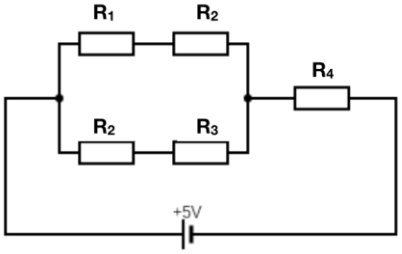
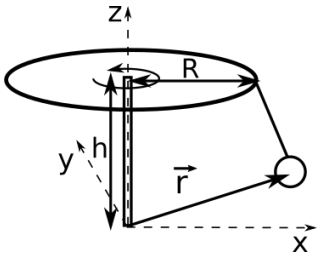
2. izpit iz fizike - 12. 2. 2020

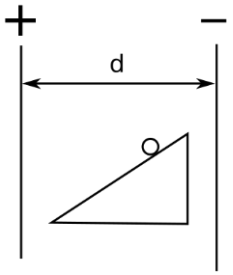
1.) Vezje, prikazano na sliki, priključimo na izvor enosmerne napetosti (U_g= 5 V). Kolikšen je nadomestni upor vezja? Kakšen tok teče skozi upor R_4? Kolikšen je padec napetosti na uporu R_4? (R_1=1**Ω**, R_2=2**Ω**, R_3=3**Ω**, R_4=4**Ω**)



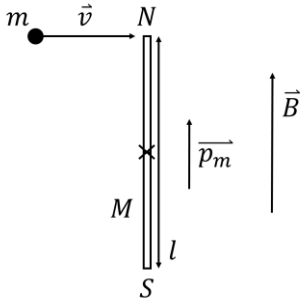
2.) Krogla se vrti na vrtiljaku, kot to prikazuje skica. Njeno gibanje opišemo s krajevnim vektorjem $\vec{r} = (a\,cos(\omega t), a\,sin(\omega t), b)$, kjer je $a = 3$ m, $b = 1\,m$. Kolikšen je vektor hitrosti in vektor pospeška kot funkcija časa? Določi konstanto ω, če je radij vrtiljaka $R = 2\,m$, višina vrtiljaka pa $h = 4\,m$. Namig: odvajaj vsako komponento posebej.



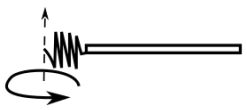
3.) Klančino z naklonom 30º postavimo med dve prevodni plošči (kondenzator d = 1 m), kot to prikazuje skica. Na klančino postavimo palico z maso 10 g in premerom 1 cm in jo izpustimo, tako da se po klančini kotali brez drsenja. Kolikšna je hitrost težišča, ko je težišče palice 10 cm nižje? Nato na plošči priključimo napetost 10 kV in opazimo, da je gibanje težišča enakomerno. S kolikšnim nabojem je nabita palica?



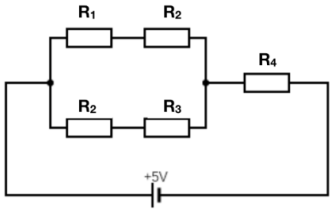
4.) Paličast magnet z magnetnim momentom $p_m = 0.5\,Am^2$, ki se lahko vrti okrog osi na njegovi sredini, je postavljen v homogeno magnetno polje z gostoto $B = 1\,T$. V konec magneta s severnim polom ustrelimo kroglico iz plastelina z maso $m = 1\,g$ in hitrostjo $v = 10\,m/s$ kot je prikazano na sliki. Po trku se kroglica zlepi z magnetom. S kolikšno kotno hitrostjo se vrtita kroglica in magnet takoj po trku? Magnet obravnavaj kot palico dolžine $l = 5\,cm$ z maso $M = 10\,g$. Za kolikšen največji kot glede na magnetno polje se magnet zavrti po trku?



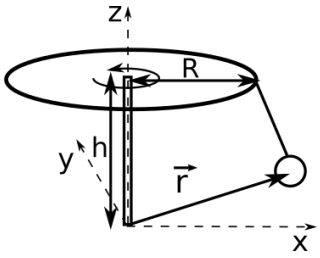
5.) Palico dolžine L = 0,8 m (m = 1 kg) pripnemo na lahko vzmet (k = 500 N/m) dolžine d = 10 cm in ju zavrtimo okoli krajišča vzmeti, kot to prikazuje skica. Kolikšen je raztezek vzmeti, če se palica vrti s kotno hitrostjo 3 s^{-1}? Privzemi, da je raztezek majhen.



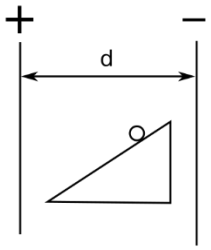
2nd exam in physics - 12. 2. 2020



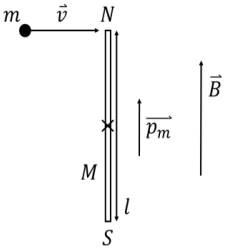
1.) Circuit, shown in the figure, is connected to the direct current source (U_g= 5 V). What is the substitute capacity of the circuit? What current flows through the capacitor R_4? What is the voltage drop on the capacitor R_4? (R_1=1**Ω**, R_2=2**Ω**, R_3=3**Ω**, R_4=4**Ω**)



2.) A ball is rotating on a hanging carousel, as shown in figure. The motion is described by the space vector $\vec{r} = (a\,cos(\omega t), a\,sin(\omega t), b)$, where $a = 3$ m, $b = 1$ m. What is the velocity vector and the acceleration vector as a function of time? Determine ω if the carousel has a radius of $R = 2\,m$, and the height of $h = 4\,m$ (see figure).



3.) A slope with inclination of 30º is placed between two conductive plates. The distance between the plates is d = 1 m. A rod of mass 10 g and with a diameter of 1 cm is placed at the top of the incline. What is the velocity of the center of gravity of the rod, when it reaches the height that is 10 cm lower than the initial height. The rod does not slip during the motion. Then we apply a voltage of U = 10 kV on the plates, which makes the rod moving with a constant velocity. What is the charge of the rod?



4.) A bar magnet with a magnetic moment of $p_m = 0.5\,Am^2$ can rotate about its axis, which is in the middle of the magnet. The magnet is set into a homogeneous magnetic field with $B = 1\,T$. We shoot a ball with mass $m = 1\,g$ and speed $v = 10\,m/s$ into the north pole end of the magnet as shown on the figure. The ball embeds itself in the magnet after the collision. Calculate the angular velocity of the ball and the magnet right after the collision. Consider the magnet as a rod of length $l = 5\,cm$ and mass $M = 10\,g$. What is the maximum angle the magnet reaches with respect to the magnetic field after the collision?

5.) A rod of a length of L = 0,8 m (and a mass of m = 1 kg) is attached to a light spring (k = 500 N/m) of a length of d = 10 cm. We rotate the rod around the free end of the spring, as shown in the figure. By how much does the spring extend if the angular velocity of the rod is 3 s^{-1}?