T-22) $F = \frac{k}{x^2} e^{-t/\tau}$ and thus $U = \frac{k}{x} e^{-t/\tau}$

Thus, $L = T - U = \frac{m\dot{x}^2}{2} - \frac{k}{x} e^{-t/\tau}$

and $p = \frac{\partial L}{\partial \dot{x}} = m\dot{x}$. Thus $p\dot{x} = \frac{p^2}{m}$

Thus, $H = p\dot{x} - \left\{ \frac{m}{2}\left(\frac{p}{m}\right)^2 - \frac{k}{x} e^{-t/\tau} \right\} = \frac{p^2}{2m} + \frac{k}{x} e^{-t/\tau}$

$E = T + U = H$.

$H = E$ because U does not depend on $\dot{x}$ and the generalized coordinate is x itself.

Clearly, E (or H) is not conserved: there is an explicit time dependence.