Science & Technology · GS - III

Launched on 25th December, 2021, James Webb Space Telescope has been much in the news since then. What are its unique features which make it superior to its predecessor Space Telescopes? What are the key goals of this mission? What potential benefits does it hold for the human race?

EXAM YEAR	PAPER	SUBJECT
2022	GS - III	Science & Technology

MARKS	WORD LIMIT
15	~250 words

Answer Hint

The James Webb Space Telescope (JWST) is a large infrared observatory designed to study the early universe, galaxy formation, stellar evolution and exoplanet atmospheres. Its segmented mirror, infrared instruments and cryogenic operation complement and extend the capabilities of Hubble and earlier observatories. Its discoveries can advance fundamental science and technology.

Model Answer

Introduction

Launched on 25 December 2021, the James Webb Space Telescope is a major international collaboration led by NASA with contributions from ESA and the Canadian Space Agency.

Unique Features

JWST has a 6.5-metre segmented primary mirror, substantially larger than Hubble’s 2.4-metre mirror. Its infrared instruments detect faint, distant objects whose light has been stretched by cosmic expansion. A five-layer sunshield keeps the telescope extremely cold, while its location near the Sun–Earth L2 point provides a stable observing environment. Unlike Hubble, which observes mainly in visible and ultraviolet wavelengths alongside some infrared, JWST is optimised for infrared astronomy.

Key Mission Goals

It aims to investigate the first galaxies and stars, trace galaxy evolution, examine the birth of stars and planetary systems, and study the atmospheric composition of exoplanets. It can also probe objects within our own Solar System.

Potential Benefits

JWST can deepen understanding of the universe’s origin and evolution, identify chemical signatures in planetary atmospheres and refine theories of planet formation. Its advanced detectors, optical engineering and thermal-control technologies can also contribute to future scientific instruments.

Conclusion

JWST extends humanity’s observational reach into the early universe. Although it cannot by itself confirm extraterrestrial life, its findings may transform astronomy and expand understanding of our place in the cosmos.

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