



Electronics exam

DC circuit bases: Definitions, Laws and Theorems [SI-S1-ELEC-1-OAC]
Calculators and documents are forbidden. Scoring scale is given as a guide
Answers exclusively on the subject. If you need more space, you can use the back of the pages.

Exercise 1. Lesson questions (3,5 points – no negative score for the MCQ)

Choose the right answer:

Q1. What is a voltage?

- a- A potential difference
- b- An orderly displacement of electrical charges
- c- A displacement of electrical charges
- d- Heat dissipation

Q2. A dipole resistance is:

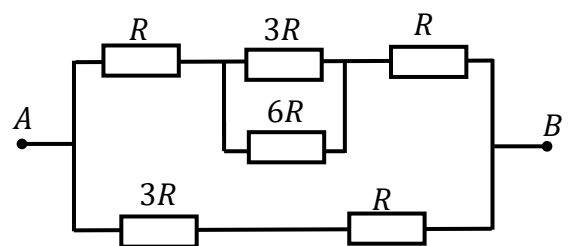
- a- It's durability
- b- It's strength
- c- It's ability to resist current flow

Q3. What is the unit for the intensity of an electrical current?

- a- Volts (V)
- b- Amperes (A)
- c- Ohms (Ω)
- d- Watts (W)

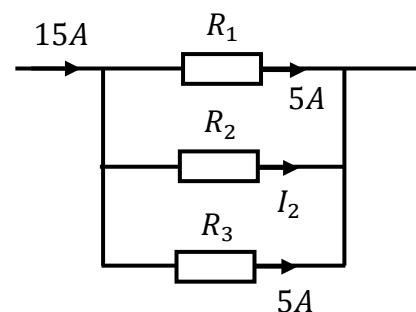
Q4. What is the resistance "seen" between A and B?

- a. $14R$
- b. $\frac{20R}{9}$
- c. $2R$
- d. $\frac{20R}{8}$



Q5. Consider the diagram on the right, compare R_2 et R_3 ?

- a- $R_2 < R_3$
- b- $R_2 = R_3$
- c- $R_2 > R_3$
- d- Unknown

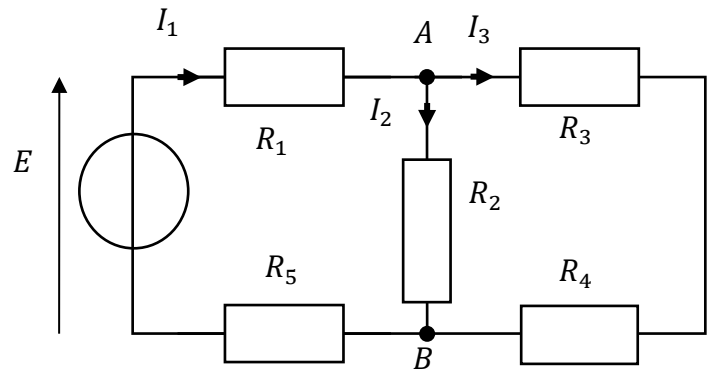


Exercise 2. Fundamental laws (5 points)

Consider the diagram on the right.

We set : $E = 12V$, $U_{AB} = V_A - V_B = 4V$,

$I_1 = 10mA$, $R_1 = 470\Omega$ et $R_2 = 1k\Omega$.



1. Draw the various voltages on the diagram using sign conventions. Note U_i for the voltage between the terminals of resistor R_i (i.e U_1 is the voltage between R_1 terminals, U_2 is the voltage between R_2 terminals ...)
2. What is the intensity of the current flowing through R_5 ?

3. The intensity of the current flowing through R_4 is $6mA$. Calculate the intensity of the current flowing through R_2 .

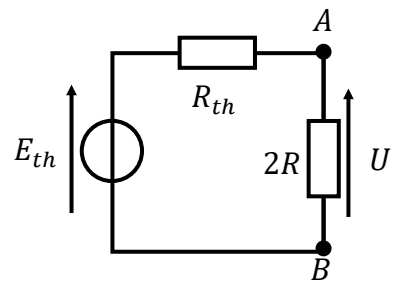
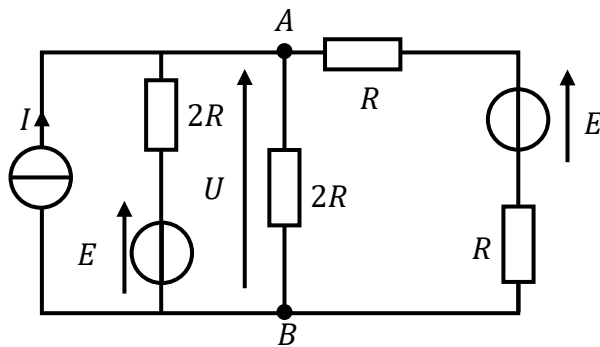
4. Give the expression of the voltage between R_5 terminals then calculate it.

