CENTRIPETAL FORCE & GRAVITY Units 14 & 8

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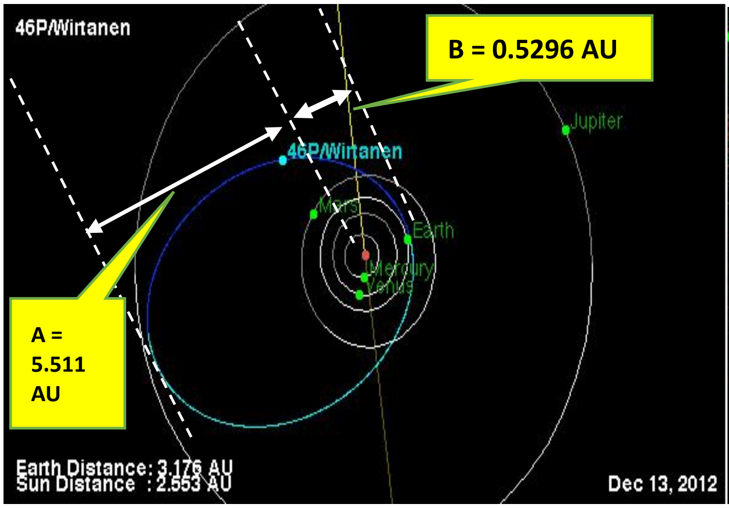
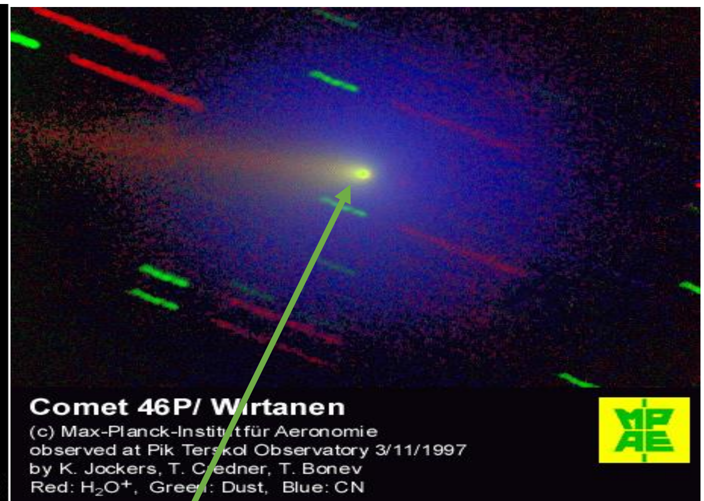
& New York Times , February 9 , 2017 by Nicholas St. Fleur . Dedicated to my HS Math teacher, Mr. Peters @ Roger Bacon HS

Lunar Eclipse and ((Green Comet)Make for Busy Friday Night in the Sky





Two celestial events will take place on Friday night: a lunar eclipse and the passing of a comet.
While both sound significant, neither will be much of a spectacle for the casual skygazer. The eclipse will be a penumbral lunar eclipse, meaning that only a portion of Earth's shadow will cover the moon. Unlike a total lunar eclipse, where the entire moon takes on a reddish color from being engulfed by the Earth's shadow, the moon will appear only slightly darker than usual during Friday's eclipse.The next event, the **passing of Comet 45P**/Honda-Mrkos-Pajdušáková, will also not be very eye-catching for most people. **(((Comet 45P circles the sun about every five years))).** On Friday night and early Saturday morning, it will be about seven million miles away from Earth, the closest it comes during its orbit. That's about 30 times the distance between Earth and the moon. Because it's still relatively far, it will be very hard to see without binoculars or a telescope. If you are able to get one of those tools, **the comet should appear as a green dot in the sky because of its chemical components.** The best time to try to see it will be in the early hours of Saturday morning, around 3 a.m. Eastern time, but don't get your hopes up. "It's not going to be something that you can just look up and say 'Oh wow!,'" said Michael A. Disanti, a comet scientist at NASA Goddard who has been closely following Comet 45P. "I would not claim that it's a great viewing opportunity for the public." While Comet 45P's visit isn't a once-in-a-lifetime opportunity for skygazers, it is important for scientists, according to Geronimo Villanueva, a planetary scientist from NASA Goddard. The close pass will allow researchers to take better images of the comet, and further determine what it is made of and where it came from, he said.

INTRODUCTION: Purpose of this application is to find mass of our sun (known to be 1.989×10^{30} kg.) using the period (T) of comet 45P and its Wikipedia found elliptical maximum (5.511 AU = A) and minimum (0.5296 AU = B) distances from the sun. 1 AU (astronomical unit) = 1.5×10^{11} m. Finding the mass of our sun is made possible by equating gravity as the force which causes the centripetal force here. Kepler's 3rd Law Thus, $G\,m\,M/R^2 = m\,v^2/R$, and $v = R\,\omega$ where $\omega = 2\pi/T$, solving for M yields: $M = [4\pi^2/G](R^3/T^2)$. In graphic above A & B are semi major and semi minor axis of comet 45P's elliptical orbit of sun.

QUESTIONS: (a) Find R in AUs? R is mean of minimum + maximum elliptical orbit distances from the sun. Thus, R = (minimum + maximum)/2. (b) Find R in units of meters? (c) Convert 5.25-year period (T) into seconds? Article said the period is 5 years, but NASA/Wikipedia gives T = 5.25 years. (d) Find mass of our sun using R & T for this comet 45P ?, (e) How well does calculated mass of sun compare with NASA found sun mass of 1.989×10^{30} kg. ?

HINTS: G = gravitational constant = 6.67×10^{-11} N $m^2/kg.^2$, 24 hrs./day, 365 days/ year, 3600 s./hr.

ANSWERS: (a) R = 3.02 AU, (b) R = 4.53×10^{11} m.), (c) T = 1.656×10^8 seconds, (d) 2.0×10^{30} kg.,(e) Quite close. Happiness!