IT IAS Toppers

Are neutrinos their own antiparticles?

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Recently, Physicists working with the Kamioka Liquid Scintillator Antineutrino Detector (KamLAND) reported they couldn't find signs that neutrinos are Majorana fermions.





[ref: the hindu]

About anti-particles:

- Anti-particles are **subatomic particles** having the same mass as one of the particles of ordinary matter but opposite electric charge and magnetic moment.
- Every elementary particle has an anti-particle. If the two meet, they will destroy each other in a flash of energy.
- The electron's anti-particle is the **positron**. Similarly, neutrinos have anti-neutrinos.
 - **Positrons** are antimatter, that is, positively charged beta-rays.
- Electron is **distinguishable** from a positron because they have opposite charges.
- One way to classify subatomic particles is as matter particles and force-carrying particles.

About Search for a Majorana neutrino:

- KamLAND looks for an event called neutrino less double beta decay (stylized as 0???).
- In normal double beta-decay, two neutrons in an atom turn into two protons by emitting two electrons and two electron anti-neutrinos (a type of anti-neutrino).
- In 0???, the anti-neutrinos aren't emitted, which can happen only if anti-neutrinos are just different kinds of neutrinos.
- The nuclei of xenon-136 atoms are known to **undergo double beta decay**.
- The **mass of the electron**, the next lightest known particle, is 511 keV, so this limit is about 5,000-10,000 times lighter than that.
- KamLAND uses a large number of atoms that can undergo 0???, thus increasing the odds of





spotting one event.