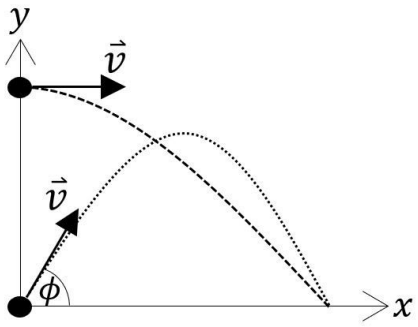
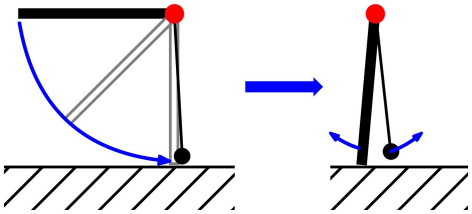
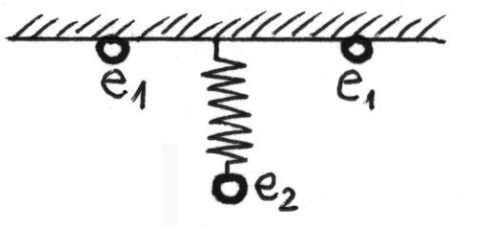
1. izpit iz fizike - 18. 1. 2021



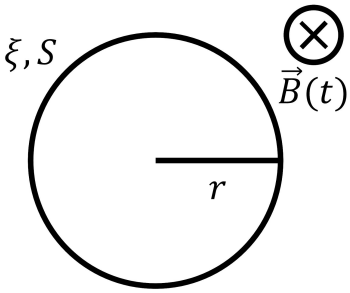
1.) Nekdo vrže žogo iz izhodišča s hitrostjo 20 m/s pod kotom 55° glede na vodoravnico (poševni met). Nekdo drug vrže žogo v vodoravni smeri z enako hitrostjo (vodoravni met). S kolikšne višine jo mora vreči, da bo žoga v vodoravni smeri priletela enako daleč kot tista pri poševnem metu?



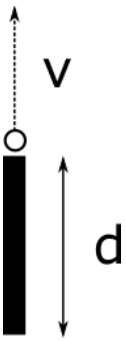
2.) Palica (dolžina 1 meter in masa 3 kg) je vrtljivo vpeta v gornjem krajišču. Dvignemo jo v vodoravno lego, nato pa spustimo. Ko je v najnižji legi, popolnoma prožno udari ob utež z maso 5 kg, ki je z lahko vrvico pripeta v isti točki kot palica. Kolikšni sta kotni hitrosti palice in uteži takoj po trku? Do kakšne višine se dvigne utež? Do kakšnega kota se dvigne palica?



3.) Na stropu sta na razdaljo $5\ cm$ nameščeni dve nabiti kroglici z nabojem $e_1 = 0.2\ \mu As$. Na sredi med kroglicama je pritrjena vzmet z razteznostnim koeficientom $10\ N/m$. Na njej visi tretja nabita kroglica z nabojem $e_2 = 0.4\ \mu As$ in maso $15\ g$. Raztegnjena vzmet ima dolžino $10\ cm$. Kolikšna je dolžina neraztegnjene vzmeti?



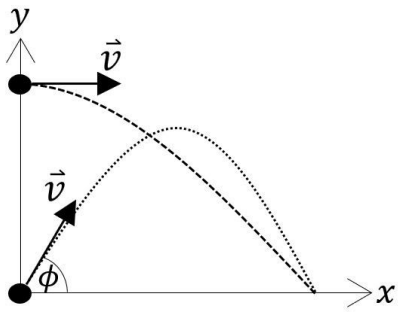
4.) Iz bakrene žice s presekom $S = 2\ mm^2$ in specifičnim uporom $\xi = 0.01\ \Omega mm^2/m$ naredimo okroglo zanko s polmerom $R = 10\ cm$. Zanko postavimo med dva elektromagneta, ki ustvarjata homogeno magnetno polje z gostoto $B_0 = 0.4\ T$ v smeri pravokotni na zanko. V trenutku $t = 0$ izklopimo napajanje magnetov, zaradi česar se magnetno polje zmanjša kot $B(t) = B_0 \exp(-t/\tau)$, kjer je $\tau = 25\ s$. Kolikšen tok teče po vodniku $50\ s$ potem, ko smo odklopili napajanje?



