

Física Experimental 3

Prática 3 – parte 1 e 2

Associação de Resistores

Prof. Carlos Renato Menegatti

Objetivos

- Montar circuitos com resistores em série, paralelo e misto;
- Calcular resistência equivalente;
- Medir tensão e corrente e diversos pontos do circuito;
- Determinar a potência dissipada/fornecida em cada elemento.

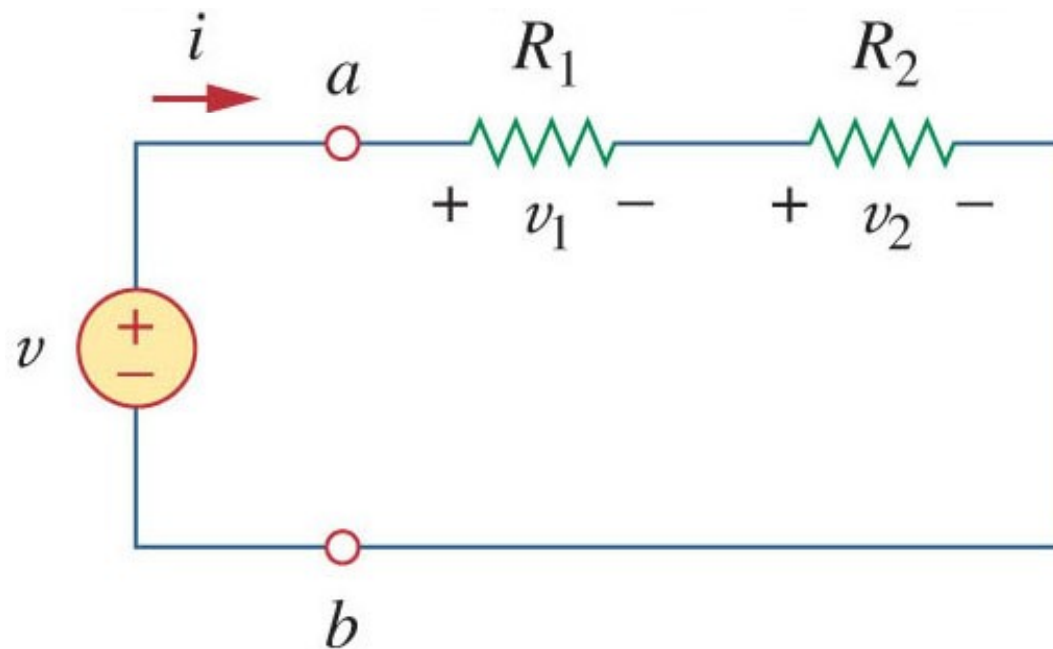
Conceitos teóricos

Lei de malhas

$$\sum_{m=1}^M v_m = 0$$

Elementos que dissipam energia + **V**

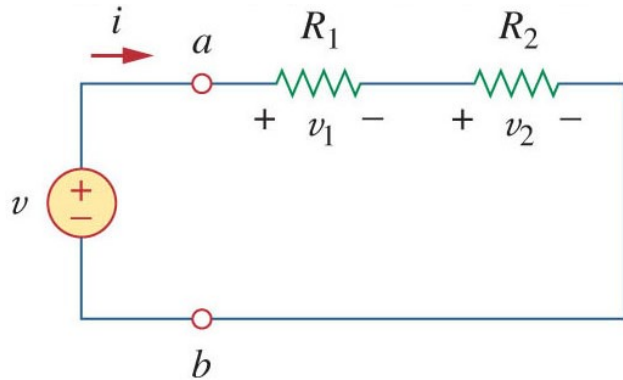
Elementos que fornecem energia - **V**



Resistores em série

$$-v + v_1 + v_2 = 0$$

Conceitos teóricos



Resistência equivalente para N resistores em série

$$v_1 = iR_1 \quad v_2 = iR_2$$

$$v = v_1 + v_2 = i(R_1 + R_2)$$

$$R_{eq} = R_1 + R_2$$

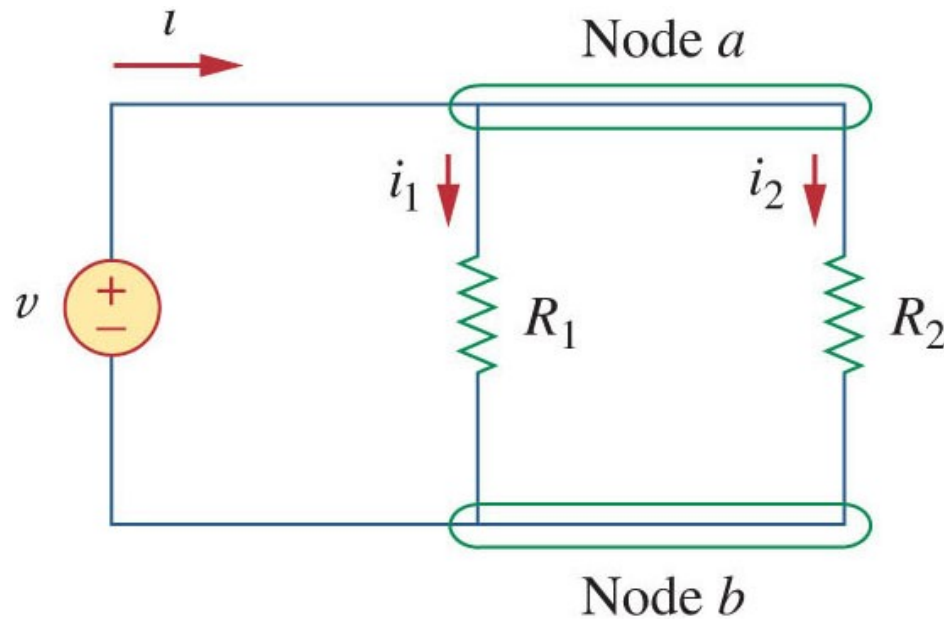
$$R_{eq} = \sum_{n=1}^N R_n$$

Conceitos teóricos

Lei de nós

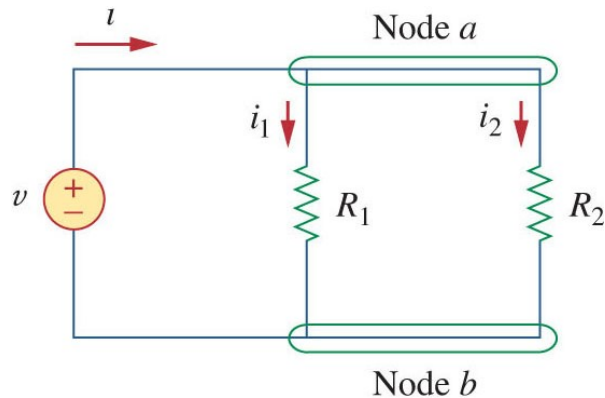
$$\sum_{n=1}^N i_n = 0$$

Correntes que entram no nó - $\mathbf{V}$
Correntes que saem do nó + $\mathbf{V}$



$$i = i_1 + i_2$$

Conceitos teóricos



Resistência equivalente para
N resistores em paralelo

$$1/R_{eq} = 1/R_1 + 1/R_2 + \dots 1/R_N$$

$$v = i_1 R_1 = i_2 R_2$$

$$i = i_1 + i_2$$

$$I = v/R_1 + v/R_2 = v (1/R_1 + 1/R_2)$$

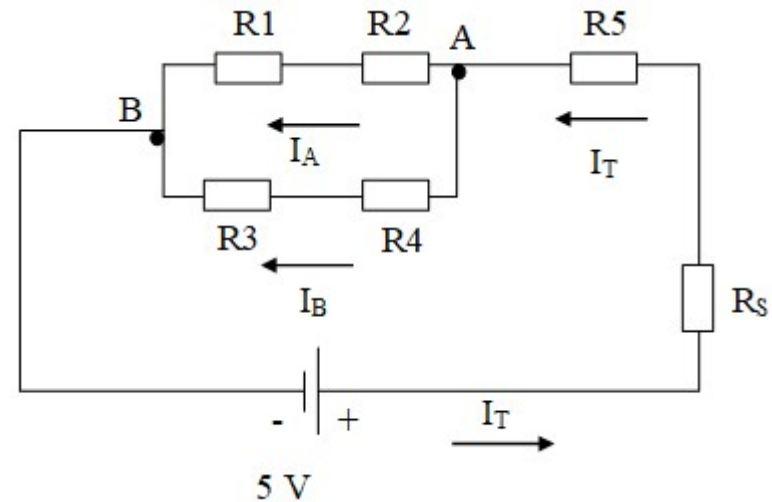
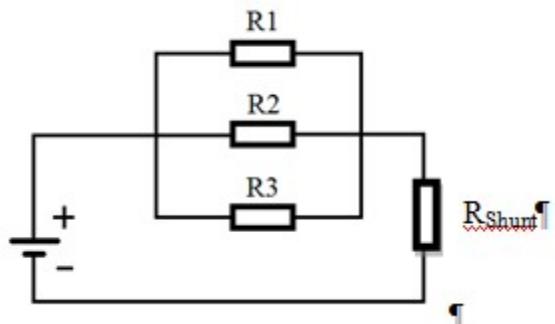
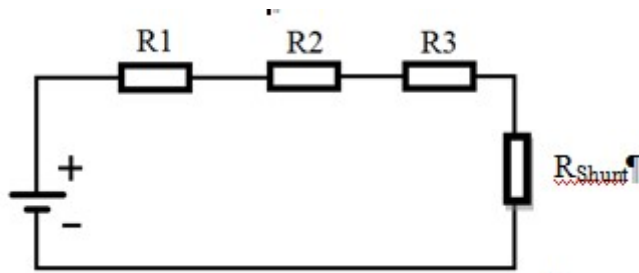
Conceitos teóricos

