

## 1. Falsche Batterie

$$R = 100 \, \Omega; \quad R_i = 0.1 \, \Omega; \quad U_1 = U_2 = 1.5 \, \text{V}$$

a)

$$\begin{array}{l} M_1 : U_1 - R_i(I_1 + I_2) - U_2 = 0 \\ M_2 : U_1 - R_i I_1 - RI = 0 \\ M_3 : U_2 - R_i I_2 - RI = 0 \\ K_1 : I_1 + I_2 = I \end{array}$$

b)

$$I = \frac{2U_1}{R_i + 2R} = \underline{\underline{14.99 \, \text{mA}}}$$

$$U = IR = \underline{\underline{1.499 \, \text{V}}}$$

$$P = UI = \underline{\underline{22.48 \, \text{mW}}}$$

c)  $U_1 = 1.5 \, \text{V}; \quad U_2 = 1.2 \, \text{V}$ 

$$I = \frac{U_1 + U_2}{R_i + 2R} = \underline{\underline{13.49 \, \text{mA}}}$$

$$U = IR = \underline{\underline{1.349 \, \text{V}}}$$

$$P = UI = \underline{\underline{18.21 \, \text{mW}}}$$

d)

$$I_1 = \frac{U_1 + U_2}{4R + 2R_i} - \frac{U_2 - U_1}{2R_i} = \underline{\underline{1.51 \, \text{A}}}$$

$$I_2 = I - I_1 = \underline{\underline{-1.49 \, \text{A}}}$$

## 2. Umladen von Kondensatoren

a)

$$q_1 = \frac{qC_1}{C_1+C_2}$$

$$q_2 = \frac{qC_2}{C_1+C_2}$$

$$U_1 = U_2 = \frac{q}{C_1+C_2}$$

$$t = \frac{q_2}{I} = \frac{qC_2}{(C_1+C_2)I}$$

b)

c)

d)  $C_1 = 1 \text{ nF}; \quad C_2 = 200 \text{ pF}; \quad R = 150 \text{ } \Omega$ e)  $U_1(0) = 100 \text{ V}; \quad U_2(0) = 0 \text{ V}$ 

## 3. Wheatstone'sche Brücke

$$R_1 = 17 \text{ k}\Omega; \quad R_2 = 9 \text{ k}\Omega; \quad R_3 = 3.6 \text{ k}\Omega$$

a)

$$U_1 = \frac{R_1}{R_1+R_2} U$$

$$U_2 = \frac{R_x}{R_x+R_3} U$$

$$\Delta U = U_1 - U_2 = \left( \frac{R_1}{R_1+R_2} - \frac{R_x}{R_x+R_3} \right) U$$

b)

$$0 = U_1 - U_2$$

$$0 = \frac{R_1}{R_1 + R_2} - \frac{R_x}{R_x + R_3}$$

$$R_2 = \underline{\underline{\frac{R_1 R_3}{R_x}}}$$

c)

$$R_x = \frac{R_1 R_3}{R_2} = \underline{\underline{6.8 \text{ k}\Omega}}$$