Chandrayaan-2:

- Chandrayaan 2 is an Indian lunar mission to investigate the south polar area of the Moon. There has never been a country that has gone there before.
- An orbiter, a rover named Pragyan, and a lander named Vikram will be carried by the launch vehicle.
- On July 22, 2019, the Chandrayaan 2 mission was launched, and land on the moon on September 7, 2019. Orbiter's mission last one year, while the lander (Vikram) and rover (Pragyan) last one Lunar day, which is equal to fourteen Earth days.

About:

- Chandrayaan is the name of the Indian Lunar Exploration Program. It means "Moon craft" in Sanskrit. The Indian Space Research Organisation (ISRO) is the brains behind it (ISRO).
- Chandrayaan is a multi-mission mission that will be carried out in three phases: Chandrayaan 1, Chandrayaan 2, and Chandrayaan 3.
- Chandrayan 1 (2008) was designed as an orbiter/impactor, Chandrayan 2 (2019) will include soft landers/rovers, and Chandrayan 3 (2024) will conduct in situ sampling.
- On July 22, 2019, a Geosynchronous Satellite Launch Vehicle Mark III launched Chandrayaan 2 to the Moon from Sriharikota Space Center (GSLV Mk III). It contains a lunar orbiter, lander, and rover, all of which were developed in the United States. The main scientific goal is to map the location of lunar water and its amount.
- Chandrayaan-2, unlike Chandrayaan-1, would attempt to soft-land its Vikram module on the lunar surface and deploy a six-wheeled Rover called Pragyaan to conduct many scientific experiments on the Moon. Chandrayaan-1 had a lift-off mass of 1380 kg, while Chandrayaan-2 has a mass of 3850 kg.

Chandrayaan 2 Components:

- The GSLV Mk-III is India's most powerful launcher to date, having been built and manufactured entirely in the country.
- Orbiter - The Orbiter will monitor the lunar surface and relay communications between Earth and Chandrayaan 2's Vikram Lander.

- Lander - India's first soft landing on the lunar surface will be accomplished by the lander dubbed 'Vikram.' 'Vikram' is named after Dr. Vikram A Sarabhai, a space pioneer who drove India's fledgling space programme.
- Rover – The rover is a 6-wheeled AI-powered vehicle called Pragyan, which means "knowledge" in Sanskrit. From the landing site on the moon, the Rover can go up to 500 metres (half a kilometre).
- The Chandrayaan 2 mission will attempt to deploy a lander and a lunar rover in a high plain between two craters known as Manzinus C and Simpelius N. The location is roughly 70 degrees south latitude.

Importance of Chandrayaan 2 Mission:

- The first spacecraft to land softly on the Moon's south polar zone.
- The first Indian mission to attempt a soft landing on the moon's surface using indigenous technology.
- The first Indian expedition to examine the lunar surface using indigenous technologies.
- After the United States, Russia, and China, the United Kingdom became the fourth country to soft-land on the lunar surface.
- The goal is to improve our understanding of the Moon through this initiative, with discoveries that will benefit India and humanity as a whole.
- This lunar expedition's findings and experiences may inspire future expeditions to the farthest reaches of the universe.

Outcomes:

- The Chandrayaan-2 mission, India's second to the Moon, failed to land softly on the lunar surface.
- In the closing minutes, the lander and rover malfunctioned and crashed, destroying the spacecraft.
- In just two years, the Chandrayaan-2 mission's Orbiter and other sensors have obtained a plethora of new data that has added to our understanding of the Moon and its environment.
- Despite the loss, the orbiter and other components of the project have been collecting data normally. The Indian Space Research Organisation (ISRO) has

disclosed the data collected by the scientific payloads up to this point, some of which had yet to be analysed and reviewed.

Information gathered:

- Water molecule presence on the Moon: The mission has provided the most exact data on the presence of H2O molecules on the Moon to date.
- Minor elements: For the first time, remote sensing has detected the presence of chromium, manganese, and sodium. The discovery could pave the way for a better understanding of magmatic evolution on the Moon, as well as deeper insights into nebular circumstances and planetary differentiation.
- Information on solar flares: For the first time, a substantial number of microflares have been recorded outside the active zone, which, according to ISRO, "has great ramifications on the understanding of the mechanism behind heating of the solar corona," which has been a long-standing mystery.
- Exploration of persistently darkened regions, craters, and boulders beneath the regolith, the loose deposit that makes up the top surface and extends up to 3-4 metres in deep. This should aid scientists in determining future landing and drilling sites, including those for human missions.

Chandrayaan-3

India wants to launch the Chandrayaan-3 mission in August 2022, according to the Department of Science.

About:

- The Chandrayaan-3 mission is a follow-up to Chandrayaan-2, which landed a rover on the lunar South Pole in July 2019.
- The failure of the Vikram lander led to the development of a new mission to demonstrate the landing capabilities required for the Lunar Polar Exploration Mission, which is planned for 2024 in collaboration with Japan.
- It will be equipped with an orbiter as well as a landing module. However, unlike the Chandrayaan-2, this orbiter would not be equipped with scientific instruments.
- Its mission will be limited to transporting the lander to the moon, overseeing the landing from orbit, and communicating with the lander and the earth station."

Features:

- Chandrayaan 3 will be launched into space with a lander and a rover. There will be no orbiter like Chandrayaan 2.
- India wants to investigate the Moon's surface, particularly parts that haven't seen sunlight in billions of years. In these darker parts of the lunar surface, scientists and astronomers suspect the presence of ice and huge mineral stores.
- Furthermore, this exploration will not be limited to the surface, but will also include research into the subsurface and exosphere.
- This spacecraft's rover will communicate with Earth through an orbiter borrowed from Chandrayaan 2.
- It will photograph the surface from a distance of 100 kilometres from the lunar orbit.
- ISRO's Chandrayaan 3 lander will be propelled by four throttle-able engines. It will also be equipped with a Laser Doppler Velocimeter (LDV).

MCQs for practice:

Q. Consider the following statements regarding Chandrayan 2:

1. It is launched by Geosynchronous Satellite Launch Vehicle Mark III (GSLV Mk III) launched to the Moon from Sriharikota Space Center.
2. It has landed on North Pole of moon.
3. After the United States, Russia, and China, the United Kingdom became the fourth country to soft-land on the lunar surface.

Select the correct option:

a. 1 only
b. 1&2 only
c. 1&3 only
d. 2&3 only

Correct answer: C

- It is launched by Geosynchronous Satellite Launch Vehicle Mark III (GSLV Mk III) launched to the Moon from Sriharikota Space Center.
- It has landed on South Pole of moon.

- After the United States, Russia, and China, the United Kingdom became the fourth country to soft-land on the lunar surface.

Q. Consider the following statements regarding Chandrayan 3:

1. It will do exploration of surface and sub surface levels.
2. It will be launched into space with a lander, rover and orbiter.

Select the correct option:

a. 1 only
b. 2 only
c. Both 1&2
d. None of the above

Correct answer: A

1. It will do exploration of surface and sub surface levels.
2. It will be launched into space with a lander, rover only.

Mains question for practice:

Q. What is the importance of South Pole of moon? What are the major missions of India for it?