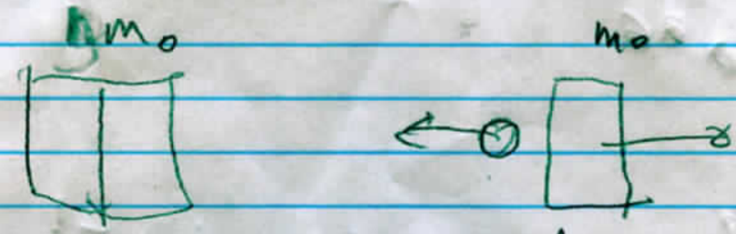
E = energy p = momentum MRN084

$E = pc \qquad E = hf$ } light quanta

$p = \dfrac{m_0 v}{\sqrt{1-\frac{v^2}{c^2}}}$ } object of rest mass m_0



Quanta $E = n m_0 c^2$

$p = n m_0 c$

object

$p = n m_0 c = \dfrac{m_0 v}{\sqrt{1-\frac{v^2}{c^2}}}$

$n^2 c^2 \left(1 - \frac{v^2}{c^2}\right) = v^2$

$n^2 c^2 - n^2 v^2 = v^2$

$n^2 c^2 = 2 v^2 \quad (n^2+1)$

$v^2 = \dfrac{c^2}{2}$

$v = \dfrac{c}{\sqrt{2}}$

$v = \dfrac{c\,n}{\sqrt{n^2+1}}$

This followed from a discussion Jack & I had in Dec '08 on how fast an object would go if part of it were converted to light (BM)

$$\approx 6 \cdot 10^{25}$$

$$n = 6 \cdot 10^{26}$$

$$\frac{n}{\sqrt{n^2+1}} = n\left(1 + \frac{1}{n^2}\right)^{-\frac{1}{2}} = 1 - \frac{1}{2n^2}$$

$$\sqrt{n^2+1} = n\sqrt{1+\frac{1}{n^2}} = n\left(1 + \frac{1}{n^2}\right)^{1/2}$$

$$(1+x)^{-\frac{1}{2}} \approx 1 - \frac{1}{2}x + O(x^2)$$

$$1 - \frac{1}{72 \cdot 10^{52}}$$

This followed from a discussion Josh & I had in Dec 07 on how fast an object would go if part of it were converted to light

BM