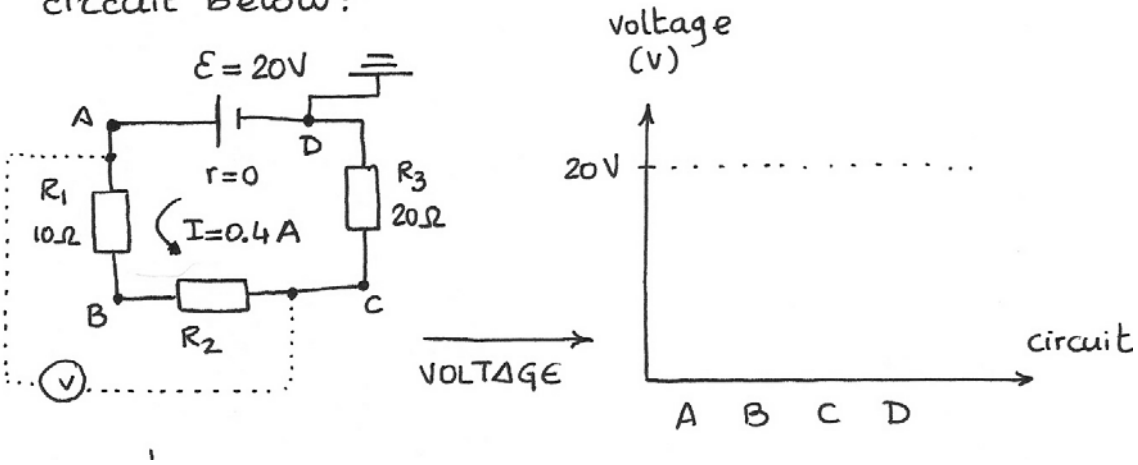
Conceptual Exercise

Complete the graphics related to the electric circuit below:



Determination of potentials (voltages)

"D" point is connected to the ground. Therefore, $V_D = 0$ V

"A" point is next to the postive electrode of the battery. It means that $V_A = 20$ V

From Ohm's Law, we can get the value of R_2:

$$I = \frac{\mathcal{E}}{R_{equiv}} = \frac{20\ V}{10\ \Omega + R_2 + 20\ \Omega} = 0.4\ A \rightarrow R_2 = 20\ \Omega$$

The potential difference between "A" and "B" (the voltage "lost") is:

$$V_A - V_B = I * R = 0.4\ A * 10\ \Omega = 4\ V$$

The potential (voltage) at "B" is:

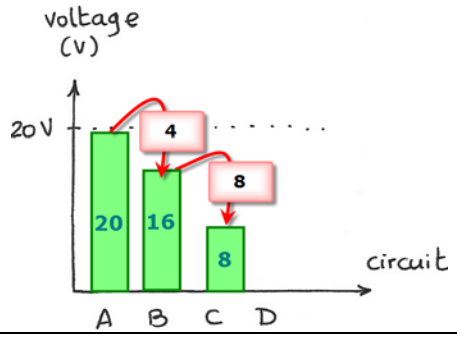
$$V_A - V_B = 4\ V \xrightarrow{V_A = 20\ V} 20\ V - V_B = 4\ V \rightarrow V_B = 16\ V$$

The potential difference between "B" and "C" is:

$$V_B - V_C = I * R = 0.4\ A * 20\ \Omega = 8\ V$$

The potential (voltage) at "C" is:

$$V_B - V_C = 8\ V \xrightarrow{V_B = 16\ V} 16\ V - V_C = 8\ V \rightarrow V_C = 8\ V$$



Determination of powers

The electric power (energy per second) supplied by the battery is:

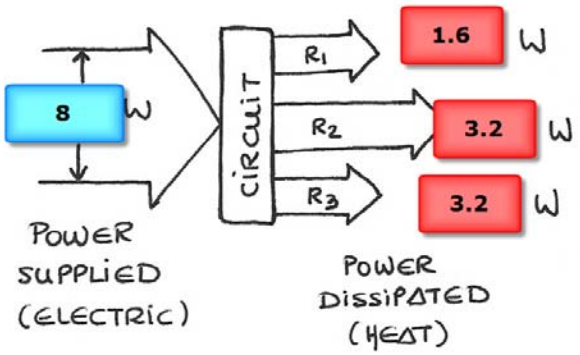
$P_{supplied} = \varepsilon * I = 20\ V * 0.4\ A = 8\ W$

The power dissipated (as heat) by each resistor is:

$P_{R1} = I^2 * R = (0.4\ A)^2 * 10\ \Omega = 1.6\ W$

$P_{R2} = I^2 * R = (0.4\ A)^2 * 20\ \Omega = 3.2\ W$

$P_{R3} = I^2 * R = (0.4\ A)^2 * 20\ \Omega = 3.2\ W$



Determination of the readings

The reading of the ammeter gives the value of the current. The reading of the voltmeter gives the value of the potential difference between two points: