

113

$$W = F \cdot \rho$$

$$W = F \cdot 20 \cdot \rho = 70 \cdot 20 \cdot 0,25 = 350 \text{ J}$$

114

$$E_p = mgh = W$$

$$W_1 = m \cdot g \cdot (3 \cdot 4) = (60 + 20) \cdot g \cdot 12 = \underline{9600 \text{ J}}$$

$$W_2 = 20 \cdot g \cdot 12 = \underline{240 \text{ J}}$$

115

$$W_1 = F \cdot \rho \cdot \cos \alpha_1 = 40 \cdot 50 \cdot \cos 45^\circ = \underline{1414 \text{ J}}$$

$$W_2 = F \cdot \rho \cdot \cos \alpha_2 = 40 \cdot 50 \cdot \cos 30^\circ = \underline{1732 \text{ J}}$$

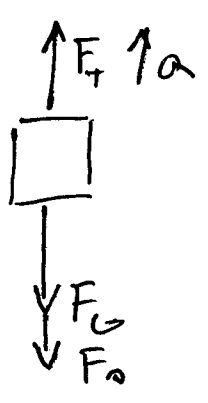
$$W_3 = 40 \cdot 50 \cdot \cos 15^\circ = \underline{1932 \text{ J}}$$

$$W_4 = 40 \cdot 50 \cdot \cos 0^\circ = \underline{2000 \text{ J}}$$

118

a) $W = E_p = mgh = 250 \cdot 10 \cdot 2 = \underline{5 \text{ kJ}}$

b)



$$F_T - F_G - F_a = ma$$

$$F_T = ma + F_G + F_a = ma + mg + ma$$

$$F_T = 250 \cdot 4 + 250 \cdot 10 + 250 \cdot 4 = 4500 \text{ N}$$

$$W = F_T \cdot \rho = 4500 \cdot 2 = \underline{9000 \text{ J}}$$

119

$$E = mgl_1 = W \Rightarrow l_1 = \frac{W}{mg} = \frac{1}{0,01 \cdot 10}$$

$$l_1 = \underline{\underline{10 \text{ m}}}$$

120

$$E_{PR} = \frac{1}{2} k \rho^2 = W$$

$$F = k \rho \Rightarrow k = \frac{F}{\rho}$$

$$k = \frac{3}{0,01} = 300$$

$$W = \frac{1}{2} 300 \cdot 0,2^2 = \underline{\underline{6 \text{ J}}}$$

121

$$E_{PR} = \frac{1}{2} k \rho^2 = W$$

$$F = k \rho$$

$$k = \frac{F}{\rho} = \frac{6000}{0,01}$$

$$W = \frac{1}{2} 6 \cdot 10^5 \cdot 0,105^2$$

$$k = 6 \cdot 10^5$$

$$W = \underline{\underline{750 \text{ J}}}$$

123



$$W = F \cdot \rho$$

$$F = ma$$

$$a = \frac{v}{t}$$

$$W = m \frac{v}{t} \cdot \frac{1}{2} v t$$

~~W =~~

$$\rho = \frac{1}{2} a t^2$$

$$W = \frac{1}{2} m v^2$$

$$F = m \frac{v}{t}$$

$$\rho = \frac{1}{2} v \cdot t$$

$$W = \frac{1}{2} 6000 \cdot 5^2 = \underline{\underline{75 \text{ kJ}}}$$

124

$$E_p = mgh$$

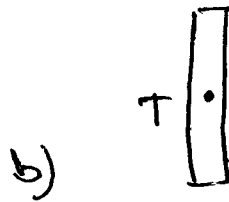
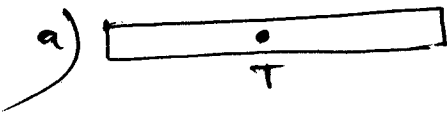
$$E_p = 20 \cdot 10 \cdot (3 \cdot 4) = \underline{\underline{240 \text{ J}}}$$

125

$$a) E_p = mgh = 0,8 \cdot 10 \cdot 1,5 = \underline{\underline{12 \text{ J}}}$$

$$b) E_p = W = \underline{\underline{12 \text{ J}}}$$

126



CELOU HMOTU UMÍSTIŤ KE ŽOŤEŽIŠŤE

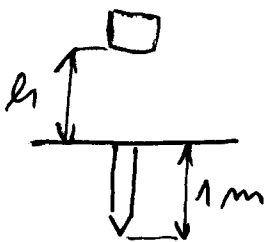
$$E_p = m \cdot g \cdot h = 25 \cdot 10 \cdot 3 = \underline{\underline{750 \text{ J}}}$$

