includes the rest of the mantle.

Barryspehere:

- It includes both the outer and inner core.
- 

- The LAB here means the Lithosphere-Asthenosphere Boundary.

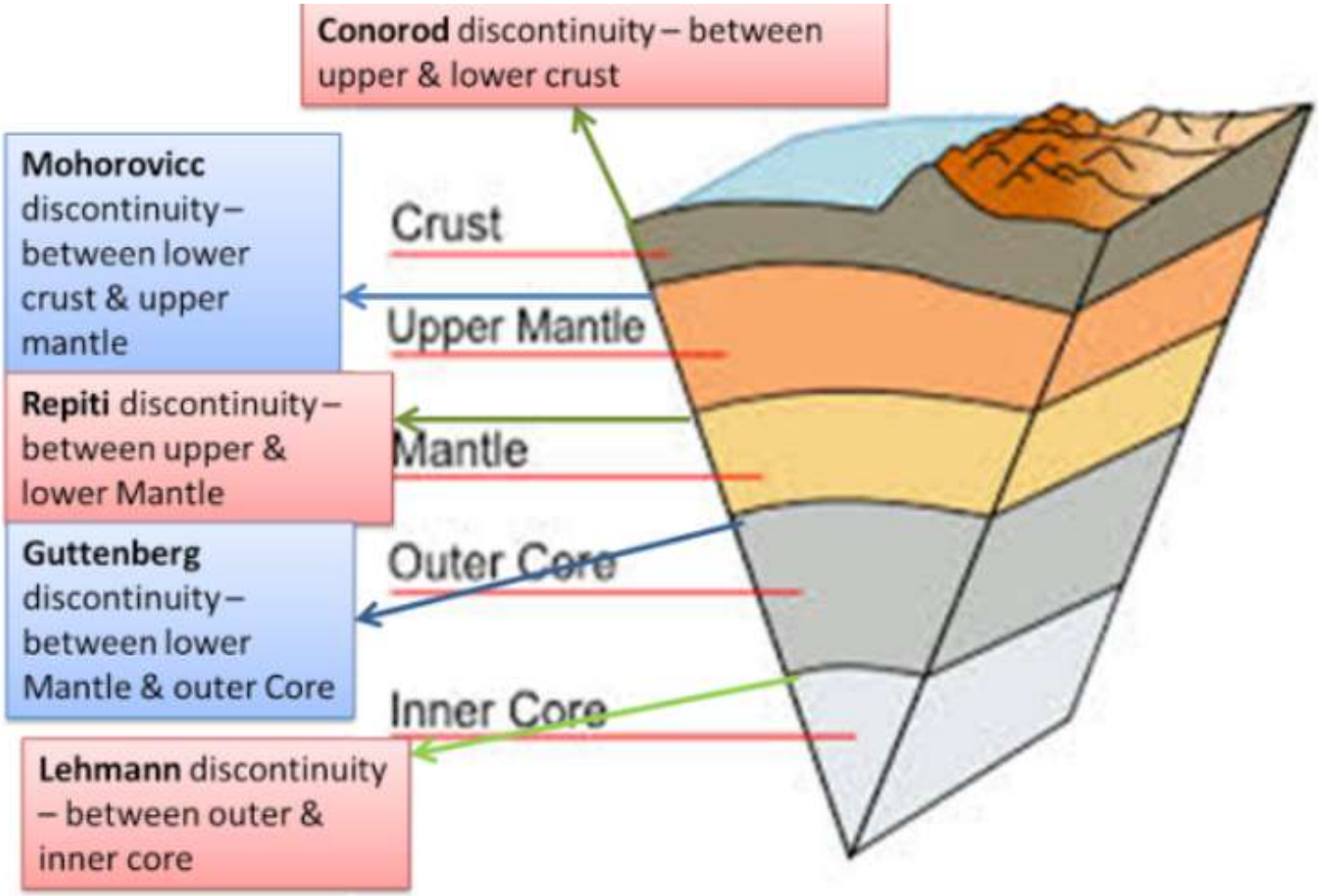
Interior of the Earth:

Discontinuity:

- It is a transition zone between the different layers of the earth's interior with differing physical and chemical characteristics.
- A discontinuity shows the change in speed and direction of seismic waves due to density changes is called discontinuity.

There are five discontinuities inside the earth.

