

## Topic: Andromeda Galaxy.

Q: Write a note on neighbouring galaxy?

Andromeda Galaxy (M31) is one of the billions of galaxies known to exist in the observable universe. It is the nearest major spiral galaxy to our own Milky Way, located approximately 2.5 million light-years away.

### Size and Structure:-

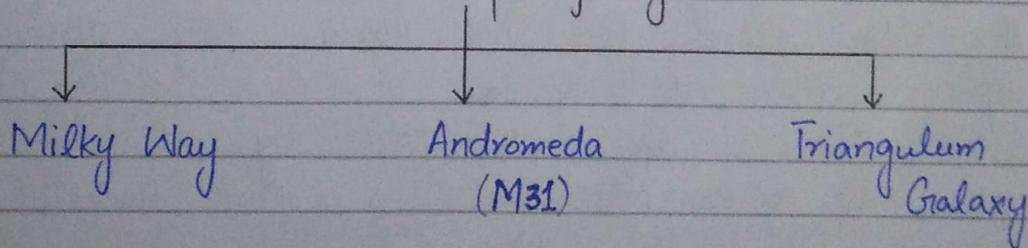
Andromeda is a giant neighbouring galaxy with a diameter of about 220,000 light years.

### Stellar Population:-

It contains around 1 trillion stars, which is significantly more than the 200 to 400 billion stars estimated for the Milky Way.

### Visibility:-

It is the most distant object visible to the naked eye from Earth on a clear, dark night. It belongs to the Local Group of galaxies.



Andromeda was first recorded by the Persian astronomer Abd-al-Rahman al-Sufi in 10<sup>th</sup> century. It helped astronomers understand the galaxy formation, evolution and existence of galaxies outside the Milky Way.

## Future with Andromeda:-

Andromeda is moving toward the Milky way at a speed of about 250,000 miles per hour and is predicted to collide and merge with it in about 4-5 billion years.

Thus, Andromeda is similar to our galaxy, consisting spiral arms, star clusters, gas and dust.

Q: Differentiate between a solar flare and coronal mass ejection (CME)?

### Solar Flare:-

A solar flare is a sudden burst of energy and light, caused by the rapid release of magnetic energy as intense electromagnetic radiation.

### Key Characteristics:-

1. Releases light and radiation (X-rays, ultraviolet, gamma rays).
2. Happens very fast (seconds to minutes).
3. A solar flare does not throw large amounts of matter into space.
4. Solar flares are classified by intensity into A, B, C, M and X-class flares (X being the strongest)

### Effects on Earth:-

1. It can disrupt high-frequency radio communications and GPS signals.
2. Strong flares may affect satellites and spacecraft electronics.
3. It does not directly harm humans on

ground because Earth's atmosphere and magnetic field block harmful radiation.

**Coronal Mass Ejection:**  
A CME is an enormous eruption of plasma and magnetic field from the Sun's outer atmosphere (corona) that blasts billions of tons of solar material into space.

**Key Characteristics:**

1. CME's often follow or occur ~~between~~ with solar flares but are distinct phenomena.
2. They reach Earth in 15 hours to several days.
3. The cloud expands enormously, often spanning millions of miles across space.

**Effects on Earth:**

1. When a CME, hits Earth it can cause a geomagnetic storm, - a disturbance in Earth's magnetic field.
2. Effects of geomagnetic storms include:

Auroras

Effects of  
geomagnetic  
storms

Power grid  
fluctuations

Increased drag  
on satellites

3. CMEs carry embedded magnetic fields that interact strongly with Earth's magnetosphere, enhancing storm effects.

So, the difference between a solar flare and CME includes their nature of phenomenon, speed of impact on Earth, mass involved and its major effects on Earth. Simply, a solar flare is an explosion of energy, while a CME is an explosion of matter and magnetic field.

- Connections between solar flares and CMEs:-
  - i- Both originate from magnetic activity on the Sun.
  - ii- A powerful flare can be accompanied by a CME, but not all flares have associated CMEs.
  - iii- CMEs tend to carry much more mass and magnetic field than flares, and their arrival on Earth causes more long-lasting space weather effects.

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in gsa, attempt the differences qs in a tabular form .....