1. From the notes, examine the relations for $T_{eff}$ as functions of $Z$ and $L$. You will note that for a fixed $T_{eff}$, increasing $Z$ results in increasing $L$, since $L \propto Z^{1/4-1/5}$ roughly. Therefore, the Pop II M-S must lie below the Pop I M-S where $Z$ is larger.

2. The electrostatic energy is given by the general relation

\[ E = \int \frac{q(r) \, dq(r)}{r} \]

where $q(r)$ is the charge enclosed in the volume within the radius $r$. We have

\[
q(r) = eZ \left[ \left( \frac{r}{R} \right)^3 - \left( \frac{r}{R_c} \right)^3 \right], \quad dq = 3eZr^2 \left[ \frac{1}{R^3} - \frac{1}{R_c^3} \right], \quad r < R,
\]

\[
q(r) = eZ \left[ 1 - \left( \frac{r}{R_c} \right)^3 \right], \quad dq = -3eZ \frac{r^2}{R_c^3}, \quad R < r < R_c
\]

The first term of the second line comes from the protons in the inner sphere. Divide the integration into the two regions, and the requested result will follow.