



India Approves Construction of LIGO

For Prelims: Gravitational Waves, LIGO-India Project

For Mains: Significance and benefit of LIGO-India Project.

Why in News?

Recently, the government approved the construction of the **Laser Interferometer Gravitational-Wave Observatory (LIGO) project** after seven years of in-principle approval.

- It will be built by the [Department of Atomic Energy](#) and the **Department of Science and Technology with the U.S. National Science Foundation** and several national and international research institutions.

What is LIGO-India Project?

- **About:**
 - The project **aims to detect [gravitational waves](#)** from the universe.
 - The Indian LIGO would have **two perpendicularly placed 4-km long vacuum chambers**, that constitute the most sensitive interferometers in the world.
 - It is expected to begin scientific runs **from 2030**.
- **Location:**
 - It will be located in the **Hingoli district of Maharashtra**, about 450 km east of Mumbai.
- **Purpose and Significance:**
 - It **will be the fifth node** of the planned network and will bring India into a **prestigious international scientific experiment**.
 - It will make India a unique platform that brings together the frontiers of science and technology of the **quantum and the cosmos**.
- **Benefits of LIGO-India:**
 - The LIGO-India project would have **several spin-off benefits** to Indian science, apart from making India an **integral part of one of the most prestigious international scientific experiments**.
 - The observatory is expected to enable dramatic returns in astronomy and **astrophysics**, as well as leapfrog Indian science and **technology in cutting-edge** frontiers of great national relevance.

What are Gravitational Waves?

- Gravitational waves were first postulated (1916) in **Albert Einstein's General Theory of Relativity**, which explains how gravity works.
- These waves are produced by the movement of massive celestial bodies, such as black holes or neutron stars, and are the ripples in spacetime that propagate outward.

- (a) 'Higgs boson particles' were detected.
(b) 'Gravitational waves' were detected.
(c) Possibility of intergalactic space travel through 'wormhole' was confirmed.
(d) It enabled the scientists to understand 'singularity'

Ans: (b)

Exp:

- Every few minutes a pair of black holes smash into each other. These cataclysms release ripples in the fabric of space time known as gravitational waves.
- Gravitational waves are 'ripples' in space-time caused by some of the most violent and energetic processes in the Universe.
- Albert Einstein predicted the existence of gravitational waves in 1916 in his General Theory of Relativity.
- The strongest gravitational waves are produced by catastrophic events such as colliding black holes, the collapse of supernovae, coalescing neutron stars or white dwarf stars, etc.
- Scientists have yet again detected gravitational waves produced by the merger of two light black holes about a billion light-years away from the Earth.
- It was recorded by Laser Interferometer Gravitational-Wave Observatory (LIGO).
- **Therefore, option (b) is the correct answer.**

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