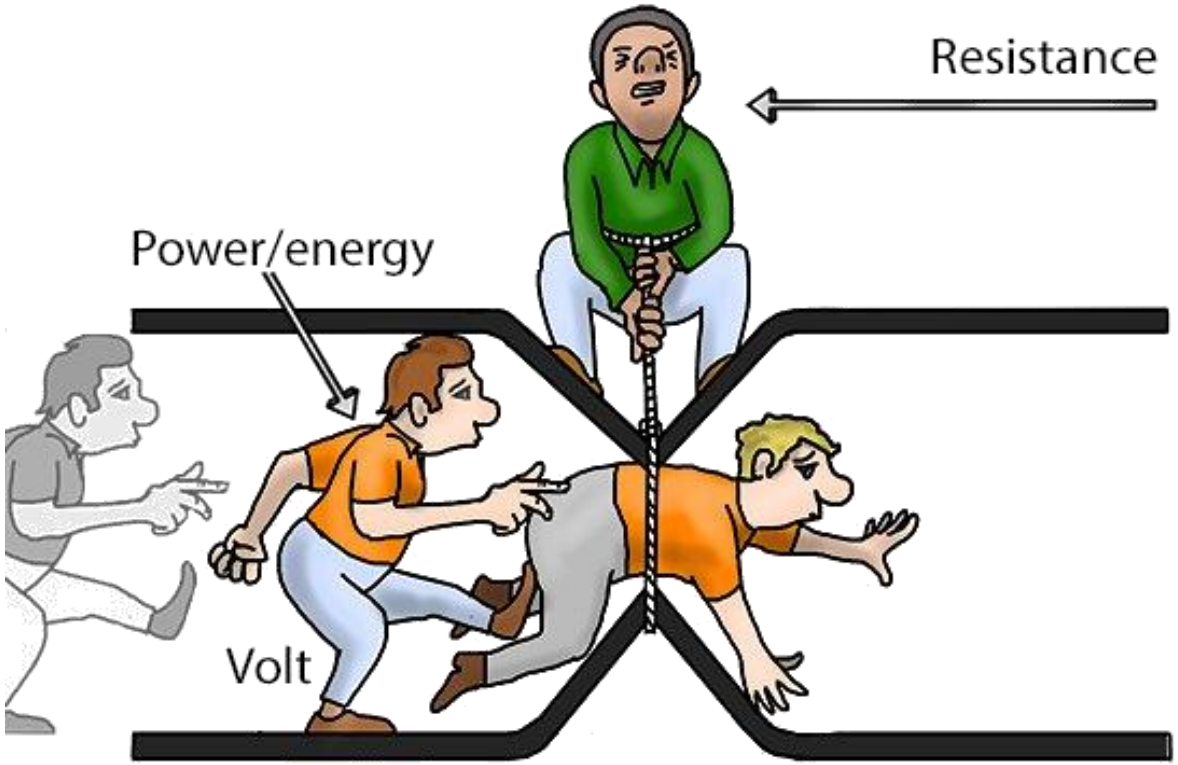
Physics – Grade 10

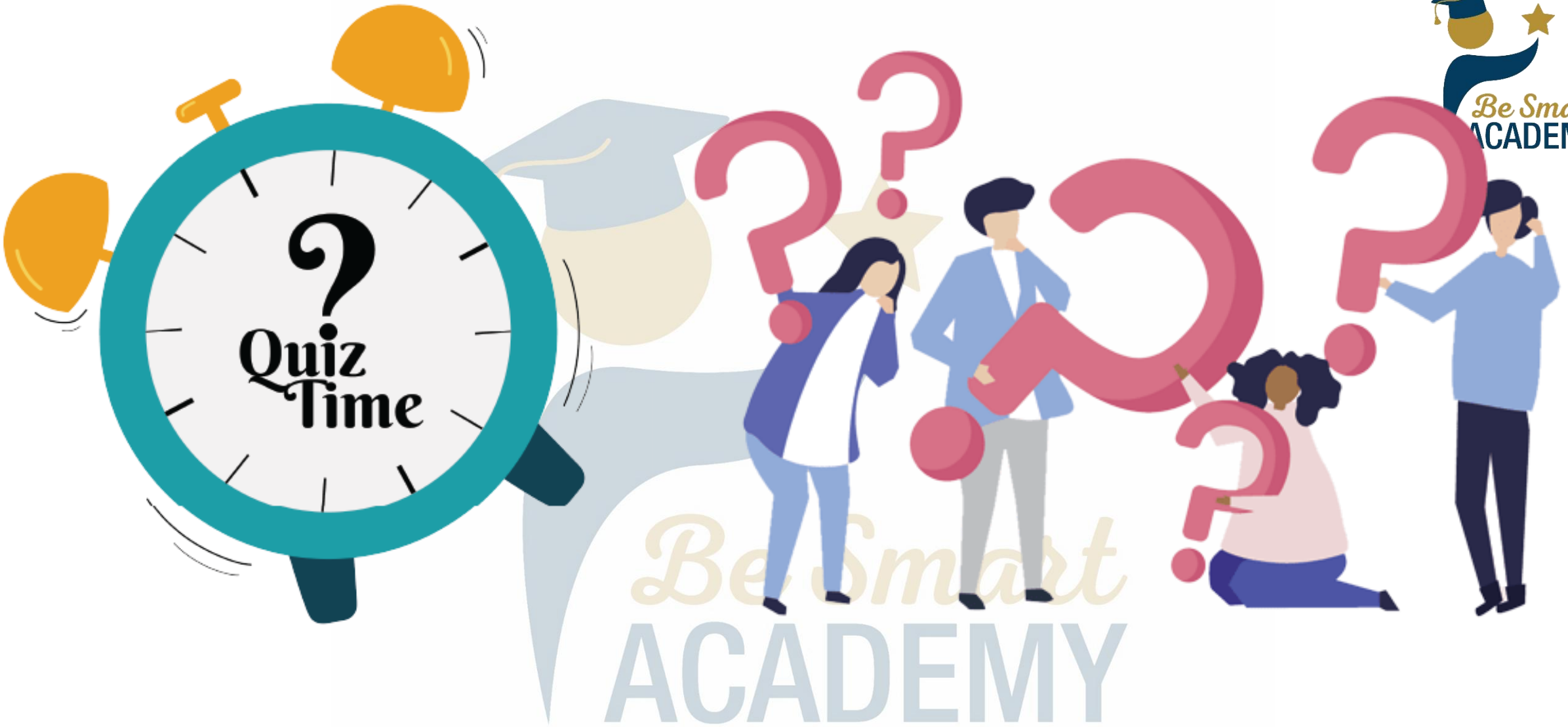


Unit One

Electricity

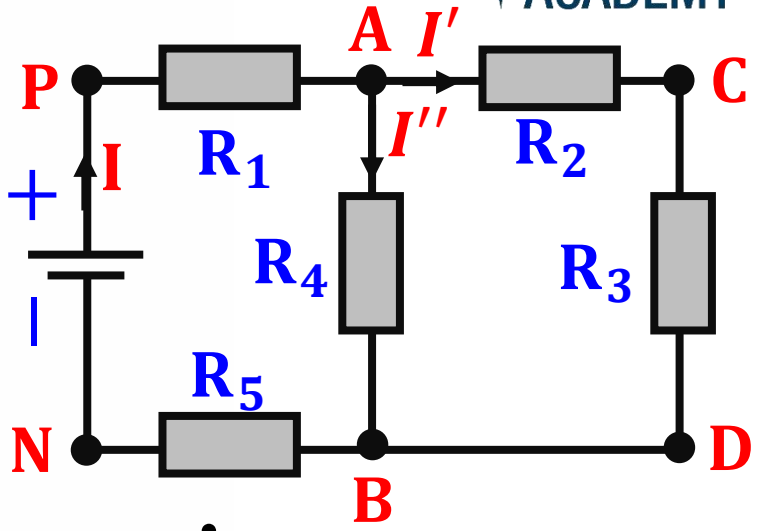
Chapter 4 – Resistors

Prepared & Presented by: Mr. Mohamad Seif



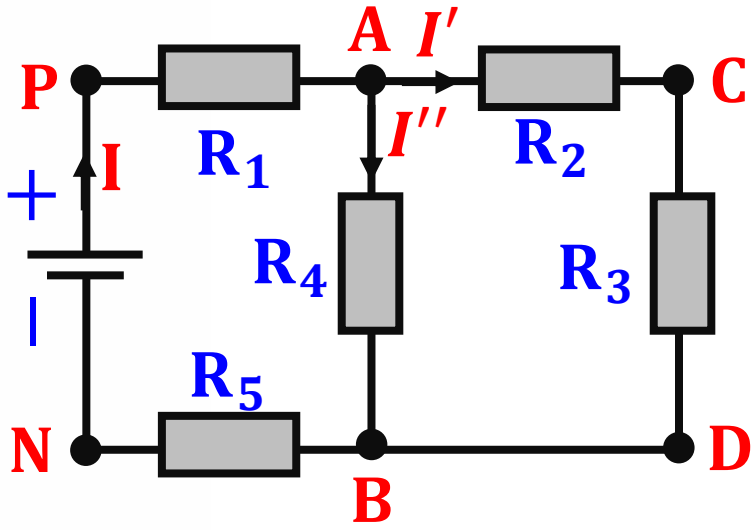
Quiz physics 20 min

Five resistors of resistances $R_1 = 4\Omega$; $R_2 = 5\Omega$; $R_3 = 10\Omega$; $R_4 = 3\Omega$; $R_5 = 2\Omega$ respectively, are connected to an ideal battery of voltage $V_{PN} = 12V$ as shown in the adjacent figure.



1. Determine the resistance of the equivalent resistor.
2. Show that the main current sent by the battery is $I = 0.15A$.
3. Determine the voltages V_{PA}; V_{AB} and V_{BN}.

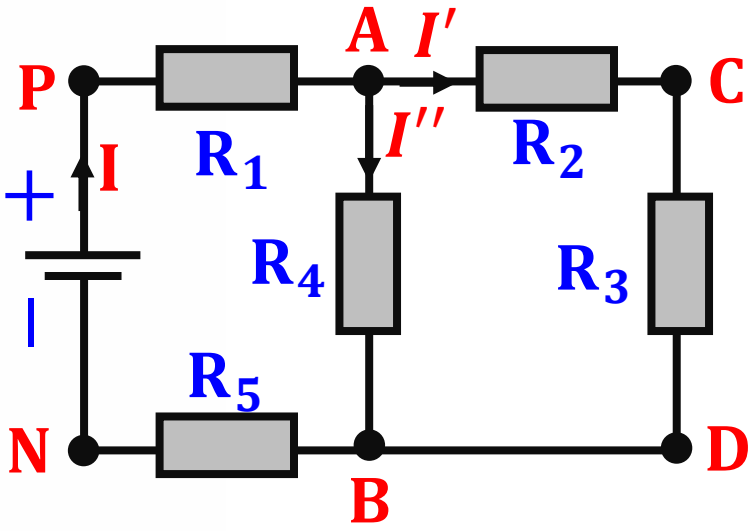
4. Deduce the dissipated power P_{PA}; P_{AB} and P_{BN}.