- **I. Conrad Discontinuity**: Transition zone between SIAL and SIMA.
- **II. Mohorovicic/Moho Discontinuity**: Transition zone between the Crust and Mantle.
- **III. Repiti Discontinuity**: Transition zone between Outer mantle and Inner mantle.
- **IV. Gutenberg Discontinuity**: Transition zone between Mantle and Core.
- **V. Lehman Discontinuity**: Transition zone between Outer core and Inner core.

- 
Conorod discontinuity – between upper & lower crust
Mohorovicc discontinuity – between lower crust & upper mantle
Repiti discontinuity – between upper & lower Mantle
Guttenberg discontinuity – between lower Mantle & outer Core
Lehmann discontinuity – between outer & inner core
Crust
Upper Mantle
Mantle
Outer Core
Inner Core

ROCKS & MINERALS (10:30 AM):

- Natural aggregates of minerals are called rocks.
- Minerals have a fixed chemical composition, unlike rocks.
- The rock composition is dependent upon the chemical composition of the minerals and the condition of formation like the rate of cooling of magma. etc.

Rocks	Minerals
Rocks are the aggregates of mineral elements	Minerals are solid inorganic substances occurring naturally
A rock has no definite chemical composition.	Minerals have a definite chemical composition
Minerals are organized to form rocks	Elements(pure substances) are organized to form compounds which are known as minerals.
Three main types of rocks are Igneous, Sedimentary & Metamorphic.	Four major mineral groups are silicates, carbonates, sulfides, and metallic minerals.
Basalt, granite, sandstone, slate & quartz are some important types of rocks.	Iron, Silicon, magnesium, nickel, etc. are some important minerals.

TYPES OF ROCKS (11:00 AM):

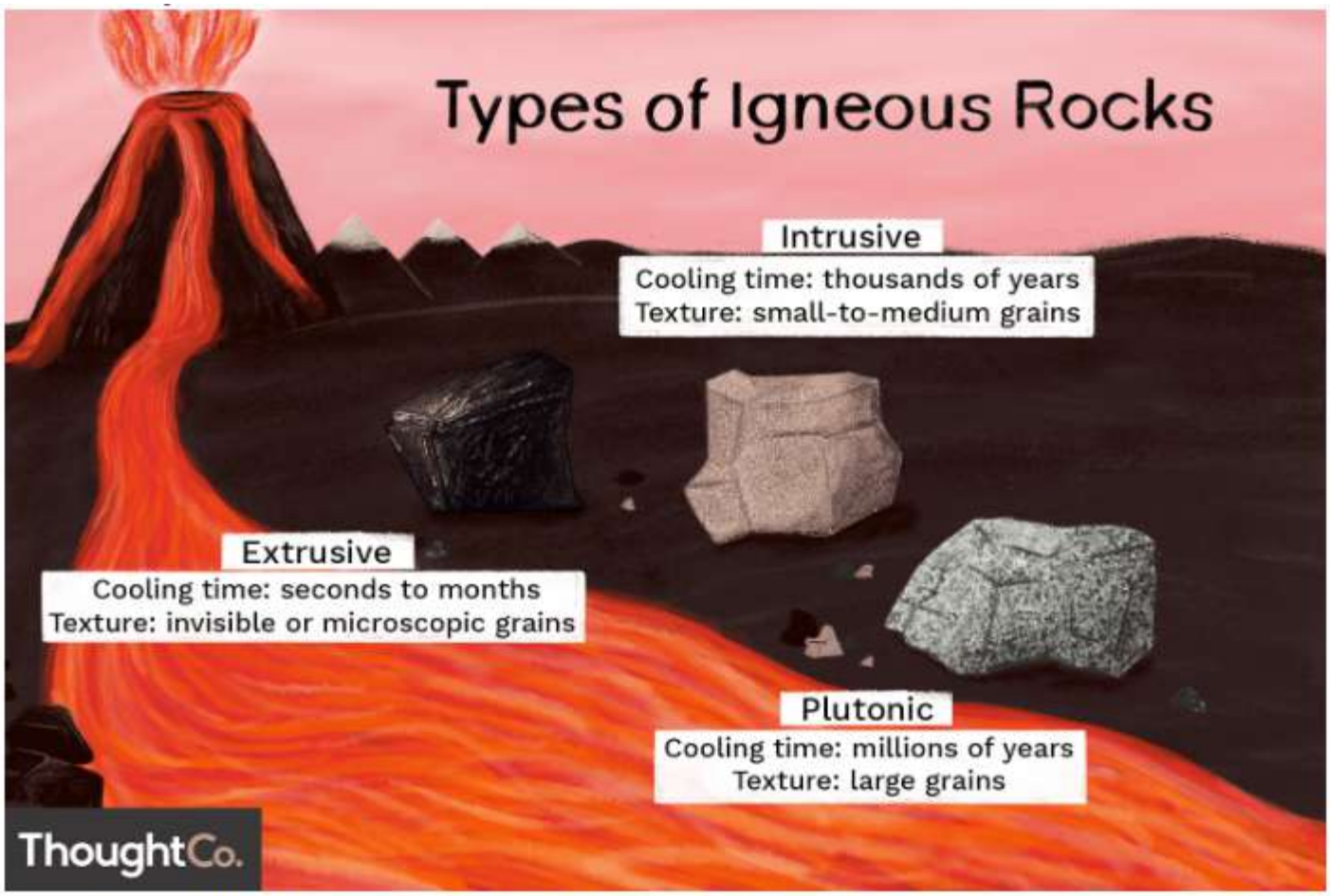
- **Igneous rocks:**
- They are formed due to the cooling, solidification, and crystallization of the earth's molten material.
- They are also called **primary rocks.**
- There are **two types of igneous rocks:**

