

Answer on Question 66372, Physics, Electric Circuits

Question:

Two spherical conductors each of capacity C are charged to potential V and $-V$. Then they are connected by a metallic wire. What is the loss of energy?

Solution:

By the definition, the energy stored in the spherical conductor can be found as follows:

$$E = \frac{1}{2}CV^2,$$

here, C is the capacity of the spherical conductor and V is the potential across the spherical conductor.

Let's first find the total energy of the system of two spherical conductors before they are connected by the wire:

$$E = E_1 + E_2 = \frac{1}{2}CV^2 + \frac{1}{2}C(-V)^2 = CV^2.$$

When two spherical conductors are connected by the wire the total charge on them becomes zero (because we know that the spheres have equal and opposite potentials):

$$Q = Q_1 + Q_2 = CV + C(-V) = 0.$$

Then, the potential and the total energy of the system also becomes zero. Therefore, the loss of energy is $E_{loss} = CV^2$.

Answer:

$$E_{loss} = CV^2.$$

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