

**[mex224] Photon absorption and photon emission**

- (a) A photon of energy  $E$  is absorbed by a stationary atom of rest mass  $m_0$  in a force-free environment. By what amount  $\Delta m_0$  has the rest mass of the atom changed when it is in the excited state?
- (b) A photon of energy  $E'$  is emitted by a stationary atom of rest mass  $m'_0$  in a force-free environment. By what amount  $\Delta m'_0$  has the mass of the atom changed when it is back in the ground state?
- (c) Express the energy of each photon in units of  $m_0 c^2$  as a function of  $\Delta m_0/m_0$  expanded two second order.

**Solution:**