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Fondamental Electricity

Tutorial N°0

I. QCM

Choose the correct answer:

A. A perfect voltage generator E = 10 V supplies a resistor R = 100 Ω. The current I flowing out of the positive terminal of the generator has a value of:

a. $I = -100$ mA b. $I = -10$ A c. $I = 100$ mA d. $I = 10$ A

B. When two resistors are connected in parallel, the equivalent resistance of this combination is always:

a. greater than the higher of the two resistances.
b. less than the lower of the two resistances.
c. less than the higher of the two resistances.
d. greater than the lower of the two resistances.

C. UA perfect voltage generator E = 10 V supplies an adjustable resistor R. We want the current supplied by the generator to be equal to I = 50 mA. To what value should the resistor be set?

a. $R = 200$ Ω
b. $R = 20$ Ω
c. $R = 500$ Ω
d. $R = 50$ Ω

D. A perfect voltage generator E = 10 V is connected across a capacitor with capacitance C = 10 µF. Let U be the voltage across the capacitor and I the current flowing through it. We have:

a. U = 10 V and I = 0 A. b. U = 0 V and I = 0 A.
c. U = 10 V and I = 0,1 mA. d. U = 0 V and I = 0,1 mA.

E. A real voltage generator E = 10 V, r = 1 Ω is connected across a variable resistor R. Let U be the voltage across the real generator, i.e. the combination (E, r). Which of these statements is true?

a. The lower the value of R, the higher the value of U.
b. The lower the value of R, the lower the value of U.
c. When the value of R is close to that of r, U = 0 V.
d. When R tends towards infinity, U = 0 V.

F. A real voltage generator E = 10 V, r = 1 Ω is placed across a resistor R = 9 Ω. Let U be the voltage across R. We have:

a. $U = 1$ V. b. $U = 8$ V. c. $U = 9$ V. d. $U = 10$ V.

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A set of resistors R1 = 5 Ω, R2 = 10 Ω and R3 = 20 Ω is constructed as follows: R2 and R3 are connected in parallel and R1 is connected in series with this combination. The whole circuit is powered by a perfect voltage generator E = 10 V. What is the value of the current I delivered by the generator?

a. I = 350 mA
b. I = 670 mA
c. I = 860 mA
d. I = 290 mA

II. True or False

	True	False
1. Electric current flows in the opposite direction to those of electrons.		
2. The receiver convention applied to the terminals of a dipole requires that voltage and current be represented by arrows pointing in the same direction.		
3. In steady state, a capacitor always has zero voltage across its terminals.		
4. A perfect voltage generator has infinite internal resistance.		
5. A perfect current generator has infinite internal resistance.		
6. A charged capacitor must have a non-zero voltage across its terminals.		
7. Two resistors connected in series always carry the same current.		
8. Two capacitors connected in parallel always carry the same current.		
9. A charged capacitor can only lose its charge if it is connected to the terminals of a resistive circuit.		
10. Kirchhoff's node law results from the fact that no electric charge can accumulate at a node in a circuit.		
11. In a circuit with 2 nodes and 3 loops, applying Kirchhoff's laws yields a system of 5 distinct equations.		