1) 159(6): Photon absorbed into an Atom of Mass M

In this case:

$$\gamma m c^2 + M c^2 = \left((m + M)^2 c^4 + c^2 p'^2\right)^{1/2} \quad -(1)$$

$$\underline{p}' = \hbar \underline{\kappa} \quad -(2)$$

The photon of mass m and initial energy $\gamma m c^2$ collides with a stationary atom of mass M and is absorbed into the atom, creating an object of mass $M + m$. This moves off at a momentum $\underline{p}'$. The latter is defined by the initial momentum of the photon in eq. (2).

Use the de Broglie Einstein equation:

$$\kappa = \frac{\omega v}{c^2} \quad -(3)$$

Therefore:

$$\left(\gamma m c^2 + M c^2\right)^2 = (m + M)^2 c^4 + \left(\frac{\hbar \omega v}{c}\right)^2 \quad -(4)$$

i.e.

$$\frac{v^2}{c^2} = \left(\frac{c^2}{\hbar\omega}\right)^2 \left[(\gamma m + M)^2 - (m + M)^2\right] \quad -(5)$$

or

$$1 - \frac{1}{\gamma^2} = \frac{1}{m^2 \gamma^2}\left[(\gamma m + M)^2 - (m + M)^2\right]$$

$$\gamma^2 - 1 = \gamma^2 + \frac{2M}{m}\gamma + \frac{M^2 - (m + M)^2}{m^2}$$

$$\frac{1}{m^2}\left((m + M)^2 - M^2\right) - \frac{2M}{m}\gamma - 1 = 0 \quad -(6)$$

$$\frac{2M}{m}\left(1 - \gamma\right) = 0 \quad -(7)$$

Therefore:

$$\boxed{\gamma = \frac{\hbar\omega}{mc^2} = 1} \quad -(8)$$

This means ~~that~~:

$$m = \frac{\hbar\omega}{c^2} \text{ for all } M \quad -(9)$$

The photon mass is not constant.

The Einstein field equation is:

$$E_2 - E_1 = \hbar\omega = mc^2. \quad -(10)$$

Eqs. (1) and (2) are the classical relativistic description of a photon of mass m and energy γmc^2 being absorbed into an atom of mass M.

Therefore the fundamentals of physics fail. In order for m to be constant, another mechanism is needed.