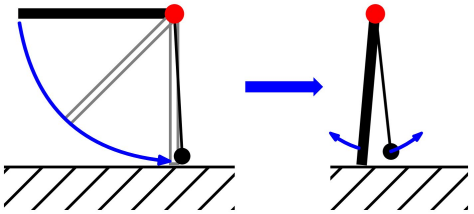
5.) Astronavt lebdi $1\ m$ nad vesoljsko ladjo v obliki palice dolžine $d = 10\ m$ in mase $1000\ t$. Kolikšen gravitacijski pospešek čuti astronavt? Najmanj s kolikšno hitrostjo se mora odriniti s pomočjo svojega pogonskega nahrbtnika v smeri vzdolž ladje (glej sliko), da bo pobegnil gravitacijskemu privlaku?

1. exam in physics - 18. 1. 2021

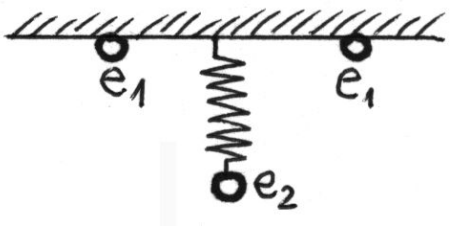
1.) Someone throws the ball from the starting point at a speed of 20 m/s at an angle of 55° to a horizontal line (oblique throw). Someone else throws the ball in a horizontal direction at the same speed (horizontal throw). From what height must he throw in order for the ball to fly in the horizontal direction as far as that of the oblique throw?



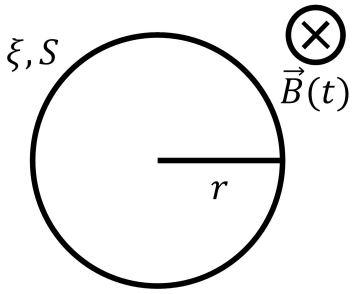
2.) A rod (length 1 meter and mass 3 kg) is attached in the upper edge. We lift it into a horizontal position and let it go. When it is in the lowest position, it elastically collides with a ball (mass 5 kg) on a string attached to the same position as the rod. What are the angular velocities of the rod and the ball after the collision? To what height does the ball go? To what angle does the rod ascend?



3.) On the ceiling there are two balls with charge $e_1 = 0.2\ mAs$ placed $5\ cm$ apart. In the middle of the two balls there is a spring with coefficient $10\ N/m$ attached to one end. On the other end there is a third ball with charge $e_2 = 0.4\ mAs$ and mass $15\ g$. The spring deforms to a length of $10\ cm$. What is the length of the undeformed spring?



4.) We make a loop with a radius of $R = 10\ cm$ out of a copper wire with a cross section area of $S = 2\ mm^2$ and with a specific resistivity $\xi = 0.01\ \Omega mm^2/m$. We place the loop in between two electromagnets, which emit a homogeneous magnetic field with a density of $B_0 = 0.4\ T$ and a direction perpendicular to the loop. At time $t = 0$ we cut the power to the electromagnets, which causes the magnetic field to decrease as $B(t) = B_0 \exp(-t/\tau)$, where $\tau = 25\ s$. What is the value of the current in the wire $50\ s$ after cutting the power?



5.) An astronaut floats $1\ m$ above a spaceship, which has a shape of a rod with a length of $d = 10\ m$ and a mass of $1000\ t$. What is the gravitational acceleration that the astronaut feels? What is the minimum speed required in order to escape the spaceship's gravitational field if the astronaut uses his jetpack in the vertical direction (see figure)?