CENTRIPETAL FORCE & GRAVITY

Units 14,8

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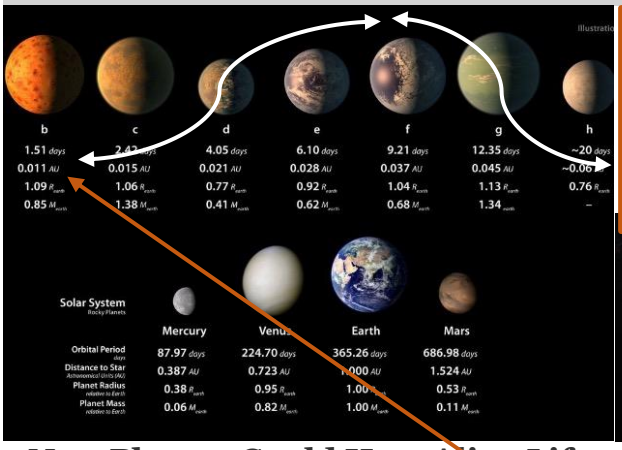
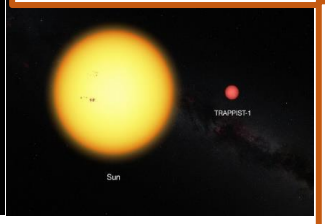
7 Earth-Size Planets Orbit Dwarf Star, NASA and European Astronomers Say





INTRODUCTION: This application's goal is to find mass of Trappist star using period (T) and distance (R) of Trappist moon b is from Trappist star. Europe Space Agency states period of moon b is 1.5 days(T) around Trappist star and distance (R) about Trappist star is 0.011 AU. Trappist b moon stays in orbit about Trappist star due to **Gravitational pull of Trappist star. G Mm/R^2 = mv^2/R**

where v = R 2π/T , thus G M/R^2 = R^2 $4\pi^2/T^2R$, or M = $[4\pi^2/G][R^3/T^2]$
This last equation is called Kepler's 3rd. law. G = 6.67 X 10^{-11} N $m^2/kg.^2$
HINTS: 24 hrs. = 1 day , 3600 s. = 1 hr., 1000 m. = 1 km. , 1 AU = 1.5 X 10^5 m. = Sun – earth dis., sun mass = 2 X 10^{30} kg.

7 New Planets Could Host Alien Life

These new Earth-size planets orbit a dwarf star named Trappist-1 about 40 light years from Earth. Some of them could have water on their surfaces. Not just one, but seven Earth-size planets that could potentially harbor life have been identified orbiting a tiny star not too far away, offering the first realistic opportunity to search for signs of alien life outside the solar system. The planets orbit a dwarf star named Trappist-1, about 40 light-years, or 235 trillion miles, from Earth. That is quite close in cosmic terms, and by happy accident, the orientation of the orbits of the seven planets allows them to be studied in great detail. One or more of the exoplanets in this new system could be at the right temperature to be awash in oceans of water, astronomers said, based on the distance of the planets from the dwarf star. "This is the first time so many planets of this kind are found around the same star," Michael Gillon, an astronomer at the University of Liege in Belgium and the leader of an international team that has been observing Trappist-1, said during a telephone news conference organized by the journal Nature, which published the findings on Wednesday.
Astronomers always knew other stars must have planets, but until a couple of decades ago, they had not been able to spot them. **Now they have confirmed more than 3,400, according to the Open Exoplanet Catalog. (An exoplanet is a planet around a star other than the sun.)** The authors of the Nature paper include Didier Queloz, one of the astronomers who discovered in 1995 the first known exoplanet around a sunlike star. While the Trappist planets are about the size of Earth — give or take 25 percent in diameter — the star is very different from our sun. **(((Trappist-1 is about 8 percent the size of the sun.))))** Trappist-1 periodically dimmed noticeably, indicating that a planet might be passing in front of the star, blocking part of the light. From the shape of the dips, the astronomers calculate the size of the planet. All seven are very close to the dwarf star, circling more quickly than the planets in our solar system. **(((The innermost completes an orbit in just 1.5 days. The farthest one completes an orbit in about 20 days.)))** Because the planets are so close to Trappist-1, they have quite likely become "gravitationally locked" to the star, always with one side of the planets facing the star, much as it is always the same side of Earth's moon facing Earth.

QUESTIONS: (a) Find period (T) of Trappist moon b in seconds? (b) Find radius (R) of Trappist moon b around Trappist star? Find R in meters. , (c) Article states mass of Trappist star is 8 % of our sun. Find mass of Trappist star in kilograms? (d) Find mass of Trappist Star using Kepler's 3rd law, (e) How do (c) and (d) compare?

ANSWERS: (a) T = 1.296 X 10^5 s., (b) R = 1.67 X 10^9 m., (c) ~ 0.16 X 10^{30} kg. (d) 0.167 X 10^{30} kg., (e) Compare well!

EXTRA EXTRA CREDIT: Find Mass of Trappist star using one or more other moon's of Trappist Star. The graphic In upper left lists the R and T of other six moons.