5. Verify that the total power dissipated by this circuit is equal to the power delivered by the battery.
6. Calculate the intensity of currents I' and I''.
7. Determine the electric energy supplied by the battery during 1 min.



Quiz physics 20 min

$V_{PN} = 12V; R_1 = 4\Omega; R_2 = 5\Omega; R_3 = 10\Omega; R_4 = 3\Omega; R_5 = 2\Omega.$

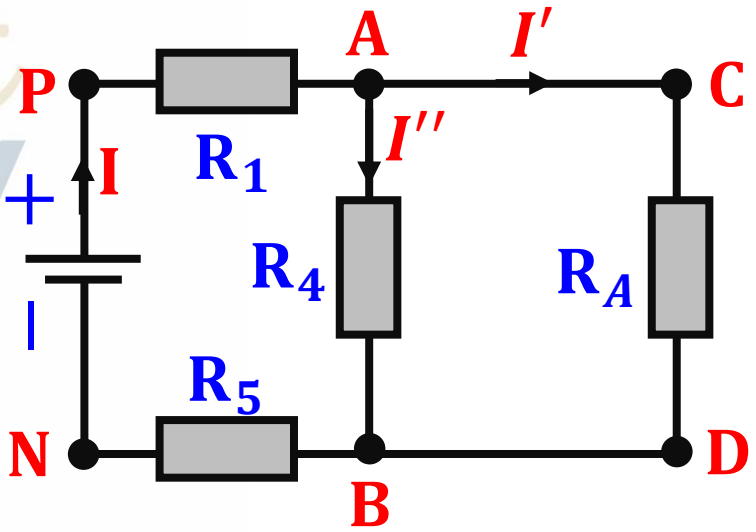
1.Determine the resistance of the equivalent resistor



R_2 and R_3 are in series:

$$R_A = R_2 + R_3$$

$$R_A = 5 + 10 = 15\Omega$$

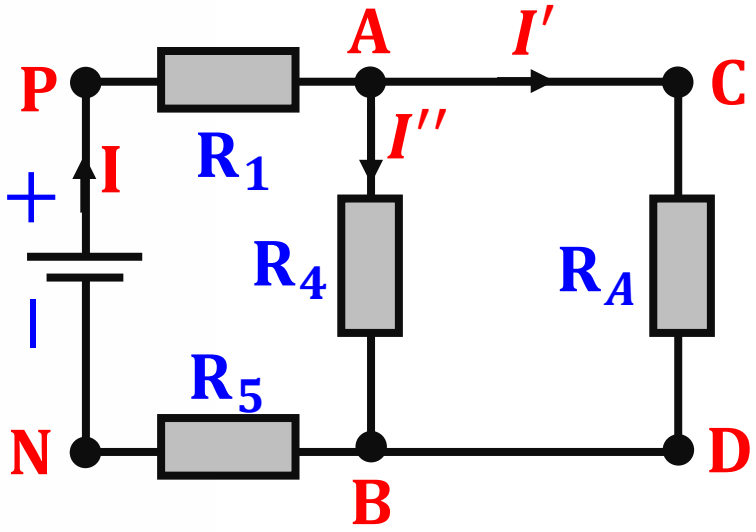


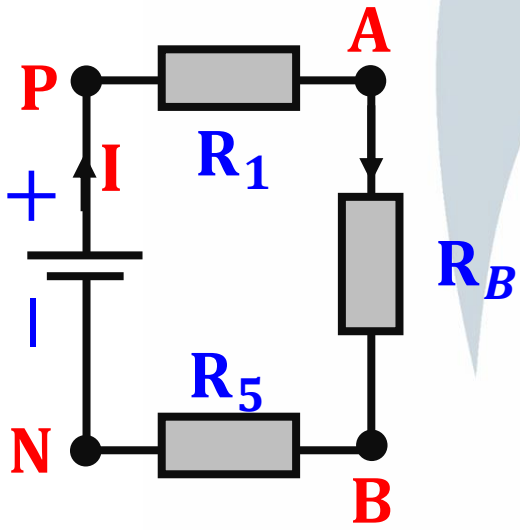
Quiz physics 20 min

$V_{PN} = 12V; R_1 = 4\Omega; R_2 = 5\Omega; R_3 = 10\Omega; R_4 = 3\Omega; R_5 = 2\Omega.$

R_A and R_4 are in parallel:

$$R_B = \frac{R_A \times R_4}{R_A + R_4} = \frac{15 \times 3}{15 + 3} = 2.5\Omega$$

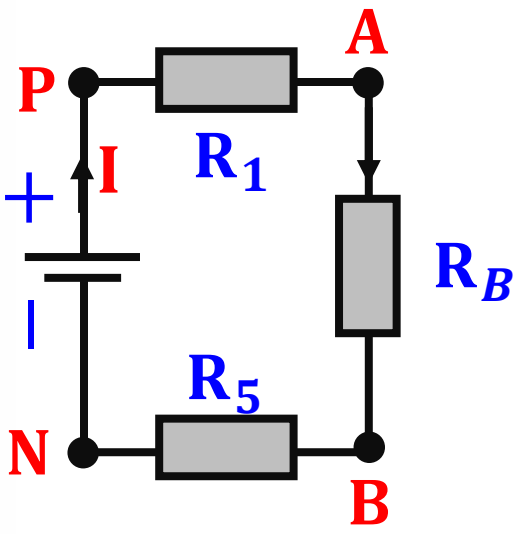




Quiz physics 20 min

$V_{PN} = 12V; R_1 = 4\Omega; R_2 = 5\Omega; R_3 = 10\Omega; R_4 = 3\Omega; R_5 = 2\Omega.$

