

$E = \text{energy}$     $p = \text{momentum}$

MRN084

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

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



Before



after

Quanta    $E = mc^2$   
 $p = mc$

object

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

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

$hc^2 - hv^2 = v^2$

$hc^2 = 2v^2$  ( $h^2 + f$ )

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

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

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

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

BM

MSB  
 To find the value of  $n$  in the denominator of the binomial expansion of  $(1+x)^{-1/2}$  we need to find the value of  $n$  such that the term  $\binom{n}{r} x^r$  is not zero. This is possible only when  $n \geq r$ . In this case,  $n$  is the number of terms in the expansion.

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

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

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

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

$$(1+x)^{-1/2} = 1 - \frac{1}{2}x + \dots$$

$$12 \cdot 10^{25}$$