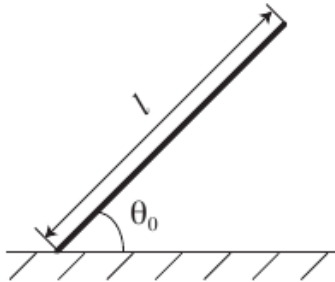


METÓDY RIEŠENIA FYZIKÁLNYCH ÚLOH zima21 – Príklady 4

Cvičenie 2.11.2021

Príklad 1

PROBLEM: A thin rod of length l is supported at one end by a smooth floor (see figure). The rod is released from a configuration where it makes an angle θ_0 relative to the horizontal. Write down the Lagrangian for this system. Determine how long it takes for the rod to fall to the floor (*the answer in terms of a definite integral will be sufficient.*) Also determine how far the lower end moves during this time.



Príklad 2

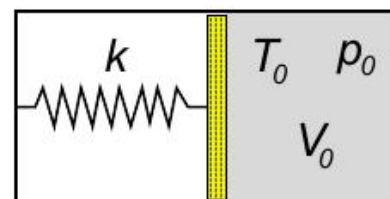
PROBLEM: An electric field $\mathbf{E} = E_0 \hat{x} e^{-i\omega t}$ is applied at the interface of a vacuum ($z > 0$) and a conductor ($z < 0$) of conductivity σ . (The conductor is nonmagnetic, *i.e.* $\mu = 1$.)

(a) For $\sigma \gg \omega$, calculate how deeply the electric field penetrates into the conductor. (*I.e.* calculate the depth at which the electric field has decreased to $1/e$ of its amplitude at the surface.)

(b) Calculate the power dissipated per unit area of the conductor.

Príklad 3

Find the heat capacity of the system consisting of a container that has two compartments separated by a piston. To the right of the piston is a gas of monoatomic molecules (gas parameters p_0, T_0, V_0), and to the left is vacuum. The piston is held by a spring. If the gas is removed, the piston touches the right wall and the spring is relaxed.



Heat capacities of the materials composing spring, piston and container walls can be neglected.