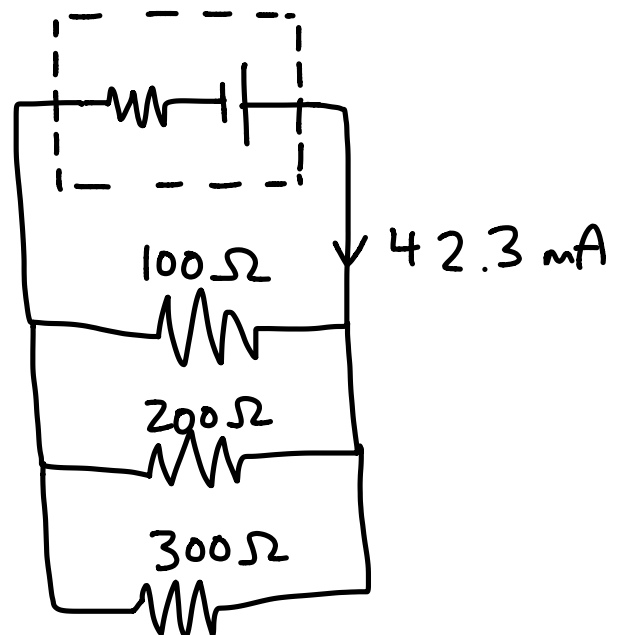
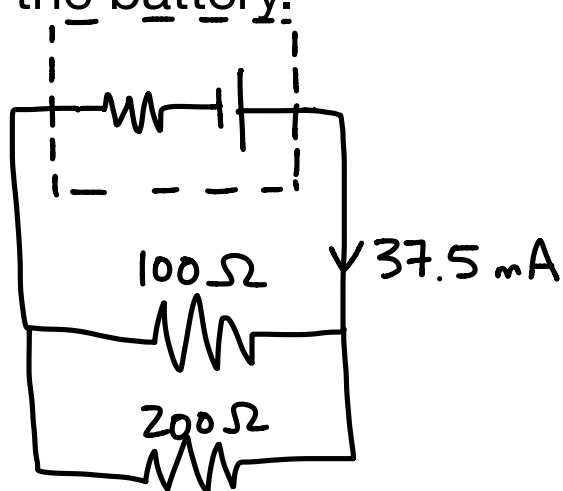
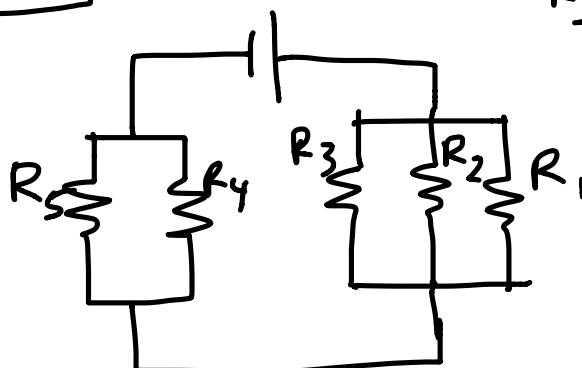
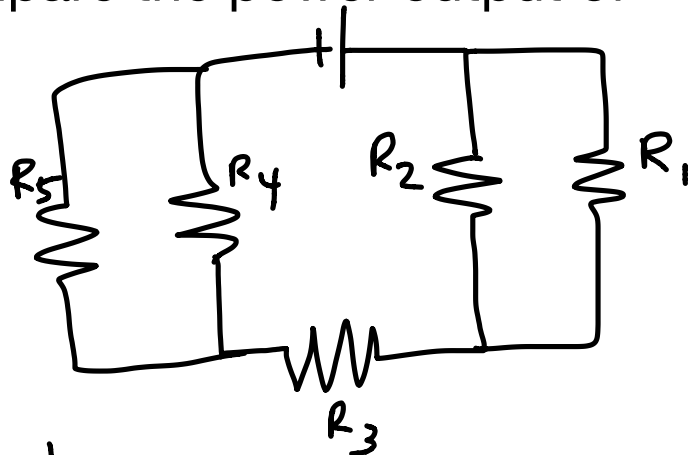
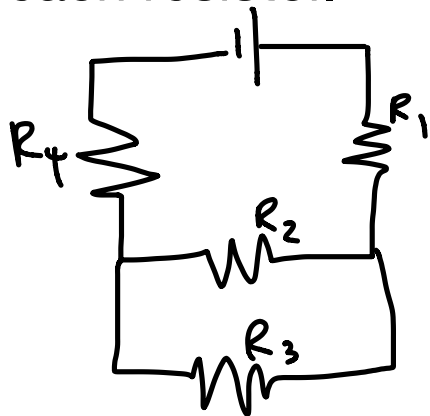