I. Intrusive:

- They are formed from the cooling g of magma below the earth's surface.
- Slow cooling of magma results in a crystalline texture with higher strength.
- They are also called **Plutonic rocks.**
- **For example** Granite, Gabbro, etc.

II. Extrusive:

- They are formed due to the cooling of magma above the earth's surface.
- Faster cooling results in a glassy texture and lower strength.
- They are also called **volcanic rocks.**
- **For example** Basalt, Andesite, etc.

- 

Igneous rocks classification as per chemical composition:

- **I. Acidic rocks:**
- They have more than 66% silica content.
- **For example-**Granite

II. Basic rocks:

- They have a silica content of less than 52 %.
- **For example** Basalt.

III. Intermediate rocks:

- These rocks have a silica content between 66% and 52 %.
- **For Example,** Andesite is an extrusive intermediate rock.
- Igneous rocks lack the presence of layers and fossils.

Sedimentary Rocks:

- They are formed by the solidification of sediments of original igneous, metamorphic, or other sedimentary rocks.
- Sedimentary rocks are not as strong as igneous or metamorphic rocks.
- **Architecture:**
  - Northern India has many monuments made up of red sandstone because of its abundance.
  - **For example** the Red Forts of Delhi & Agra.
  - This school of art is called **Mathura School.**
  - **Gandhara School** used Grey Sandstone.
  - **Amravati School** used white marble.

Stages in the formation of sedimentary rocks:

- **I. Weathering:**
- This involves the breakdown of original rocks.

