

### Answer on Question #55894, Physics / Electromagnetism

**Task:** The electron beam in a television tube consists of electrons accelerated from rest through a potential difference of about 20 000V. What is the speed of the electrons? (Ignore relativistic effects). Electron rest mass is  $9.11 \times 10^{-31}$  kg and electronic charge is  $1.6 \times 10^{-19}$  C.

**8.4×10<sup>7</sup> m/s**

3.8×10<sup>6</sup> m/s

6×10<sup>6</sup> m/s

4.7×10<sup>7</sup> m/s

#### **Solution:**

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

$$m_e \cdot v_e^2 / 2 = q_e \cdot V ,$$

where  $m_e = 9.11 \cdot 10^{-31}$  kg – is electron rest mass;

$q_e = 1.6 \cdot 10^{-19}$  C – is electron electronic charge;

$V = 20\,000$  V - potential difference;

$v_e$  – is the speed of the electrons.

Find the electron speed:

$$v_e = \sqrt{\frac{2q_e V}{m_e}} = \sqrt{\frac{2 \cdot 1.6 \cdot 10^{-19} \cdot 20000}{9.11 \cdot 10^{-31}}} = 8.4 \cdot 10^7 \text{ m/s}$$

**Answer:** the electron speed is **8.4 · 10<sup>7</sup> m/s**.