This is a short cut for finding $E_{p}, E_{k}$ and $E_{\text {total }}$ in orbit.


Because Ak is based on velocity (v) we will use


$$
E_{\sigma_{0} T}=\frac{1}{2} E_{\rho}
$$

Calculate the Ep, Ek and Etotal for the moon in orbit about the Earth.

$$
\mathrm{E}_{\text {total }}=\mathrm{Ep}+\mathrm{Ek}
$$

$$
\begin{aligned}
& E_{p}=-\frac{G_{m_{m} m e}}{r}=\frac{-6.67 \times 10^{-11} 7.35 \times 10^{22} 5.98 \times 10^{24}}{3.84 \times 10^{8}} \\
&=-7.63 \times 10^{28} \mathrm{~J} \\
& \begin{array}{l}
\text { nergy }=E p+E k \\
E p+E k \\
E_{k}
\end{array}=\frac{1}{2}\left|E_{p}\right|=3.82 \times 10^{28} \mathrm{~J} \quad E_{\text {TOT }}-\frac{-2}{2} E_{p}=-3.82 \times 10^{28} \mathrm{~J}
\end{aligned}
$$

Total Energy = Ep + Ek

Calculate the potential energy, kinetic energy and total energy of the Moon in orbit about the Earth.

$$
\begin{aligned}
& E_{\rho}=-G_{r} m_{m} m_{e}=-6.67 \times 10^{-11} 7.35 \times 10^{22} 5.98 \times 10^{24} \\
& r=-7.63 \times 10^{28} \mathrm{~J} \\
& E_{k}=\left|\frac{1}{2} E_{p}\right|=3.82 \times 10^{28} \mathrm{~J} \\
& E_{\text {TOT }}=\frac{1}{2} E_{p}=-3.82 \times 10^{28} \mathrm{~J}
\end{aligned}
$$

Do the sheets on Gravitational Potential Energy and Extra Problems Ch 4

