

Часть 1

Олимпиада: **Физика, 11 класс (1 часть)**

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Вариант 1

Черновик
√2.

Результат 11кл.

ν
T₀

$$C(T) = 2R \frac{T}{T_0} = \frac{Q}{\nu \Delta T}$$

$$Q_1 = ? \quad T_0 \rightarrow \frac{5}{6} T_0$$

$$-Q_1 = \frac{2R\nu}{6} C \nu \cdot \left(-\frac{T_0}{6}\right)$$

$$Q_1 = \frac{C\nu T_0}{6}$$

$$dQ_2 = C \nu dT = \frac{2R\nu}{T_0} T dT$$

$$\int_0^{Q_1} dQ_2 = \frac{2R\nu}{T_0} \int_{T_0}^{\frac{5}{6}T_0} T dT$$

$$-Q_1 = \frac{2R\nu}{T_0} \cdot \frac{T^2}{2} \Big|_{T_0}^{\frac{5}{6}T_0} =$$

$$= \frac{2R\nu}{T_0} \left(\frac{25}{36} T_0^2 - T_0^2 \right) =$$

$$= -\frac{11R\nu T_0}{36}$$

$$= \frac{R\nu}{16} \cdot \frac{7}{16} T_0^2 + \frac{21}{8} \nu R T_0 = \frac{7R\nu T_0^2}{16} + \frac{21}{8} \nu R T_0$$

$$= \frac{R\nu}{16} \cdot \frac{35}{16}$$

$$A = Q_1 - \Delta U = \frac{2R\nu}{T_0} \int_{T_0}^{T_m} T dT + \frac{3}{2} \nu R (T_m - T_0)$$

$$= \frac{R\nu}{T_0} (T_m^2 - T_0^2) + \frac{3}{2} \nu R (T_m - T_0)$$

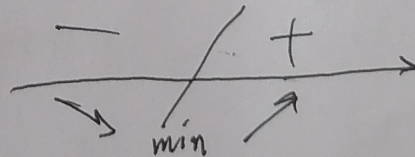
$$A'(T_m) = \frac{2R\nu}{T_0} T_m + \frac{3}{2} \nu R = 0$$

$$A_{\min} = A(T_m) =$$

$$= \frac{R\nu}{16} \left(\frac{9}{16} T_0^2 - T_0^2 \right) +$$

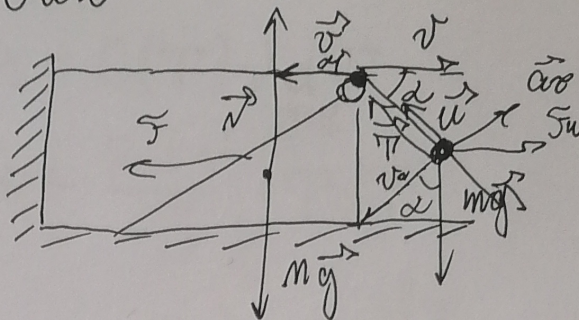
$$\frac{3}{2} \nu R \cdot \frac{9}{4} T_0 =$$

$$T_m = -\frac{\frac{3}{2} \nu R}{2R\nu} T_0 = -\frac{3}{4} T_0$$

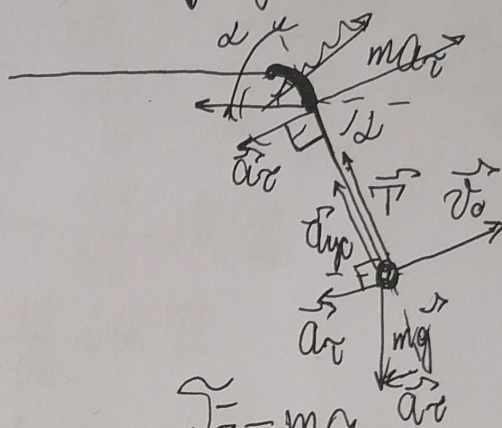
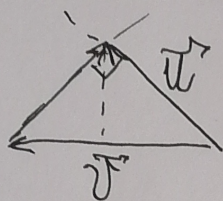


Yerproblemi

$$\cos \alpha = \frac{3}{5}$$

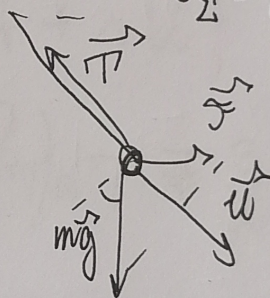
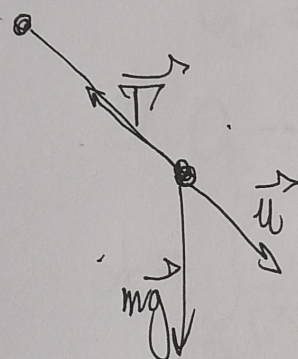


$$v \cos \alpha = u$$



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

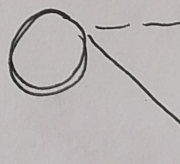
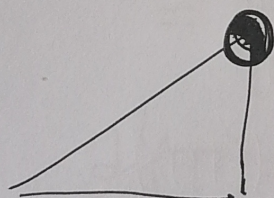
$$F \cos \alpha = mg \sin \alpha$$



$$F = mg \cos \alpha$$

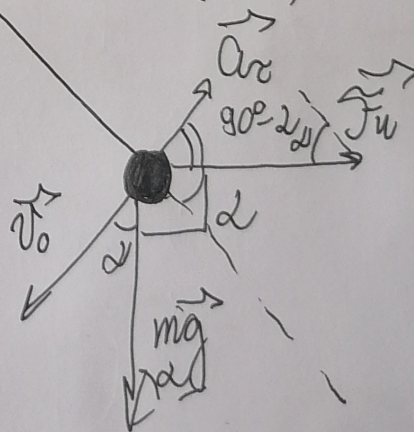
$$F \sin \alpha - mg \cos \alpha = m a$$

$180^\circ - (90^\circ + \alpha) = 90^\circ - \alpha$



$$F = m a$$

$$a = \frac{m}{m} g \cos \alpha$$



$$F \cos \alpha + mg \sin \alpha = m a = m a \cos \alpha$$

Учетовки

Физика 11 кл.

1.)

$$\cos \alpha = \frac{3}{5}; \quad \sin \alpha = \frac{4}{5}; \quad \text{отсюда} = \frac{4}{3}$$

$$a_{\text{кр}} = g \left(\frac{4}{3} + \frac{3}{4} \right) = \frac{25}{12} g$$
$$\cos \alpha = \frac{3}{4}$$

3) II з. н. где кинема

$$\vec{F}_2 = M \vec{a}_{\text{кр}}$$

$$F = M a_{\text{кр}}$$

$$m g \cos \alpha = M \cdot \frac{25}{12} g; \quad \underline{\frac{m}{M} = \frac{25}{12}}, \quad \underline{\frac{4}{3} = \frac{25}{9}}$$

4) $H = a$

3.

Умножение

2.) ν
 T_0

$$C(T) = 2R \frac{T}{T_0}$$

1) $Q_{11} = ?$

2) $T_m = ?$

3) $A_m = ?$

1) $dQ = C(T) \nu dT$

$$\int_0^{-Q_{11}} dQ = \frac{2R\nu}{T_0} \int_{T_0}^{\frac{5}{6}T_0} T dT$$

$$-Q_{11} = \frac{2R\nu}{T_0} \left. \frac{T^2}{2} \right|_{T_0}^{\frac{5}{6}T_0} = \frac{R\nu}{T_0} \left(\frac{25}{36} - 1 \right) T_0^2$$

$$= -\frac{11}{36} \nu R T_0$$

$$Q_{11} = \frac{11}{36} \nu R T_0$$

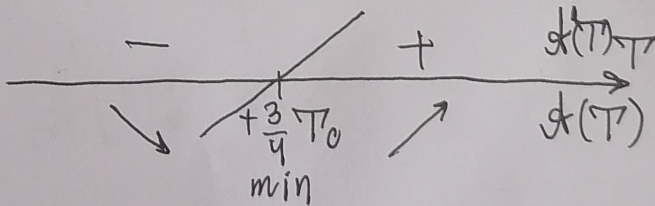
2) $Q = A + \Delta U$; $A = Q - \Delta U$

$$A = \int_{T_0}^T \left(\frac{2R\nu}{T_0} T \right) dT - \frac{3}{2} \nu R (T - T_0) =$$

$$= \frac{R\nu}{T_0} (T^2 - T_0^2) - \frac{3}{2} \nu R (T - T_0)$$

$$A'(T) = \frac{2R\nu}{T_0} T - \frac{3}{2} \nu R, \quad D(A) = 1R$$

$$A'(T) = 0 \text{ при } T = +\frac{3}{4} T_0$$



$$T_m = +\frac{3}{4} T_0$$

3) $A_m = A(T_m) = \left(\frac{9}{16} - 1 \right) R\nu T_0 + \frac{3}{2} \nu R \frac{T_0}{4} =$
 $= \frac{(6-7)}{16} \nu R T_0 = -\frac{\nu R T_0}{16}$

Ответ: $Q_{11} = \frac{11}{36} \nu R T_0$; $T_m = \frac{3}{4} T_0$; $A_m = -\frac{\nu R T_0}{16}$

Чистовик

Физика 11 кл.

1.) Н

$$\cos \alpha = \frac{3}{5}$$

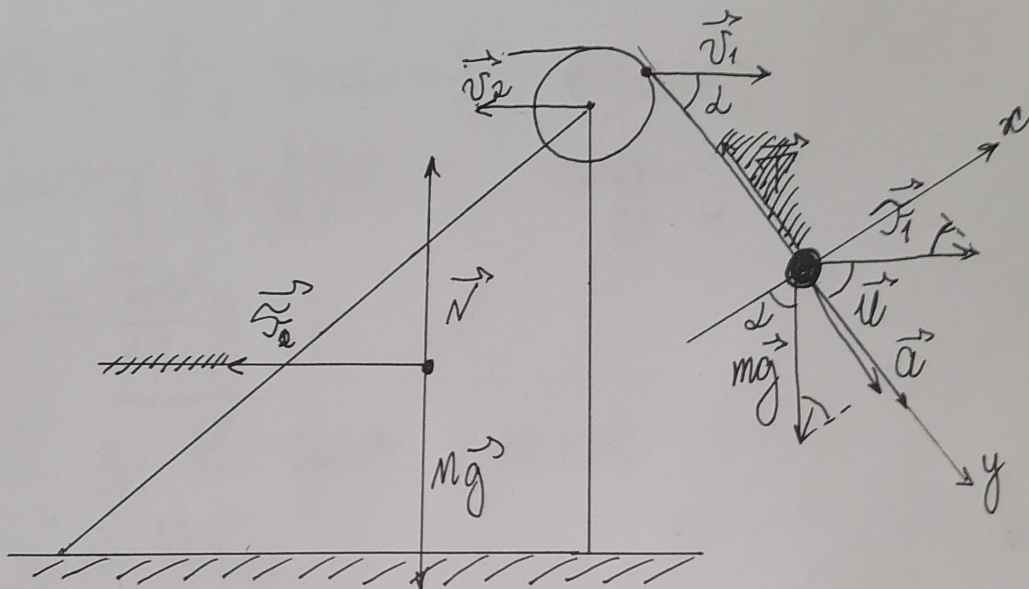
~~$\cos \alpha = \frac{3}{5}$~~

1) $\beta = ?$

2) $a_{\text{шар}} = ?$

3) $\frac{m}{M} = ?$

4) $r = ?$



- 1) $\begin{cases} u = v_1 \cos \alpha \text{ (нить нерастяжима)} \\ \vec{v}_1 = -\vec{v}_2 \text{ (абсолютно твердое тело)} \\ m, k, \text{ угол не меняется, ускорения по оси } x \text{ нет} \end{cases}$

$\vec{a} \parallel O_y \Rightarrow \cos \beta = \cos \alpha = \frac{3}{5}$

2) $\vec{F}_1 = -\vec{F}_2; F_1 = F_2 = F \text{ (III з. к.)}$

II з. к. для шара

~~\vec{F}_1~~ $\vec{F}_1 + m\vec{g} = m\vec{a}$

(x): $F \sin \alpha = mg \cos \alpha; F = mg \cot \alpha$

(y): $F \cos \alpha + mg \sin \alpha = ma = m \frac{du}{dt} =$

$$a_{\text{шар}} = g \cot \alpha + g \frac{\sin \alpha}{\cos \alpha} = \frac{m \frac{du}{dt} \cos \alpha}{m} = g (\cot \alpha + \tan \alpha) = m a_{\text{шар}} \cos \alpha$$

(2)

Часть 2

Олимпиада: **Физика, 11 класс (2 часть)**

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Вариант 1

Учуробур

Ризува Мад.

5.) $F = 9 \text{ all}$
 $H = 9 \text{ all}$
 $d = 36 \text{ all}$
 $l = 24 \text{ all}$

1) $x = ?$

2) $D_m = ?$

3) $\Delta = ?$

1) $\frac{1}{d} + \frac{1}{f} = \frac{1}{F}$

$\frac{1}{f} = \frac{1}{d} + \frac{1}{F} = \frac{1}{36 \text{ all}} + \frac{1}{9} = \frac{3}{36 \text{ all}}$

$f = 12 \text{ all}$

$x = f + l = 36 \text{ all}$

(3,)

Омбем: 1) $x = 36 \text{ all}$

Ускорение

Результат 41 ул.

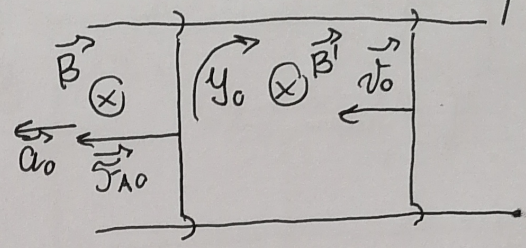
В пор. малым временем:

- 4.) B
L
m
R
v₀

$$1.) \quad \vec{F}_{A0} = B y_0 \vec{L} =$$

$$= B \frac{e i_0}{3R} L =$$

$$= B^2 L^2 \frac{v_0}{3R}$$



$$a_0 = B^2 L^2 \frac{v_0}{6mR}$$

- 1) a₀ = ?
2) v₁ = ?
v₂ = ?
3) S₀
S = ?

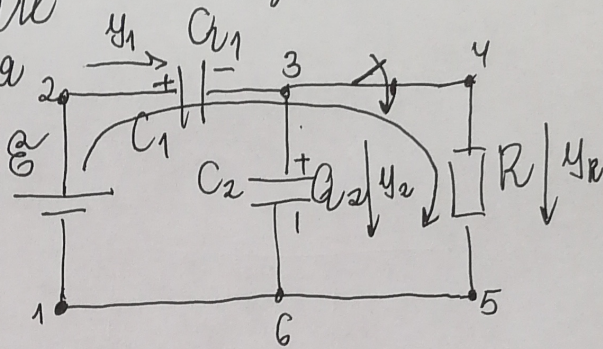
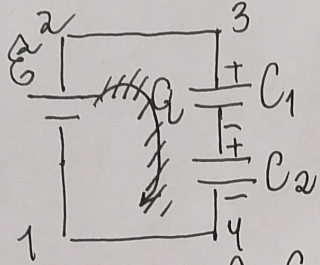
2.

Ответы: 1) a₀ = B²L² $\frac{v_0}{6mR}$

Чистовое Физика 11 кл.

- 3.) \mathcal{E}
 R
 $C_1 = 2C$
 $C_2 = C$
 1) $U = ?$
 2) $Q = ?$
 3) $U_R = ?$

1) До замыкания
 штора.



$$C_0 = \frac{2C \cdot C}{3C} = \frac{2}{3}C$$

$$Q = \frac{2}{3}C\mathcal{E}$$

$$U_1 = \frac{Q}{C_1} = \frac{\mathcal{E}}{3}$$

II з. К; для контура 12456
 начальными момента времени:

$$\mathcal{E} = \frac{\mathcal{E}}{3} + UR$$

$$U = \frac{2\mathcal{E}}{3R}$$

1.