5. Establish the expression of voltage U_3 between R_3 terminals in terms of voltages U_2 and U_4 . Given the fact that the voltage between R_4 terminals is $1.2V$, give the value of the voltage between R_3 terminals.



Exercise 3. Thévenin/Norton equivalents (11,5 points)

1. Consider the two diagrams below . .



- a. On the left diagram, find the number of:

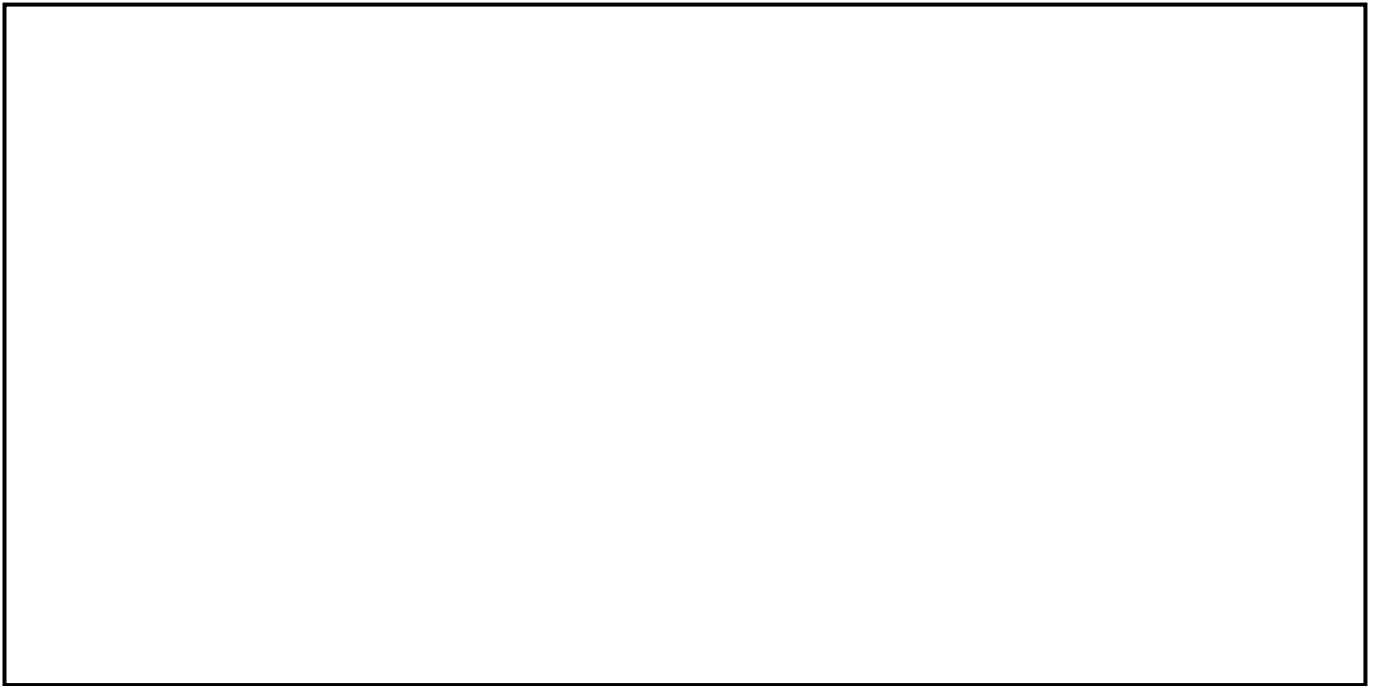
a. Nodes?

b. Branches?

c. Loops?

- b. Set the expressions of E_{th} and R_{th} so as the 2 diagrams above are equivalents.





c. Deduce the expression of the voltage U between the terminals of resistor $2R$ in terms of E , I and R .



2. Consider the diagram on the right. Calculate the voltage U in terms of E , I and R . You can use Thévenin/Norton equivalents.

