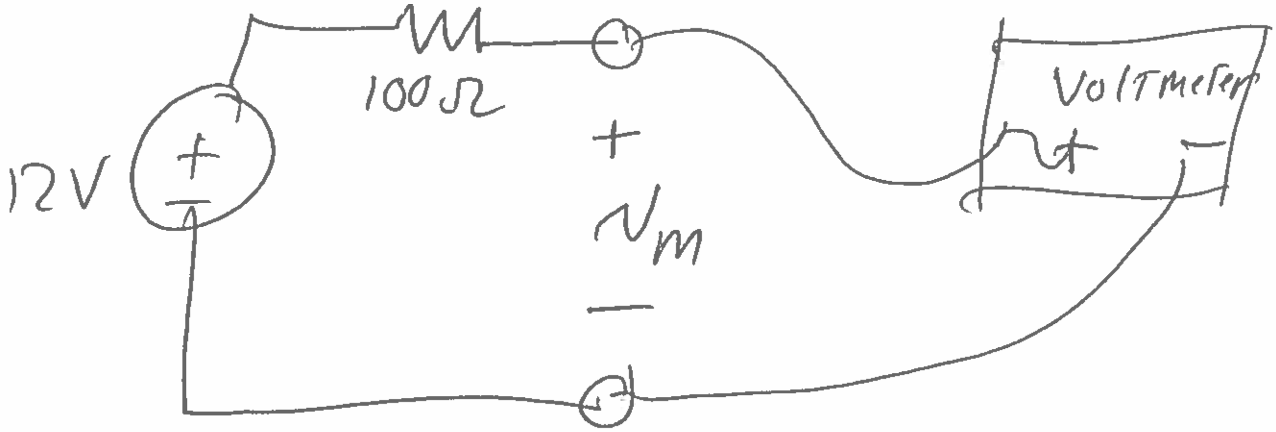
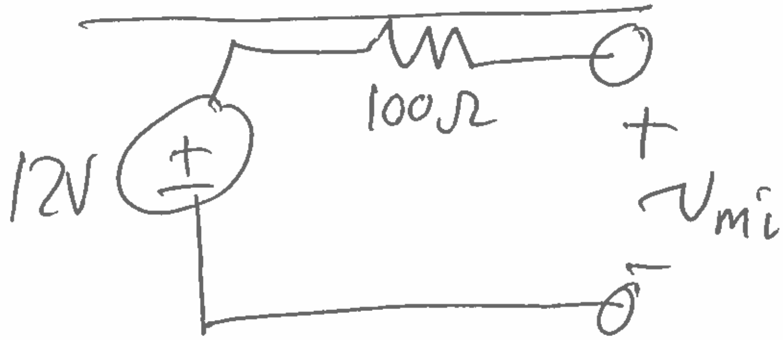
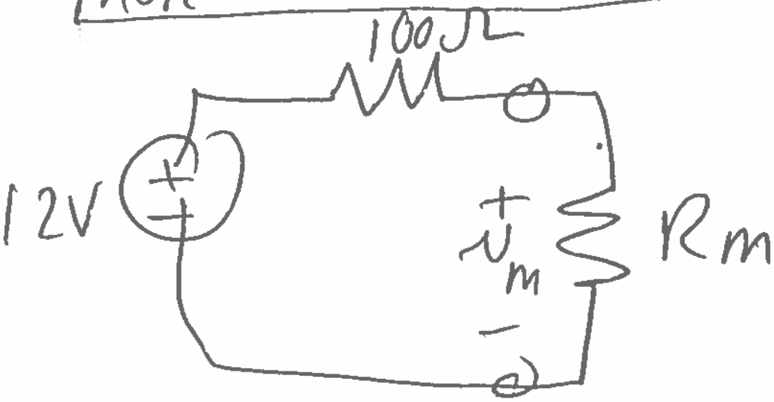


Ideal case



More realistic



$$V_m = \frac{R_m}{100\Omega + R_m} V_s = \frac{R_m}{100\Omega + R_m}(12V)$$

ideal case $R_m \to \infty$ open circuit

$$V_m \to 12V$$

when $R_m < \infty$ not ideal

$$V_{m} < V_{mi} = 12V$$
ideal

what is error if $R_m = 900\Omega$

$$\%\text{ error} = \frac{V_{mi} - V_m}{V_{mi}} \times 100\% = 1 - \frac{V_m}{V_{mi}}$$

$$V_m = \frac{R_m}{100\Omega + R_m}(12V) = \left(\frac{900\Omega}{100\Omega + 900\Omega}\right)(12V$$

$$V_m = .9(12V)$$

$$\%\text{ error} = \frac{12V - .9(12V)}{12V} \times 100\% = 1 - .9 \times 100\%$$

