

1. kolokvij iz fizike - 13. 12. 2021

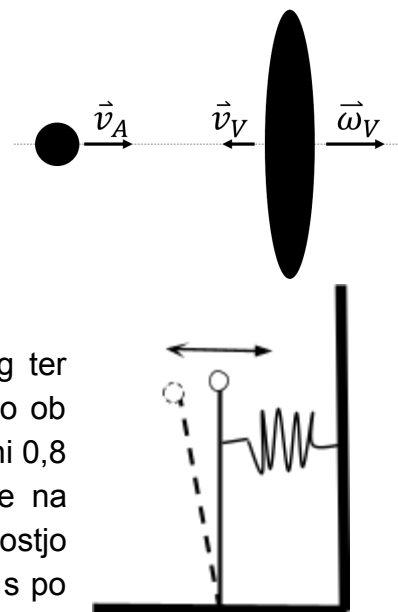
18:15-19:45, oddaja do 20:05. Podaljšan čas pisanja do 20:30, oddaja 20:50

1.) Klada z maso 1 kg miruje na klanecu z naklonom 20° . Koeficient lepenja je $\sqrt{3}/3$. S kolikšno silo deluje klada pravokotno na klanec in kolikšna je sila lepenja na klado? S kolikšno silo deluje podlaga na klado? Izračunaj največji možen naklon klanca, tako da klada še ne zdrsne. S kolikšnim pospeškom se začne klada premikati, če je naklon klanca enak 60° ?

2.) Volkswagen Passat tehta 1459 kg in pospeši od 0 do 100 km/h v 9,4 sekunde.

- Predpostavi, da motor avto potiska s konstantno silo. Kolikšna je ta sila?
- Predpostavi, da motor avto potiska s konstantno močjo. Kolikšna je ta moč? Zapiši odvisnost hitrosti od časa $v(t)$.
- Za primer b) zapiši kako se s časom spreminja lega $s(t)$.

3.) Galaktični zapisnik opisuje katastrofalno nesrečo v vesolju, kjer v vesoljsko ladjo v obliki tanke okrogle plošče ($M = 10^5 t$, $R = 1 km$, $v_V = 5 km/s$, $\omega_V = 10 Hz$) trči asteroid v obliki krogle ($m = 100 t$, $r = 50 m$). Celotno gibanje vesoljske ladje in asteroida se popolnoma ustavi. Izračunaj hitrost, kotno hitrost in označi smer kotne hitrosti asteroida pred trkom. Koliko energije se izgubi med trkom?



4.) Nihalo je sestavljeno iz lesene palice dolžine 1 m in mase 1 kg ter majhne svinčene kroglice z maso 1 kg. Pritrdimo ga na tla in vpnemo ob steno z vzmetjo s koeficientom vzmeti 1 N/cm s prijemališčem na višini 0,8 m, kot to prikazuje skica. Kolikšna je frekvenca nihanja? Nihalo je na začetku v ravnovesni legi, poženemo pa z začetno kotno hitrostjo $\omega = 0,5 Hz$. Kolikšen je odmik kroglice (glede na ravnovesno lego) 1 s po tem, ko nihalo začne nihati?

5.) Nekje v vesolju se nahaja vesoljska raketa Saturn V, ki ima maso 3 kt in dolžino 100 m. V smeri vzdolž rakete se na razdalji 10 metrov nahaja satelit Voyager 1 z maso 720 kg. S kolikšno gravitacijsko silo privlači satelit raketo? Koliko dela mora Voyager 1 opraviti, da ubeži gravitacijskemu privlaku rakete ($r \rightarrow \infty$)?



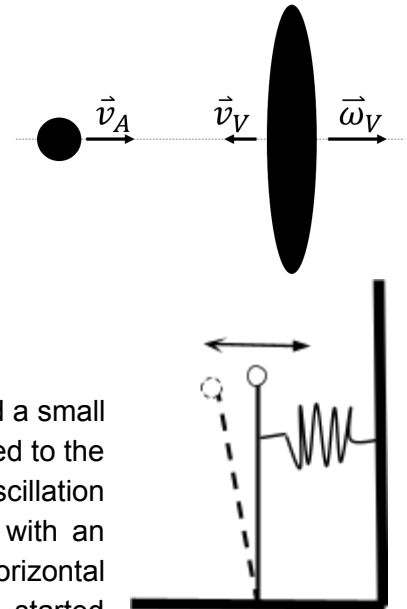
1. midterm exam in physics - 13. 12. 2021

1.) A 1 kg box is standing still on a slope with an inclination of 20° . The coefficient of static friction is $\sqrt{3}/3$. What is the perpendicular force exerted by the box on the slope and what is the static friction force on the box? How much force does the slope exert on the box? Calculate the maximum possible inclination of the slope so that the box does not slip. What is the acceleration with which the box starts to move if the inclination is 60° ?

2.) The Volkswagen Passat weighs 1459 kg and accelerates from 0 to 100 km/h in 9.4 seconds.

- Assume that the engine is pushing the car with constant force. What is this force?
- Assume that the engine is pushing the car with constant power. What is this power? Determine the velocity versus time $v(t)$.
- For example b), write down how the position $s(t)$ changes with time.

3.) The galactic log describes a catastrophic accident in space, where an asteroid in the shape of a sphere ($m = 100 \text{ t}$, $r = 50 \text{ m}$) impacts with a spaceship in the shape of a thin circular plate ($M = 10^5 \text{ t}$, $R = 1 \text{ km}$, $v_V = 5 \text{ km/s}$, $\omega_V = 10 \text{ Hz}$). After the collision, the spaceship and the asteroid stop moving and rotating. Calculate the velocity, angular velocity and mark the direction of the angular velocity of the asteroid before the impact. How much energy is lost during the impact?



4.) A pendulum is made of a 1 m long wooden stick with a mass of 1 kg and a small lead ball weighing 1 kg. The pendulum is attached to the ground and clamped to the wall with a spring with a spring coefficient of 1 N/cm. What is the oscillation frequency? The pendulum is pushed from the initial equilibrium position with an angular velocity of 0.5 Hz. What is the displacement of the ball in the horizontal direction (relative to the equilibrium position) 1 s after the pendulum has started oscillating?

5.) Somewhere in space is a Saturn V space rocket, weighing 3 kt and 100 m long. The Voyager 1 satellite, with a mass of 720 kg, is located 10 m along the rocket. How much gravitational force is the satellite exerting on the rocket? How much work must Voyager 1 do to escape the gravitational pull of the rocket ($r \rightarrow \infty$)?

