

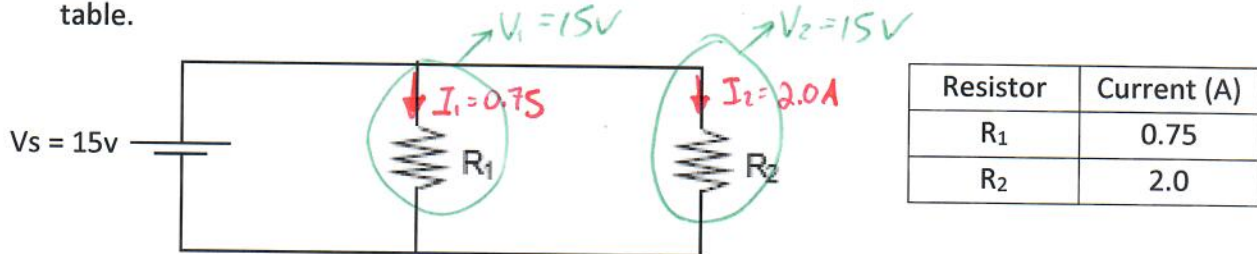
# SOLUTIONS

## Practice Problems D

### (Kirchoff's Laws)

Must Show All Work/Explanations:

1. The following circuit consists of 2 resistors,  $R_1$  and  $R_2$ , and a power source. Using an ammeter, you measured the current intensity through each resistor. See results in table.



- a) What is the total current provided by the power source,  $I_s$  ?

$$\begin{aligned} I_s &= I_1 + I_2 \\ \text{(Parallel)} \\ I_s &= 0.75 + 2 \end{aligned} \quad \underline{I_s = 2.75 \text{ A}}$$

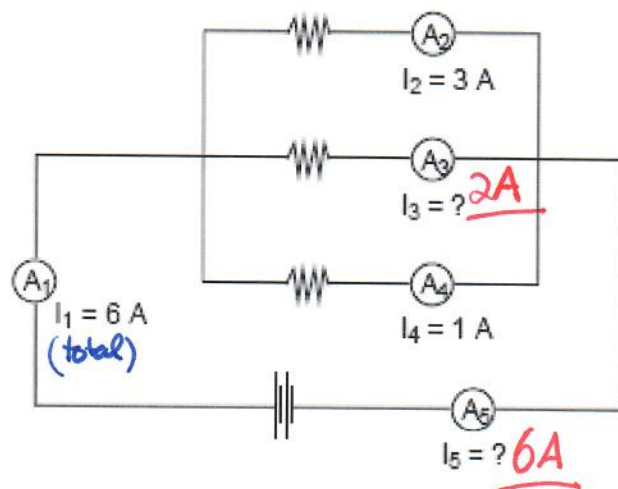
- b) What is the potential difference (voltage) across each of the resistor ?

$$\begin{aligned} V_s &= V_1 = V_2 \\ \text{(Parallel)} \\ &= \underline{15 \text{ V}} \end{aligned} \quad \begin{aligned} \underline{V_1 = 15 \text{ V}} \\ \underline{V_2 = 15 \text{ V}} \end{aligned}$$

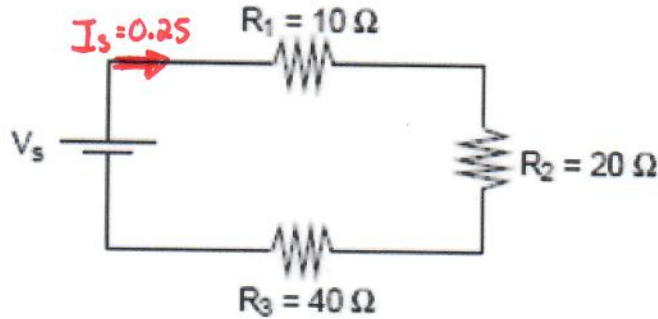
2. Study the following electric circuit that is composed of several resistors and ammeters.

What is the reading on ammeter #3 ?

What is the reading on ammeter #5 ?



3. In the electric circuit below the current intensity provided by the power source,  $I_s$ , is 0.25A.



- a) What is the potential difference across the terminals of the power source,  $V_s$  ?

$$\begin{aligned} \textcircled{1} R_T &= R_1 + R_2 + R_3 \\ R_T &= 70 \Omega \\ \textcircled{2} V_s &= I_s R_T \\ V_s &= 0.25(70) \\ V_s &= 17.5 \text{ V} \end{aligned}$$

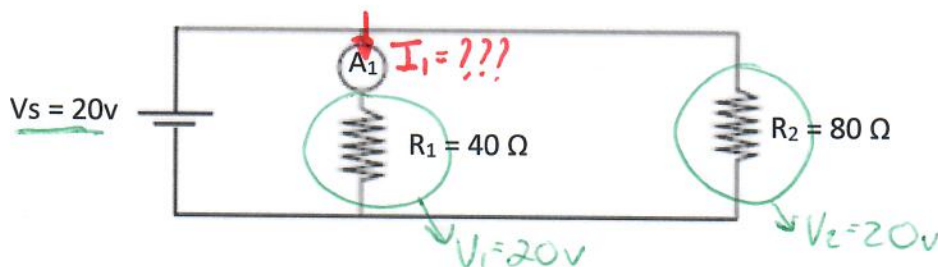
- b) What is the current across each of the 3 resistors ( $I_1, I_2, I_3$ ) ?

