

9. Einstein derived the expression for relativistic kinetic energy as

$$KE = m c^2 [(1 - v^2/c^2)^{-1/2}] - mc^2$$

Factoring mc^2 from each term gives

$$KE = m c^2 [(1 - v^2/c^2)^{-1/2} - 1]$$

$$KE = (4000 \text{ kg})(3 \times 10^8 \text{ /s})^2 [(1 - (0.8c)^2/c^2)^{-1/2} - 1]$$

$$KE = (3.6 \times 10^{20}) [(1 - 0.64)^{-1/2} - 1] \text{ J}$$

$$KE = (3.6 \times 10^{20}) [(0.36)^{-1/2} - 1] \text{ J}$$

$$KE = (3.6 \times 10^{20}) [(1 / 0.6) - 1] \text{ J}$$

$$KE = (3.6 \times 10^{20}) (1.67 - 1) \text{ J}$$

$$KE = 2.4 \times 10^{20} \text{ J}$$