Answer on Question#40101, Physics, Electrodynamics

TWO SPHERICAL CONDUCTORS EACH OF CAPACITY C ARE CHARGED TO A POTENTIAL V AND -V. THESE ARE THEN CONNECTED BY MEANS OF A FINE WIRE . THE LOSS OF ENERGY IS -

1. ZERO 2. 1/2CV^2 3. CV^2 4. 2CV^2

Solution

The energy stored in the spherical conductor with positive potential is, $E_1 = \left(\frac{1}{2}\right)CV^2$.

The energy stored in the spherical conductor negative potential is, $E_2 = \left(\frac{1}{2}\right)C(-V)^2 = \left(\frac{1}{2}\right)CV^2$.

Total energy of the system before conductors are connected is $E = E_1 + E_2 = \left(\frac{1}{2}\right)CV^2 + \left(\frac{1}{2}\right)CV^2 = CV^2$.

When the spherical conductors are connected total charge on the two conductors is zero because the spheres had equal and opposite charges

$$Q_1 = CV, Q_2 = C(-V) = -CV, Q_{system} = Q_1 + Q_2 = CV + (-CV) = 0.$$

And the potential becomes zero.

Hence, all the energy is lost. That is, the energy lost is $E_{\text{lost}} = CV^2$.

Answer: 3. CV^2.