М-36 | Чистовик

1. Дано:
$d = 0{,}25\,м$
$r = 0{,}035\,м$
$R = 0{,}065\,м$
$f = 1{,}28\,Гц$
$\frac{t_м}{t_о}$?

Решение:
$v_{обр} = \frac{2\pi R}{T} \rightarrow v_{обр} = \frac{2\pi R}{\frac{1}{f}} = 2\pi R f$
$f = \frac{1}{T}$
$v_{обр\,м} = 2 \cdot \pi \cdot 0{,}035 \cdot 1{,}28 = 0{,}28 \frac{м}{с}$
$v_{обр\,о} = 2 \cdot \pi \cdot 0{,}065 \cdot 1{,}28 = 0{,}52 \frac{м}{с}$
l - длина ремня
$l = 2d + 2\pi R$
$l_м = 2 \cdot 0{,}25 + 2 \cdot \pi \cdot 0{,}035 = 0{,}7\,м$
$l_о = 2 \cdot 0{,}25 + 2 \cdot \pi \cdot 0{,}065 = 0{,}9\,м$
$t = \frac{l}{v_{обр}}$
$t_м = \frac{l_м}{v_{обр\,м}} = \frac{0{,}7}{0{,}28} = 2{,}5\,с$
$t_о = \frac{l_о}{v_{обр\,о}} = \frac{0{,}9}{0{,}52} = 1{,}73\,с$
$\frac{t_м}{t_о} = \frac{2{,}5}{1{,}73} = 1{,}44$

10б

Ответ: 1,44.

3. Дано:
$k = 100 \frac{Н}{м}$
$m = 400\,г$
$x_0 = 0{,}02\,м$
$h = 1\,м$
$\Delta x_п$?

СИ
$0{,}4\,кг$

Решение:
1. $E_{п\,пр\,1} = \frac{k\Delta x_0^2}{2} = \frac{k(x - x_0)^2}{2}$
2. $E_{к\,пш\,1} = \frac{mv_0^2}{2}$
3. $E_{п\,пш} = mgh_0$
4. $E_{к\,пш\,2} = \frac{mv_к^2}{2}$
5. $E_{п\,пр\,2} = \frac{k\Delta x_{п0}^2}{2} = \frac{k(x - x_0 + x_{п0})^2}{2}$

8б

Процесс 1-5 повторяется до момента:
$E_{п\,пр\,2} = E_{п\,пш}$
$\frac{k\Delta x_п^2}{2} = mgh \Rightarrow \Delta x_п = \sqrt{\frac{2mgh}{k}}$
$\Delta x_п = 0{,}28\,м$

Ответ: 0,28м.

4. Дано:

$T_2 = T_1 + 80\% T_1$

$p_2 = p_1 - 60\% p_1$

$\frac{V_2}{V_1}$

Решение:

$pV = \nu RT \Rightarrow V = \frac{\nu RT}{p}$ — формула Менделеева-Клапейрона

$V_1 = \frac{\nu RT_1}{p_1}$

$V_2 = \frac{\nu RT_2}{p_2}$

$T_2 = T_1 + 80\% T_1 = 180\% T_1 = 1{,}8 T_1$

$p_2 = p_1 - 60\% p_1 = 40\% p_1 = 0{,}4 p_1$

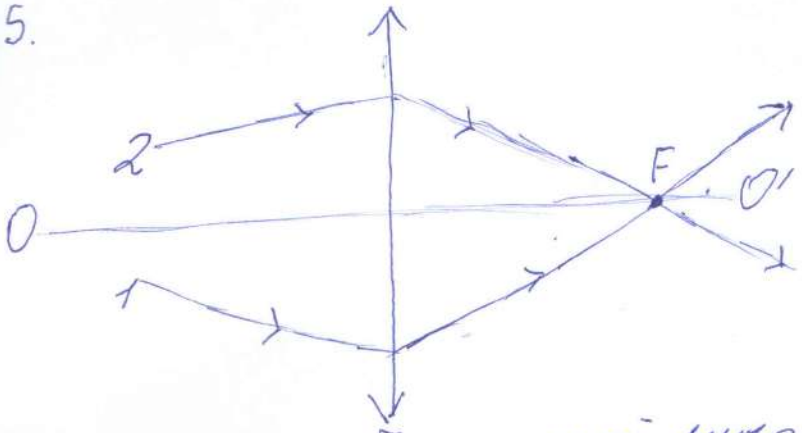
$V_2 = \frac{1{,}8 \nu RT_1}{0{,}4 p_1}$

105

$\frac{V_2}{V_1} = \frac{\frac{0{,}4 p_1}{\nu RT_1}}{\frac{p_1}{\nu RT_1}} = \frac{1{,}8 \nu RT_1}{0{,}4 \nu RT_1} = 4{,}5$

Ответ: 4,5.

5.



