36.76. **Model:** Particles can be created from energy.

Solve: **(a)** The decrease in kinetic energy is exactly equal to the energy-equivalent of the mass of the two particles that have been created. The threshold kinetic energy is when the electron and positron are created at rest, thus

$$K = 2m_e c^2 = 2(9.11 \times 10^{-31} \text{ kg})(3.0 \times 10^8 \text{ m/s})^2 = 1.64 \times 10^{-13} \text{ J}$$

(b) The kinetic energy of the fast electron is

$$K = 2m_e c^2 = (\gamma_p - 1)m_e c^2 \Rightarrow \gamma_p = 3 = \frac{1}{\sqrt{1 - u^2/c^2}} \Rightarrow u = 0.943c$$