

# Week Quiz Review

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## Classes Materials

### Modern Pic of Galaxy

- diameter 100,000 l.y.
- radius 50,000 l.y.
- thickness 1,000 l.y.
- number of stars 200 billions

Half of the visible matter in our galaxy appears to be in stars, and the other half makes up the Interstellar Medium (**ISM**). It absorbs and scatters visible light, and as a result it masks most of the milky way. We tend to use infrared to observe galaxy. ISM also radiates energy depending on what stage of the gas-star-gas cycle.

Supernova emits a lot that can create bubbles around the ISM's hot air. 20% - 50% are in ISM are bubbles.

As atomic hydrogen cools further to 10 - 30 K, it forms molecular Hydrogen. The cold clouds' cores collapse into protostars. Stars only form in the place where we have cold gas, which is the center line of galaxy.

## Stellar Orbits in the Galaxy

Stars in the bulge and halo all orbit the Galactic center, but in randomly distributed directions and inclinations relative to the disk, and with much higher average velocities than stars in the Milky Way's Disk. They do bobble up and down quite a bit though, because of

- the gravitational pull from nearby objects.
- the combined pull of the entire disk.

The reason why stars orbit around the center of galaxy is because there is a center of mass. This is not because there is a dominant things in the center.

There are some dark objects at the center location of the galaxy. We call as Sgr A. Coming within 90 AU and reaching a top speed. In order to reach that speed around Sgr A, the mass should be huge as 4 millions mass of sun.

We are still wondering how the blackhole form.

Estimate the number of alien species in our galaxy that are capable of communicating with us. **Drake's Equation** doesn't really provide the answer but break the question into several parts.

1. How many habitable planets are there in our galaxy?

Only those stars at around the suns mass or lower can at least required for intelligent life to exist. While most stars are lower than the mass of the sun. Proxima Centauri is an M dwarf with a planet in its "habitable zone". (which is common). But moons of Jupiter and Saturn also suggests that the water can exist on planets on objects out of habitable zone.

2. What fraction of those planets ever had life?

Roughly 1 in 10 billion phenomenon that life might exist. But based on the fossil record cast in the rock shows that simple life arose very quickly after the surface of Earth cooled down. So *simple life* might arise in a much wider range.

3. What fraction of those habitable planets ever had intelligent life, capable of communicating.

Life might arise on many worlds without any species ever evolving into a form capable of space travel or interstellar communication.

4. What fraction of all those that have ever existed, exist **now**?

If there have been millions of extraterrestrial space faring civilizationjthroughout Galactiv History, then under all but th emost spocalyptic assumptions many of them stilll exist right now.

We can send self-replacing machines to nearby planets.

Solutions are there to Fermi Paradox:

## Quiz Materials

### Galaxy

- Disk: flattened, thin stretch of stars.
- Bulge: Elliptical shaped, lots of concentrated stars.
- Halo: Large region outside if disk encompassing the entire Galaxy.

### Interstellar Medium (ISM)

Only disk and bulge we see lots of gass, dust and other bits of matter between stars, which is called interstellar medium. No stars formation in Halol.