

Prvi ispitni rok – Tehnička fizika

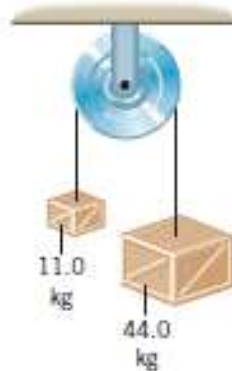
Rezultati pismenog ispita

Rbr.	JMBAG	Br. bodova na pismenom djelu ispit
1	0113147804	0
2	0113148976	0
3	0113147851	20
4	0011164169	30
5	0113149008	Nije pristupila
6	0113147916	0
7	0113149013	0
8	0113149034	0
9	0113148112	0
10	0113149060	0
11	0113144935	0
12	0113148266	0
13	0113148315	22
14	0113148320	38
15	0113148357	60
16	0113148378	60
17	0113148411	30
18	0113148614	0
19	0113148640	45
20	0113148656	15
21	0113148705	
22	0113149200	12
23	0113148731	
24	0113147552	Nije pristupila
25	0113148822	3
26	0113149279	2
27	0113148908	7
28	0113148929	50
29	1311029511	0
30	0011167818	
31	0113148955	
32	0113148960	

NAPOMENA: Studenti koji imaju 50 i više bodova su položili pismeni dio ispita. Usmeni dio ispita će se održati u ponedjeljak, 10.02.2020. u 11:00 na Odjelu za fiziku.

06.02.2020.

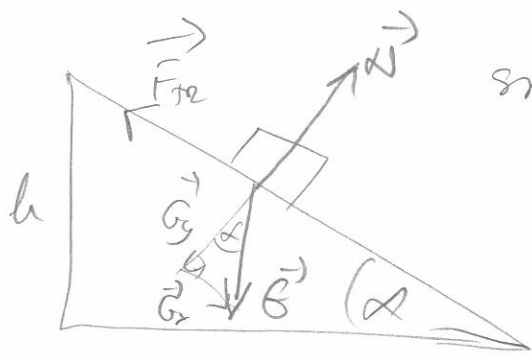
1. Koliko se dugo spušta tijelo niz kosinu visine 1 m i nagiba 45° ako je maksimalni kut pri kojem tijelo može mirovati na kosini 30° ? Izračunajte brzinu koju tijelo postigne na dnu kosine. (0,98 s; 2,87 m/s)
2. Dvije mase su obješene na užu, koje je prebačeno preko koloture. Masu užeta možemo zanemariti, a koloturu smatrati uniformnim diskom. Ako se masa od 44,0 kg giba prema dolje akceleracijom od točno pola akceleracije sile teže, a napetost niti nije jednaka na obje strane, odredite masu koloture. (22,0 kg)



3. Kocka s bridom 10 cm ima gustoću $11,02 \text{ g/cm}^3$ i pliva u živi gustoće $13,6 \text{ g/cm}^3$, iznad koje je voda. Koliko duboko kocka uroni u živu? (7,95 cm)
4. Kolika je energija potrebna da ispari 2 L vode temperature 15°C ? $\lambda_{\text{H}_2\text{O}} = 2,26 \frac{\text{MJ}}{\text{kg}}$; $c_{\text{H}_2\text{O}} = 4200 \frac{\text{J}}{\text{kgK}}$ (5,234 MJ)
5. Indeks loma stakla od kojeg je napravljena kocka čija je stranica duga 10cm iznosi $5/3$. U središtu te kocke je točkasti izvor svjetlosti. Odredite koju najmanju površinu na svakoj plohi te kocke treba potamniti ako želimo da se izvor svjetlosti ne vidi. ($44,18 \text{ cm}^2$; $265,08 \text{ cm}^2$)

(A)

