$^8/_{10}$

H3 Speed of Electron in an Electric Field

For electrons moving at a speed greater than 10% of the speed of light, you should only claim that your answer is approximate (unless you have used relativistic equations). If you reckon that the electron is travelling at a speed greater than 80% of the speed of light, you should decline to give your answer unless using relativity.

H3.1   Convert 7.2 eV into joules.

H3.2   Convert 3.0×10^{-11} J into electronvolts.

H3.3   How fast is an electron going if it has been accelerated from rest by a potential difference of…

    a) 50 V

    b) 20 kV

    c) 1.5 GV

H3.4   What accelerating potential is needed to produce electrons with a speed of…

    a) 7000 m s^{-1}

    b) $4.00 \times 10^7 \text{ m s}^{-1}$

H3.5   How fast is an alpha particle going if it accelerated by a 1.5 MV potential? Assume that the alpha particle has twice the charge and four times the mass of a proton.

H3.6   To trigger a particular nuclear reaction, a deuterium nucleus (same charge as the proton, but twice the mass) needs to have a kinetic energy of 4.0×10^{-13} J. What accelerating voltage is needed?

H3.7   In order to produce protons with a kinetic energy of 5.0 MeV, what accelerating voltage is needed?