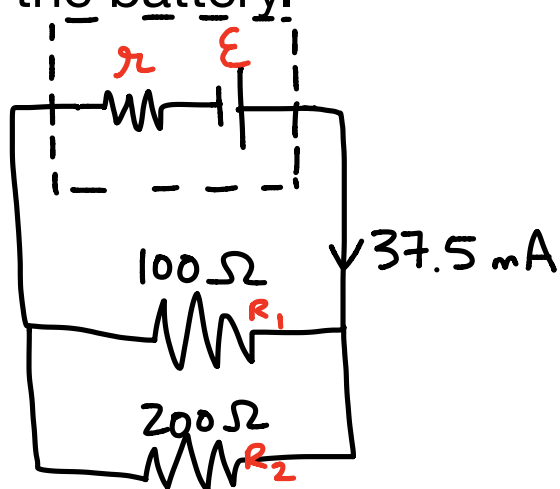
Determine the emf and the internal resistance of the battery.



Each circuit is constructed of identical resistors. For each circuit, compare the power output of each resistor.



Determine the emf and the internal resistance of the battery.



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

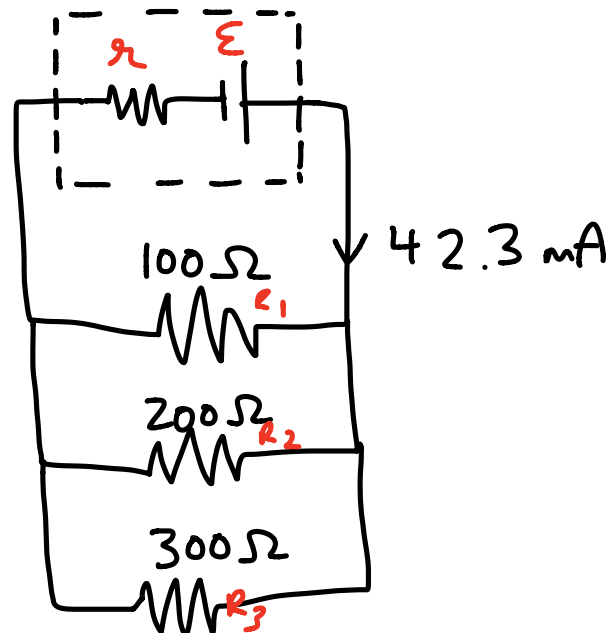
$$R_{eq} = 66.\overline{6}\ \Omega$$

$$\textcircled{2} \quad R_T = R_{eq} + r$$

$$\textcircled{3} \quad \epsilon = I_T R_T$$

$$\epsilon = 0.0375 (66.\overline{6} + r)$$

$$\epsilon = 2.5 + 0.0375 r$$



$$\textcircled{1} \quad \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$R_{eq} = 54.\overline{54}\ \Omega$$

