Scientists have Discovered an Unprecedented Quadruple Star System in the Milky Way

An international team of scientists announced the discovery of an extremely rare quadruple star system, named UPM J1040-3551 AabBab, in the Milky Way. The system consists of two young red dwarfs being orbited by a pair of cold brown dwarfs. The discovery is the first of its kind to include two brown dwarfs orbiting two stars.

Composition and structure of the system

- **Location**: The system is approximately 82 light-years from Earth in the constellation Antlia.
- **Hierarchical orbit**: The four stellar objects are gravitationally bound in a complex, hierarchical arrangement:
  - **Inner binaries**: The red dwarfs form one binary pair, while the two brown dwarfs form a second binary pair.
  - **Outer orbit**: These two binaries are separated by a vast distance of 1,656 astronomical units and orbit each other over a period of more than 100,000 years.
- **Stellar components**:
  - **Red dwarfs**: The brighter pair, UPM J1040-3551 Aab, are M-type red dwarfs with temperatures around 3,200 Kelvin and masses roughly 17% of the Sun's.
  - **Brown dwarfs**: The cooler, fainter pair, UPM J1040-3551 Bab, are T-type brown dwarfs that are roughly the size of Jupiter but 10 to 30 times more massive. Brown dwarfs are often called "failed stars" because they do not have enough mass for sustained hydrogen fusion.

Significance for Brown Dwarf Research:

- It's the first time a quadruple system with a pair of T-type brown dwarfs orbiting stars has been found.
- Brown dwarfs are hard to study because they are faint and cool, making it difficult to determine their age and mass.
- Because the age of the red dwarf stars is more easily determined, they can act as a reference to help scientists accurately age the companion brown dwarfs.

Practice Questions:

1. **Recently, scientists discovered a rare quadruple star system, UPM J1040−3551 AabBab, in the Milky Way galaxy. With reference to this discovery, consider the following statements:**

   I. The system consists of two red dwarf stars and two brown dwarf stars

   II. Brown dwarfs are often called "failed stars" because they do not have enough mass to sustain hydrogen fusion

   III. The brown dwarfs in this system are larger and brighter than the red dwarf stars

   IV. This is the first time a quadruple system with this specific configuration has been discovered.

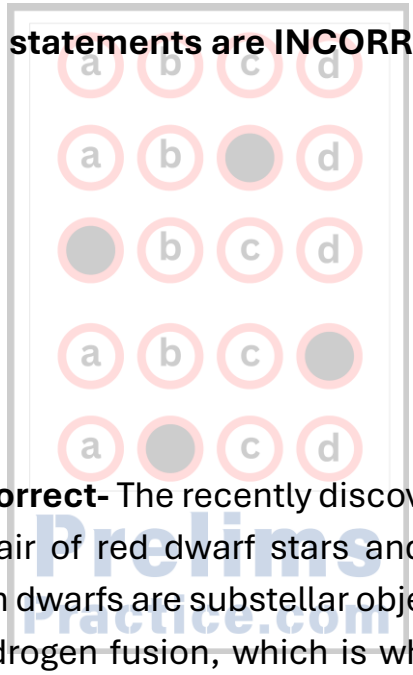
   How many of the above statements are INCORRECT?

   a) Only one

   b) Only two

   c) Only three

   d) All four



Answer: a

Explanation: Statement I is correct- The recently discovered system, UPM J1040−3551 AabBab, is composed of a pair of red dwarf stars and a pair of brown dwarf stars. **Statement II is correct-** Brown dwarfs are substellar objects that form like stars but lack sufficient mass to sustain hydrogen fusion, which is why they are often called "failed stars". **Statement III is incorrect-** Brown dwarfs are significantly fainter and cooler than red dwarfs, emitting almost no visible light. In the UPM J1040−3551 AabBab system, the red dwarfs are much brighter than the brown dwarfs. **Statement IV is correct-** This is the first known quadruple system consisting of two brown dwarfs orbiting a pair of red dwarf stars. This specific configuration had never been observed before.

Class Discussion Space