$R_1; R_B$ and R_5 are in series:



$$R_{eq} = R_1 + R_B + R_5$$

$$R_{eq} = 4 + 2.5 + 2$$

$$R_{eq} = 8.5\Omega$$

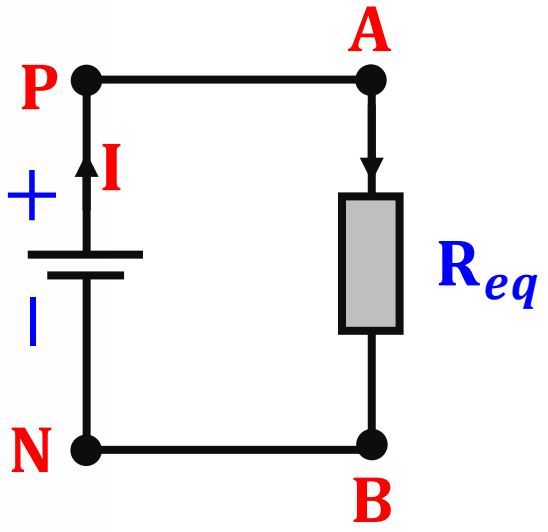
$V_{PN} = 12V; R_1 = 4\Omega; R_2 = 5\Omega; R_3 = 10\Omega; R_4 = 3\Omega; R_5 = 2\Omega.$

2. Deduce the intensity of the current sent by the battery.

$$V_{PN} = R_{eq} \times I$$

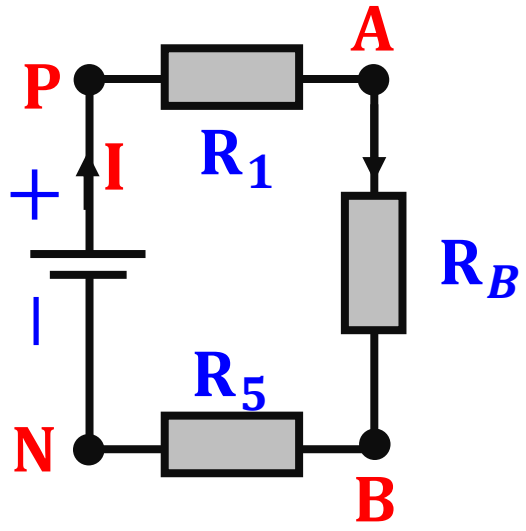
$$I = \frac{V_{PN}}{R_{eq}} = \frac{12}{8.5}$$

$$I = 141A$$



$V_{PN} = 12V; R_1 = 4\Omega; R_2 = 5\Omega; R_3 = 10\Omega; R_4 = 3\Omega; R_5 = 2\Omega.$

3. Determine the voltages V_{PA}; V_{AB} and V_{BN}



$$V_{PA} = R_1 \times I$$

$$V_{PA} = 4 \times 1.41$$

$$V_{PA} = 5.64V$$

$$V_{AB} = R_B \times I$$

$$V_{AB} = 2 \times 1.41$$

$$V_{AB} = 2.82V$$

$$V_{BN} = R_5 \times I$$

$$V_{BN} = 2 \times 1.41$$

$$V_{BN} = 2.82V$$

$V_{PN} = 12V; R_1 = 4\Omega; R_2 = 5\Omega; R_3 = 10\Omega; R_4 = 3\Omega; R_5 = 2\Omega.$

4. Deduce the dissipated power P_{PA}; P_{AB} and P_{BN}.

$$P_{PA} = V_{PA} \times I$$

$$P_{PA} = 5.64V \times 1.41$$

$$P_{PA} = 7.95W$$

$$P_{AB} = V_{AB} \times I$$

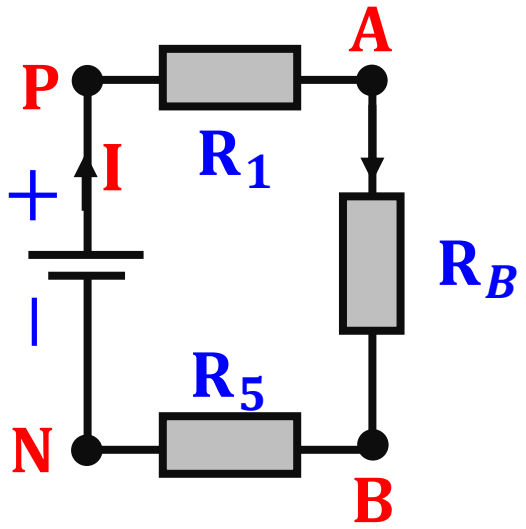
$$P_{AB} = 2.82V \times 1.41$$

$$P_{AB} = 3.97W$$

$$P_{BN} = V_{BN} \times I$$

$$P_{BN} = 2.82 \times 1.41$$

$$P_{BN} = 3.97W$$



$V_{PN} = 12V; R_1 = 4\Omega; R_2 = 5\Omega; R_3 = 10\Omega; R_4 = 3\Omega; R_5 = 2\Omega.$

