$1\ eV = (1.602\times10^{-19}C)\,(1\ volt) = 1.602\times10^{-19}$ Joules

K.E. of election of 1 eV implies

$$\frac{1}{2}mv^2 = 1.602\times10^{-19}\ \text{Joules} \quad ; \quad m = 9.11\times10^{-31}\ kg$$

$$v^2 = \frac{2\times1.602\times10^{-19}}{9.11\times10^{-31}} = 0.35\times10^{12}$$

$$v = 5.9\times10^{5}\ m/sec.$$

$$v/c = 2\times10^{-3}$$ (rather slow compared to the speed of light)

Another way to do the number game.

$$m = 9.11\times10^{-31}kg \;;\qquad mc^2 = 9.11\times10^{-31}\,kg\times(3\times10^8\,m/s)^2$$

$$= 8.2\times10^{-14}\ \text{joules}$$

$$1eV = 1.602\times10^{-19}\ \text{joules}$$

$$mc^2 = 8.2\times10^{-14}J/(1.602\times10^{-19}J/eV) = 0.511\times10^{6}eV$$

$$= .511\ MeV$$

$m = .511\ MeV/c^2$

$\frac{1}{2}mv^2 = K.E.\ ;\quad v^2 = \frac{2K.E.}{m}$

For the case $K.E. = 1eV$

$$v^2 = \frac{2\cdot1(eV)}{0.511\times10^6(eV/c^2)} = 4\times10^{-6}c^2 \quad ; \quad v/c = 2\times10^{-3}$$ (as before)

E28-30 $\quad m_p = 938\ MeV/c^2 \quad ; \quad E(total) = 1200\ MeV;$

$$E/m_pc^2 = \frac{1}{\sqrt{1-v^2/c^2}} \quad ; \quad \frac{1200\ MeV}{938\ MeV} = \frac{1}{\sqrt{1-v^2/c^2}} \quad ; \quad \frac{1}{\sqrt{1-v^2/c^2}} = 1.28$$

$$\sqrt{1-v^2/c^2} = 0.782 \qquad 1-v^2/c^2 = 0.611 \quad ; \quad v^2/c^2 = 0.389$$

$$v/c = \sqrt{0.389} = 0.624 \qquad v = 1.87\times10^{8}\ m/s$$

$$p = \frac{mv}{\sqrt{1-v^2/c^2}} = \left(\frac{mc^2}{\sqrt{1-v^2/c^2}}\right)v/c^2 = (1200\ MeV)\times0.624/c$$

$$= 749\ MeV/c.$$