127

$$a) E_p = mgh \Rightarrow h = \frac{E_p}{mg} = \frac{10 \text{ kJ}}{500 \cdot 10} = \underline{\underline{2 \text{ m}}}$$

$$b) h = \frac{10000}{500 \cdot 10} = \underline{\underline{0,2 \text{ m}}}$$

129



PRÁCE PROHĚKNUTÍ KILU $W = F \cdot s$
 $W = 12000 \cdot 1$
 $W = \underline{\underline{12 \text{ kJ}}}$

ENERGIE SE NEKŮDĚ NIKAM ŽTRATIT

$$E_p = W$$

$$mgh = 12 \text{ kJ} \Rightarrow h = \frac{12 \text{ kJ}}{mg} = \frac{12000}{500 \cdot 10}$$

$$h = \underline{\underline{2,4 \text{ m}}}$$

130

List 4

$$E_p = mgh \Rightarrow h = \frac{E_p}{mg} = \frac{15000}{50 \cdot 10}$$

$$h = \underline{30 \text{ m}}$$

$$v = \frac{D}{t} \Rightarrow t = \frac{D}{v}$$

$$t = \frac{30}{1.5} = \underline{20 \text{ s}}$$

131

$$E_k = \frac{1}{2} m v^2 = \frac{1}{2} 80 \cdot 25^2 = \underline{18750 \text{ J}}$$

132

$$E_{k1} = \frac{1}{2} m_1 v_1^2 = \frac{1}{2} 50 \cdot 2^2 = \underline{100 \text{ J}}$$

$$E_{k2} = \frac{1}{2} m_2 v_2^2 = \frac{1}{2} 0.5 \cdot 20^2 = \underline{100 \text{ J}}$$

133

$$E_{k1} = \frac{1}{2} m v_1^2 = \frac{1}{2} 60 \cdot 5^2 = \underline{750 \text{ J}}$$

$$E_{k2} = \frac{1}{2} m (2v_1)^2 = \frac{1}{2} 60 \cdot 10^2 = \underline{3000 \text{ J}}$$

134

$$E_{k1} = \frac{1}{2} m v^2$$

$$m_2 = \frac{m}{4}$$

$$v_2 = ?$$

$$E_{k1} = E_{k2}$$

$$\frac{1}{2} m v^2 = \frac{1}{2} \frac{m}{4} v_2^2$$

$$v_2^2 = \sqrt{4v^2}$$

$$\underline{v_2 = 2v}$$

135

$$E_{k1} = \frac{1}{2} 80 m \left(\frac{v}{9}\right)^2 \leftarrow \text{PRO VLAK}$$

$$E_{k2} = \frac{1}{2} m v^2 \leftarrow \text{PRO LETADLO}$$

$$E_{k1} = \frac{1}{2} 80 m \frac{v^2}{81}$$

$$\frac{E_{k1}}{E_{k2}}$$

$$E_{k2} = \frac{1}{2} m v^2$$

$$\frac{E_{k1}}{E_{k2}} = \frac{\frac{1}{2} 80 m \frac{v^2}{81}}{\frac{1}{2} m v^2} = \frac{80}{81} \leftarrow$$

⇒ LETADLO MÁ VĚTŠÍ KINETICKOU ENERGIÍ.

137

$$a) E_k = \frac{1}{2} m v^2 = F \cdot \rho \Rightarrow \rho = \frac{m v^2}{2 F}$$

$$\rho = \frac{0,3 \cdot 4^2}{2 \cdot 1200} = \underline{0,002 \text{ m}} \leftarrow \text{PRO 1 ÚDER}$$

KA 1 cm JE POTŘEBA 5 TI ÚDERŮ.

$$b) 5 \text{ ÚDERŮ KA } 2 \text{ cm} \Rightarrow \text{PRO 1 ÚDER } 0,004 \text{ m}$$

$$\Rightarrow m = \frac{2 F \cdot \rho}{v^2} = \frac{2 \cdot 1200 \cdot 0,004}{4^2}$$

$$m = \underline{0,6 \text{ kg}}$$

138

$$E_k = \frac{1}{2} m v^2$$

$$W = F \cdot r$$

$$E_k = W$$

$$\frac{1}{2} m v^2 = F \cdot r \Rightarrow v = \sqrt{\frac{2 F \cdot r}{m}}$$

$$v = \sqrt{\frac{2 \cdot 4000 \cdot 0.1}{0.02}} = \underline{\underline{200 \text{ m/s}}}$$

