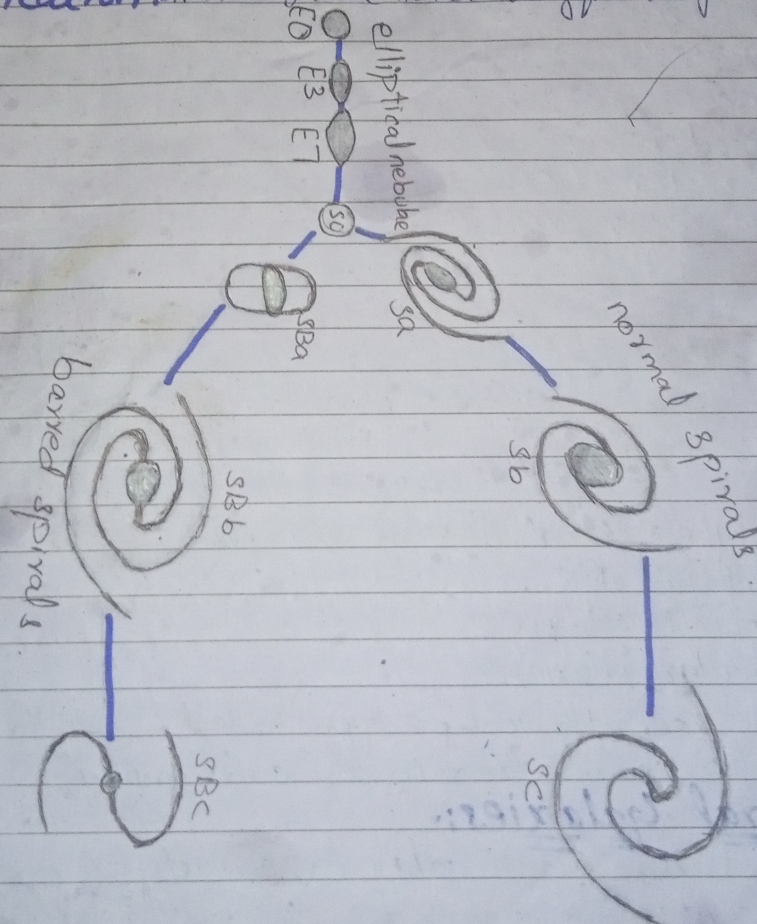


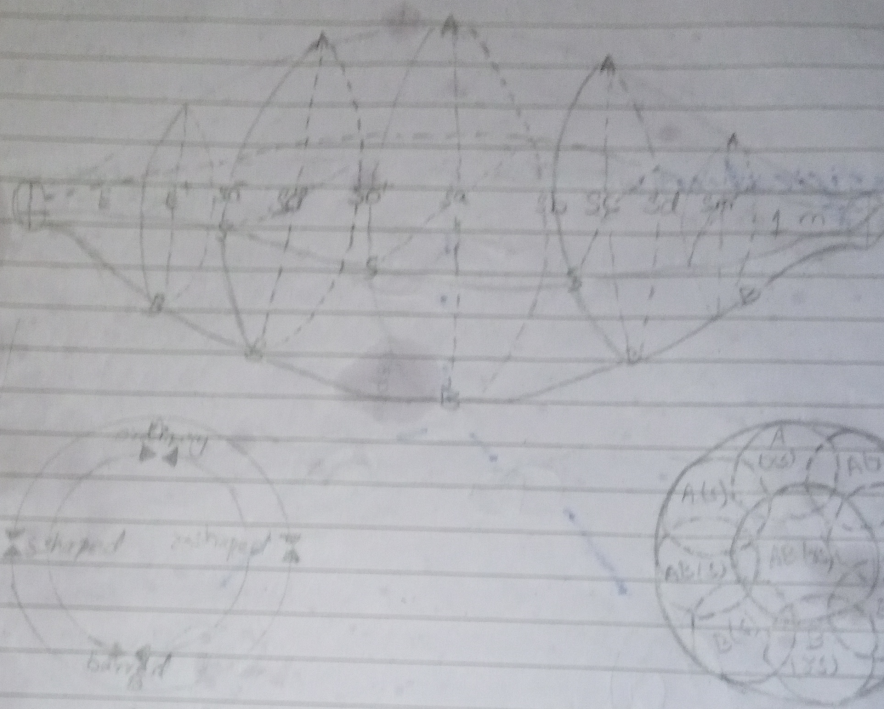
Unit :- Physical Sciences:-
Topic :-

Galaxy :- A galaxy is a gravitationally bound system containing black hole, stars, stellar remnants, interstellar gas & dust (nebulae), planets, dwarf planets, small solar system bodies, satellites etc. are all contained within a galaxy.
There are billions of galaxies within our universe.