Potência

$$P = vi = Ri^2$$

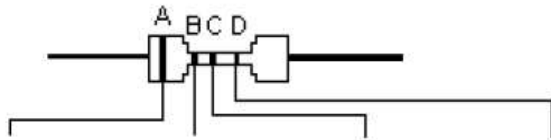
Procedimentos

- Atenção !!!! Em todos os experimentos onde tiver o R_s (shunt) trocar por **Amperímetro**!!!



Procedimentos (Parte 1 - série)

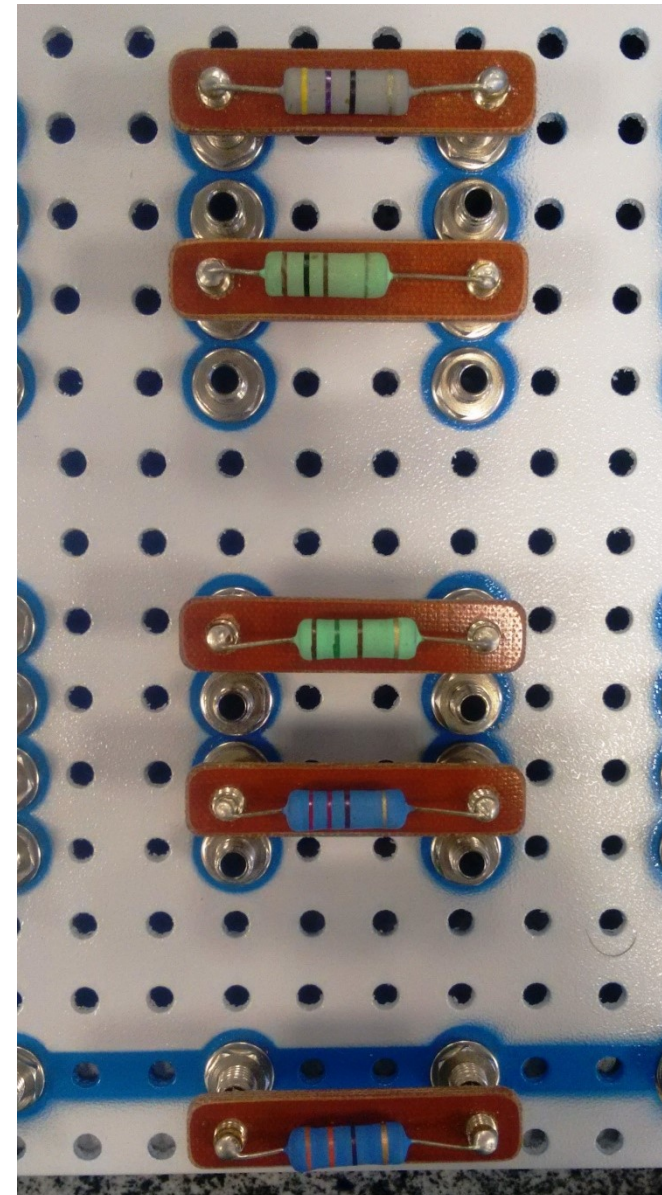
Item 2: Código de cores



Cor	1º algarismo	2º algarismo	Fator multiplicativo	Tolerância
preto	-----	0	x1	-----
marrom	1	1	x10	1%
vermelho	2	2	x10 ²	2%
laranja	3	3	x10 ³	-----
amarelo	4	4	x10 ⁴	-----
verde	5	5	x10 ⁵	-----
azul	6	6	x10 ⁶	-----
violeta	7	7	-----	-----
cinza	8	8	-----	-----
branco	9	9	-----	-----
ouro	-----	-----	x10 ⁻¹	5%
prata	-----	-----	x10 ⁻²	10%

R1 = Amarelo – violeta – preto - ouro
 4 7 x 10⁰ +/- 5%

$$R1 = (47 \pm 2)\Omega$$



Procedimentos (Parte 1 - série)