139

$$E_k = \frac{1}{2} m v^2$$

$$W = F \cdot r$$

$$E_k = F \cdot r$$

$$E_k = 10 \cdot 15 = \underline{\underline{150 \text{ J}}}$$

140

$$v = g \cdot t$$

$$E_{k1} = \frac{1}{2} m v_1^2$$

$$E_{k1} = \frac{1}{2} m (g t_1)^2 = \frac{1}{2} \cdot 1 \cdot (10 \cdot 1)^2 = \underline{\underline{50 \text{ J}}}$$

$$E_{k2} = \frac{1}{2} \cdot 1 \cdot (10 \cdot 2)^2 = \underline{\underline{200 \text{ J}}}$$

$$E_{k3} = \frac{1}{2} \cdot 1 \cdot (10 \cdot 3)^2 = \underline{\underline{450 \text{ J}}}$$

$$E_{k4} = \frac{1}{2} \cdot 1 \cdot (10 \cdot 4)^2 = \underline{\underline{800 \text{ J}}}$$

141

$$a) E_p = mgh = 45 \cdot 10 \cdot 0,2 = \underline{90 \text{ J}} = E_c$$

$$c) E_p = E_k \Rightarrow \frac{1}{2} mv^2 = mgh$$

$$E_k = \underline{90 \text{ J}} = E_c$$

$$v = g \cdot t$$

$$b) E_k = \frac{1}{2} m (gt)^2 = \frac{1}{2} \cdot 0,2 \cdot (10 \cdot 1)^2$$

$$E_k = \underline{10 \text{ J}}$$

$$E_p = 90 - 10 = \underline{80 \text{ J}}$$

$$E_c = E_k + E_p = \underline{90 \text{ J}}$$

KUTNO SI UVĚDOMIT: ŽÁDNÁ ENERGIJE SE NEZTRÁTÍ!

PRO b) LZE POČÍTAT I TAKTO

$$E_p = mgh$$

$$p = \frac{1}{2} gt^2$$

$$E_p = m \cdot g (h - p)$$

$$p = \frac{1}{2} \cdot 10 \cdot 1^2 = \underline{5 \text{ m}}$$

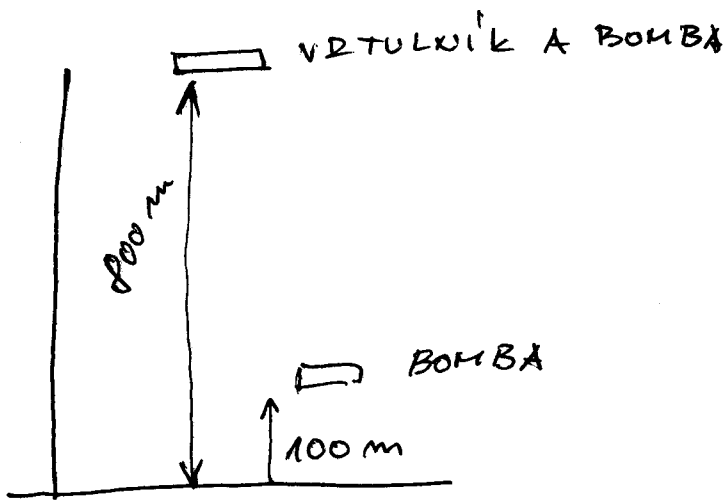
$$E_p = 0,2 \cdot 10 \cdot (45 - 5) = \underline{80 \text{ J}} \Rightarrow E_k = 90 - 80$$

$$\underline{\underline{E_k = 10 \text{ J}}}$$

(142)

$$a) E_p = \cancel{m} \cdot mgh = 20 \cdot 10 \cdot 100 = \underline{20000 \text{ J}}$$

$$E_k = \frac{1}{2} mv^2$$



Rychlost ve 100 m

$$\text{je } v = g \cdot t$$

$$t \text{ zjistím z } s = \frac{1}{2} g t^2$$

$$s = 700 \text{ m} \Rightarrow t = \sqrt{\frac{2s}{g}}$$

$$t = \sqrt{\frac{2 \cdot 700}{10}} = \underline{11,83 \text{ s}}$$

$$v = g \cdot t = 10 \cdot 11,83 = \underline{118,3 \frac{\text{m}}{\text{s}}}$$

$$E_k = \frac{1}{2} 20 \cdot (118,3)^2 = \underline{139949 \text{ J}}$$

$$E_p \text{ v } 800 \text{ JE } E_p = 20 \cdot 10 \cdot 800 = \underline{160000 \text{ J}}$$

