

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.

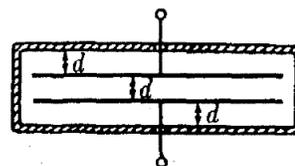
TODAY'S MEETING

We continue with electricity and magnetism. The new assignment is about capacitors and energy of electric field.

HOMEWORK

1. a) Find the capacity of a parallel plate capacitor consisting of two plates of area A at a distance d from each other.
b) How will this capacity change if a metal slab of thickness $\frac{d}{3}$ and the same area A is inserted in between the plates? Does the answer change if this slab is in contact with one of the plates?
2. Find the capacity of a capacitor made out of two concentric spheres of radii R_1 and R_2 (spherical capacitor).
3. Geometric size of a capacitor in all directions is increased n times while keeping the voltage between the plates the same. How will the energy stored in a capacitor change? If the size is kept the same but the charge of plates is increased k times how many times will the energy change?
4. a) A parallel plate capacitor has charge Q . Area of the plates is A , the distance between them is d . What work has to be performed in order to increase the distance between the plates by Δ ?
b) What work has to be performed to change the distance in the same way if the voltage between the plates of the capacitor is kept constant by a battery? Why is work different in this case?
5. Find the surface charge density on a planar plate separating two regions if these regions have different electric field E_1 and E_2 perpendicular to this separating plate. Find the force acting on unit area of the plate (this is also known as electric pressure). Consider the cases $E_1 = E, E_2 = 2E$ and $E_1 = E, E_2 = -2E$. Is the electric pressure different in these two cases? Why?

- *6. a) A parallel plate capacitor is placed into a metal box so that the distance between the plates and faces of the box is the same as the distance between the plates d (see figure). How does the capacity change compared to a capacitor not surrounded by a box?
b) Now one of the capacitor plates is connected to the box with a wire without changing any distances. How does the capacity change in this case?



- *7. Understand the result of problem 3 using the notion of energy density of electric field.

FOR THE NEXT MEETING

IMPORTANT: The next club's meeting is at 3:00pm, via Zoom, on Sunday, **April 10**.