Classification :- According to the Hubble Tuning fork diagram.



Observations of Galaxy Structure & Dynamics



→ The types of galaxies are as follow.

- * Spiral galaxies.
- * Elliptical galaxies.
- * Lenticular galaxies.

→ more recently another type called Irregular galaxies have also been added to the categorization.

(i) Spiral Galaxies:-

• Structure, spiral galaxies consist of a flat, rotating disk containing stars, gas, & dust along with a central bulge made up mostly of older stars. The disk often features spiral arms that emanate from

The central bulge

- Subtypes:
 - Normal spirals (sa, sb, sc): classified based on their spiral arms & the size of their central bulge. sa galaxies have tightly wound arms & large bulges, while sc galaxies have loosely wound arms & smaller bulges.
 - Barred spirals (SBa, SBb, SBc): Similar to normal spirals but have a central bar structure made up of stars. the arms of barred spirals originate from the ends of the bar.
- Examples: The Milky way, Andromeda (M31)

Elliptical Galaxies:

- Structure: Elliptical galaxies range from nearly spherical (E0) to highly elongated (E7). they have a smooth, featureless light profile & lack the spiral arms seen in spiral galaxies.
- Characteristic: they contain older, red stars & have very little gas or dust, which means minimal new star formation. these galaxies are more common in large galaxy clusters.
- Examples: M87, Centaurus A.

Lenticular Galaxies (SO):

- Structure: Lenticular galaxies are an intermediate form b/w spiral & elliptical galaxies. they have a central bulge & a disk like spirals but lack significant spiral arms.
- Characteristic: they contain older stars & very little interstellar matter, leading to minimal new star formation.

- Examples: NGC 5866.

Irregular Galaxies:

- Structure: Irregular galaxies do not fit into the categories of spiral or elliptical galaxies. they

have an irregular shape with no ^{defined} structure.
characteristics: Often rich in gas & dust, leading to significant star formation. They may have been distorted by gravitational interactions or collisions with other galaxies.

Examples: Large Magellanic cloud, Small Magellanic cloud.

Additional Classification.

Dwarf Galaxies:

- Structure: Smaller in size & lower in luminosity compared to regular galaxies. They can be found in various forms, including dwarf ellipticals, dwarf irregulars, & dwarf spheroidals.

- Characteristics: Dwarf galaxies often orbit larger galaxies & can be abundant in galaxy clusters.

- Examples: Draco Dwarf, Fornax Dwarf.

Peculiar Galaxies:

- Structure: Galaxies with unusual shapes or features that do not fit into the standard categories, often due to gravitational interactions, mergers, or other processes.

- Examples: Antennae Galaxy (NGC 4038/NGC 4039).

Ring Galaxies:

- Structure: These galaxies have a ring-like structure of stars & gas surrounding a central core. The ring is typically formed by a collision with another galaxy.

- Examples: Hoag's Object.

Conclusion: Galaxies are not only fascinating in their diverse structure but also crucial to understanding the large-scale structure of the universe. Each type of galaxy provides insights into the processes of cosmic evolution, star formation,

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The Milky Way: The earth belongs to the Milky Way galaxy. It is a spiral shaped galaxy with a bulge at the center & spiral arms. ~~with it makes with~~ ~~100,000 stars~~ it spreads about 100,000 light years in diameter. It consists of four major arms named as Perseus, Sagittarius, Centaurus & Cygnus.

The galaxy makes with 100-400 stars. It is the home to our solar system which is Orion & Cygnus arm.

Distance: The distance b/w sun & galactic center is 26,000 - 27,200 light year.

Future of the Milky Way galaxy: In approximately 4.5 to 5.5 billion years, the Milky Way & the Andromeda Galaxy are predicted to collide & merge, forming a new, large elliptical galaxy called Milkomeda.

Giordano Bruno: A cosmologist was hanged, naked & burned to death only for suggesting that the stars in the sky were distant suns so surrounded by their own planets.

And Yet it moves:

Galileo, was an Italian astronomer, physicist & engineer, sometimes described as a polymath.

Developers of the thermoscope, military compasses. With an improved telescope he built, he observed the stars of the Milky Way, the phases of Venus, the four largest satellites of Jupiter, Saturn's rings, lunar craters & sunspots. He also built an early microscope.

Galileo was found "vehemently suspect of heresy" for having held the opinions that the sun lies motionless at the center of the universe, that the Earth is not its center ~~of the universe~~ & moves.

& it was declared contrary to the holy scripture. He was required to "abjure, curse & detest" those opinions. According to popular legends Galileo allegedly muttered the rebellious phrase "And yet it moves".