Item 3: Multímetro

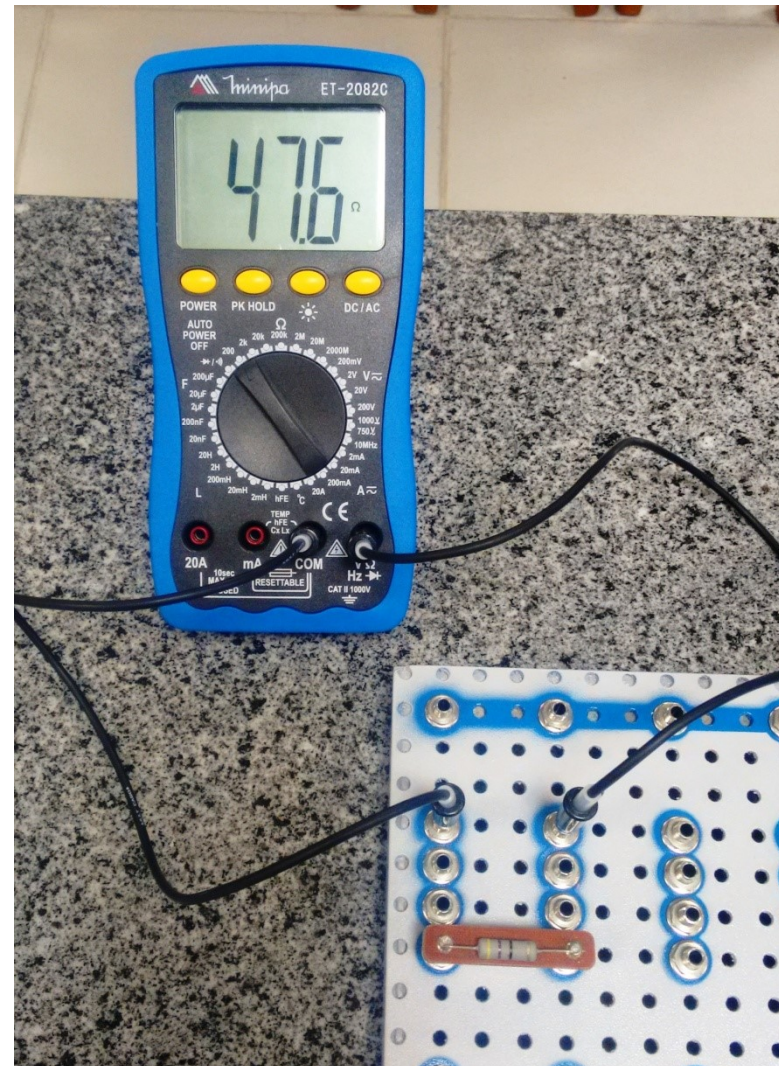
$$R1 = 47,6 \, \Omega$$

$$R2 = 100,3 \, \Omega$$

$$R3 = 150 \, \Omega$$

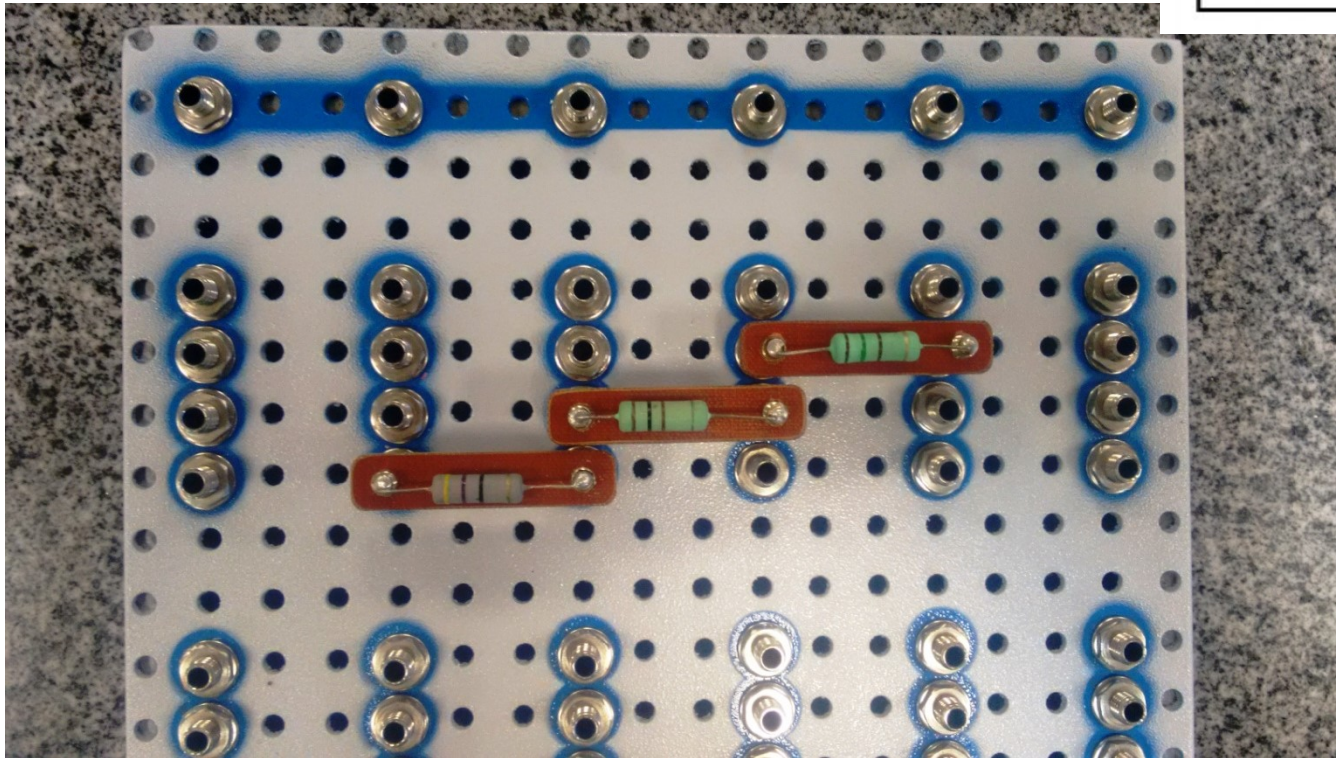
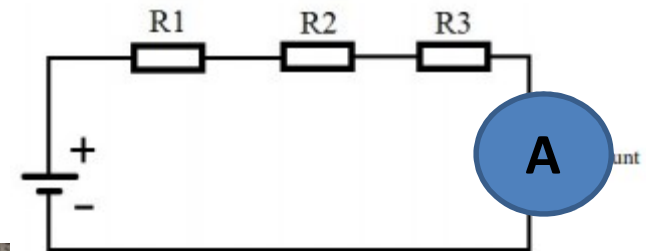
$$R4 = 224 \, \Omega$$

$$R5 = 331 \, \Omega$$



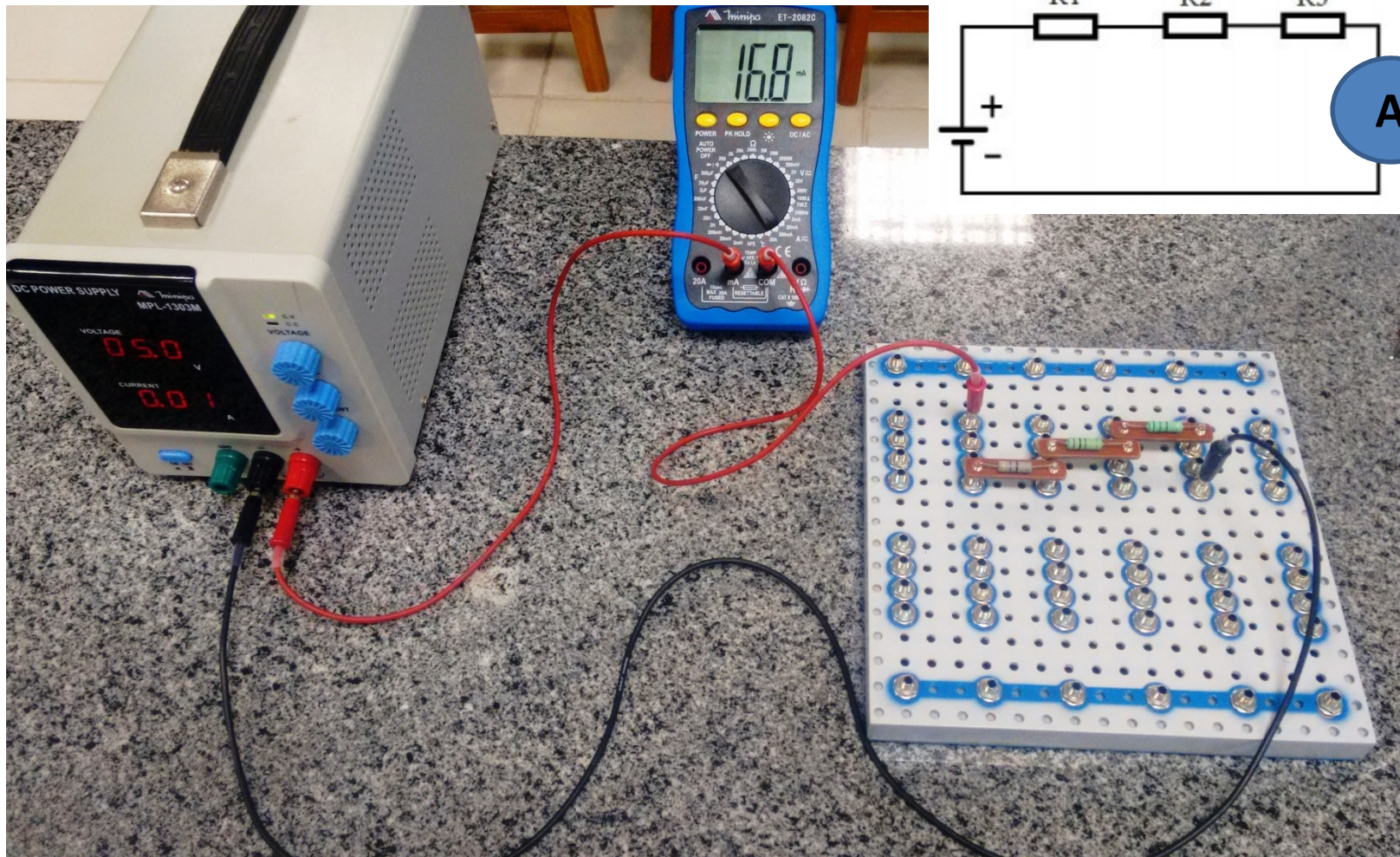
Procedimentos (Parte 1 - série)

Item 1: monte 3 resistores em série



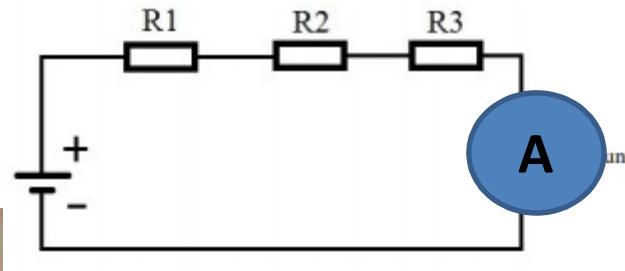
Procedimentos (Parte 1 - série)

Item 1: monte o circuito



Procedimentos (Parte 1 - série)

