

CENTRIPETAL FORCE FROM GRAVITY

COMET 45P

Unit 14 & 8 Dr. John P. Cise, Professor of Physics, Austin Com. College, Austin Tx.

jpcise@austincc.edu & New York Times , February 9, 2017 by Nicholas St. Fleur. Dedicated to my 1964 Physics Prof.: Mr Hart

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



A penumbral lunar eclipse, similar to this one seen from Manila in February 2009, will occur Friday night.

INTRODUCTION: Gravity keeps all objects in orbit about the sun: planets, meteors, comets like 45P in this article.

$GmM/R^2 = m v^2/R$, where $v = R \omega = R2\pi f = 2\pi R/T$

$GM/R^2 = [4\pi^2 R^2/T^2] /R$

$M = [4\pi^2/G] [R^3/T^2]$ Kepler's 3rd. Law

NASA has found Comet 45P period of orbit to be 5.26 years (1,921.8716 days). Also, NASA confirms comet 45P's semimajor axis (radius of orbit R) to be 3.02517589 AU (astronomical unit = distance from center of earth to center of sun = 1.5×10^{11} meters = 93,000,000 miles).

QUESTIONS: (a) Find the period (T) in seconds?, (b) Find Semimajor axis (R) in meter units?, (c) Using comet 45P's R & T, find mass of our sun?, (d) How well does computed M_{SUN} compare to actual NASA stated mass of sun of 2×10^{30} kg. ?

HINTS: $G = 6.67 \times 10^{-11} \text{ N m}^2 / \text{kg}^2$, 24 hrs./day, 3600 s./hr.

ANSWERS: (a) $T = 1.66 \times 10^8 \text{ s.}$, (b) $R = 4.526 \times 10^{11} \text{ m.}$

(c) $M_{SUN} \sim 2.0 \times 10^{30} \text{ kg.}$, (d) Computed & NASA #s compare.

EVENT 1: Two celestial events will take place on Friday night (Early February 2017): a **lunar eclipse** (earth's shadow on moon) 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. "These things are very subtle," said Noah Petro, a research scientist at NASA's Goddard Space Flight Center. "If it's a cloudy night you might not even notice it." The best time to try and see the eclipse is around 7:44 p.m. Eastern time. That's when part of the moon's top will most noticeably appear gray.

EVENT 2: 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. (Thus $T \sim 5 \text{ yrs.}$)** 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.