

USEFUL RESOURCES

The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:

https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2021

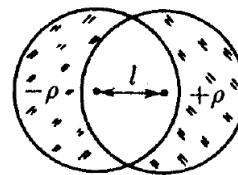
The practical information about the club and contacts can be found on the same web page.

TODAY'S MEETING

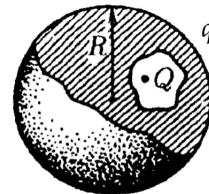
We continue with electricity and magnetism. There are some unfinished problems on the Gauss's law. The new assignment is about electrostatic potential.

REMAINING FROM PREVIOUS HOMEWORK

1. A point charge q is placed at the center of a uniformly charged tetrahedron with surface charge density σ . With what force does the charge act on each face of the tetrahedron?
- *2. a) When two balls of radius R are located at the distance between the centers $l < 2R$ they form two "crescents" (see figure). The "crescents" have uniform volume charge densities $-\rho$ on the left and ρ on the right. Prove that electric field in the intersection region (which is empty) is uniform and find this electric field.
b) By considering a limit such that $l \rightarrow 0$, $\rho \rightarrow \infty$, $l\rho = \text{const}$ find a distribution of charge on the surface of a sphere that produces a uniform electric field inside the sphere.
- *3. 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. 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?
2. 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?
3. 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.
- *4. 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 3:00pm, via Zoom, on Sunday, **April 3**.