Item 5: Determine as tensões e corrente nos resistores

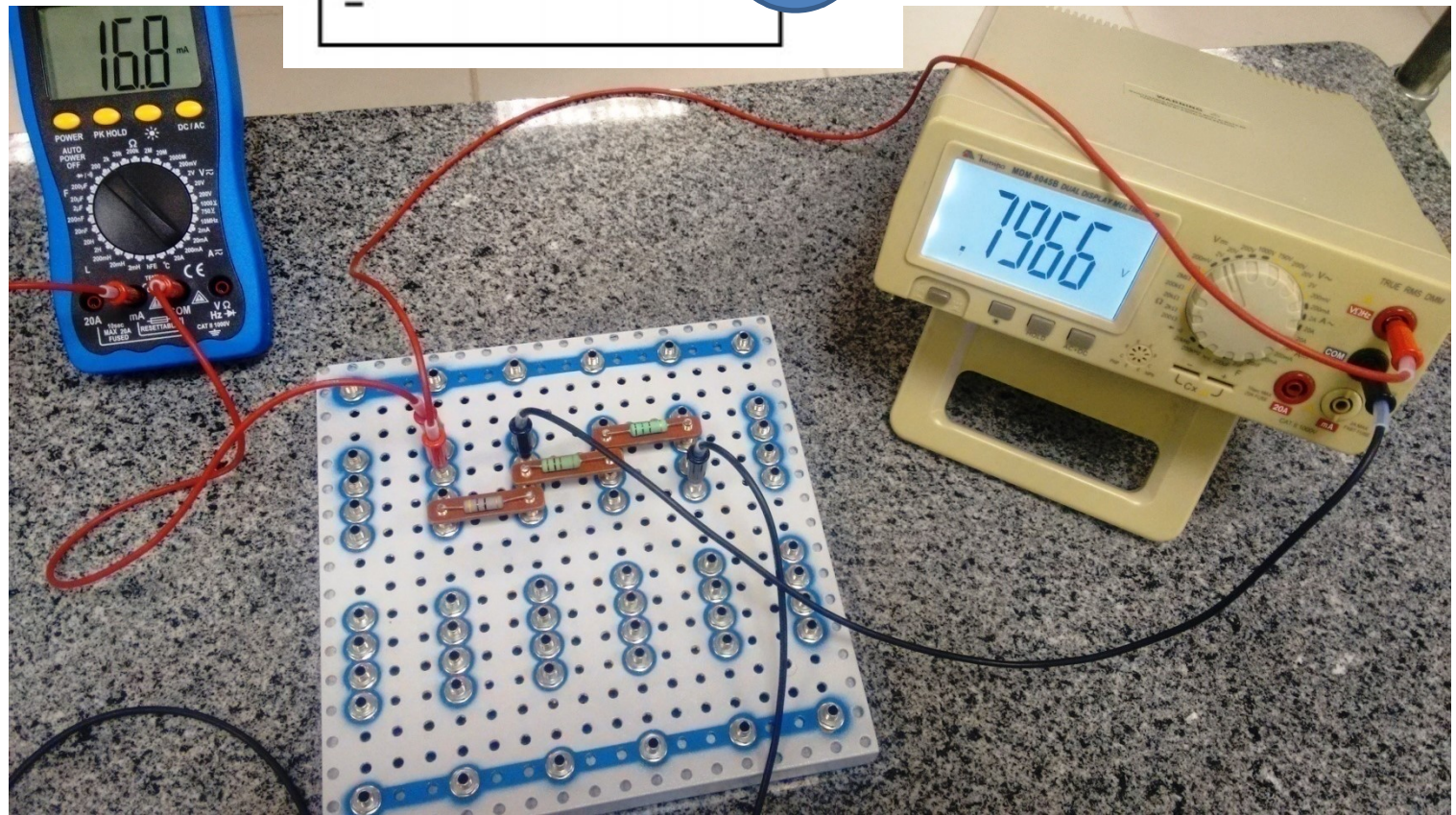


$$V1 = 0,80 \text{ V}$$

$$V2 = 1,68 \text{ V}$$

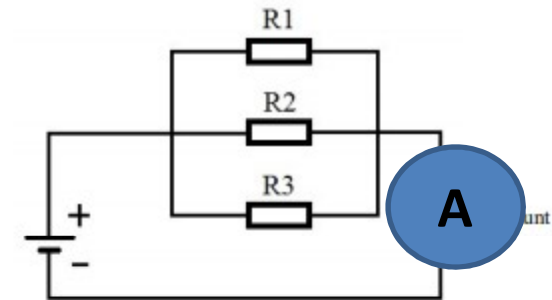
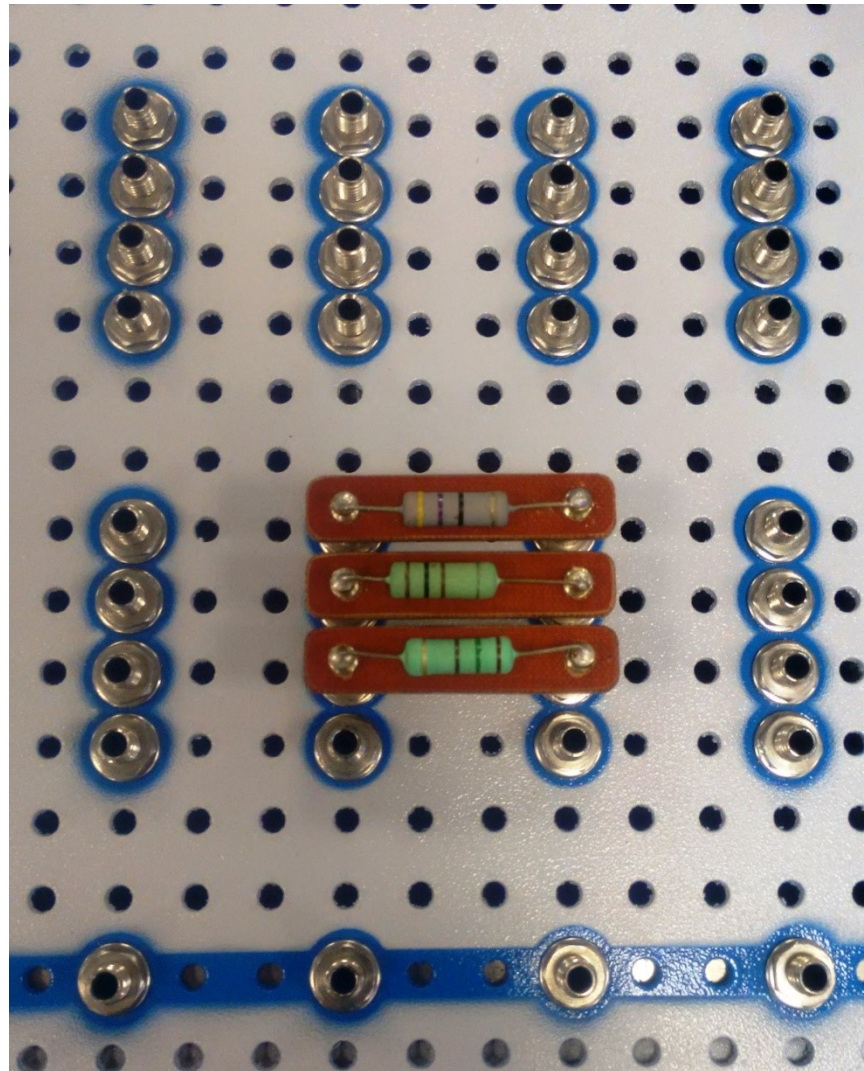
$$V3 = 2,51$$