to je rovno $E_c \Rightarrow E_c$ ve 100 m JE

$$E_k + E_p = 20000 + 139949 = \underline{159949 \text{ J}}$$

rozdíl oproti 160000 J je v zanedbatelnosti

(143)

$$P = \frac{W}{t} = \frac{F \cdot s}{t} = \frac{m \cdot g \cdot \cancel{t} \cdot s}{t} = \frac{12 \cdot 10 \cdot 2}{3}$$

$$P = \underline{80 \text{ W}}$$

144

$$P_1 = \frac{W}{t_1} = \frac{F \cdot \rho}{t_1} = \frac{m \cdot g \cdot \rho}{t_1} = \frac{40 \cdot 10 \cdot (3 \cdot 3)}{12} \text{ HST } 9$$

$$P_1 = \underline{400 \text{ W}}$$

$$P_2 = \frac{m_2 \cdot g \cdot (3 \cdot 3)}{9} = \frac{60 \cdot 10 \cdot 9}{9} = \underline{600 \text{ W}}$$

146

$$P = \frac{W}{t} = \frac{\overset{F}{m \cdot g \cdot \rho}}{t}$$

$$m = \rho \cdot V = 1000 \cdot 150 = \underline{150000 \text{ kg}}$$

$$P = \frac{150000 \cdot 10 \cdot 4}{60} = \underline{100000 \text{ W}}$$

DEN MA' 24 \cdot 60 \text{ MINUT} = 1440 \text{ min}

$$P = \frac{W}{t} \Rightarrow W = P \cdot t$$

PRA'CE ZA 1 minutu $150000 \cdot 10 \cdot 4 = \underline{6 \cdot 10^6 \text{ J}}$

ZA CELI DEN $6 \cdot 10^6 \cdot 1440 = \underline{8,64 \cdot 10^9 \text{ J}}$

147

$$P = 200 \text{ kW} \quad P = \frac{W}{t} = \frac{F \cdot \rho}{t} = \frac{m \cdot g \cdot \rho}{t}$$

$$\Rightarrow m = \frac{P \cdot t}{g \cdot \rho} = \frac{200000 \cdot 3600}{10 \cdot 360} = \underline{200000 \text{ kg}}$$

$$200000 \text{ kg} = \underline{200 \text{ m}^3}$$

149

$$P = \frac{W}{t} = \frac{F \cdot s}{t}$$

$$P \cdot t = F \cdot s$$

$$F = m a$$

$$s = \frac{1}{2} a t^2$$

$$a = \frac{v}{t}$$

$$F = m \frac{v}{t}$$

$$s = \frac{1}{2} \frac{v}{t} \cdot t^2$$

$$P \cdot t = m \frac{v}{t} \cdot \frac{1}{2} \frac{v}{t} t^2$$

$$P \cdot t = \frac{1}{2} m v^2$$

$$v = \sqrt{\frac{2 P t}{m}} = \sqrt{\frac{2 \cdot 22500 \cdot 30}{1500}}$$

$$v = 30 \text{ m s}^{-1}$$

152

$$P_p = 24 \text{ kW}$$

$$\eta = ?$$

$$P = \frac{W}{t} = \frac{F \cdot s}{t} = \frac{m \cdot g \cdot s}{t} = \frac{180000 \cdot 10 \cdot 6}{600}$$

$$P = 18 \text{ kW}$$

$$\eta = \frac{P}{P_p} = \frac{18}{24} \cdot 100 = \underline{\underline{75\%}}$$

153

$$P = F \cdot v = m \cdot g \cdot v = mg \cdot \frac{r}{t}$$

$$P = 800 \cdot 10 \cdot \frac{27}{30} = \underline{7200 \text{ W}}$$

$$\eta = \frac{P}{P_p} \Rightarrow P_p = \frac{P}{\eta} = \frac{7200}{0,9} = \underline{8000 \text{ W}}$$

154

$$\eta = \frac{P}{P_p} \Rightarrow P = P_p \cdot \eta = 3000 \cdot 0,9 = \underline{2700 \text{ W}}$$

$$P = F \cdot v \Rightarrow F = \frac{P}{v} = \frac{2700}{\frac{20}{60}} = \underline{8100 \text{ N}}$$

$$v = 20 \frac{\text{m}}{\text{min}} \doteq 0,33 \text{ m/s}$$