1.) $h = 1 \text{ m}$
 $\alpha = 45^\circ$
 $\alpha_0 = 30^\circ$



$$\sin \alpha' = \frac{h}{s} \rightarrow s = \frac{h}{\sin \alpha}$$

$$s = 1,41 \text{ m}$$

$t, v = ?$

$$s = \frac{a}{2} t^2$$

$$a = 2,93 \text{ m/s}^2 \leftarrow a = g \sin \alpha - \mu g \cos \alpha$$

I.N.Z. $G_x - F_{fr} = 0$

$$\mu g \sin \alpha_0 - \mu g \cos \alpha_0 = 0$$

$$\sin \alpha_0 = \mu \cos \alpha_0$$

$$\mu = \tan \alpha_0 = 0,577 \text{ *}$$

$$t = \sqrt{\frac{2s}{a}} = \underline{\underline{0,981 \text{ s}}}$$

$$v = a \cdot t = \underline{\underline{2,87 \text{ m/s}}}$$

4.) $V = 2 \text{ L}$

$t_1 = 15^\circ \text{C}$

$\lambda_{H_2O} = 2,26 \text{ MJ/kg}$

$c_{H_2O} = 4200 \text{ J/kg}\cdot\text{K}$

$\Delta Q = ?$

$$\rho = \frac{m}{V} \Rightarrow m = \rho \cdot V$$

$$\Delta Q = \Delta Q_{H_2O} + L_{H_2O}$$

$$\Delta Q = m \cdot c_{H_2O} \cdot \Delta T + m \cdot \lambda_{H_2O}$$

$$\Delta Q = 10^3 \cdot 2 \cdot 10^3 \cdot 4200 \cdot (100 - 15) + 10^3 \cdot 2 \cdot 10^3 \cdot 2,26 \cdot 10^6$$

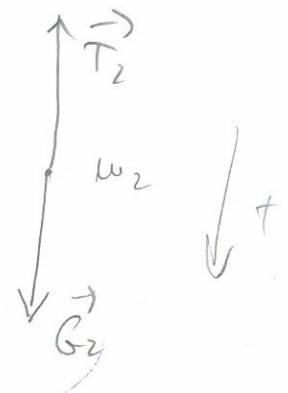
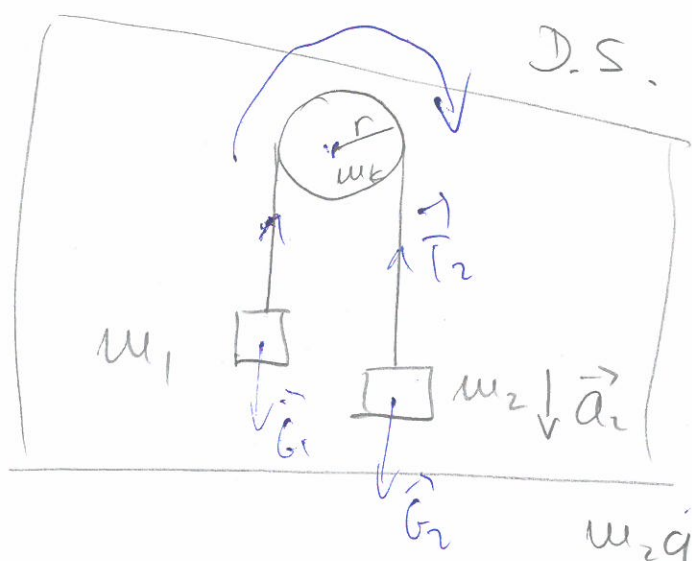
$$\Delta Q = 5,234 \cdot 10^6 \text{ J} = \underline{\underline{5,234 \text{ MJ}}}$$

