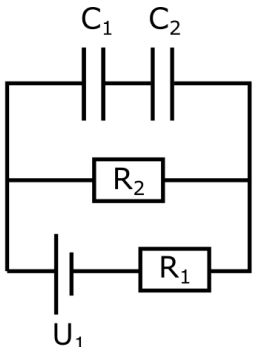
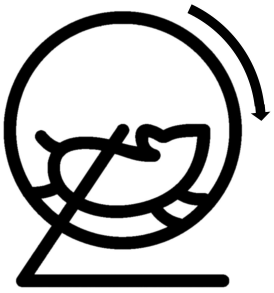
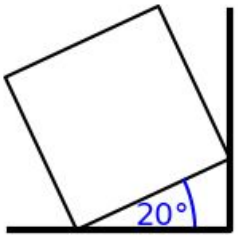
pred-izpit iz fizike - 12. 1. 2021



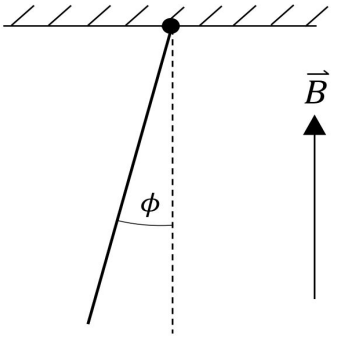
1.) Kolikšna je skupna energija kondenzatorjev (energija nadomestnega kondenzatorja), če je napetost baterije $U_1 = 3\ V$, $C_1 = 10\ nF$, $C_2 = 20\ nF$, $R_1 = 10\ \Omega$ in $R_2 = 20\ \Omega$? Kolikšna moč se troši na uporu R_2? Kolikšen naboj se nabere na kondenzatorju C_1?



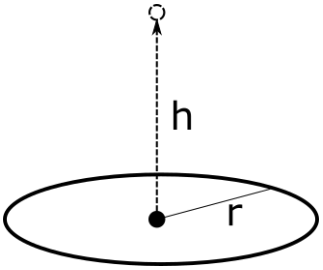
2.) Hrček z maso $m_H = 20\ g$ poganja svoje telovadno kolo. Telovadno kolo poenostavljeno obravnavamo kot tanek plašč valja z radijem $R = 10\ cm$ in maso $m_K = 10\ g$, ki se lahko vrti okrog osi v njegovem središču. Hrčka obravnavamo kot točkasto telo, ki se nahaja na razdalji R od središča kolesa. Hrček sprva poganja kolo s krožno frekvenco ω_0. V nekem trenutku preneha poganjati kolo in se začne vrteti skupaj s kolesom brez zdrsavanja. Kolikšna mora biti ω_0 da hrček opravi vsaj en obrat kolesa brez da pade med vrtenjem?



3.) Kocko s stranico $50\ cm$ in maso $25\ kg$ postavimo tako, da z enim robom leži na tleh in je z enim naslonjena na steno (glej skico). Kot med tlemi in spodnjo stranico kocke je $20°$. Kolikšen mora biti najmanjši koeficient lepenja med tlemi in kocko, da kocka ne zdrsne? Med kocko in steno ni lepenja.

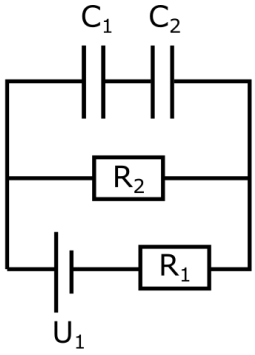


4.) Magnetna paličica z maso $0.4\ g$, dolžino $1\ cm$ in magnetnim momentom $80\ \mu Am^{-2}$ je na zgornjem krajišču vpeta in se lahko prosto vrti. Paličica se nahaja v homogenem magnetnem polju $0.2\ T$, ki kaže navpično navzgor. V ravnovesni legi je paličica poravnana z magnetnim poljem. Kolikšen je nihajni čas paličice, če jo izmaknemo iz ravnovesne lege?

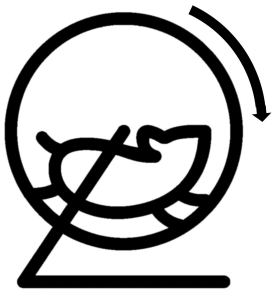


5.) Astronavt se nahaja v osi vesoljske postaje v obliki obroča z radijem $r = 10\ m$ in mase $500\ t$. Koliko dela opravi, če se prestavi iz ravnine postaje do višine $h = 10\ m$ nad ravnino (glej skico). Kolikšna je na višini h gravitacijska sila? Kolikšna je ubežna hitrost astronavta?

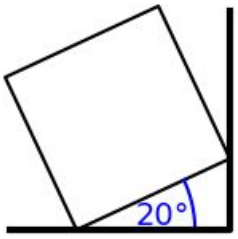
pre-exam in physics - 12. 1. 2021



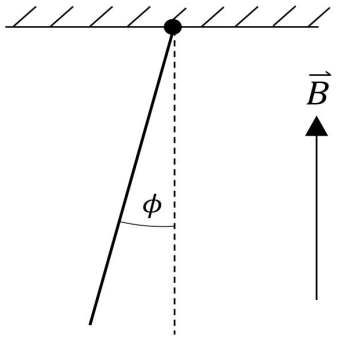
1.) What is the total electric energy of the two capacitors (energy of the substitute capacitor)? What is the power consumption on the resistor R_2? What is the charge on capacitor C_1? Assume $U_1 = 3\ V$, $C_1 = 10\ nF$, $C_2 = 20\ nF$, $R_1 = 10\ \Omega$ and $R_2 = 20\ \Omega$.



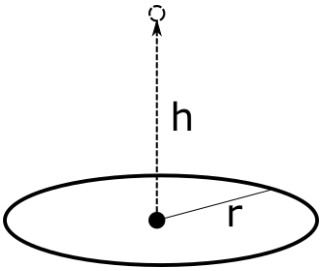
2.) A hamster with mass $m_H = 20\ g$ is spinning its exercise wheel. We simplify the consideration of the exercise wheel to a thin cylinder shell with radius $R = 10\ cm$ and a mass of $m_K = 10\ g$, which can rotate about an axis that goes through its centre. We consider the hamster as a point body at a distance R from the centre of the cylinder shell. The hamster is at first spinning the wheel with an angular frequency ω_0. At some point it decides to stop spinning the wheel and begins to rotate together with the wheel with no slipping. What is the value of ω_0 in order for the hamster to make at least one rotation of the wheel without falling?



3.) A cube box with a side length of $50\ cm$ and a mass of $25\ kg$ is positioned on the floor with one edge and another edge on the wall (see image). The angle between the floor and the lower side of the box is $20°$. What is the minimum coefficient of static friction between the floor and the box if the box doesn't slide? There is no friction between the wall and the box.



4.) A magnetic stick with a mass of $0.4\ g$, a length of $1\ cm$ and a magnetic moment of $80\ \mu Am^{-2}$ is fixed at the upper end and can swing freely. The stick is located in a homogeneous magnetic field of $0.2\ T$, pointing vertically upwards. In the equilibrium position, the stick is aligned with the magnetic field. Calculate the time of one oscillation of the stick if we move it out of the equilibrium.



5.) An astronaut is in the plane of a ring-shaped spaceship with a radius of $r = 10\ m$ and a mass of $500\ t$. What work needs to be done if he moves in the axis of the spaceship to a point $h = 10\ m$ above the plane (see figure). What is the gravitational force at height h? What is the escape velocity?