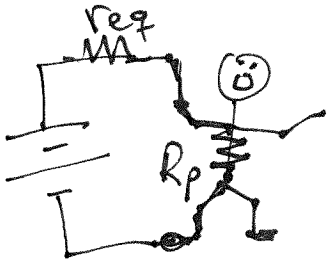
Ch10 Prob. 24

$R_p = 10.0\,k\Omega$

$V = 20.0\,kV$

a)



b) $r_{eq} = 2000\,\Omega$

Find the current through the body.

$$V = I \cdot R_p + I r_{eq} = I(R_p + r_{eq})$$

$$I = \frac{V}{R_p + r_{eq}} = \frac{20{,}000\,V}{10{,}000\,\Omega + 2000\,\Omega} = \frac{20{,}000\,V}{12{,}000\,\Omega}$$

$$\boxed{I = 1.67\,A}$$

c) Find the power dissipated in the body

$$P = I_p \cdot V_p = I_p \cdot (I_p \cdot R_p) = I_p^2 R_p$$

$$= (1.67\,A)^2 (10{,}000\,\Omega) = 2.79 \times 10^4\,W$$

$$\boxed{27.9\,kW}$$

d) $I_{max} = 1.00\,mA$

$$V = I_{max}(R_p + r_{new}) \rightarrow r_{new} = \frac{V}{I_{max}} - R_p$$

$$r_{new} = \frac{20{,}000\,V}{1.00 \times 10^{-3}\,A} - 10{,}000\,\Omega = 1.999 \times 10^7\,\Omega$$

$$\boxed{20\,M\Omega}$$

e) This will not be effective at low resistance ~~devic~~ devices since most of the power will be lost inside the power supply.