1. Examine the benefits of scientific and technological advances in deep sea ocean exploration, search of life on another planet and search of water on moon through various Government Initiative? Explain with respective programme involved

Introduction: Brief about deep sea ocean exploration

Body

- Deep sea exploration
- Life on other planet
- Search of water on moon
- Mention Government initiatives for all

Conclusion: Write importance of life exploration on other planet

Introduction

Deep-sea exploration is the investigation of physical, chemical, and biological conditions on the sea bed, for scientific or commercial purposes. Deep-sea exploration is considered a relatively recent human activity compared to the other areas of geophysical research, as the depths of the sea have been investigated only during comparatively recent years.

Body

Benefits of scientific and technological advances in Deep sea exploration

- Information from ocean exploration can help us understand how we are affecting and being affected by changes in Earth's environment, including changes in weather and climate. Insights from ocean exploration can help us better understand and respond to earthquakes, tsunamis, and other hazards.
- Fluorescence-detecting cameras to find glowing fish: One of the biggest recent discoveries made in the field of deep ocean exploration is the proliferation of biofluorescence in the darkest parts of the sea.
- Affordable aquatic drones to explore high-pressure depths: A remotely operated vehicle (ROV) can explore the tight, crushing pockets of the ocean that human divers can't reach. This technology is often costly and limited to research teams with big budgets.
- Satellite imaging for mapping the ocean floor: Satellites in orbit can estimate measurements of the peaks and valleys shaping the seabed by beaming radar pulses towards Earth and calculating the time it takes for them to bounce back.
- Swarms of mini robots that bob and float like plankton: Autonomous undersea robots come in all shapes and sizes. Mini-autonomous underwater explorers, or m-AUEs, developed by Scripps oceanographer Jules Jaffe are meant to be deployed in large groups or "swarms." The grapefruit-sized devices act like plankton, bobbing at a constant depth in the ocean and measuring factors like water temperature.

Government initiatives

In 2019, the government of India has initiated a ¹ 8,000-crore plan to explore the depths of the ocean (2) with multidimensional aims including the exploration of metals and minerals. Moreover, India has also been allotted a site of 75,000 sq. km.

Samudrayan

- India has launched its first manned ocean mission, 'Samudrayan', joining six other nations engaged in exploring the ocean depths for studies and research.
- Undertaken by the National Institute of Ocean Technology (NIOT), the Samudrayan project will be a part of the ¹ 6,000 crore Deep Ocean Mission.
- The Matsya 6000, the deep-sea vehicle under the Samudrayan initiative, is designed to carry three people in a titanium alloy personnel sphere of 2.1-metre diameter enclosed space.

Deep ocean mission

- It will be a mission mode project to support the Blue Economy Initiatives of the Government of India.
- Blue Economy is the sustainable use of ocean resources for economic growth, improved livelihoods and jobs, and ocean ecosystem health.

- The technology and expertise needed in such missions is now available with only five countries - US, Russia, France, Japan and China.
- India will now be the sixth country to have it.

Benefits of scientific and technological advances- Life on other planet

Space technology

- These satellites are used for a variety of applications including observation (by both military and civilian agencies), communication, navigation, and weather monitoring. Space stations, space telescopes and spacecraft in orbit around the Earth are also regarded as satellites.
- Communications satellites are used for a variety of purposes including television, telephone, radio, internet and military applications.
- Weather satellites: Weather monitoring satellites have also been used to assess the viability of solar panel sites by monitoring cloud cover and weather patterns. Nigeria and South Africa have successfully employed satellite-based disaster management and climate monitoring

Artificial intelligence and machine learning

- AI has proven its great potential and is a game-changer in space exploration such as charting unnoted galaxies, stars, black holes, and studying cosmic events, as well as communication, autonomous starcraft navigation, monitoring and system control.
- Search for extraterrestrial intelligence (SETI) is a collective term for scientific searches for intelligent extraterrestrial life, for example, monitoring electromagnetic radiation for signs of transmissions from civilizations on other planets.

Nanotechnology

- Nanotechnology products that could provide future space missions with unprecedented capability include smart materials (materials engineered on the nanoscale to perform a specific function), more selective and sensitive sensors, high-density electronic devices, and miniaturized spacecraft systems

Government initiatives

- The Kepler Mission is specifically designed to survey our region of the Milky Way galaxy to discover hundreds of Earth-size and smaller planets in or near the habitable zone and determine the fraction of the hundreds of billions of stars in our galaxy that might have such planets.
- Exploration of Mars: Long-term proposals have included sending settlers and terraforming the planet. Proposals for human missions to Mars came from e.g. NASA, Russia, Boeing, SpaceX, and the Inspiration Mars Foundation.
- Mars rover: As of May 2021, there have been six successful robotically operated Mars rovers; the first five, managed by the American NASA Jet Propulsion Laboratory, were (by date of Mars landing): Sojourner (1997–1997), Opportunity (2004–2018), Spirit (2004–2010), Curiosity (2012–), and Perseverance (2021–till today).
- Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) mission is a robotic lander designed to study the deep interior of the planet Mars.

In India

- Mars Orbiter Mission: Mars Orbiter Mission (MOM), also called Mangalyaan, is a spacecraft orbiting Mars since 24 September 2014. It was launched on 5 November 2013 by the Indian Space Research Organisation (ISRO).

Benefits of scientific and technological advances- Search of water on moon

- For astronauts landing on the Moon, water is necessary not only to sustain life but also for purposes such as generating rocket fuel.
- Readings from NASA's Stratospheric Observatory for Infrared Astronomy (SOFIA) indicate that water is present in Clavius Crater - one of the largest craters on the Moon. This discovery is important because water was thought to be present on the Moon only in the permanently shadowed craters near the lunar South Pole.

Government initiatives

- Chandrayaan-1 mission, NASA's Cassini and Deep Impact comet mission, and NASA's ground-based Infrared Telescope Facility checked water molecules.

Chandrayaan-2 mission

- Chandrayaan-2 is an Indian lunar mission to explore the uncharted south pole of the celestial body by landing a rover.
- Aim: To enhance understanding of the Moon, stimulate the advancement of technology, promote global alliances and inspire a future generation of explorers and scientists.
- Mission coverage: This is a unique mission that aims at studying not just one area of the Moon but all the areas combining the exosphere, the surface as well as the sub-surface of the moon in a single mission.
- The GSLV Mk-III is India's most powerful launcher to date, and has been completely designed and fabricated from within the country.

Conclusion:

Space exploration allows us to prove or disprove scientific theories developed on Earth. Studying the solar system, for example, has brought us insights into such phenomena as gravity, the magnetosphere, the atmosphere, fluid dynamics and the geological evolution of other planets.

❑