

PH213 - Chapter 25 Homework Solutions

$$1) I = 1.50 \text{ A} \quad I = \frac{\Delta Q}{\Delta t} = \frac{N Q_e}{\Delta t} = \frac{N}{\Delta t} Q_e$$

$$\frac{N}{\Delta t} = \frac{I}{Q_e} = \frac{1.50}{1.60 \times 10^{-19}} = 9.38 \times 10^{18} \frac{\text{electrons}}{\text{sec}}$$

$$2) I = \frac{\Delta Q}{\Delta t} \quad \Delta Q = I \Delta t = (5.70)(7.00)(60)(60) = 1.44 \times 10^5 \text{ C}$$

$$8) V_R = IR \quad R = \frac{V}{I} = \frac{12.0}{0.500} = 24.0 \Omega$$

$$P = \frac{\Delta E}{\Delta t} = IV \quad \Delta E = IV \Delta t = (0.500)(12.0)(60.0) = 360 \text{ J}$$

$$9) (a) R = \frac{V}{I} = \frac{120}{7.50} = 16.0 \Omega$$

$$(b) \Delta Q = I \Delta t = (7.50)(15.0)(60) = 6750 \text{ C} = 6.75 \times 10^3 \text{ C}$$

$$28) P = \frac{V^2}{R} \quad R = \frac{V^2}{P} = \frac{(240)^2}{3100} = 18.6 \Omega$$

$$37) I(\text{total}) = NI_1 = N \frac{P_1}{V}$$

$$N = \frac{I(\text{total})V}{P_1} = \frac{(2.50)(120)}{100} = 3$$

$$39) P_2 - P_1 = I_2^2 R - I_1^2 R = (I_2^2 - I_1^2) R = \left[\left(\frac{P}{V_2} \right)^2 - \left(\frac{P}{V_1} \right)^2 \right] R$$

$$\Delta P = P^2 R \left[\frac{1}{V_2^2} - \frac{1}{V_1^2} \right] = (520 \times 10^3)^2 (3) \left[\frac{1}{(12000)^2} - \frac{1}{(50000)^2} \right]$$

$$\Delta P = 5310 \text{ W} = 5.31 \text{ kW}$$

$$75) \quad I = 11.0 \text{ mA} \quad v = 3.00 \times 10^8 \text{ m/sec} \quad \Delta x = 6300 \text{ m} \quad N = ?$$

$$I = \frac{\Delta Q}{\Delta t} = \left(\frac{\Delta Q}{\Delta x} \right) \left(\frac{\Delta x}{\Delta t} \right) = \left(\frac{\Delta Q}{\Delta x} \right) v = \left(\frac{N Q_p}{\Delta x} \right) v$$

$$N = \frac{I \Delta x}{Q_p v} = \frac{(11.0 \times 10^{-3})(6300)}{(1.60 \times 10^{-19})(3.00 \times 10^8)} = 1.44 \times 10^{12} \text{ protons}$$