$$\% = 0.\not{1}\not{0}\%$$ 10%

What should R_m be for 2% error

$$\%\text{ error} = \frac{V_{mi} - V_m}{V_{mi}} \times 100\%$$

$$2\% = 1 - \frac{V_m}{V_{mi}} \times 100\%$$

$$.02 = 1 - \frac{V_m}{V_{mi}}$$

$$\frac{V_m}{V_{mi}} = 1 - .02 = 0.98$$

$$V_m = \frac{R_m}{100\Omega + R_m}(12V) \qquad V_{mi} = 12V$$

$$\frac{R_m}{100\Omega + R_m} = 0.98 \qquad R_m = 0.98(100\Omega + R_m)$$

$$.02 R_m = .98(100\Omega$$

$$R_m = \frac{98\Omega}{.02} = \boxed{4,900\Omega}$$

Complex Circuits

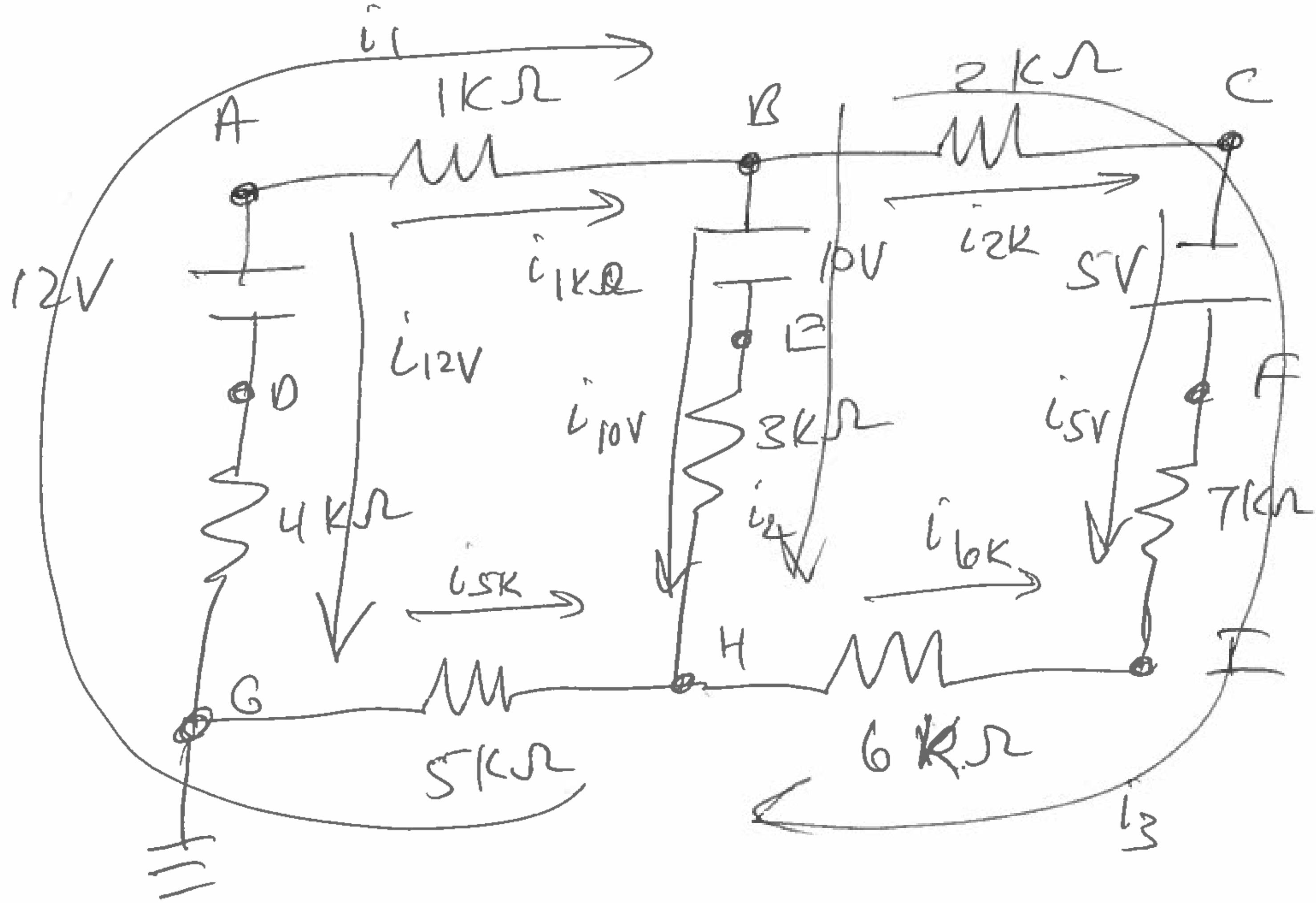
Most Basic <u>Kirchhoff's Laws</u>

Two

1) Junction Rule $\Sigma i_{in} = \Sigma i_{out}$ at junction $\Rightarrow$ Conservation of charge.

2) Loop Rule ΣV_i around a closed loop must $= 0$.

$\Rightarrow$ Conservation of Energy.



Currents to right or down assumed > 0

Currents to left or up assumed < 0

$$i_{1K\Omega} = i_{12V} = -i_{5K} = i_1$$

$$i_{2K\Omega} = i_{5V} = -i_{6K} = i_3$$

$$i_{10V} = i_2$$

Need 1 Junction 2 loops

Junction at point B $\Rightarrow$ $i_1 = i_2 + i_3$

Left loop Go Clockwise start at A

$$-i_1(1k\Omega) - 10V - i_2(3k\Omega)$$

$$- i_1(5k\Omega) - i_1(4k\Omega)$$