8.3/ $U(r) = -k/r$ so if $k \to k/2$ U decreases by a factor of 2.

The original orbit is circular so $T=$ constant and $V=$ constant.

By the virial theorem $\langle T \rangle = -\frac{1}{2}\langle U \rangle$, but, because it is a circular orbit $\langle T \rangle = T$ and $\langle V \rangle = V$, both constants.

$\therefore$ The kinetic energy in the circular orbit is

$$T = -\tfrac{1}{2} V \quad \text{where } V \text{ is the original potential energy}$$

The original energy is

$$E_1 = T + V = -\tfrac{1}{2}V + V = \tfrac{1}{2}V$$

Now, when $k \to k/2$ "suddenly" the kinetic energy doesn't change, but $V \to V/2$.

The new energy is therefore

$$E_2 = -\tfrac{1}{2}V + \tfrac{V}{2} = 0$$

The eccentricity is given by

$$\epsilon = \sqrt{1 + \frac{2E\ell^2}{\mu k^2}} \to 1 \quad \text{for } E=0$$

i.e. a parabolic orbit