ADVANCED PHYSICS CLUB

MARCH 17, 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.

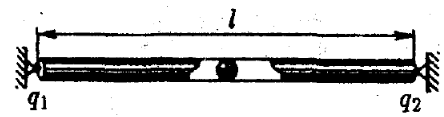
Today's meeting

Today we finished the assigned problems on Paskal's and Archimedes laws. The problems on Coulomb law are reassigned. We will also discuss this year's $F = ma$ problems in our meeting. The link to look at the problems (and solutions at the same time) is
`https://www.aapt.org/physicsteam/2024/upload/F-ma-2024-Solutions_v2.pdf`

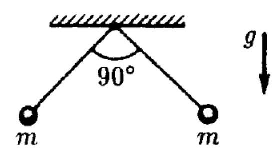
Reassigned Homework

1. Assume that somebody managed to completely separate positive and negative charges in 1 cm^3 of water and these charges were put 100 km apart. What would be the force of attraction between these charges?

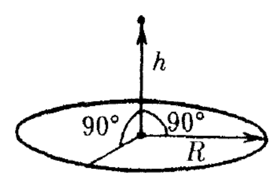
2. Two positive charges q_1 and q_2 are located at the ends of a horizontal tube of length l. Find the equilibrium position of a bead with positive charge q inside the tube. Is this equilibrium stable? Would the equilibrium be stable for a negatively charged bead?



3. Two beads have the same mass m and the same charge. The beads are hung on two threads of length l which are attached to the same point. Find the charge of the beads, if the threads make 90° at equilibrium.



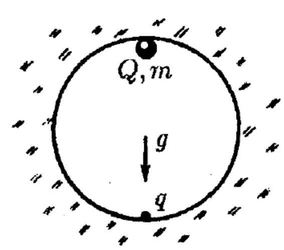
4. What is the electric field at the center of a uniformly charged thin ring of radius R? What is the electric field on the axis of the ring at distance h from its center? The charge of the ring is Q.



5. a) A metal ring with more and more electric charge steadily put onto it was torn by the Coulomb force when its charge reached Q. Another ring with exactly the same dimensions was made out of a material 10 times more durable than the first one. What charge would tear the new ring?

b) If the first material is used to make a ring with all dimensions three times larger than the first one, what charge would tear such a ring?

***6.** A charge q is attached to the bottom point of a spherical cavity of radius R. A small bead of mass M is placed at the top point of the cavity. What charge should the bead have in order to be in stable equilibrium at the top of the cavity? Free fall acceleration is g.



For the next meeting

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **March 24**.