Problems 26.1,8,20 from MasteringPhysics.

26.1

Two resistors, with resistances of R_1 and R_2 are connected in parallel, and the combination is connected across a DC line with a voltage of V.

Part A

What is the resistance of the parallel combination?

Part B

What is the total current through the parallel combination?

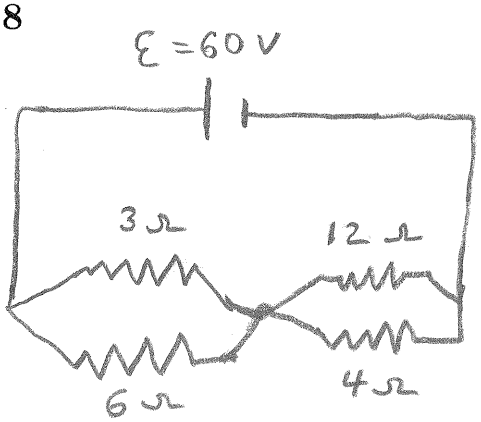
Part C

What is the current through the first resistor?

Part D

What is the current through the second resistor?

26.8



Part A

Compute the equivalent resistance of the network in the figure. The battery has negligible internal resistance.

Part B

What is the current through the 3.00Ω resistor?

Part C

What is the current through the 6.00Ω resistor?

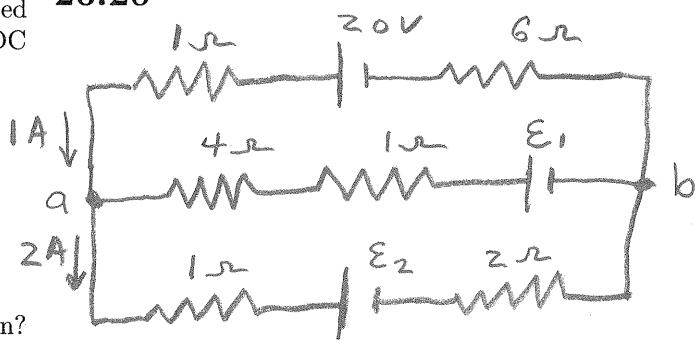
Part D

What is the current through the 12.00Ω resistor?

Part E

What is the current through the 4.00Ω resistor?

26.20



Part A

Find the emf EMF $\mathcal{E}_1$ in the circuit of the figure.

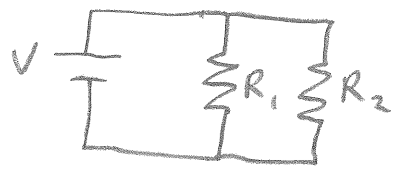
Part B

Find the emf EMF $\mathcal{E}_2$ in the circuit of the figure.

Part C

Find the potential difference of point b relative to point a.

26.1



A)

$$R_{eq} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} = \frac{1}{\frac{R_2 + R_1}{R_1 R_2}} = \boxed{\frac{R_1 R_2}{R_1 + R_2}}$$

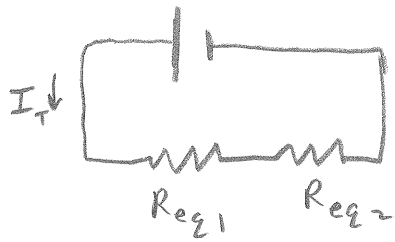
B) $$I = \frac{V}{R_{eq}} = \boxed{\frac{V(R_1 + R_2)}{R_1 R_2}}$$

C) $$I_1 = \boxed{\frac{V}{R_1}}$$

D) $$I_2 = \boxed{\frac{V}{R_2}}$$

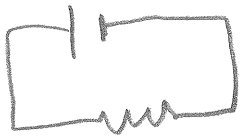
26.8

A)



$$R_{eq1} = \frac{1}{\frac{1}{3\Omega} + \frac{1}{6\Omega}} = \frac{1}{\frac{3}{6}} = 2\Omega$$

$$R_{eq2} = \frac{1}{\frac{1}{12\Omega} + \frac{1}{4\Omega}} = \frac{1}{\frac{4}{12}}\Omega = 3\Omega$$



$$R_{eq} = R_{eq1} + R_{eq2} = (2+3)\Omega = \boxed{5\Omega}$$

B) $$I_T = \frac{\mathcal{E}}{R_{eq}} \qquad V_{Req1} = I_T R_{eq1} = \frac{\mathcal{E}}{R_{eq}} R_{eq1} = \mathcal{E}\,\frac{2\Omega}{5\Omega}$$

$$I_{3\Omega} = \frac{V_{Req1}}{R_{3\Omega}} = \frac{\mathcal{E}\,\frac{2}{5}}{3\Omega} = 60\,\frac{2}{15}\,A = \boxed{8\,A}$$

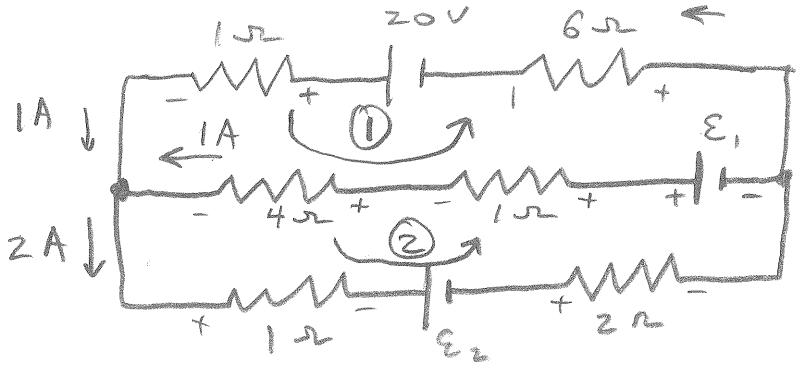
26.8

C) $I_{6\Omega} = \dfrac{V_{Req1}}{R_{6\Omega}} = \dfrac{60\left(\frac{2}{5}\right)V}{6\Omega} = \boxed{4\,A}$

D) $I_{12\Omega} = \dfrac{V_{Req2}}{12\Omega} = \dfrac{60\left(\frac{3}{5}\right)V}{12\Omega} = \boxed{3\,A}$

E) $I_{4\Omega} = \dfrac{V_{Req2}}{4\Omega} = \dfrac{60\left(\frac{3}{5}\right)V}{4\Omega} = \boxed{9\,A}$

26.20



A) KVR ① $\Rightarrow$ $1A(4\Omega) + 1A(1\Omega) - \varepsilon_1 - 1A(6\Omega) + 20V - 1A(1\Omega) = 0$

$\Rightarrow (4 + 1 - 6 + 20 - 1)V = \varepsilon_1 \Rightarrow \varepsilon_1 = \boxed{18\,V}$

B) KVR ② $\Rightarrow -\varepsilon_2 - 2A(2\Omega) + 18V - 1A(1\Omega) - 1A(4\Omega) - 2A(1\Omega) = 0$

$\Rightarrow \varepsilon_2 = (18 - 4 - 1 - 4 - 2)V = \boxed{7\,V}$

26.20

c) KVR ② $\Rightarrow$ $-2A(1\Omega) - 7V - 2A(2\Omega) - V_{ba} = 0$

$\Rightarrow$ $V_{ba} = \boxed{-13\,V}$