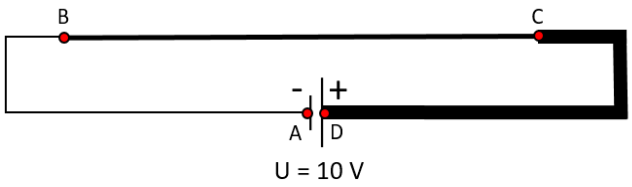
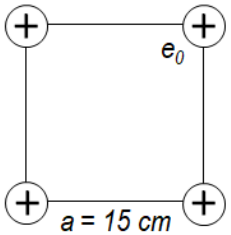
2. kolokvij iz fizike - 17. 1. 2020

1.) Tri bakrene žice enakih dolžin 0.5 m s polmeri *0.7 mm*, *2 mm* in *5 mm* vežemo zaporedno in priključimo na napetost *U = 10 V*. Kolikšen tok teče po žicah? Kolikšne so napetosti na posameznih odsekih? (Specifična upornost bakra je *0.017 Ω mm² / m*.)

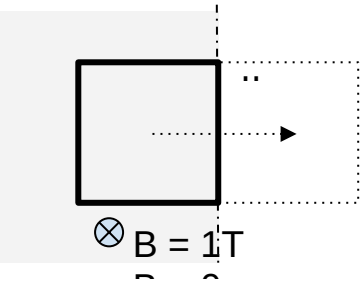


2.) Štiri enako nabite kroglice (e_0 = *5 μC*, *m = 50 mg*) postavimo v oglišča kvadrata s stranico 15 cm. Ko jih spustimo se začnejo zaradi odbojnih sil oddaljevati druga of druge. Kolikšen je pospešek posamezne kroglice v trenutku ko jih spustimo? Kolikšno hitrost dosežejo kroglice, ko so daleč narazen?



3.) V sredini ploščatega kondenzatorja s površino 1 dm² imamo na vrtljivo os fiksirano zelo lahko paličico z dolžino 5 *μ*m, ki ima na obeh koncih pritrjena nasprotno enaka naboja 2 x 10^{-11} As in -2 x 10^{-11} As. Masa vsakega je 10 *μ*g. Paličica je vpeta na njeni sredini, os pa je pravokotna nanjo in vzporedna s ploščama kondenzatorja. Na kondenzator nanesemo naboj 10^{-8} As. S kolikšno frekvenco zaniha paličica, če jo izmaknemo iz ravnovesne lege za majhen kot?

4.) Kvadratno zanko z dolžino stranice 1 m in upornostjo 2 Ω izvlečemo iz območja z magnetnim poljem 1T (območje I.) s pospeškom 0,5 m/s² v območje brez magnetnega polja (območje II.), kot prikazuje skica. Skiciraj odvisnost toka, ki teče po žici kot funkcijo časa in določi smer toka. Kolikšna je največja vrednost toka? Koliko energije se izgubi v žici od trenutka, ko začnemo vleči zanko iz magnetnega polja, do trenutka, ko je celotna zanka izven magnetnega polja?

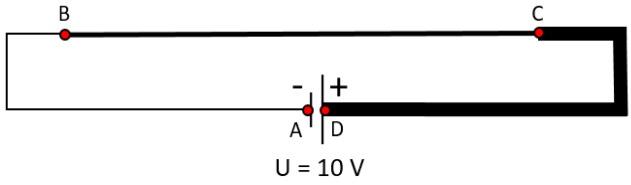


5.) Dva vodnika postavimo vzporedno drug ob drugega na medsebojno razdaljo 10 cm. Skozi prvega teče tok 2 A in skozi drugega 3 A v isto smer. Nato ju prestavimo na razdaljo 30 cm. Koliko dela na dolžinsko enoto vodnika smo pri tem opravili?

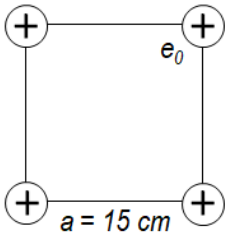
($\varepsilon_0 = 8.85 \times 10^{-12}\ A\ \ s\ \ V^{-1}m^{-1}\ \ , \mu_0 = 4\pi \times 10^{-7}\ kg\ m\ s^{-2}A^{-2}$)

2nd midterm exam in physics - 17. 1. 2020

1.) Three half a meter long copper wires with radii *0.7 mm*, *2 mm* and *5 mm* are connected in series and connected to a DC voltage source with *U = 10* V. How much current flows through the wires? What is the voltage drop in each section? (The specific resistance of copper is *0.017 Ω mm² / m*.)

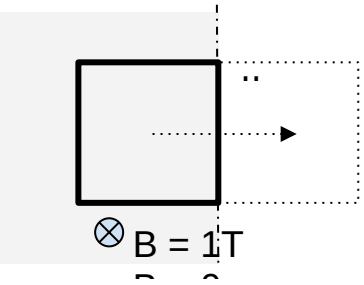


2.) We place four identically charged balls (e_0 = *5 μC*, *m = 50 mg*) in the corners of a square with a *15 cm* long side. We release them. What is the acceleration of each ball immediately after they are released? What is the velocity that each ball reaches when they are far apart?



3.) In the middle of a flat capacitor with a 1 dm² plate area we have a very light rod mounted on a rotation axis. The stick has two opposite charges 2 x 10^{-11} As and -2 x 10^{-11} As attached on both sides. The mass of each charge is 10 μg. The rod is attached to the axis in the center and the axis is perpendicular to the rod and parallel with the capacitor's planes. We charge the capacitor with 10^{-8} As. What is the oscillation frequency, if we displace the rod from equilibrium by a small angle?

4.) A square loop with a 1 m side length is made of a wire with a resistance of 2 Ω. The loop is pulled out from region I. with a magnetic field of 1T into region II. with zero magnetic field as shown in the figure. The loop is pulled out with a constant acceleration of 0,5 m/s². Show on a graph how the induced current changes with time and define the direction of the current. What is the maximum current? How much energy is dissipated in the wire from the moment we start pulling the wire to the moment it exits the magnetic field entirely?



5.) We set two wires in parallel next to each other at a distance of 10 cm. The first wire carries a current of 2 A and the second 3 A. Both currents flow in the same direction. Afterwards we move the wires to a distance of 30 cm. How much work per wire length did we do?

($\varepsilon_0 = 8.85 \times 10^{-12}\ A\ \ s\ \ V^{-1}m^{-1}\ \ , \mu_0 = 4\pi \times 10^{-7}\ kg\ m\ s^{-2}A^{-2}$)