

### Answer on Question #47194-Physics-Atomic Physics

The electron beam in a television tube consists of electrons accelerated from rest through a potential difference of about 20000V. What is the speed of the electrons? (Ignore relativistic effects). Electron rest mass is  $9.11 \cdot 10^{-31}$  kg and electronic charge is  $1.6 \cdot 10^{-19}$  C.

#### Solution

Kinetic energy of electron accelerated from rest is equal to its potential energy change.

$$\frac{m_e v^2}{2} = eU,$$

where  $m_e = 9.11 \cdot 10^{-31}$  kg is electron's rest mass,  $e = 1.6 \cdot 10^{-19}$  C is electron's charge,  $U = 20000V$  is potential difference,  $v$  is the speed of the electrons.

Find the electron's speed:

$$v = \sqrt{\frac{2eU}{m_e}} = \sqrt{\frac{2 \cdot 1.6 \cdot 10^{-19} \cdot 20000}{9.11 \cdot 10^{-31}}} = 8.4 \cdot 10^7 \frac{m}{s}.$$

**Answer:  $8.4 \cdot 10^7 \frac{m}{s}$ .**