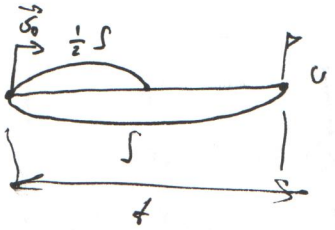
№1 Чистовик

Дано:
$v = 0$
$E_к = 8$ Дж
$m = 4$ кг
v_0 – ?

Решение:



Т. к. тело двигается равноускоренно, то скорость v_1 после прохождения половины пути равна $v_{ср}$ средней скорости

$v_{ср} = \frac{v_1 + v}{2}$, $v_1 = v_{ср} = \frac{S}{t}$

$E_к = \frac{m v_1^2}{2} \Rightarrow v_1 = \sqrt{\frac{2E_к}{m}}$ 2 3+2=5 ± 5

$\sqrt{\frac{2E_к}{m}} = \frac{S}{t}$

$t = \frac{S}{\sqrt{\frac{2E_к}{m}}}$ ~~по $S = v_0 t + \frac{at^2}{2}$ и $v = v_0 + at$~~

$S = v_{ср} t = v_1 t$

$S = v_0 t + \frac{at^2}{2}$, $v = v_0 + at$ $at = v - v_0$

~~$v_{ср} t$~~ $v_1 t = v_0 t + \frac{at^2}{2}$

$v_1 = v_0 + \frac{at}{2}$

$v_1 = v_0 + 0{,}5v - 0{,}5v_0$

$v_0 = \frac{v_1 + 0{,}5v}{0{,}5} = 2v_1 = 2\sqrt{\frac{2E_к}{m}}$,

$v_0 = 2 \cdot \sqrt{\frac{2 \cdot 8 Дж}{4 кг}} = 8 \frac{м}{с}$

Ответ: $8 \frac{м}{с}$

№2 – 0 баллов

№ 5.

Дано:

$U_{об} = 12\ В$

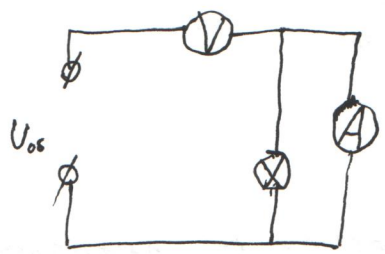
$U_V = 11\ В$

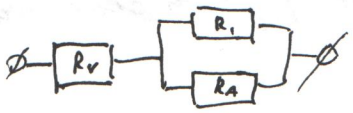
$I_A = 0{,}2\ А$

$R_V = 50\ Ом$

$U_V' - ?$ $I_A' - ?$

Решение:





1) При посл. соединении: $I_{об} = I_V = I_{1A}$, $U_{об} = U_V + U_{1A}$

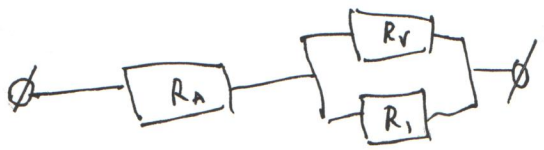
$$I_{1A} = I_V = \frac{U_V}{R_V} = \frac{11\ В}{50\ Ом} = 0{,}22\ А \text{ (по закону Ома)}$$

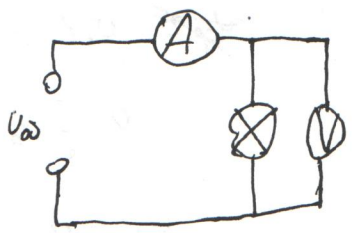
$$U_1 = U_A = U_{1A} = 12\ В - 11\ В = 1\ В$$

$$R_A = \frac{U_A}{I_A} = \frac{1\ В}{0{,}2\ А} = 5\ Ом$$

$$R_1 = \frac{U_1}{I_1} = \frac{1\ В}{(0{,}22 - 0{,}2)\ А} = 50\ Ом$$

2)





$R_1 = 50\ Ом$

$R_V = 50\ Ом$

$R_A = 5\ Ом$.

При $R_{об} = R_A + \frac{R_V \cdot R_1}{R_V + R_1} = 5\ Ом + \frac{50 \cdot 50\ Ом^2}{(50+50)\ Ом} = 5\ Ом + 25\ Ом =$

$= 30\ Ом$

При послед. соединении $I_{1V} = I_A = I_{об}$

$$I_A = I_{1V} = \frac{U_{об}}{R_{об}} = \frac{12\ В}{30\ Ом} = 0{,}4\ А.$$

При пар-лом соединении:

$$U_V = U_1 = U_{об} = I_{1V} \cdot R_{1V} = 0{,}4\ А \cdot 25\ Ом = 10\ В$$

Ответ: 10 В ; 0,4 А

7 20

Дано:

$m_1 = 20$ кг
$t_1 = 298$ К $= 25°C$
$m_2 = 15$ кг
$t_2 = 600$ К $= 327°C$
$\Delta m_1 = 0{,}1$ кг
$r = 2{,}25 \cdot 10^6 \frac{Дж}{кг}$
$c_1 = 4190 \frac{Дж}{кг°C}$
$c_2 = 130 \frac{Дж}{кг°C}$
$\lambda = 30 \cdot 10^3 \frac{Дж}{кг}$

$t_{см} - ?$

Решение:

1) $0°C = 273°K$, значит
$t_1 = 298°K = 25°C$
$t_2 = 600°K = 327°C$

2) Ур-е теплового баланса:

$Q_1 + Q_2 + Q_3 + Q_4 = 0$
$Q_1 = m_1 c_1 (t_{см} - t_1)$
$Q_2 = m_2 c_2 (t_{см} - t_2)$
$Q_3 = \Delta m_1 \cdot r$
$Q_4 = m_2 \cdot \lambda$

$m_1 c_1 (t_{см} - t_1) + m_2 c_2 (t_{см} - t_2) + \Delta m_1 r + m_2 \lambda = 0$

$m_1 c_1 t_{см} - m_1 c_1 t_1 + m_2 c_2 t_{см} - m_2 c_2 t_2 + \Delta m_1 r + m_2 \lambda = 0$

$t_{см}(m_1 c_1 + m_2 c_2) = m_1 c_1 t_1 + m_2 c_2 t_2 - \Delta m_1 r + m_2 \lambda$

$$t_{см} = \frac{m_1 c_1 t_1 + m_2 c_2 t_2 - \Delta m_1 r + m_2 \lambda}{m_1 c_1 + m_2 c_2}$$

$$t_{см} = \frac{20 кг \cdot 4190 \frac{Дж}{кг°C} \cdot 25°C + 15 кг \cdot 130 \frac{Дж}{кг°C} \cdot 327°C - 0{,}1 кг \cdot 2{,}25 \cdot 10^6 \frac{Дж}{кг} + 15 кг \cdot 30 \cdot 10^3 \frac{Дж}{кг}}{20 кг \cdot 4190 \frac{Дж}{кг°C} + 15 кг \cdot 130 \frac{Дж}{кг°C}} =$$

$$= \frac{2035000 Дж + 637650 Дж - 225000 Дж + 450000 Дж}{83800 \frac{Дж}{°C} + 1950 \frac{Дж}{°C}} \approx 33{,}8°C$$

$$= \frac{199765 Дж}{5750 \frac{Дж}{°C}} =$$

Ответ: 33,8°C или 306,8°K

+
25

№3.

Дано:

$H = 4\,см = 0{,}04\,м$

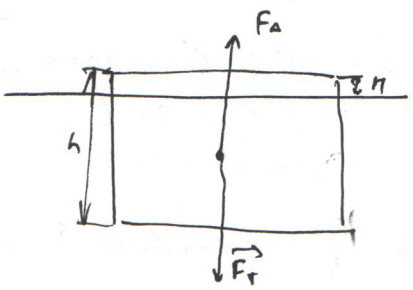
$h = 2$

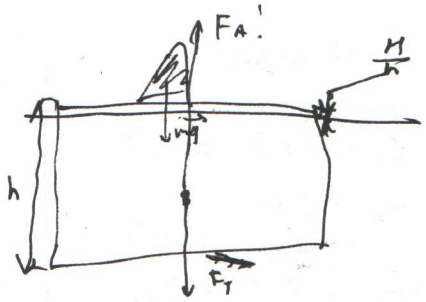
$\rho_в = 1000\ \frac{кг}{м^3}$

$m = 80\,кг$

$S - ?$

Решение:





Т.к. тело находится в покое то:

$$\begin{cases} \vec{F_A} + \vec{F_T} = 0 \\ \vec{F_A} + \vec{F_T} + m\vec{g} = 0 \end{cases}$$

$$\begin{cases} F_A - F_T = 0 \\ F_A' - F_T - mg = 0 \end{cases}$$

$$F_A - F_T = F_A' - F_T - mg$$

$$F_A = F_A' - mg$$

$$F_A = \rho_в g V_{нт} = \rho_в g S \cdot (h - H)$$

$$\rho_в g S (h - H) = \rho_в g S \left(h - \frac{H}{n}\right) - mg$$

$$\rho_в S h - \rho_в S H = \rho_в S h - \frac{\rho_в S H}{n} - m$$

$$-\rho_в S H + \frac{\rho_в S H}{n} = -m$$

$$\frac{S \rho_в H (1-n)}{n} = -m$$

$$S = \frac{-mn}{\rho_в H (1-n)} = \frac{-80\,кг \cdot 2}{-1000\ \frac{кг}{м^3} \cdot 0{,}04\,м \cdot 1} = \frac{160\,м}{40\ \frac{м}{м^2}} = 40\,м^2$$

Ответ: $40\,м^2$

15 ±

ответ неверный

~~Дано:~~

Черновик

№1.

$E_к = 800$ Дж

$m = 4$ кг

$S_1 = \frac{1}{2} S$

$v_0 - ?$

$E_к = \frac{m v_1^2}{2}$

$v_1 = \sqrt{\frac{2E_к}{m}} = 4 \frac{м}{с}$

$v_0 = \frac{\frac{16 м^2}{с^2} - \frac{4 \cdot 800 Дж}{4 кг} \left(\frac{4}{4} - 1\right)}{4}$

$S_1 = v_0 t + \frac{at^2}{2}$ $\quad v_1 = v_0 + at$

$v_0 = v_1 - at$

$S_1 = v_1 t - at^2 + \frac{at^2}{2} = v_1 t - \frac{at^2}{2}$

~~Дано~~ $S_1 = v_0 t_1 + \frac{a t_1^2}{2}$

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

$v = v_0 - at$

$v_0 = at$

$v_0 t_1 + \frac{a t_1^2}{2} = v_0 t + \frac{at^2}{2}$

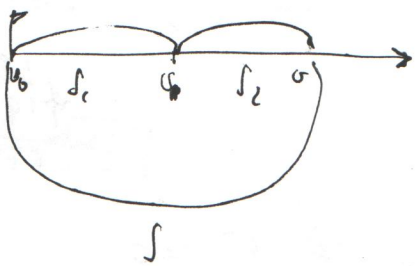
$v_0 t_1 + \frac{a t_1^2}{2} = 1{,}5 at^2$

$v_0 = \frac{(t_1^2 - t^2) \cdot a}{3 t_1}$

$\frac{v - v_0}{a} \cdot t = \frac{4 \frac{E_к}{m} \left(\frac{v}{\sqrt{\frac{2E_к}{m}}} - 1\right)}{a}$

$v^2 - v_0 v = \frac{4 E_к}{m} \left(\frac{v}{\sqrt{\frac{2E_к}{m}}} - 1\right)$

$v_0 = \frac{v^2 - \frac{4E_к}{m} \left(\frac{v}{\sqrt{\frac{2E_к}{m}}} - 1\right)}{v}$



S

$v = 0 \frac{м}{с}$

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

$S_1 = v_0 t_1 + \frac{a t_1^2}{2}$

~~$v_1 = v_0 + at$~~

$v_1 = v_0 + a t_1$

$S_2 = v_1 (t - t_1) + \frac{a (t - t_1)^2}{2}$

~~$S = S_1 + S_2$~~

$S = v_{ср} t$

$v_{ср} = \frac{S_1 + S_2}{t_1 + (t - t_1)} =$

$= \frac{v_0 t_1 + \frac{a t_1^2}{2} + 4(t - t_1) + \frac{a(t - t_1)^2}{2}}{t} =$

$S = \frac{4 \left(\frac{v}{\sqrt{\frac{2E_к}{m}}} - \right) \frac{E_к}{m}}{a}$

$v_0 = v - at$ $\quad t = \frac{v_к - v_0}{a}$

$S = \left(v - \frac{a S}{\sqrt{\frac{2E_к}{m}}}\right) \frac{S}{\sqrt{\frac{2E_к}{m}}} + \frac{a \frac{S^2}{2E_к}}{2}$

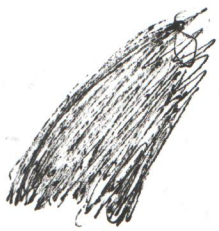
$S = \frac{vS}{\sqrt{\frac{2E_к}{m}}} - \frac{aS^2}{\frac{2E_к}{m}} + \frac{\frac{aS^2}{2E_к}}{2} =$

$1 = \frac{v}{\sqrt{\frac{2E_к}{m}}} - \frac{aS}{4E_к}$

$$S = \frac{v_0 S}{\sqrt{\frac{2E_к}{m}}} + \frac{\frac{aS^2}{2}}{\frac{2E_к}{m}}$$

$$1 = \frac{v_0}{\sqrt{\frac{2E_к}{m}}} + \frac{aS}{\frac{4E_к}{m}}$$

$$v_0 = \frac{1 - \frac{aS}{\frac{4E_к}{m}}}{\sqrt{\frac{2E_к}{m}}}$$



№2.

№4.

$0°C = 273°K.$

$t_1 = 298°K = 25°C$

$t_2 = 600°K = 327°C$

3800
+1950
5750

Ур-е теплового баланса.

$$Q_1 + Q_2 + Q_3 + Q_4 = 0$$

$$m_1 c_1 (t_{см} - t_1) + m_2 c_2 (t_{см} - t_2) + m_2 \lambda + \Delta m_1 r = 0$$

$t_{см} - ?$

$$m_1 c_1 t_{см} - m_1 c_1 t_1 + m_2 c_2 t_{см} - m_2 c_2 t_2 + m_2 \lambda + \Delta m_1 r = 0$$

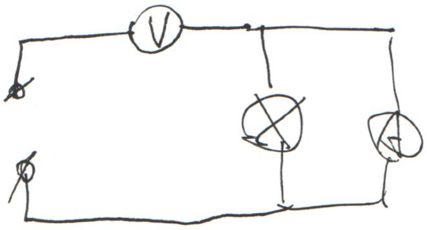
$$t_{см}(m_1 c_1 + m_2 c_2) = m_1 c_1 t_1 + m_2 c_2 t_2 - m_2 \lambda - \Delta m_1 r$$

$$t_{см} = \frac{m_1 c_1 t_1 + m_2 c_2 t_2 - m_2 \lambda - \Delta m r}{m_1 c_1 + m_2 c_2}$$

$$t_{см} = \frac{20кг \cdot 4190 \frac{Дж}{кг°C} \cdot 25°C + 15кг \cdot 130 \frac{Дж}{кг°C} \cdot 327°C - 15кг \cdot 30000 \frac{Дж}{кг} + 0{,}1кг \cdot 2{,}25 \cdot 10^6 \frac{Дж}{кг}}{20кг \cdot 4190 \frac{Дж}{кг°C} + 15кг \cdot 130 \frac{Дж}{кг°C}}$$

$$t_{см} = \frac{2095000Дж + 637650Дж - 450000Дж - 225000Дж}{83800 \frac{Дж}{°C} + 1950 \frac{Дж}{°C}} = \approx 24°C$$

№ 5.



$I_A = 0{,}2\,A.$

$R_V = 500\,Ом$

$U_V = 11\,B$

$U = 12\,B.$

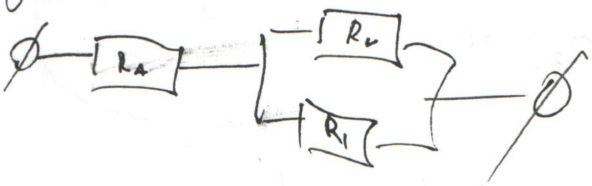
$U_1 = U_1 = U_A = U - U_V = 1\,B$

$R_A = \frac{1\,B}{0{,}2\,A} = 5\,Ом$

$I_V = \frac{11\,B}{500\,м} = 0{,}22\,A.$

$I_1 = I_V - I_A = 0{,}22A - 0{,}2\,A = 0{,}02\,A.$

U



$v = v_0 + at$

$at = v - v_0$

$\frac{1}{2} S = v_1(t - t_1) + \frac{a(t-t_1)^2}{2}$

$\frac{1}{2} v_1 t = v_1 t - v_1 t_1 + \frac{at^2 - 2att_1 - at_1^2}{2}$

$v_{cp} = \frac{S}{t}$

$v_{cp} = \frac{S}{}$

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

$v_0 t + \frac{at^2}{2} = v_1 t$

$v_0 + \frac{at^2}{2} = v_1$

$v_0 = v_1 - \frac{at}{2} = v_1 - \frac{v - v_0}{2}$

$v_0 = \frac{v}{}$

$0{,}5\,v_0 = v_1 - 0{,}5\,v.$

№3.

Дано:

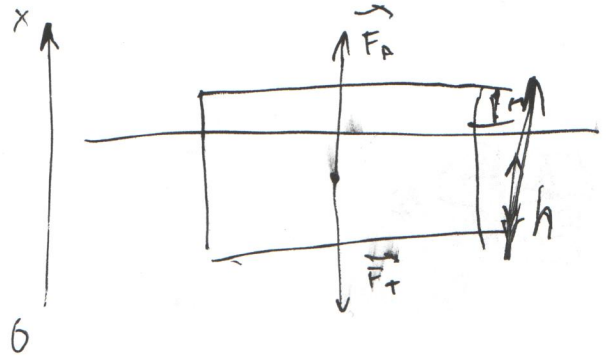
$H = 4$ см

$h = 2$

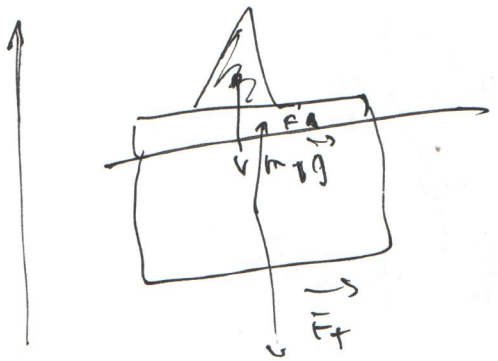
$\rho_в = 1000 \frac{кг}{м^3}$

$m = 80$ кг

$S - ?$



$$F_A + F_т = 0$$



$$F_{A1} + F_т + m_1 g = 0$$

$$F_A + F_т = F_{A1} + m_1 g + F_т$$

$$F_A = F_{A1} + mg$$

$$\rho_в g V_{п.ч} = \rho_в g V_{ч1} + mg$$

$$\rho_в S(h - H) = \rho_в S\left(h - \frac{H}{2}\right) + m$$

$$-\rho_в S H = -\rho_в S \cdot \frac{H}{2} + m$$

$$\frac{\rho_в S \cdot H}{2} - \rho_в S H = m$$