$$I = 16,8 \text{ mA}$$



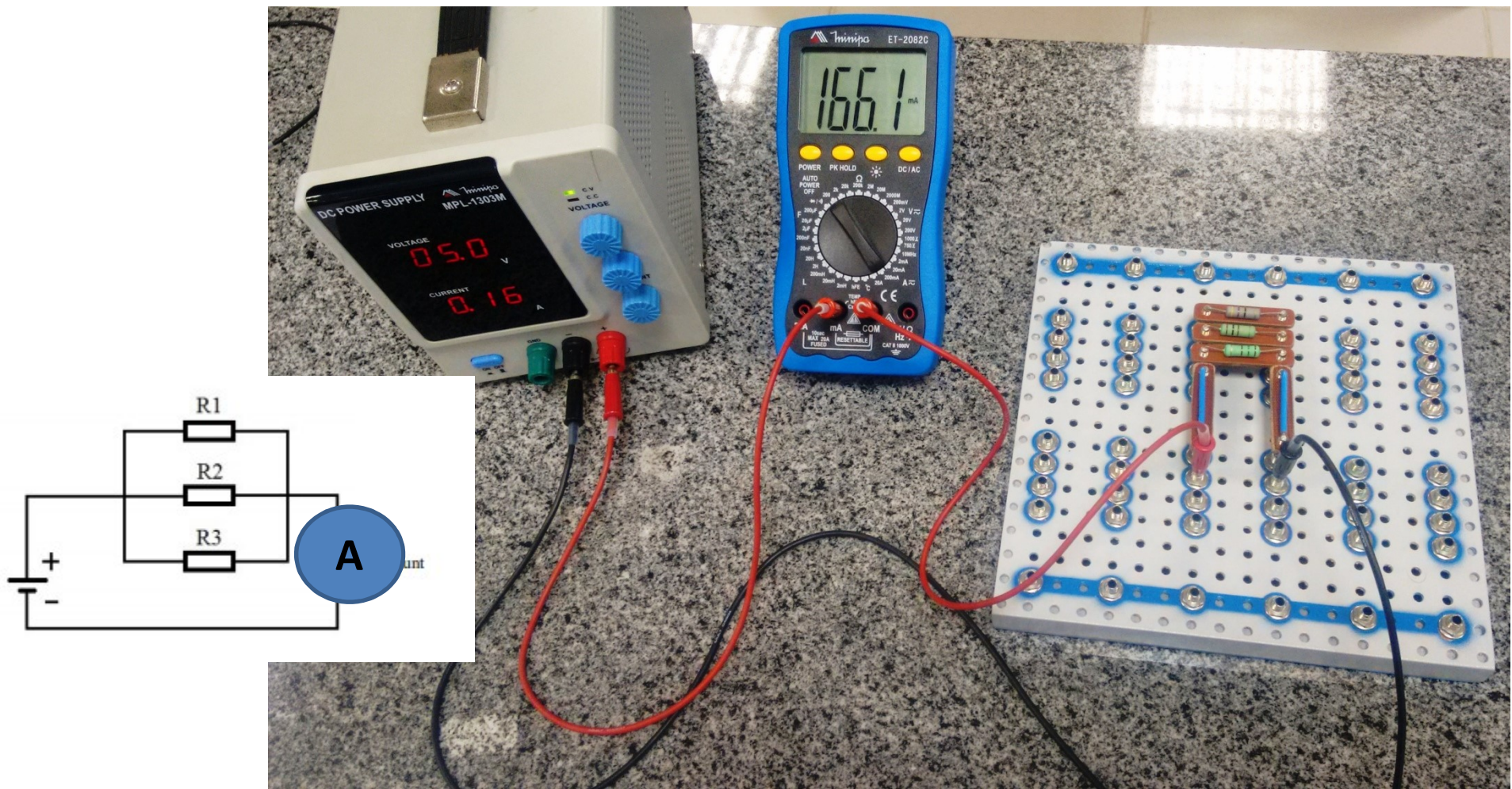
Procedimentos (Parte 1 - paralelo)

Item 1:



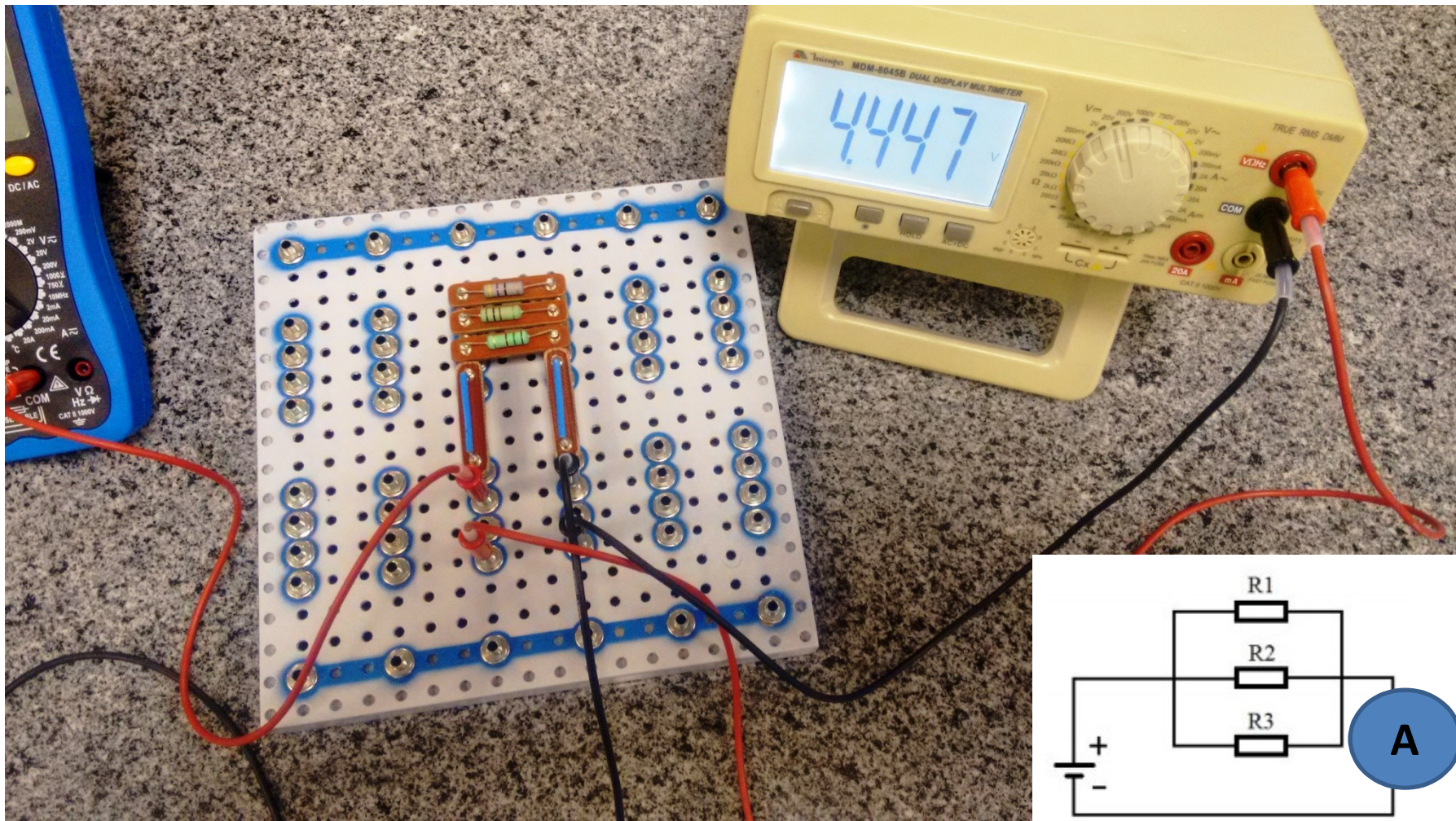
Procedimentos (Parte 1 - paralelo)

Item 4: $i_{\text{total}} = 168,2 \text{ mA}$



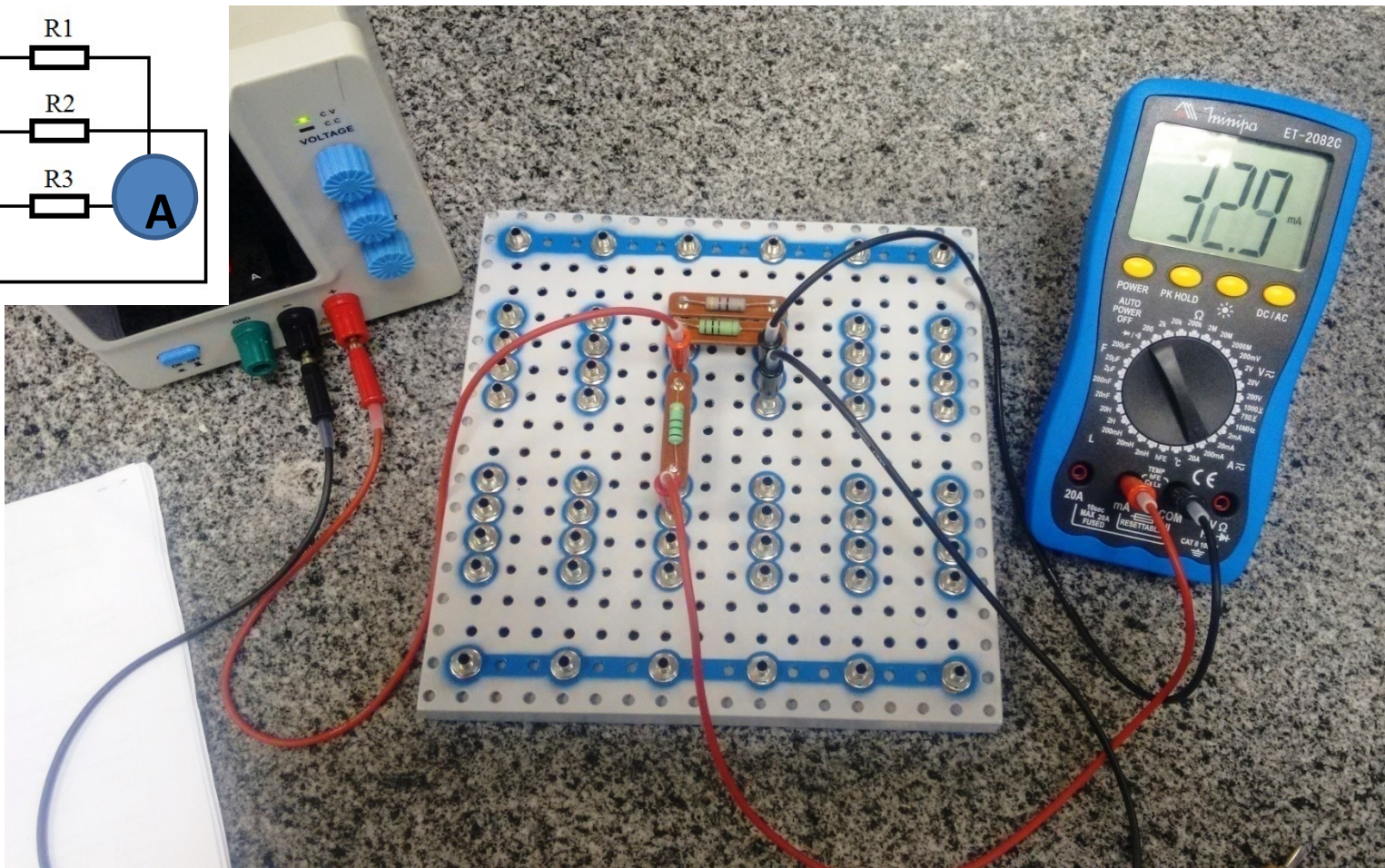
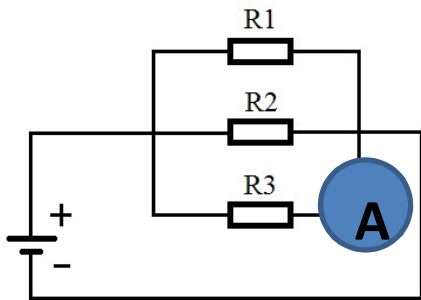
Procedimentos (Parte 1 - paralelo)

