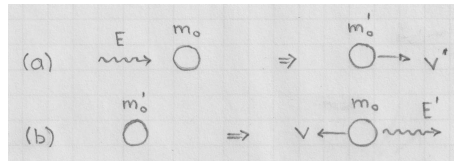


[mex224] Photon absorption and photon emission

(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 $\Delta m_0 > 0$ has the rest mass of the atom changed when it is in the excited state? Express $\Delta m_0/m_0$ as a function of E/m_0c^2 .

(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 $\Delta m'_0 < 0$ has the mass of the atom changed when it is back in the ground state? Express $\Delta m'_0/m'_0$ as a function of E'/m'_0c^2 .

(c) Express the energies E and E' of each photon in units of m_0c^2 as a function of $\Delta m_0/m_0$ expanded two second order.



Solution: