

(0-2 m):

$$S = v_0 t + \frac{a t^2}{2}$$

$$S(0-2) = x_2 - x_0 = 2 \text{ m}$$

$$v_{0(0-2)} = 0,5 \text{ m/s}; v_{0-2} = 0,25 \text{ m/s}$$

$$a_{(0-2)} \approx -0,05 \text{ m/s}^2$$

$$t(0-2) = 5 \text{ s}$$

$$S = \frac{v^2 - v_0^2}{2a} \Rightarrow a = \frac{v^2 - v_0^2}{2S}$$

$$a(0-2) = \frac{v_{0-2}^2 - v_{0(0-2)}^2}{2S(0-2)}$$

$$a(0-2) = \frac{(0,25 \text{ m/s})^2 - (0,5 \text{ m/s})^2}{2 \cdot 2 \text{ m}}$$

$$a(0-2) \approx -0,05 \text{ m/s}^2$$

(2-3 m):

$$v = \frac{S}{t}; S = v t; t = \frac{S}{v}$$

$$S(2-3) = 1 \text{ m}$$

$$v(2-3) = 0,25 \text{ m/s}$$

$$t(2-3) = 4 \text{ s}$$

$$v = v_0 + a t \Rightarrow t = \frac{v - v_0}{a}$$

$$t(0-2) = \frac{v_{0-2} - v_{0(0-2)}}{a(0-2)}$$

$$t(0-2) = 5 \text{ s}$$

(3-6 m):

$$S(0-6) = v_{0(3-6)} \cdot t(3-6) + \frac{a(3-6) \cdot t(3-6)^2}{2}$$

$$a_{(3-6)} = \frac{v_{(3-6)}^2 - v_{0(3-6)}^2}{2S(3-6)}$$

$$S(3-6) = x_6 - x_3 = 6 - 3 = 3 \text{ (m)}$$

$$v_{0(3-6)} = 0,25 \text{ m/s}$$

$$v_{(3-6)} = 2 \text{ m/s}$$

$$a(3-6) = 0,7 \text{ m/s}^2$$

$$t(3-6) = 2,5 \text{ m/s}$$

$$a(3-6) \approx 0,7 \text{ m/s}^2$$

$$t(3-6) = \frac{v_{(3-6)} - v_{0(3-6)}}{a(3-6)}$$

$$t(3-6) = 2,5 \text{ s}$$

(6-10 m):

$$v = \frac{S}{t}; t = \frac{S}{v}; S = v \cdot t$$

$$v(6-10) = 2 \text{ m/s}$$

$$S(6-10) = x_{10} - x_6 = 4 \text{ m}$$

$$t(6-10) = \frac{S(6-10)}{v(6-10)} = 2 \text{ s}$$

a)  $t(0-10) = t(0-2) + t(2-3) + t(3-6) + t(6-10) = 5 \text{ s} + 4 \text{ s} + 2,5 \text{ s} + 2 \text{ s} = 13,5 \text{ s}$

b)  $t_1 = t(0-5)$   
 $t_2 = t(5-10)$





$$t(0-5) = t(0-2) + t(2-3) + t(3-5)$$

$$t(0-2) = 5 \text{ сек}$$

$$t(2-3) = 4 \text{ сек}$$

$$t(3-5) = 1 \text{ сек}$$

(3-5)

$$v_0(3-5) = 0,25 \text{ м/с}$$

$$v(3-5) = 1 \text{ м/с}$$

$$s(3-5) = x_5 - x_3 = 2 \text{ м}$$

$$a(3-5) = a(3-6) = 0,4 \text{ м/с}^2$$

$$t(3-5) = 1,1 \text{ с}$$

$$t(3-5) = \frac{v(3-5) - v_0(3-5)}{a(3-5)}$$

$$t(3-5) = 1,1 \text{ с}$$

$$t(5-10) = t(5-6) + t(6-10)$$

$$t(5-6) = t(3-6) - t(3-5) = 1,4 \text{ с}$$

$$t(6-10) = 2 \text{ с}$$

$$t(0-5) = 5 \text{ с} + 4 \text{ с} + 1 \text{ с} = 10 \text{ с}$$

$$t(5-10) = 1,4 \text{ с} + 2 \text{ с} = 3,4 \text{ с}$$

$$t_1 = 10 \text{ с}$$

$$t_2 = 3,4 \text{ с}$$

б)  $t_1 < t_2 \Rightarrow$  второму половине пути он пройдет быстрее.

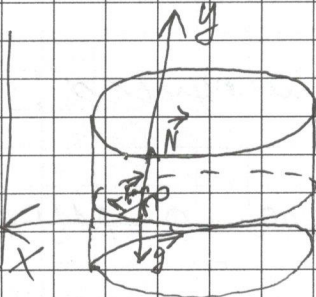
Ответ: а) 13,5 с

$$б) t_1 = 10,1 \text{ с}$$

$$t_2 = 3,4 \text{ с}$$

в) второму

Дано:  
 $D = 16 \text{ м}$   
 $\mu = 0,8$   
 $g = 10 \text{ м/с}^2$



Решение:

По II закону Ньютона:

$$\vec{F} = m\vec{a}$$

$$F = F_{\text{mp}} + N + mg$$

$$a = a_{\text{yc}} = \frac{v^2}{R}$$

$$\Rightarrow \vec{F}_{\text{mp}} + \vec{N} + m\vec{g} = \frac{v^2}{R} \cdot m \quad (1)$$

OX:

$$F_{\text{mp}} = F_{\text{mp}}$$

$$m\vec{g} = \vec{N} = 0$$

OY:

$$\vec{N} = N$$

$$m\vec{g} = -mg$$

из Oy:  $N - mg = 0 \Rightarrow N = mg$

$$F_{\text{mp}} = \mu N \Rightarrow F_{\text{mp}} = \mu mg \quad (2)$$

(2) → (1)  $R = \frac{g}{2} \quad (3)$

$$\mu mg = \frac{v^2}{R} m$$

$$\mu g = \frac{v^2}{R} \Rightarrow v = \sqrt{\mu g R} \quad (4)$$

(3) → (4)

$$v = \sqrt{\frac{\mu g g}{2}}$$

$$v = \sqrt{\frac{0,8 \cdot 10^4 \text{ м/с}^2 \cdot 16 \text{ м}}{2}} = 8 \text{ м/с}$$

Ответ: 8 м/с

5

Решение:

Дано:

$$m = 0,01 \text{ кг}$$

$$v_0 = 800 \text{ м/с}$$

$$M = 1 \text{ кг}$$

$$v = 400 \text{ м/с}$$

$$m \vec{v}_0$$



Решение:



$$M \vec{v} \quad m \vec{v}$$

а) Q-?

б) U-?

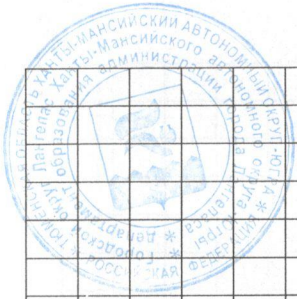
б) По з. сохранения импульса:

$$P_1 + P_2 = P_1' + P_2'$$

$$P_2 = 0, m \cdot v_0 \text{ напра} = 0 \Rightarrow m \cdot v_0 + 0 = Mv + m \cdot v$$

$$m v_0 - m v = Mv \Rightarrow$$





$$\Rightarrow U = \frac{m v_0 - m v}{M} = \frac{m(v_0 - v)}{M}$$

$$U = \frac{0,01 \text{ кг} (800 \text{ м/с} - 400 \text{ м/с})}{1 \text{ кг}} = 4 \text{ м/с}$$

а) По з. сохранения энергии:

$$\underbrace{E_{k1} + E_{k2}}_{E_{kI}} = \underbrace{E_{k1}' + E_{k2}'}_{E_{kII}}$$

$Q = E_{kI} - E_{kII}$ , т.е. некоторая часть энергии первоначальной системы перешла в количество теплоты

$$Q = \frac{m v_0^2}{2} - \left( \frac{m v^2}{2} + \frac{M U^2}{2} \right)$$

$$Q = \frac{0,01 \text{ кг} \cdot (800 \text{ м/с})^2}{2} - \left( \frac{0,01 \text{ кг} \cdot (400 \text{ м/с})^2}{2} + \frac{1 \text{ кг} \cdot (4 \text{ м/с})^2}{2} \right) =$$

$$= 2392 \text{ Дж}$$

Ответ: а) ~~2392 Дж~~ 2392 Дж

б) 4 м/с