II. Transportation:

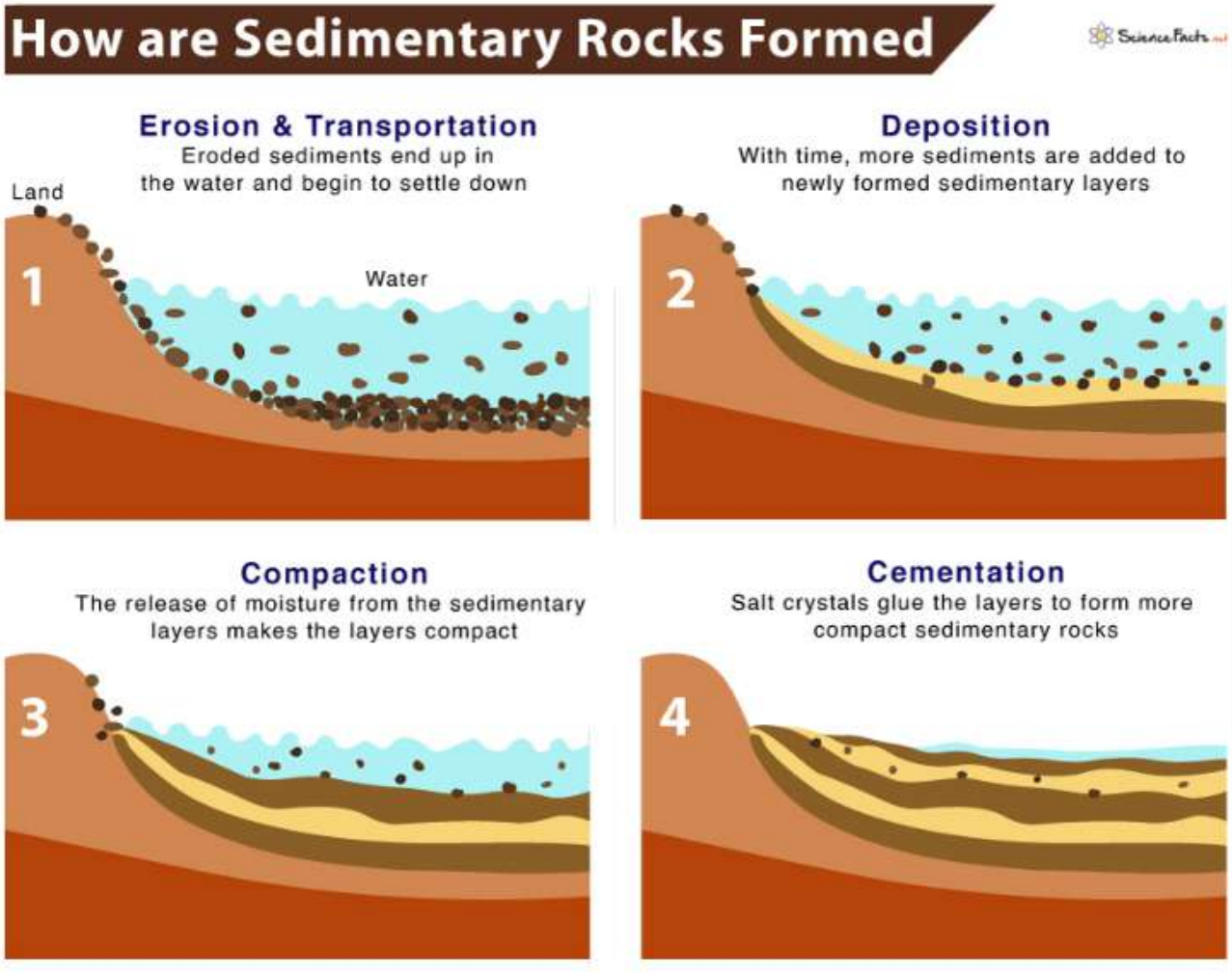
- This is done by agents like wind, water, glacier, etc.

III. Deposition:

- It is done in a deep basin.

IV. Lithification:

- Conversion of loose sediments into hard rocks.
- This process involves :
- **(a) Compaction** where the sediments are squeezed by the weight of the overlying layers.
- **(b) Cementation-** binding together of compacted materials by natural cementing material.



