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Q5

How does the Juno Mission of NASA help to understand the origin and evolution of the Earth?

UPSC Civil Services Mains 2017 · GS I · 10 marks · Indian Heritage and Culture

Indian culture will cover the salient aspects of Art Forms, literature and Architecture from ancient to modern times.

Core demand of the question

- How does the Juno Mission of NASA help to understand the origin and evolution of the Earth?
- Cover Jupiter as a time capsule, water and core clues, magnetosphere, and what that means for terrestrial planets
- Keep the explanation within a 10-mark length

Revision summary

Jupiter stored early nebular gas that Earth did not keep, so it is a formation archive.

Juno measures deep water, gravity, and the magnetic field from polar orbit.

Water and core structure constrain how wet and how mixed the disc was.

That disc story controls Earth's water, metals, and bombardment history.

Juno feeds models; it does not replace Earth and Moon samples.

Flow diagram

Juno at Jupiter -> Water ammonia

Juno at Jupiter -> Gravity core

Juno at Jupiter -> Dynamo magnetosphere

Water ammonia -> Solar nebula

Gravity core -> Solar nebula

Solar nebula -> Earth origin models

Conclusion

- State clearly that Juno does not photograph early Earth; it supplies boundary conditions for solar-system formation models.
- Pair Juno with meteorites, lunar samples, and Earth geology rather than treating one orbiter as a full history of our planet.

Juno helps us understand Earth's origin by measuring the first giant's water, core, and magnetic engine, which are leftovers of the nebula that also built the terrestrial planets. Earth's later evolution still needs its own rocks; Juno sets the family story in which those rocks make sense.

Facts & figures

Juno orbit insertion, 2016

NASA polar orbiter at Jupiter designed to map interior, atmosphere, and magnetosphere.

Microwave radiometer

Instrument to sense water and ammonia below the visible clouds.

Gravity science

Doppler tracking that tests whether Jupiter's core is compact or diluted.

Solar nebula

The disc of gas and dust around the young Sun from which planets grew.

Dynamo comparison

Jupiter's magnetic field offers a giant-planet analogue to Earth's core-generated magnetosphere.

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