32. Energy conservation for this situation may be expressed as follows:

$$\begin{aligned} K_1 + U_1 &= K_2 + U_2 \\ K_1 - \frac{GmM}{r_1} &= K_2 - \frac{GmM}{r_2} \end{aligned}$$

where $M = 5.0 \times 10^{23}\,\text{kg}$, $r_1 = R = 3.0 \times 10^6\,\text{m}$ and $m = 10\,\text{kg}$.

(a) If $K_1 = 5.0 \times 10^7\,\text{J}$ and $r_2 = 4.0 \times 10^6\,\text{m}$, then the above equation leads to

$$K_2 = K_1 + GmM\left(\frac{1}{r_2} - \frac{1}{r_1}\right) = 2.2 \times 10^7\ \text{J}\ .$$

(b) In this case, we require $K_2 = 0$ and $r_2 = 8.0 \times 10^6\,\text{m}$, and solve for K_1:

$$K_1 = K_2 + GmM\left(\frac{1}{r_1} - \frac{1}{r_2}\right) = 6.9 \times 10^7\ \text{J}\ .$$