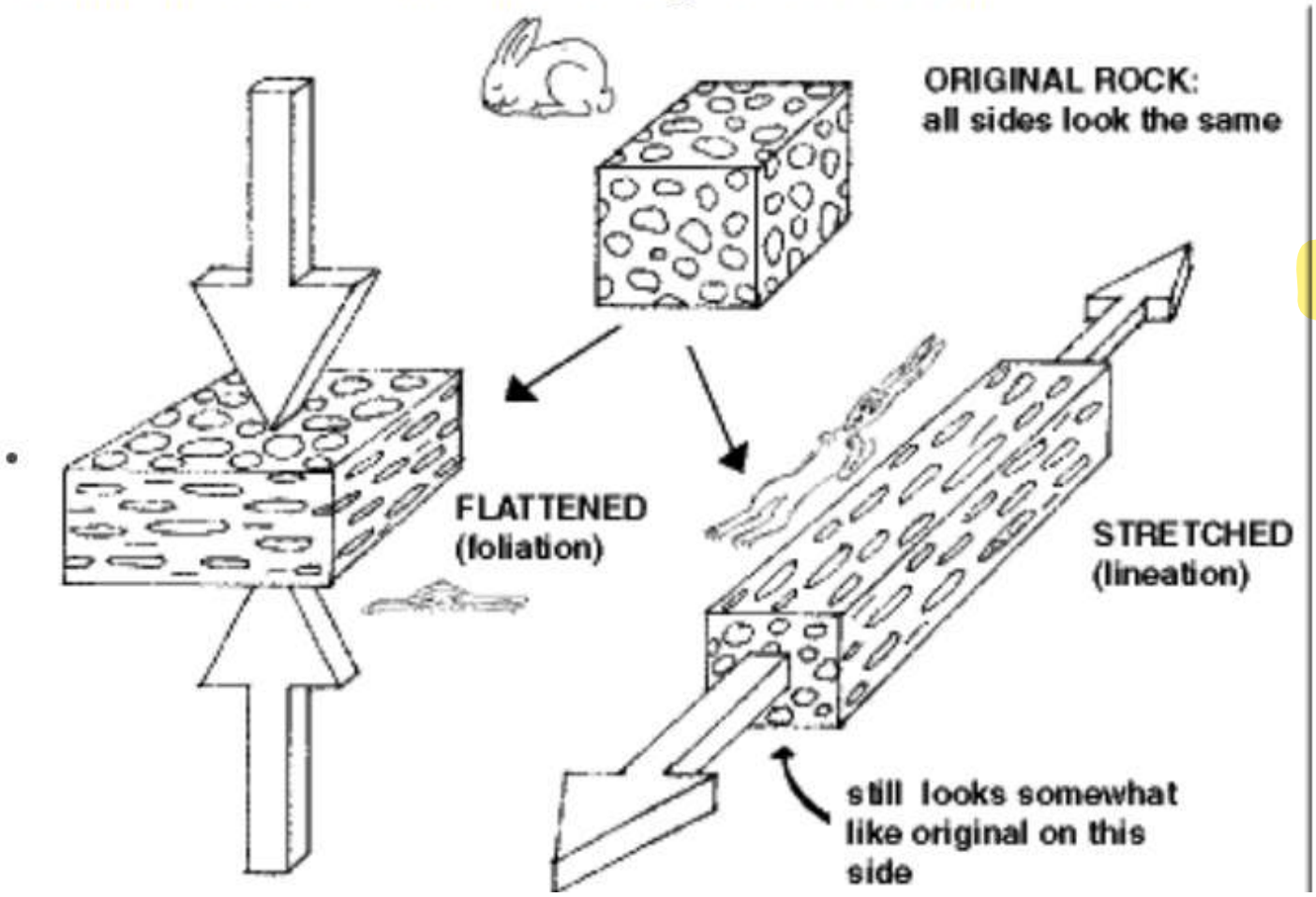
1. Compaction:
Definition:
Compaction is the process where sediments are compressed due to the weight of overlying layers (overburden). This reduces the pore space between sediment grains.
How it Works:
As layers of sediment accumulate over time, the pressure from the weight of the overlying layers forces the grains closer together, squeezing out water and air trapped in the spaces (pores).
This reduction in pore space increases the density of the sediment.
Result:
The sediments become tightly packed and more solid but are still held together loosely.
Example: Clay particles compact into shale.
2. Cementation:
Definition:
Cementation is the process where minerals precipitate from groundwater and fill the spaces (pores) between sediment grains, binding them together to form a solid rock.
How it Works:
Dissolved minerals, such as calcite, silica, or iron oxides, are carried by water flowing through the sediments.
Over time, these minerals precipitate out of the water and act like a glue, sticking the sediment grains together.
Result:
The sediments are transformed into hard, cohesive rock.
Example: Sand particles cemented by silica or calcite form sandstone.

General features of Sedimentary rocks:

- Sedimentary rocks are formed in different layers or strata.
- They contain fossil evidence.
- **For example** Sandstone, limestone, shale, chalk, clay, gypsum.

METAMORPHIC ROCKS (11:30 AM): (Metamorphism means Transformation)

- It involves changes in the form of rocks through physical and chemical processes.
- The changes in the pressure condition result in **dynamic metamorphism.**
- The changes in temperature lead to **thermal metamorphism.**
- Together, they can cause **thermodynamic metamorphism.**
- **Foliation** is the process of metamorphism during which the minerals get arranged in the planar direction as a series of bands (**Banding).**
- **Lineation** is when the minerals are arranged in a linear manner.

