771.

Problem 52.1 (RHK)

We have to show that the short-wavelength cut-off in the continuous x-ray spectrum is given by

$$\lambda_{min} = 1240 \text{ pm}/V,$$

where V is the applied potential difference in kilovolts.

Solution:

In a bremsstrahlung process the wavelength of the maximum energy photon that can be emitted by deceleration of an electron of energy eV keV will be

$$\lambda_{min} = \frac{hc}{eV} = \frac{6.626 \times 10^{-34} \times 2.997 \times 10^{8}}{1.602 \times 10^{-19} \times 10^{3} V} \text{ m}$$

$$= \frac{1240}{V} \times 10^{-12} \text{ m} = \frac{1240}{V} \text{ pm}.$$