§12.2 Planetary & Satellite Motion

Geostationary orbit - when the satellite is always directly above the same spot on the earth.
(Geosynchronous)

- the satellite must have the same period as the Earth rotating on its axis (24h)

MP | 589

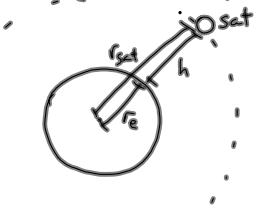
$T = 24h$

$m_{earth} = 5.98 \times 10^{24} kg$

$V = ?$

$h = ?$

$r_e = 6.38 \times 10^6 m$



Using Newton's Hypotheses:

$$F_g = F_c$$

$$\frac{G m_{earth} m_{sat}}{r^2} = \frac{m_{sat} 4\pi^2 r}{T^2}$$

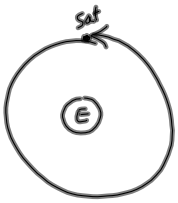
$$r^3 = \frac{G m_{earth} T^2}{4\pi^2}$$

$$r^3 = \frac{\left(6.67 \times 10^{-11} \frac{N \cdot m^2}{kg^2}\right)\left(5.98 \times 10^{24} kg\right)\left(86400 s\right)^2}{4\pi^2}$$

radius of the satellite's orbit. $\rightarrow r = 4.2 \times 10^7 m$

$h = 4.2 \times 10^7 m - 6.38 \times 10^6 m$

altitude. $\rightarrow h = 3.6 \times 10^7 m$



$$V = \frac{2\pi r}{T}$$

$$V = \frac{2\pi (4.2 \times 10^7 m)}{86400 s}$$

$$V = 3.1 \times 10^3 \frac{m}{s}$$

TO DO

① PP|591

② Assignment (due Tues)
p597|22-33

Notes: Weight of a flea (google: Planck's mass + mass of flea)

#32 => use the mean K to find the mass of Saturn

#33 => the answer is wrong!

HProbe on Fri.?