$$\begin{aligned} I_s &= I_1 = I_2 = I_3 \\ (\text{series}) \\ &= 0.25 \text{ A} \end{aligned}$$

- c) What is the potential difference across each of the 3 resistors ( $V_1, V_2, V_3$ ) ?

$$\begin{aligned} V_1 &= I_1 R_1 & V_2 &= I_2 R_2 & V_3 &= I_3 R_3 & V_s &= V_1 + V_2 + V_3 \\ V_1 &= 0.25(10) & V_2 &= 0.25(20) & V_3 &= 0.25(40) & (\text{series}) \\ V_1 &= 2.5 \text{ V} & V_2 &= 5 \text{ V} & V_3 &= 10 \text{ V} & V_s &= 2.5 + 5 + 10 \\ & & & & & & V_s &= 17.5 \text{ V} \end{aligned}$$

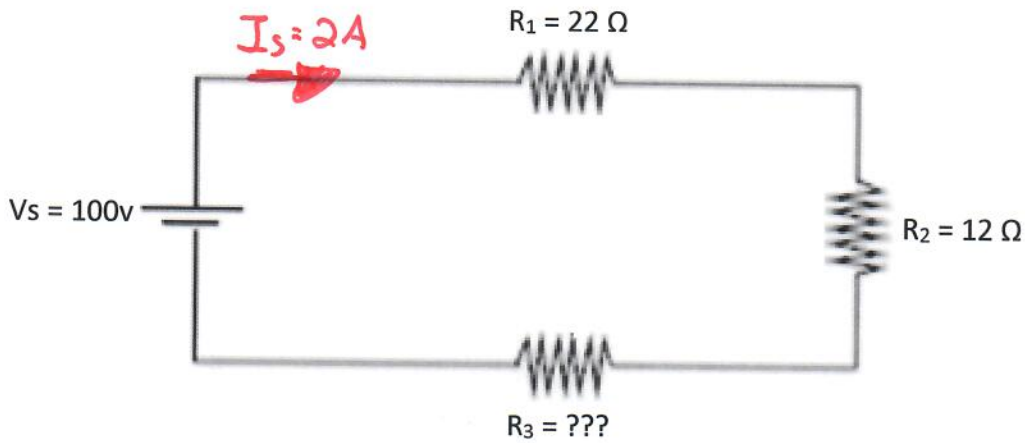
4. The electric circuit below consists of an ammeter, A, a power supply, and resistors  $R_1$  and  $R_2$  connected in parallel.



What is the current intensity flowing the ammeter ?

$$\begin{aligned} \textcircled{1} V_s &= V_1 = V_2 \\ (\text{Parallel}) \\ V_1 &= 20 \text{ V} \\ \textcircled{2} I_1 &= \frac{V_1}{R_1} \\ I_1 &= \frac{20}{40} & I_1 &= 0.5 \text{ A} \end{aligned}$$

5. The following circuit is connected to a source that provides a current of 2A with a potential difference of 100V. The values of  $R_1$  is  $22 \Omega$  and the value of  $R_2$  is  $12 \Omega$ .



- a) What is the value of  $R_3$  ?

$$\textcircled{1} R_T = \frac{V_S}{I_S}$$

$$R_T = \frac{100}{2}$$

$$\underline{R_T = 50 \Omega}$$

$$\textcircled{2} R_T = R_1 + R_2 + R_3$$

$$50 = 22 + 12 + R_3$$

$$\underline{\underline{R_3 = 16 \Omega}}$$

- b) What is the value of  $V_3$  ?

$$\textcircled{1} I_S = I_1 = I_2 = I_3$$

(series)

$$\underline{I_3 = 2A}$$

$$\textcircled{2} V_3 = I_3 R_3$$

$$V_3 = 2(16)$$

$$\underline{\underline{V_3 = 32V}}$$

6. Study the following circuit diagram:

a) What is the value of  $V_3$

$$V_3 = V_1 = V_2 = V_3$$

(Parallel) = 60V

b) What is the value of  $I_3$

$$I_5 = I_1 + I_2 + I_3$$

(Parallel)

$$8 = 1.5 + 2.5 + I_3$$

$$I_3 = \underline{\underline{4A}}$$

c) What is the value of  $R_3$

$$R_3 = \frac{V_3}{I_3}$$

$$R_3 = \frac{60}{4} \quad \underline{\underline{R_3 = 15\Omega}}$$

d) What is the value of  $R_T$

$$R_T = \frac{V_5}{I_5}$$

$$R_T = \frac{60}{8} \quad \underline{\underline{R_T = 7.5\Omega}}$$