F - фокус собирающей линзы

Чернобаев И-36

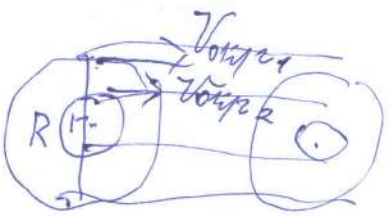
1. Дано:

$d = 0{,}25\ м$

$r_1 = 0{,}035\ м$

$R = 0{,}065\ м$

$\nu = 1{,}28\ \frac{1}{с}$



$v_{окр_2} = \frac{2\pi R}{T} \Rightarrow v_{окр} = \frac{2\pi R}{\frac{1}{\nu}} = 2\pi R\nu$

$\nu = \frac{1}{T} \Rightarrow T = \frac{1}{\nu}$

$v_{окр_1} = 2 \cdot \pi \cdot 0{,}065 \cdot 1{,}28 = 0{,}52\ \frac{м}{с}$

$v_{окр_2} = 2 \cdot \pi \cdot 0{,}035 \cdot 1{,}28 = 0{,}28\ \frac{м}{с}$

$l_1 = 2d + 2\pi R$

$l_1 = 2 \cdot 0{,}25 + 2 \cdot \pi \cdot 0{,}065 = 0{,}9\ м$

$l_2 = 2d + 2\pi r$

$l_2 = 2 \cdot 0{,}25 + 2 \cdot \pi \cdot 0{,}035 = 0{,}4\ м$

$t = \frac{1}{v_{окр}} = \frac{м}{\frac{м}{с}} = \frac{м \cdot с}{м} = с$

$t_1 = \frac{0{,}9}{0{,}52} = 1{,}73\ с$

$t_2 = \frac{0{,}4}{0{,}28} = 2{,}5\ с$

$\frac{t_2}{t_1} = \frac{2{,}5}{1{,}73} = 1{,}44$ Ответ: 1,44

10б

2. Дано:

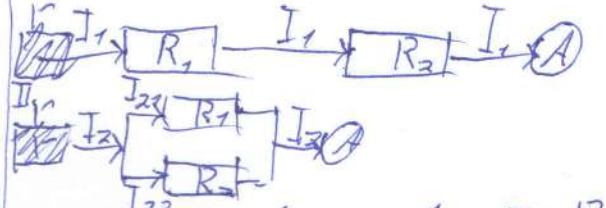
$R_1 = R_2 = 10\ Ом$

$I_1 = 1{,}2\ А$

$I_2 = 4\ А$

$r - ?$

I.



II.

II. $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots + \frac{1}{R_n}$ I. $R = R_1 + R_2 + \ldots + R_n$

$R = r + R_1 + R_2$ 4б

$\frac{1}{R_2} = \frac{1}{r} + \frac{1}{R_1} + \frac{1}{R_2}$

$I = \frac{V}{R} \Rightarrow V = I R$ $\frac{I_1}{I_2} = \frac{R_2}{R_1}$

$V_1 =$

$$\begin{cases} \frac{1}{R} = \frac{1}{r} + \frac{1}{R_1} + \frac{1}{R_2} \\ R = r + R_1 + R_2 \end{cases} \begin{cases} \frac{1}{R} = \frac{1}{r} + \frac{1}{5r} \\ R = r + 20 \end{cases} \begin{cases} \frac{1}{R} = \frac{5}{5r} + \frac{r}{5r} \\ R = r + 20 \end{cases} \begin{cases} \frac{1}{R} = \frac{5 + r}{5r} \\ R = r + 20 \end{cases}$$

$$\begin{cases} R = \frac{5r}{5 + r} \\ R = r + 20 \end{cases} \quad \frac{5r}{5 + r} = r + 20$$

$5r = (r + 20)(5 + r)$

$5r = 5r + r^2 + 100 + 20r$

$5r = r^2 + 25r + 100$

$r^2 + 20r + 100 = 0$

$D: 400 - 4 \cdot 1 \cdot 100 = 400 - 400 = 0$

$r = \frac{-20}{2 \cdot 1} = -10$

$\frac{1}{R_{общ}} = \frac{1}{n} + \frac{1}{R_1} + \frac{1}{R_2}$ $\frac{1}{R_2} = \frac{R_1 R_2}{nR_1R_2} + \frac{nR_2}{nR_1R_2} + \frac{nR_1}{nR_1R_2}$ $\frac{1}{R_{общ2}} = \frac{R_1R_2 + nR_2 + nR_1}{nR_1R_2}$

$R_{общ2} = \frac{nR_1R}{R_1R_2 + nR_2 + nR_1}$

$\frac{I_1}{I_2} = \frac{R_{общ2}}{R_{общ1}}$

$\frac{I_1}{I_2} = \frac{\frac{nR_1R_2}{R_1R_2 + nR_2 + nR_1}}{n + R_1 + R_2}$

$\frac{I_2}{4} = \frac{\frac{n \cdot 10 \cdot 10}{10 \cdot 10 + n10 + n10}}{n + 10 + 10} = \frac{\frac{100n}{100 + 20n}}{20 + n} = \frac{100n}{(20+n)(100+20n)} = \frac{100n}{2000 + 400n + 100n + 20n^2} =$

