

HW No. 5

1- Consider the electrostatic system consisting of the point charge q at the distance D from the center of the spherical shell made of the ideal conductor with the inner and the outer radii R_1 and R_2 respectively ($R_2 < D$) which is held at the electrostatic potential zero. Using the method of images, find
(a) the electric field inside and outside the shell,
(b) the electrostatic forces exerted on the point charge, and on each surface element of the inner and the outer surface of the shell,
and (c) the electrostatic energy of the system.

2- Answer the parts of the previous question when the aforementioned charge is inside the shell, i.e. when $D < R_1$.

3- Answer the part (a) of the question 1 when the shell is held at the electrostatic potential V .

4- Using the method of images, find the capacitance of the system consisting of the spheres made of the ideal conductor with the radii R_1 and R_2 whose centers are at the distance D from each other ($R_1 + R_2 < D$).

Hint: Talking about the capacitance implies that you have to put the net charges Q and $-Q$ on the two elements. This question relates to the part (a) of the question 3 of the HW 3.

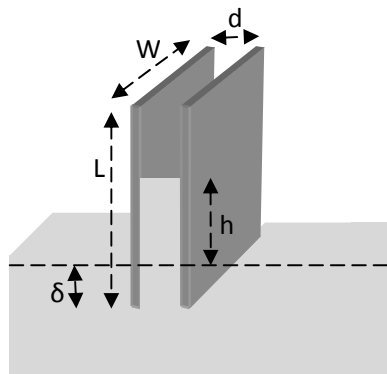
5- Find the force per length between the two infinitely long wires made of the ideal conductor with the equal radii a , at the distance D from each other, and held at the differential electrostatic potential V assuming $a \ll D$.

6- This figure shows that we sink the two parallel plates made of the ideal conductor into the liquid, which is perfect insulator with the permittivity ϵ and the mass density ρ , to the extent of δ . Find h .

(a) When the plates are held at the differential electrostatic potential V .

(b) When the net charges Q and $-Q$ are put on the plates.

Assume that the electric field between the plates has no spatial variation when they are in air.



Be Happy,

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