

1 Mars Missions (Source: The Indian Express)



Mars Missions



Mars missions are scientific endeavours by various countries to explore Mars and understand its geology, climate, potential for past or present life, and to develop future human exploration capabilities.

Objectives



Study the geology and evolution of Mars



Search for evidence of past or present life



Understand Martian climate and atmosphere



Map the surface and resources (water, minerals)



Test technologies for future human exploration

Why Mars?

- Closest and most Earth-like planet
- Evidence of past liquid water
- Possibility of microbial life
- Helps understand planetary evolution
- A stepping stone for future human exploration beyond Earth

Major Mars Missions

Year	Mission (Country)	Type	Key Objectives / Achievements
1960s	 Mariner (USA)	Flyby	First flyby missions to Mars (1964). Early images and data.
1971	 Mariner 9 (USA)	Orbiter	First spacecraft to orbit Mars.
1975	 Viking 1 & 2 (USA)	Lander	First successful landers; searched for signs of life.
1996	 Mars Global Surveyor (USA)	Orbiter	Mapped the entire Martian surface.
2001	 Mars Odyssey (USA)	Orbiter	Studied water, minerals and radiation environment.
2003	 Mars Express (ESA)	Orbiter	Mapped surface and studied atmosphere.
2004	 Mars Rovers Spirit & Opportunity (USA)	Rover	Studied geology and searched for past water.
2011	 Mars Science Laboratory (Curiosity Rover) (USA)	Rover	Studied habitability and climate.
2013	 Mars Orbiter Mission (MOM / Mangalyaan) (India)	Orbiter	India's first interplanetary mission; studied Martian atmosphere.
2016	 ExoMars (ESA-Roscosmos)	Orbiter + Lander (partial)	Studied atmosphere; planned rover (cancelled).
2020	 Perseverance Rover (USA)	Rover	Searched for signs of ancient life and collected samples.
2020	 Tianwen-1 (China)	Orbiter + Lander + Rover	First Chinese mission to Mars; mapped surface, explored climate and geology.
2021	 Emirates Mars Mission (Hope Orbiter) (UAE)	Orbiter	Studies Martian atmosphere and weather.
2026	 MMX (Japan)	Sample Return (planned)	Will collect samples from Mars's moons (Phobos), and return them to Earth (planned launch in 2026).
2028	 Mars Sample Return (USA-ESA, planned)	Sample Return	To return samples collected by Perseverance (planned).

Types of Mars Missions



Flyby
Passes by Mars to collect data (early missions).



Orbiter
Moves around Mars to map the surface, study atmosphere and relay data.



Lander
Lands on the surface to conduct in-situ experiments.



Rover
Explores the surface, analyses rocks and soil and searches for signs of past life.



Sample Return
Collects Martian samples and brings them back to Earth (for detailed analysis).

Significance



- Enhanced understanding of Martian geology, climate and potential habitability.
- Evidence of ancient water and organic molecules.
- Technological advancements for future human missions.
- International collaboration and scientific knowledge.
- Assessment of resources for future human exploration (e.g., water, minerals).
- Inspiration for space science and technology.

Future Prospects



- Mars Sample Return missions
- Human missions to Mars
- Search for definitive evidence of life
- Use of in-situ resources (ISRU) for sustained presence
- Long-term colonisation prospects

2 Tajikistan (Source: The Indian Express)

- **Location:** Tajikistan is a landlocked country in Central Asia.
- **Capital:** Dushanbe
- **Borders:** Afghanistan, Uzbekistan, Kyrgyzstan, and China.
- **Geography**
 - Major Mountain Range: Pamir Mountains, often called the Roof of the World.
- **International Groupings:** Collective Security Treaty Organization (CSTO), SCO.