2.] $m_1 = 11,0 \text{ kg}$
 $m_2 = 44,0 \text{ kg}$

$a_1 = a_2 = \frac{1}{2}g$

$T_1 \neq T_2$

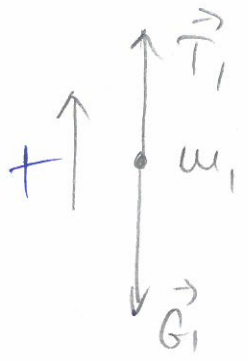
$m_k = ?$



$G_2 - T_2 = m_2 a_2$

$m_2 g - m_2 a_2 = T_2$

$T_2 = \frac{1}{2} m_2 g = 215,82 \text{ N}$

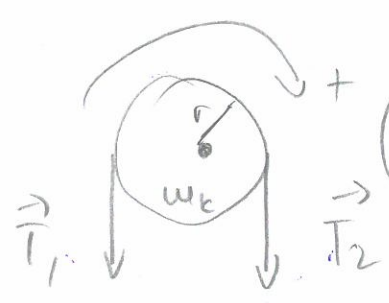


II. N. Z.

$T_1 - G_1 = m_1 a_1$

$T_1 = m_1 a_1 + m_1 g$

$T_1 = 161,865 \text{ N}$



$M = I \cdot \alpha$

$(T_2 - T_1) \cdot r = I \cdot \frac{a_1}{r}$

$(T_2 - T_1) \cdot r = \frac{1}{2} m_k r^2 \cdot \frac{a_1}{r}$

$m_k = \frac{2(T_2 - T_1)}{a_1} = \underline{\underline{22 \text{ kg}}}$

$I = \frac{1}{2} m_k r^2$

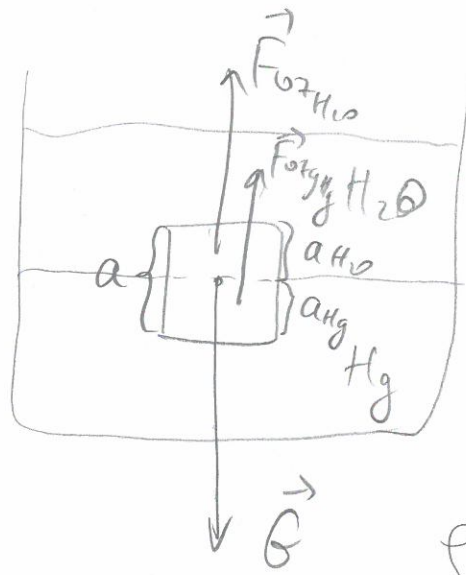
3. $a = 0,1 \text{ m} = 10 \text{ cm}$

$\rho_k = 11,02 \text{ g/cm}^3$

$\rho_{\text{Hg}} = 13,6 \text{ g/cm}^3$

$\rho_{\text{H}_2\text{O}} = 1 \text{ g/cm}^3$

$a_{\text{Hg}} = ?$



$\rho = \frac{m}{V} \Rightarrow m = \rho \cdot V$

$F_{b_{\text{H}_2\text{O}}} + F_{b_{\text{Hg}}} = G$

$a_{\text{H}_2\text{O}} + a_{\text{Hg}} = a$

$\rho_{\text{H}_2\text{O}} \cdot g \cdot V_{\text{H}_2\text{O}} + \rho_{\text{Hg}} \cdot g \cdot V_{\text{Hg}} = m \cdot g$

$a_{\text{H}_2\text{O}} = a - a_{\text{Hg}}$

$1 \cdot a \cdot a \cdot a_{\text{H}_2\text{O}} + 13,6 \cdot a \cdot a \cdot a_{\text{Hg}} = \rho_k \cdot a \cdot a \cdot a$

$a_{\text{H}_2\text{O}} + 13,6 a_{\text{Hg}} = 11,02 a$

$a - a_{\text{Hg}} + 13,6 a_{\text{Hg}} = 11,02 a$

$12,6 a_{\text{Hg}} = 10,02 a \quad / : 12,6$

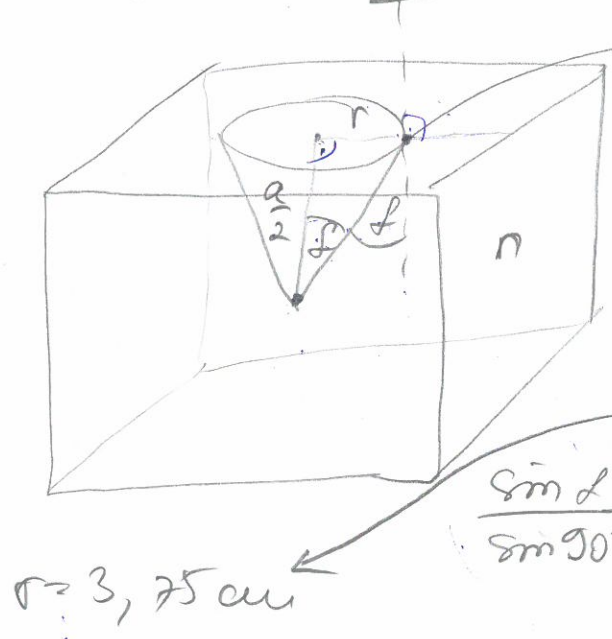
$a_{\text{Hg}} = \frac{10,02 \cdot 10}{12,6} = \underline{\underline{7,95 \text{ cm}}}$

5. $a = 10 \text{ cm}$
 $n = 5/3$

 $\rho = ?$

$\rho = r^2 \pi$

$\rho = 44,18 \text{ cm}^2$



totalna refleksija

$\text{tg } d = \frac{r}{\frac{a}{2}} \Rightarrow$

$r = \frac{a}{2} \cdot \text{tg } d$

$\frac{\text{sin } d}{\text{sin } 90^\circ} = \frac{1}{n} \Rightarrow \text{sin } d = \frac{1}{n}$

$d = 36,87^\circ$

$r = 3,75 \text{ cm}$