$$\textcircled{2} \quad R_T = R_{eq} + r$$

$$\textcircled{3} \quad \epsilon = I_T R_T$$

$$\epsilon = 0.0423 (54.\overline{54} + r)$$

$$\epsilon = 2.3072 + 0.0423 r$$

$$2.5 + 0.0375 r = 2.3072 + 0.0423 r$$

$$0.1927 = 0.0048 r$$

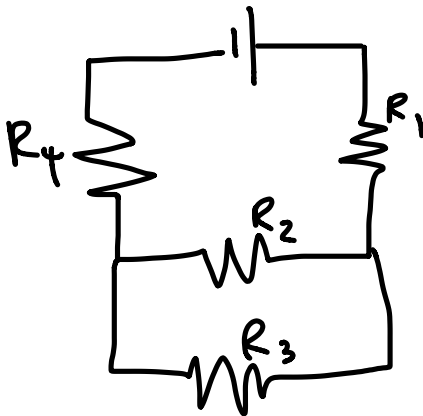
$$r = 40.2\ \Omega$$

$$\epsilon = 2.5 + 0.0375 r$$

$$\epsilon = 2.5 + 0.0375 (40.2)$$

$$\epsilon = 4.01\ \text{V}$$

Each circuit is constructed of identical resistors.
For each circuit, compare the power output of each resistor.

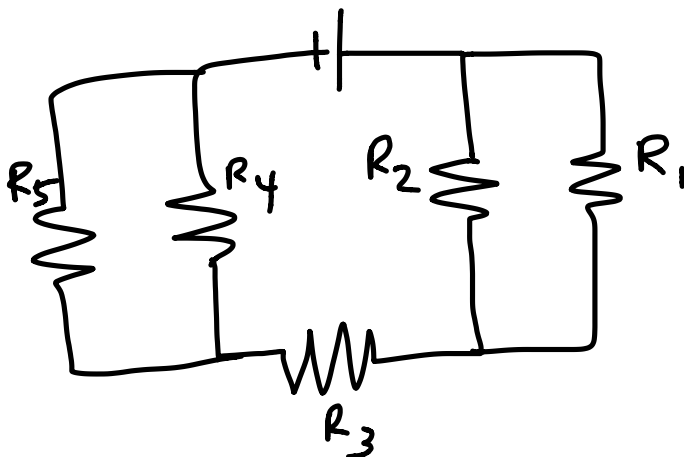


$$I_1 = I_4 = 2I_2 = 2I_3$$

$$R_1 = R_2 = R_3 = R_4$$

$$P = I^2 R$$

$$P_1 = P_4 = 4P_2 = 4P_3$$

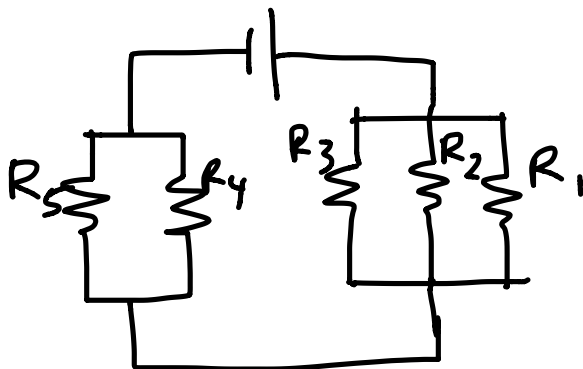


$$I_3 = 2I_1 = 2I_2 = 2I_4 = 2I_5$$

$$R_1 = R_2 = R_3 = R_4 = R_5$$

$$P = I^2 R$$

$$P_3 = 4P_1 = 4P_2 = 4P_4 = 4P_5$$



$$I_3 = 3I_1 = 3I_2 = 3I_4$$

$$= 2I_5$$

$$I_4 = I_5 = \frac{3}{2}I_1 = \frac{3}{2}I_2 = \frac{3}{2}I_3$$

$$R_1 = R_2 = R_3 = R_4 = R_5$$

$$P = I^2 R$$

$$P_4 = P_5 = \frac{9}{4}P_1 = \frac{9}{4}P_2 = \frac{9}{4}P_3$$