

Kepler sheet #5/6

Use Tethys to determine the K constant for Saturn. Now using this K value find the speed of a satellite that is put into orbit around Saturn at a height or altitude of 600 km.

#5

$R_s = 2.94 \times 10^8 \text{ m}$
 $T = 1.4 \text{ d} = 1.4 \times 24 \times 3600 \text{ s} = 116640 \text{ s}$
 $R_T = 1.1 \times 10^9 \text{ m}$
 $T = 163080 \text{ s}$

$K = \frac{R^3}{T^2} = \frac{(2.94 \times 10^8 \text{ m})^3}{(116640 \text{ s})^2} = 9.56 \times 10^{14} \frac{\text{m}^3}{\text{s}^2}$

#6

$R_o = R_s + \text{Alt.} = 6.09 \times 10^7 \text{ m} + 600,000 \text{ m} = 6.09 \times 10^7 \text{ m}$

$T^2 = \frac{R^3}{K}$
 $T^2 = \frac{(6.09 \times 10^7 \text{ m})^3}{9.56 \times 10^{14} \frac{\text{m}^3}{\text{s}^2}} = 3.62 \times 10^8 \text{ s}^2$
 $T = 15370.82 \text{ s}$

$V = \frac{2\pi R}{T}$
 $V = \frac{2\pi(6.09 \times 10^7 \text{ m})}{15370.82 \text{ s}} = 24881.69 \text{ m/s}$

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