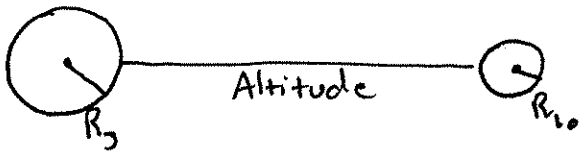

11) a) Io – Jupiter

Altitude: $3.48\times10^{8}\,m$

Period : $1.529\times10^{5}\,s$

$R_{Io} = 1.82\times10^{6}\,m$

$R_{Jupiter} = 7.14\times10^{7}\,m$

$4.212\times10^{8}\,m$

$$V=\frac{d}{T}=\frac{2\pi r}{T}=\frac{2\pi(R_{Io}+R_J+Alt)}{T}=\frac{2\pi(1.82\times10^{6}+7.14\times10^{7}+3.48\times10^{8})}{1.529\times10^{5}}$$

$$\boxed{V=1.73\times10^{4}\,\frac{m}{s}}$$

(b) $$\frac{GM_JM_{Io}}{r^2}=\frac{M_{Io}V^2}{r}$$

$$\frac{\left(6.67\times10^{-11}\,\frac{N\,m^2}{kg^2}\right)M_J\,(7.87\times10^{22}\,kg)}{(4.212\times10^{8}\,m)^2}=\frac{(7.87\times10^{22}\,kg)\left(1.73\times10^{4}\,\frac{m}{s}\right)^2}{(4.212\times10^{8}\,m)}$$

$$\boxed{M_J=1.89\times10^{27}\,kg}$$

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12) Same idea as #11

$$687\,days\times\frac{24\,hr}{1\,day}\times\frac{3600\,s}{1\,hr}=5.936\times10^{7}\,s$$

$r=(6.96\times10^{8}\,m)+(3.39\times10^{6})+(2.28\times10^{11})$

$r=2.287\times10^{11}\,m$

(a) $$V=\frac{2\pi(2.287\times10^{11})}{(5.936\times10^{7})}=\boxed{2.42\times10^{4}\,\frac{m}{s}}$$

(b) $$\frac{\left(6.67\times10^{-11}\,\frac{N\cdot m^2}{kg^2}\right)M_{sun}}{(2.287\times10^{11})^2}=\frac{(2.42\times10^{4}\,\frac{m}{s})^2}{(2.287\times10^{11})}\rightarrow\boxed{M_{sun}=2.01\times10^{30}\,kg}$$