$= \frac{100n}{2000 + 500n + 20n^2} = \frac{\cdot 5n}{100 + 25n + n^2}$

$\frac{I_2}{4} = \frac{5n}{100 + 25n + n^2}$ $1{,}2(100 + 25n + n^2) = 4 \cdot 5n$

$120 + 30n + 1{,}2n^2 = 20n \mid \cdot 5$

$600 + 150n + 6n^2 = 100n$

$6n^2 + 50n + 600 = 0$

$D: 2500 - 4 \cdot 6 \cdot 600 =$

3. Дано:

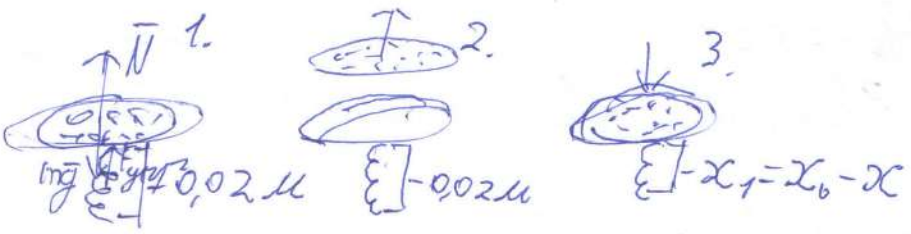
$k = 100 \frac{Н}{м}$

$m = 0{,}4 кг$

$x_0 = 0{,}02$

$n = 1$

$\Delta x_n - ?$



$F_{упр} = k\Delta x$

$\Delta x = x - x_0$

$E_{п.пр} = \frac{k\Delta x^2}{2}$

$E_{к.пм1} = \frac{mv^2}{2}$

$E_{п.пм} = mg(n + x_0)$

$E_{к.пм2} = \frac{mv_1^2}{2}$

$E_{п.пр} = E_{п.пм}$

$\frac{k\Delta x_n^2}{2} = mgn$

$k\Delta x_n^2 = 2mgn$

$\Delta x_n^2 = \frac{2mgn}{k}$

$\Delta x_n = \sqrt{\frac{2mgn}{k}}$

$\Delta x_n = 0{,}28 м$

Черновик ц-36

Дано:

$T_2 = T_1 + 80\% T_1$

$p_2 = p_1 - 60\% p_1$

$\frac{V_2}{V_1} - ?$

Решение:

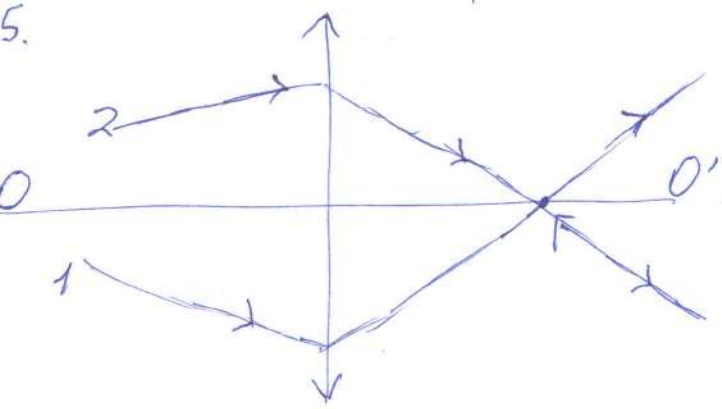
$pV = \nu RT \Rightarrow V = \frac{\nu RT}{p}$

$V_1 = \frac{\nu RT_1}{p_1}$

$V_2 = \frac{1{,}8\,\nu RT_1}{0{,}4\,p_1}$

$\frac{V_2}{V_1} = \frac{\frac{1{,}8\,\nu RT_1}{0{,}4\,p_1}}{\frac{\nu RT_1}{p_1}} = \frac{1{,}8\,\nu RT_1}{0{,}4\,\nu RT_1} = 4{,}5$

5.



2. $I = \frac{q}{t}$

$U = \frac{A}{q}$

$R = \frac{\rho l}{S}$

$R_{общ\,1,2} =$

$\frac{I_1}{I_2} = \frac{R_{общ\,2}}{R_{общ\,1}}$

$I = \frac{U}{R} \Rightarrow U = IR$

$\frac{U_1}{U_2} = \frac{R_{общ\,1}}{R_{общ\,2}} = \frac{R_{общ\,2}}{R_{общ\,1}} \quad \frac{UR_{общ\,2}}{UR_{общ\,1}} = \frac{R_{общ\,2}}{R_{общ\,1}}$

$U_1 = 1{,}2 \cdot 20 = 24\,В$

$U_2 = 4.5 = 20\,В$

$R_{общ\,1} = R_1 + R_2 = 20\,Ом$

$\frac{1}{R_{общ\,2}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{5}$

$R_{общ\,2} = 5\,Ом$