

Universe – SSC Notes

1. Definition of Universe

- **Universe:** Everything that exists – including space, stars, planets, galaxies, and all forms of matter and energy.
- **Components:** Stars, planets, moons, comets, asteroids, meteoroids, cosmic dust, dark matter, dark energy

2. Origin of the Universe

Big Bang Theory (Most Accepted)

- Proposed by Georges Lemaître
- **Key Points:**
 - Universe began 13.8 billion years ago from a singular point
 - Rapid expansion → Formation of matter, galaxies, stars, planets
 - Evidence: Cosmic Microwave Background Radiation (CMBR), Redshift of galaxies

Steady State Theory

- Universe has no beginning or end, always expanding
- Constant creation of matter to maintain density
- Less accepted today

3. Components of Universe

Component	Description
Galaxy	Large system of stars, gas, dust → Milky Way is our galaxy
Stars	Luminous celestial bodies → Sun, Sirius, Betelgeuse
Planets	Non-luminous bodies orbiting stars → Mercury, Venus, Earth, Mars
Moons / Satellites	Natural bodies orbiting planets → Moon, Phobos, Deimos
Comets	Ice & dust bodies → Long elliptical orbit → “Dirty snowballs”
Asteroids	Small rocky bodies → Mostly between Mars & Jupiter (Asteroid Belt)
Meteoroids	Small rock/metal fragments → Meteors when entering atmosphere
Nebula	Clouds of gas & dust → Birthplace of stars
Black Holes	Regions of extreme gravity → Nothing escapes, not even light
Dark Matter & Dark Energy	Invisible, forms ~95% of universe → Explains gravitational effects

4. Solar System

- **Definition:** Sun + planets + moons + comets + asteroids + meteoroids
- **Planets:**
 - **Inner / Terrestrial** → Mercury, Venus, Earth, Mars

- Outer / Gas Giants → Jupiter, Saturn, Uranus, Neptune
- Other Objects:
 - Asteroid Belt → Between Mars & Jupiter
 - Kuiper Belt → Beyond Neptune → Pluto, dwarf planets
 - Oort Cloud → Icy bodies, source of long-period comets

5. Important Astronomical Phenomena

1. **Eclipse**
 - Solar Eclipse → Moon blocks Sun → New Moon
 - Lunar Eclipse → Earth blocks Sun → Moon in Earth's shadow
2. **Meteor Shower**
 - Meteors entering atmosphere → Burning → Shooting stars
3. **Comet Appearance**
 - Periodic comets → Halley's Comet (Every 76 years)
4. **Aurora**
 - Northern / Southern lights → Interaction of solar wind & Earth's magnetic field
5. **Redshift & Blueshift**
 - Redshift → Galaxies moving away → Universe expanding
 - Blueshift → Galaxies moving closer

6. Important SSC Points – Universe

- Universe age → ~13.8 billion years
- Theory of origin → Big Bang → Georges Lemaître
- Galaxy of Earth → Milky Way
- Sun → Star → Center of Solar System
- Planets → 8 (Mercury → Neptune), Pluto = dwarf planet
- Eclipses → Solar (New Moon), Lunar (Full Moon)
- Shooting stars → Meteors → Meteor showers (Perseids, Leonids)
- Expanding universe → Evidence → Redshift of galaxies