Item 4: v em cada resistor = 4,46 V

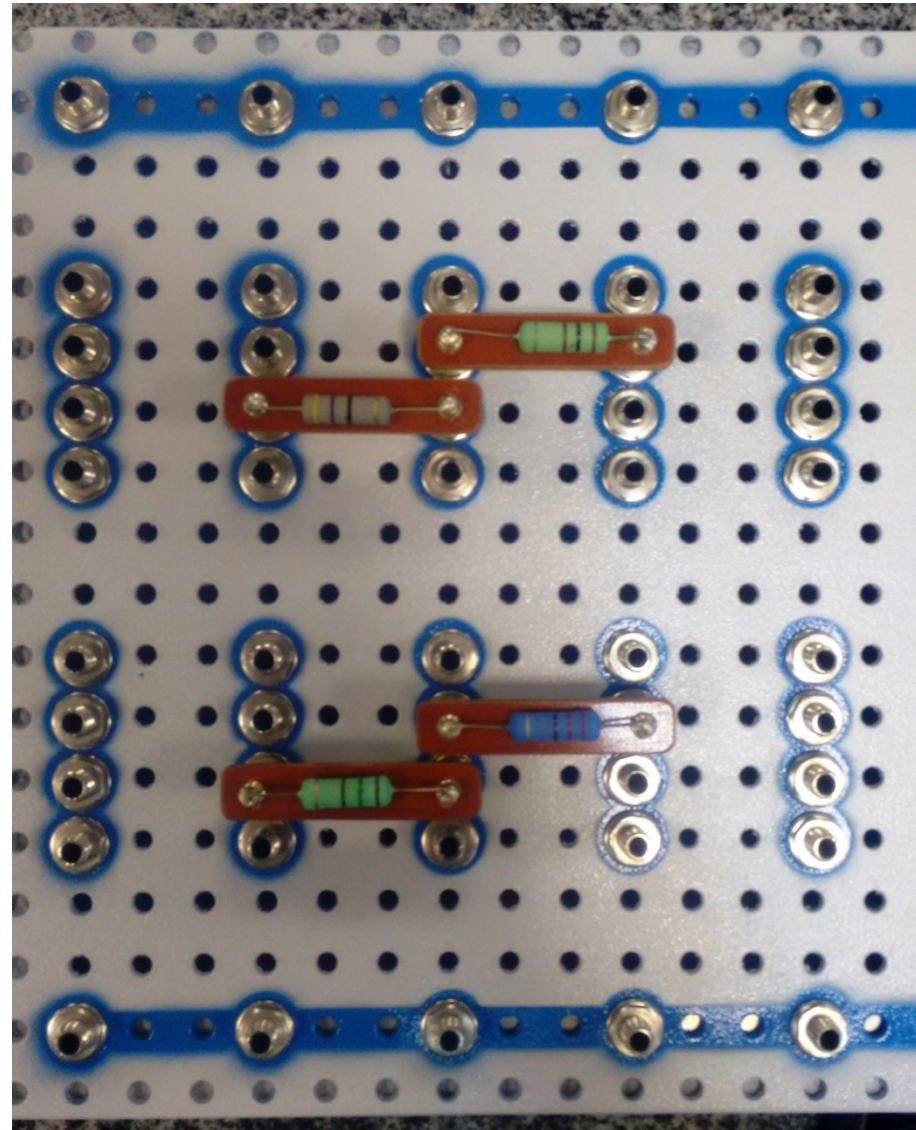
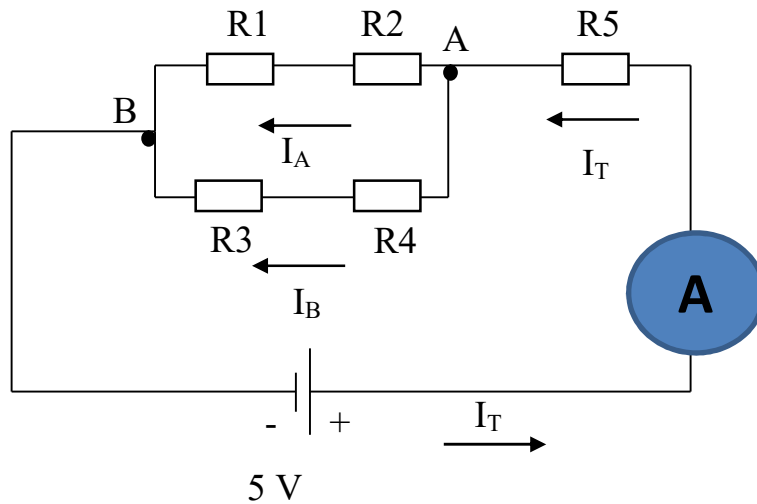


Procedimentos (Parte 1 - paralelo)

