



$$\begin{aligned} R_1 &= 60 \, \Omega & R_2 &= 6 \, \Omega \\ R_3 &= 10 \, \Omega & R_4 &= 20 \, \Omega \\ E_1 &= 15 \, \text{V} & E_2 &= 10 \, \text{V} \end{aligned}$$

- 1) What is the relationship between the magnitudes of the currents  $I_3$  (through resistor  $R_3$ ) and  $I_4$  (through resistor  $R_4$ )? [4]

a)  $|I_3| > |I_4|$       b)  $|I_3| = |I_4|$       c)  $|I_3| < |I_4|$

Rubric:

Correct answer (4)

- 2) What is the current  $I_1$  through resistor  $R_1$ ? (A positive value means current flows in the direction of the arrow on the diagram.) [4]

$$\begin{aligned} E_1 + E_2 - I_1 R_1 &= 0 \\ I_1 &= 0.42 \text{ A} \end{aligned}$$

Rubric:

Correct problem setup (2)

Correct answer (2)

- 3) What is the current  $I_2$  through resistor  $R_2$ ? (A positive value means current flows in the direction of the arrow on the diagram.) [6]

$$\begin{aligned} E_1 + E_2 - I_2 (R_1 + R_{34}) &= 0 \text{ where } R_{34} \text{ is the equivalent resistance for } R_3 \text{ and } R_4, R_{34} = 6.7 \text{ ohms} \\ I_2 &= 1.97 \text{ A} \end{aligned}$$

Rubric:

Correct problem setup (4)

Correct answer (2)

- 4) What is the potential difference  $V_B - V_C$  between points **B** and **C**? [6]

$$V_B - V_C = V_2 - I_2 R_2 = -1.84 \text{ V}$$

Rubric:

Correct problem setup (4)

Correct answer (2)