ADVANCED PHYSICS CLUB

APRIL 14, 2019

Today's meeting

We solved the problem from the last homework using Thevenin's theorem.
`https://en.wikipedia.org/wiki/Thevenin%27s_theorem`

We solved few problems on Coulomb's law. Talked about Gauss' law and its application to highly symmetric distribution of charges. The following are some examples of the problems we solved.

1. Find the equilibrium distance a between charges. The strings are fixed to walls and have stiffness k each. The length of an undeformed string is l and a distance between walls is $2l$. See the figure.

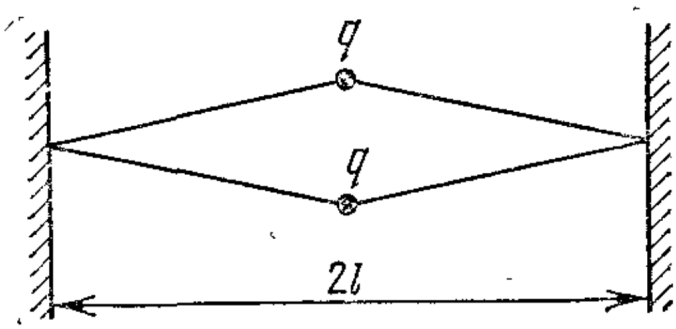

Figure 1.

2. Four charges q are placed in vertices of the square of size l. The charges are connected by unstretchable strings of the length l forming sides of the square and one additional string of the length $\sqrt{2}l$ in place of one of the diagonals of the square. The charges are let go. Find the tension of each string in equilibrium.

3. Using Coulomb's law find the electric field at the point P inside the uniformly charged sphere of radius R and total charge Q. Assume that the point P is at the distance $h < R$ from the center of the sphere.

Homework

1. Four charges q are placed in vertices of the square of size l. The charges are connected by springs of stiffness k and undeformed length l each forming sides of the square and one additional string of the same material and of the undeformed length $\sqrt{2}l$ in place of one of the diagonals of the square. The charges are let go. Find the tension of each string in equilibrium. Assume that the stiffness k is rather large so that the deformation of the square is small compared to its size.

***2.** Find the electric field created by a uniformly charged half-sphere of radius R and total charge Q at its center.

3. Faces of the tetrahedron are charged with the same constant surface charge density. It is known that to bring together (from infinity) two faces of the tetrahedron it is necessary to perform work W. What total work is required to assemble the tetrahedron from its 4 faces?

***4.** The shape shown in the figure is obtained by overlapping two spheres of the same radius R. Two parts, each having a form of a crescent are charged with constant volume charge density $+\rho$ and $-\rho$

as shown. Find the electric field in the volume between crescents if the distance between charges of spheres is a.

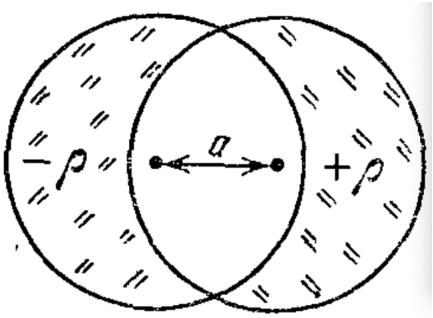

Figure 2.

For the next meeting

The next club's meeting is at 2:40pm, room P-123, on Sunday, **April 28**. We plan to continue solving electricity and magnetism problems.