58. Although altitudes are given, it is the orbital radii which enter the equations. Thus, $r_A = 6370 + 6370 = 12740$ km, and $r_B = 19110 + 6370 = 25480$ km

(a) The ratio of potential energies is

$$\frac{U_B}{U_A} = \frac{-\frac{GmM}{r_B}}{-\frac{GmM}{r_A}} = \frac{r_A}{r_B} = \frac{1}{2} \ .$$

(b) Using Eq. 14-42, the ratio of kinetic energies is

$$\frac{K_B}{K_A} = \frac{\frac{GmM}{2r_B}}{\frac{GmM}{2r_A}} = \frac{r_A}{r_B} = \frac{1}{2} \ .$$

(c) From Eq. 14-44, it is clear that the satellite with the largest value of r has the smallest value of $|E|$ (since r is in the denominator). And since the values of E are negative, then the smallest value of $|E|$ corresponds to the largest energy E. Thus, satellite B has the largest energy, by an amount

$$\Delta E = E_B - E_A = -\frac{GmM}{2}\left(\frac{1}{r_B} - \frac{1}{r_A}\right) \ .$$

Being careful to convert the r values to meters, we obtain $\Delta E = 1.1 \times 10^8$ J. The mass M of Earth is found in Appendix C.