

74. Eq. 25-32 applies with $dq = \lambda dx = bx dx$ (along $0 \leq x \leq 0.20$ m).

(a) Here $r = x > 0$, so that

$$V = \frac{1}{4\pi\epsilon_0} \int_0^{0.20} \frac{bx dx}{x} = \frac{b(0.20)}{4\pi\epsilon_0}$$

which yields $V = 36$ V.

(b) Now $r = \sqrt{x^2 + d^2}$ where $d = 0.15$ m, so that

$$V = \frac{1}{4\pi\epsilon_0} \int_0^{0.20} \frac{bx dx}{\sqrt{x^2 + d^2}} = \frac{b}{4\pi\epsilon_0} \left(\sqrt{x^2 + d^2} \right) \Big|_0^{0.20}$$

which yields $V = 18$ V.