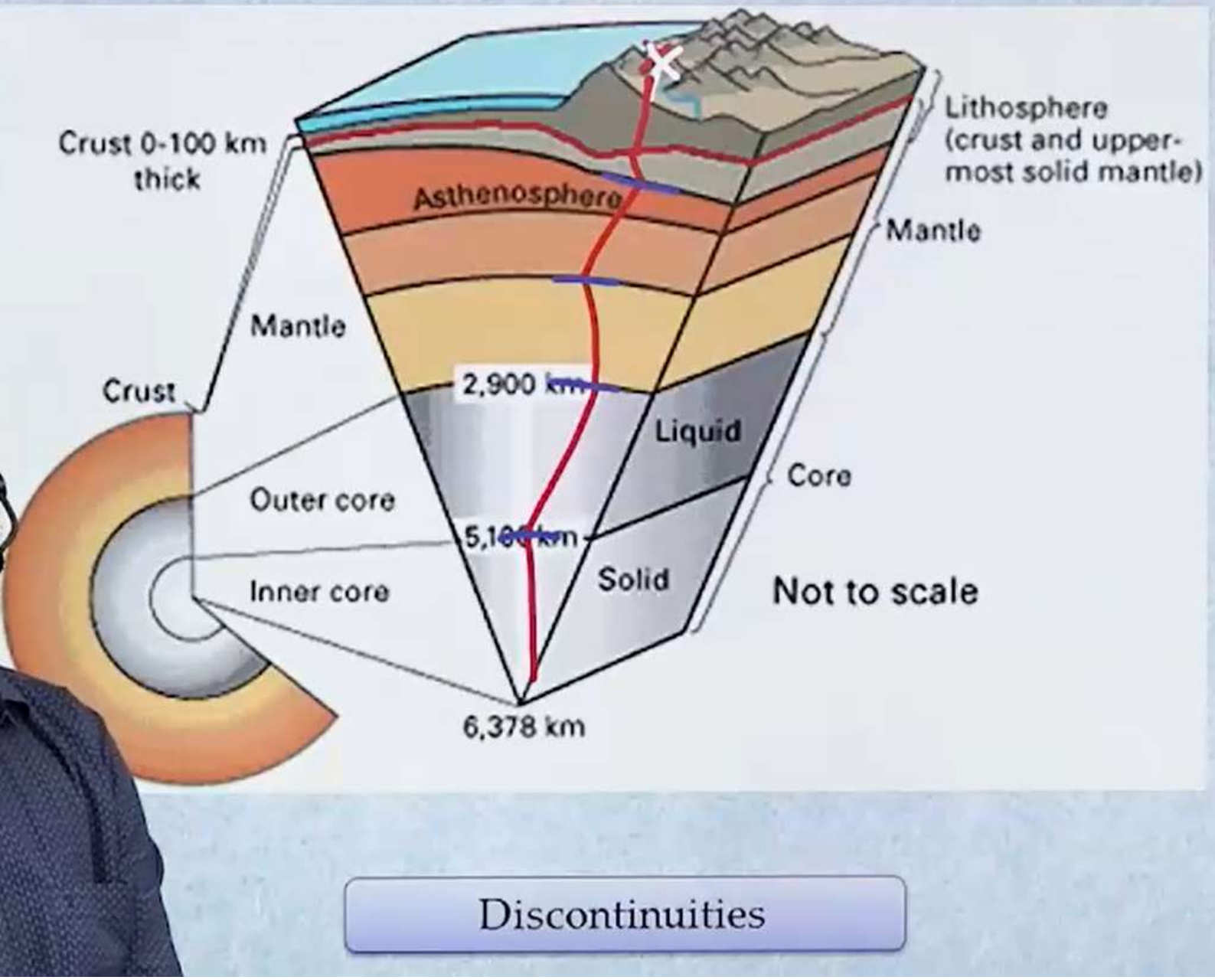


- **For example:**
- Granite undergoes metamorphism to become Gneiss.
- Sandstone becomes Quartzite.
- Limestone becomes Marble.
- Shale can become either Schist or Slate.
- Coal can become either Graphite or Diamond.

Rock Cycle:

- It refers to the cyclic conversion of one type of rock into another.
- This is a web of pr

The topics for the next class are Earth's movements and continental drift



Discontinuities

Exposed rock on the surface of earth which goes to weathering, transportation and deposition.