ADVANCED PHYSICS CLUB

APRIL 14, 2024

The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
http://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2023
The practical information about the club and contacts can be found on the same web page.

TODAY'S MEETING

Today we almost finished solving the problems on Gauss's law. The one remaining problem is reassigned, the problems on electrostatic potential are reassigned as well and there are two new problems on that topic.

REASSIGNED HOMEWORK

*1. What force is pushing apart the faces of a uniformly charged hollow cube? How about a tetrahedron? Surface charge density is σ, the edge length is l.

NEW HOMEWORK

1. Four point charges q are located in the vertices of a square with a side of length l. Find the electrostatic potential at the center of the square.

2. *All the following questions are about electrostatics, when there is no electric current.* Why is the electric field inside a conductor equal to zero? Why the electric field right outside a conductor is perpendicular to its surface? Are these two conditions sufficient to prove that the electrostatic potential is the same at every point of a conductor? Find the surface density of charge on the surface of a conductor if the electric field outside the conductor at that location is E.

3. A hollow sphere of radius R has total charge Q. What is the electrostatic potential at the center of the sphere? Does the potential at the center depend on how the charge is distributed on the sphere? Does the potential at the surface of the sphere depend on how the charge is distributed?

4. A solid metal ball of charge q has a cavity. A point charge Q is placed in this cavity. What total charge is induced on the surface of the cavity? What is the electric field outside the ball at distance L from its' center? Does it depend on the shape of the cavity or its' location in the ball?
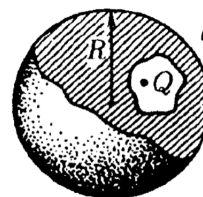
5. There are two concentric hollow metal spheres of radii R_1 and R_2 ($R_2 > R_1$). The outer sphere has charge q while the inner sphere is grounded. Find the electric field and electrostatic potential at every point as functions of the distance from the common center of the spheres.

*6. A point charge Q is located at distance h from an infinite metal plane. With what force does the plane act on the charge? What is the density of the surface charge induced on the plane?

FOR THE NEXT MEETING

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **April 21**.