5. Verify that the total power dissipated by this circuit is equal to the power delivered by the battery.

$$P_{PN} = V_{PN} \times I$$

$$P_{PN} = 12V \times 1.41$$

$$P_{PN} = 16.92W$$

$$P_{PN} = P_{PA} + P_{AB} + P_{BN}$$

$$P_{PN} = 7.95 + 3.97 + 3.97$$

$$P_{PN} = 16.92W$$

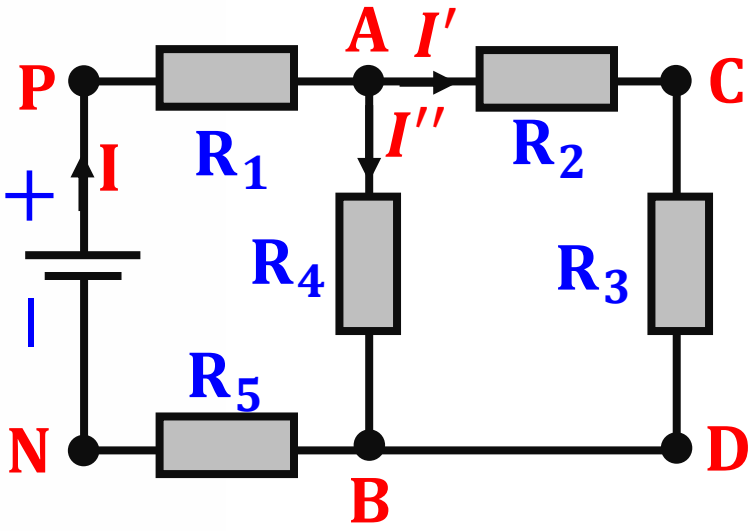
$$P_{PN} = R_{eq} \times I^2$$

$$P_{diss} = 8.5 \times (1.41)^2$$

$$P_{diss} = 16.92W$$

$V_{PN} = 12V; R_1 = 4\Omega; R_2 = 5\Omega; R_3 = 10\Omega; R_4 = 3\Omega; R_5 = 2\Omega.$

6. Calculate the intensity of currents I' and I“.



$$V_{AB} = R_4 \times I'' \Rightarrow I'' = \frac{V_{AB}}{R_4} = \frac{2.82V}{3}$$

$$I'' = 0.94A$$

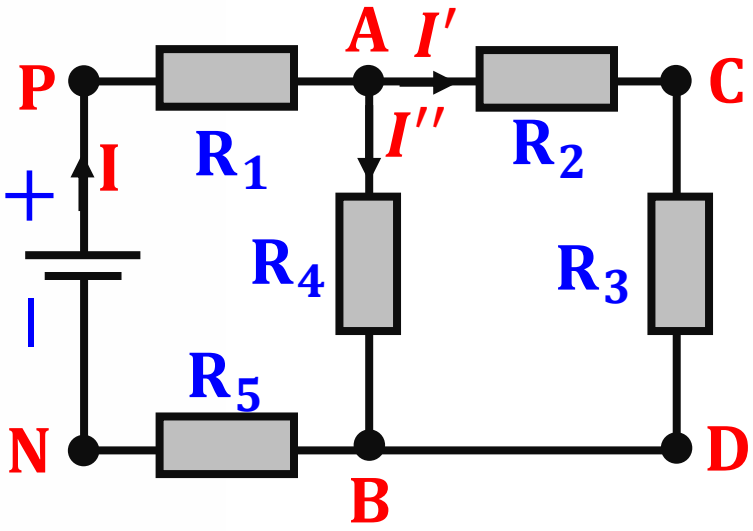
Law of addition of current (junction point A)

$$I = I' + I'' \Rightarrow I - I'' = I' \Rightarrow 1.42 - 0.94 = I'$$

$$I' = 0.48A$$

$V_{PN} = 12V; R_1 = 4\Omega; R_2 = 5\Omega; R_3 = 10\Omega; R_4 = 3\Omega; R_5 = 2\Omega.$

7. Determine the electric energy supplied by the battery during l min.



$$E = P_{PN} \times t$$

$$E = 16.92 \times (1 \times 60)$$

$$E = 1015.2J$$

The End