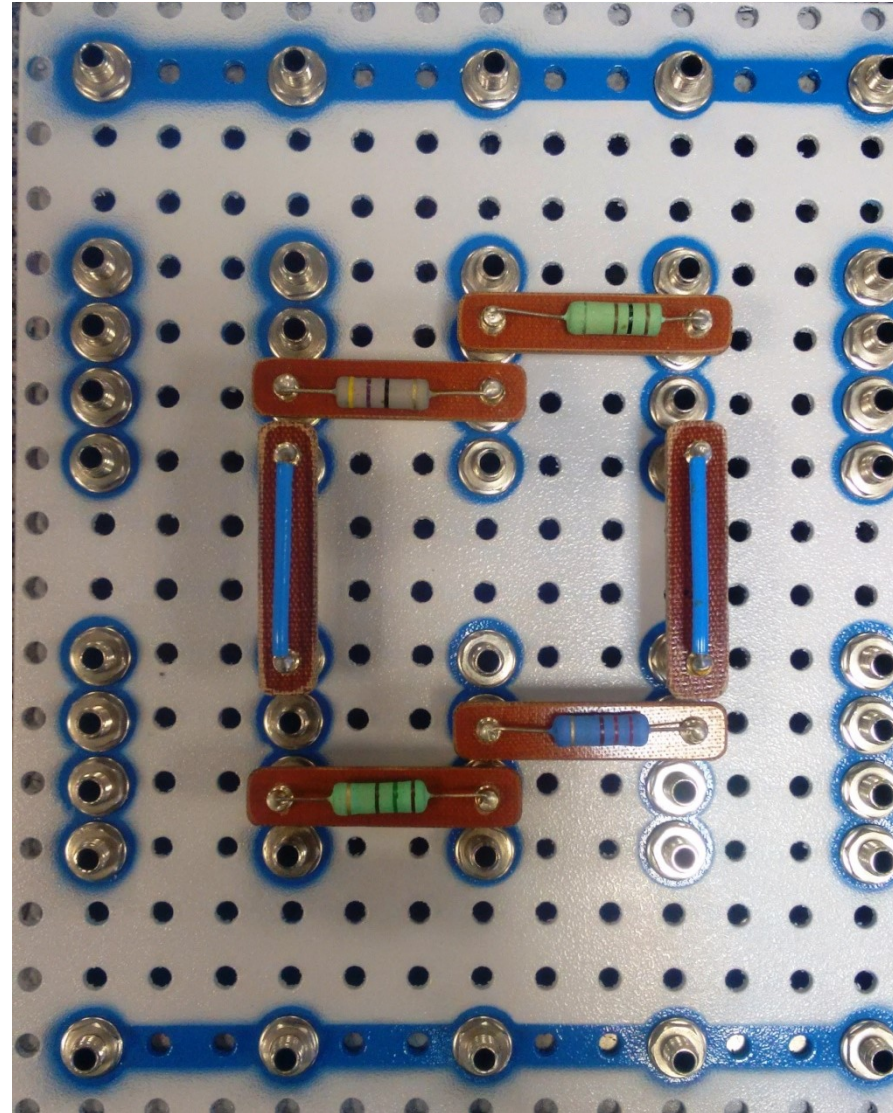
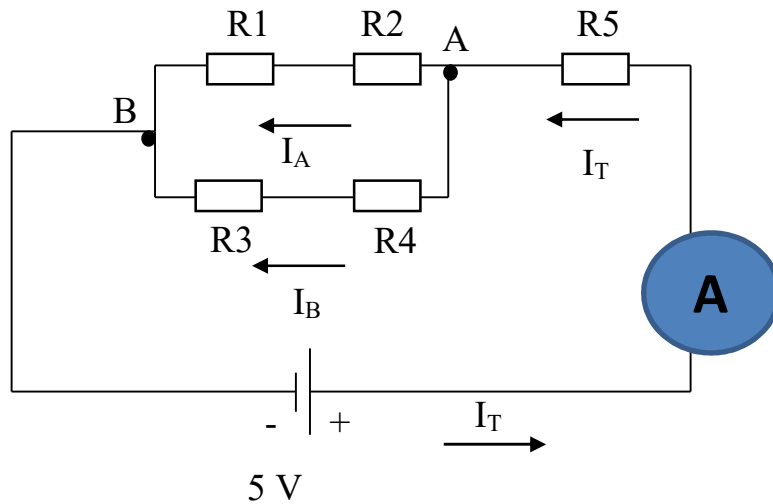
Item 4: $i_1 = 93,9 \text{ mA}$ / $i_2 = 45,6 \text{ mA}$ / $i_3 = 29,0 \text{ mA}$



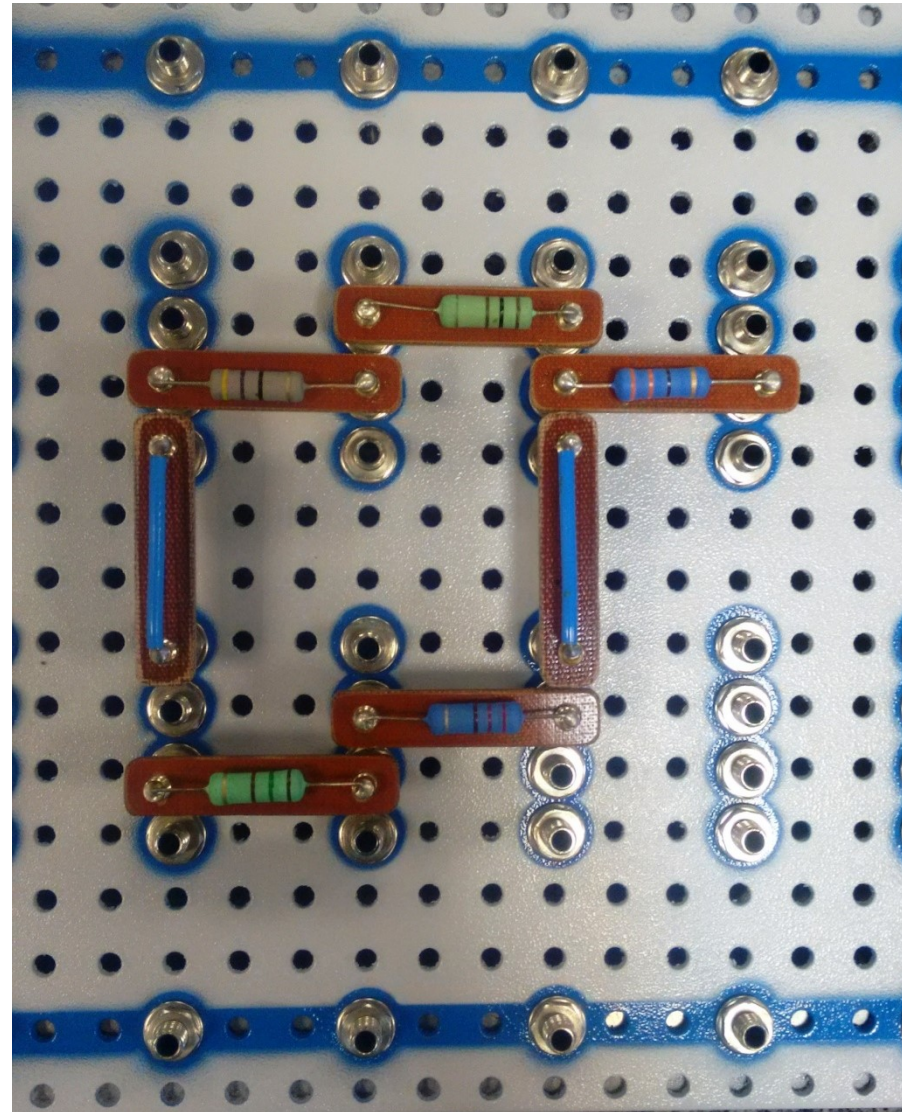
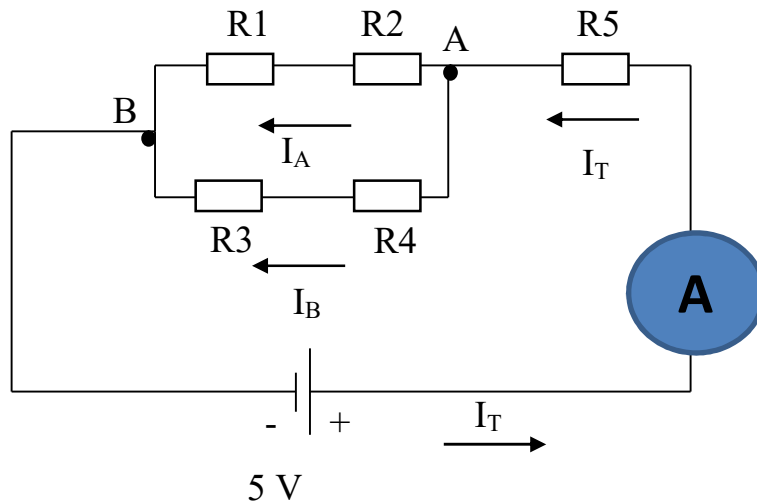
Procedimientos (Parte 2 - Misto)



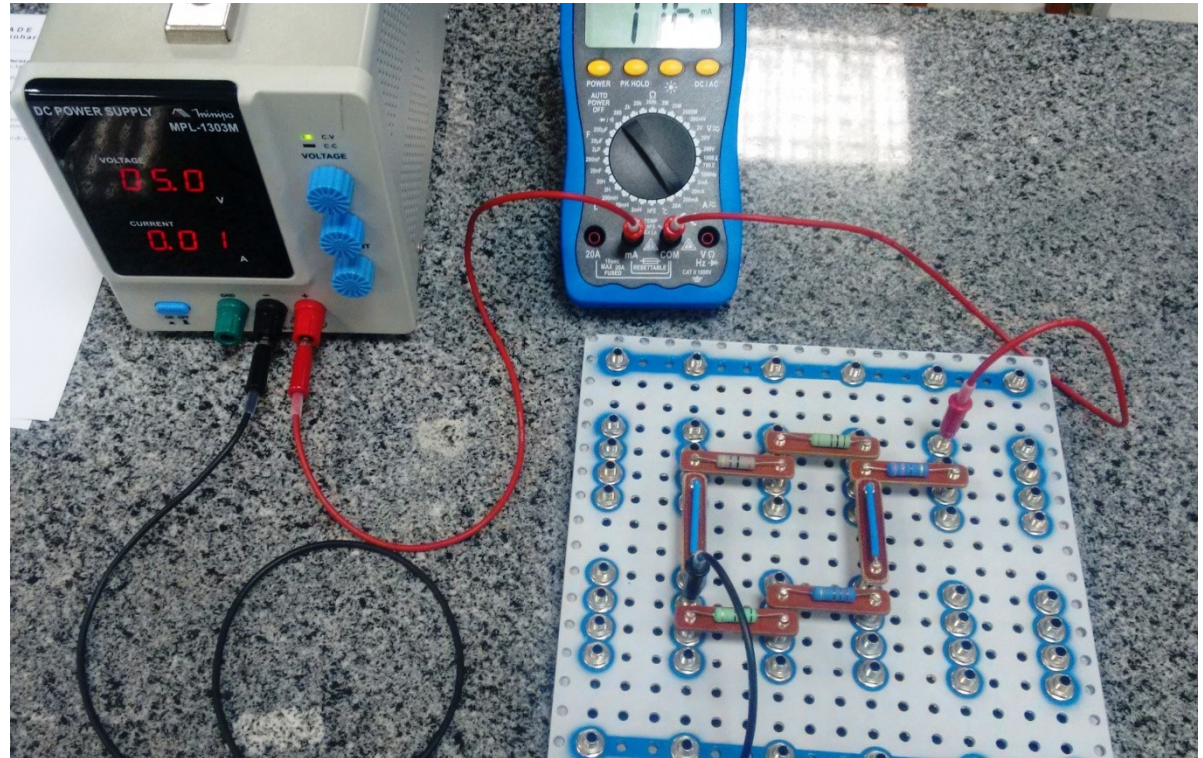
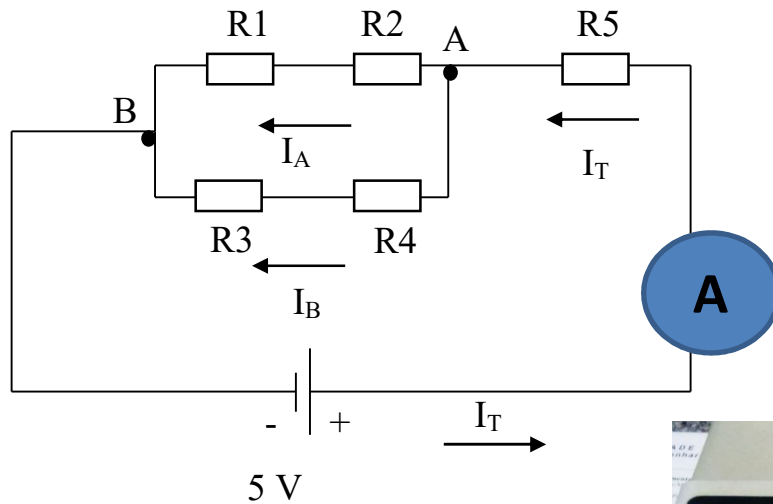
Procedimientos (Parte 2 - Misto)



Procedimentos (Parte 2 - Misto)

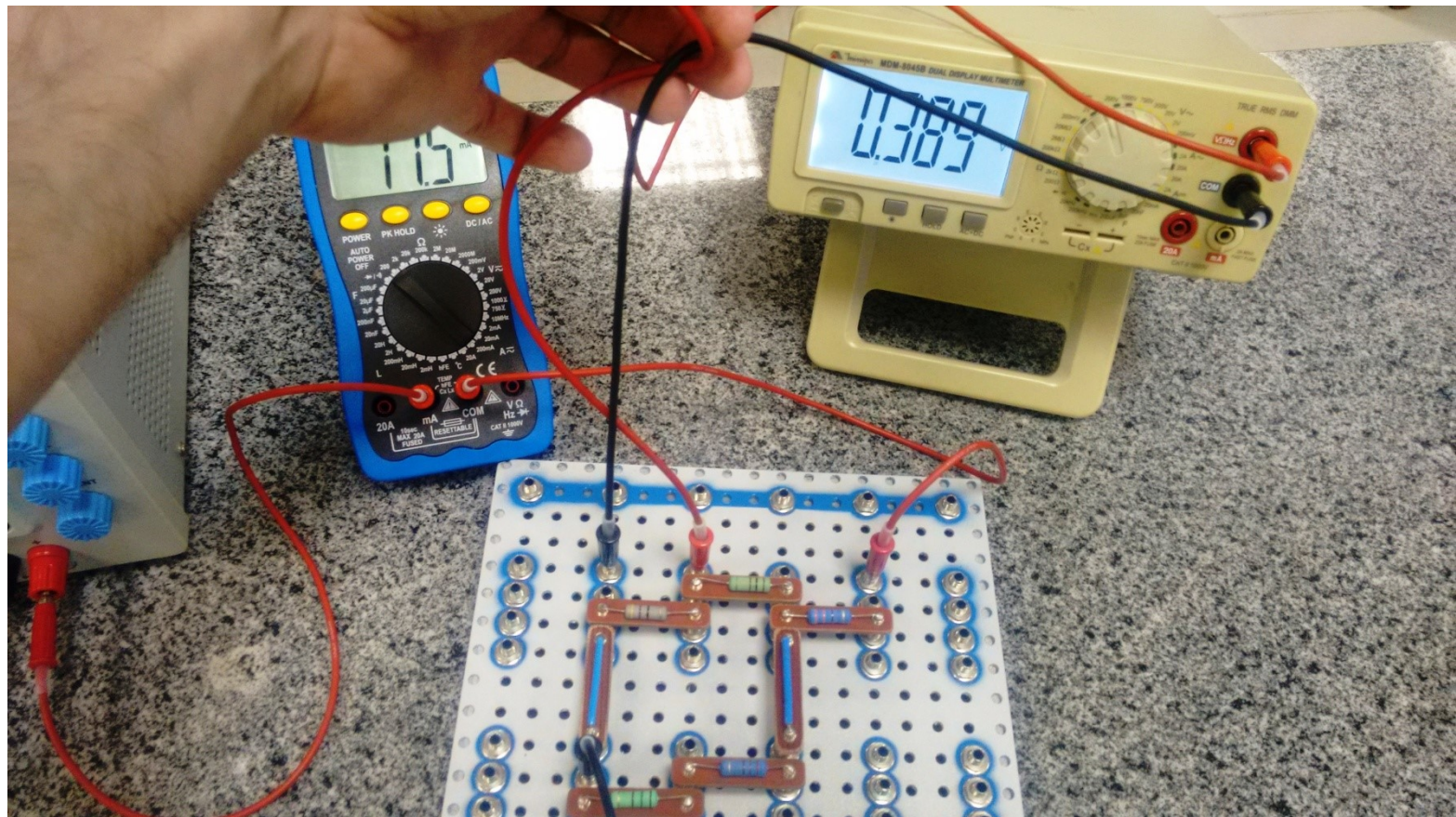


Procedimentos (Parte 2 - Misto)



Procedimentos (Parte 2 - Misto)

Medindo a tensão em cada resistor:



Resultados (Parte 2 - Misto)

$$V1 = 0,39 \text{ V}$$

$$V2 = 0,82 \text{ V}$$

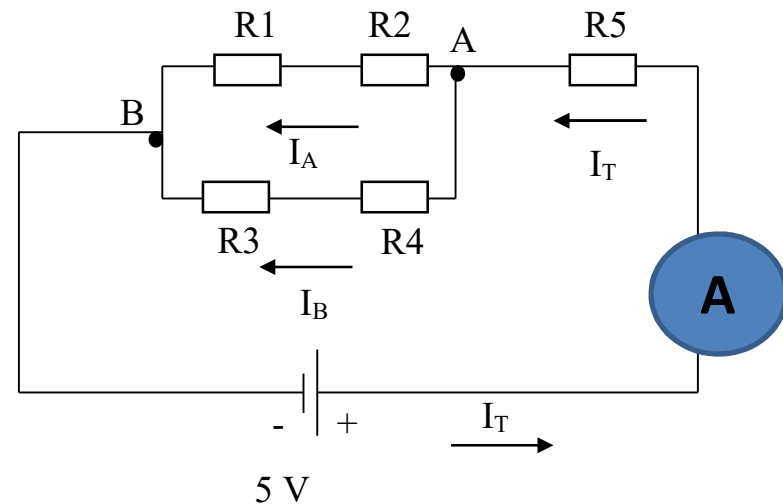
$$V3 = 0,49 \text{ V}$$

$$V4 = 0,72 \text{ V}$$

$$V5 = 3,78 \text{ V}$$

$$V_{\text{fonte}} = 5,00 \text{ V}$$

$$I_{\text{total}} = 11,6 \text{ mA}$$



Trabalho

- Relatório 3 = parte 1 + parte 2
- Entrega 2/06 (duas semanas)