2) ЗСЭ для цепи после замыкания
 штора.

$$(C_1\mathcal{E} - C_0\mathcal{E}) = \frac{C_1\mathcal{E}^2}{2} - \frac{C_0\mathcal{E}^2}{2} + Q$$

$$Q = (C_1 - C_0)\frac{\mathcal{E}^2}{2} = (2C - \frac{2}{3}C)\frac{\mathcal{E}^2}{2} = \frac{2}{3}C\mathcal{E}^2$$

3) II з. К; для контура 1234 после
 замык штора;

$$\mathcal{E} = \frac{C_1}{2C} + \frac{C_2}{C}; \quad \mathcal{E}' = 0 = \frac{U_1}{2C} + \frac{U_2}{C}$$

$$U_2 = -\frac{U_1}{2} \Rightarrow U_2 \text{ угём от м.6 к м.3}$$

$$U_R = U_0 + \frac{U_0}{2} = \frac{3}{2}U_0 \text{ (I з. К; для уза з)}$$

Ответ: 1) $U = \frac{3\mathcal{E}}{2R}$;
 2) $Q = \frac{2}{3}C\mathcal{E}^2$; 3) $U_R = \frac{3}{2}U_0$

Цепь

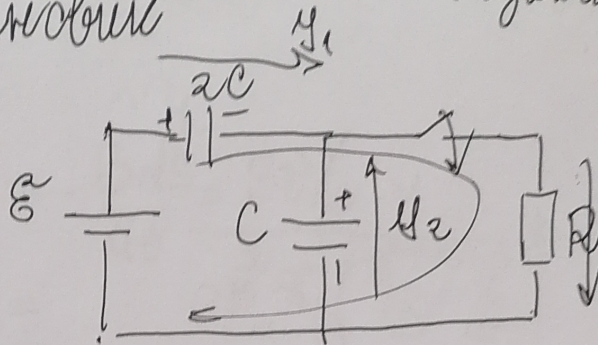
Результат 11 шт.

$$\frac{1}{C_0} = \frac{1}{2C} + \frac{1}{C}$$

$$C_0 = \frac{C \cdot 2C}{3C} = \frac{2}{3}C$$

$$G_0 = \frac{2}{3}CG$$

$$U_{\#} = \frac{G_0}{2C} = \frac{G}{3}$$



$$G = \frac{G}{3} + Y_0 R \quad d = 0,2$$

$$Y_0 = \frac{2G}{3R}$$

$$d, a = \frac{d}{M - D_m} = \frac{36}{9 - D_m}$$

~~$$\Delta q G = \frac{2CG^2}{3} - \frac{2CG^2}{2} + G$$~~

~~$$\left(\frac{2}{3} - \frac{2}{2} \right) CG^2 = G$$~~

$$D_m = M - \frac{d}{2} = 9 - \frac{36}{2} = 9 - 18 = -9$$

~~$$CG^2 - \frac{CG^2}{3} = G = \frac{2}{3}CG^2$$~~

~~$$\frac{1}{3} = \frac{1}{3} + \frac{1}{d}$$~~

~~$$G = Y_0 R + \frac{G_0}{2C}$$~~

~~$$G = \frac{G_1}{2C} + \frac{G_2}{C}$$~~

~~$$0 = \frac{Y_1}{2C} + \frac{Y_2}{C}$$~~

~~$$Y_2 = -\frac{Y_1}{2}$$~~

$$M - D_m = \frac{d}{2} \quad 9 - D_m = \frac{d}{2}$$

$$D_m = \frac{9d - 36}{2}$$

$$Y = \frac{3}{2} Y_1$$

$$M - \frac{d}{2} = \frac{d}{2}$$

$$\frac{d}{M - D_m} = d = 0,005$$

$$D'_m = 0 = \frac{36}{d^2}$$

$$D_m = M - \frac{d}{0,005} = d = 0,005M - 0,005D_m$$

Упробуре

Курсова тра.

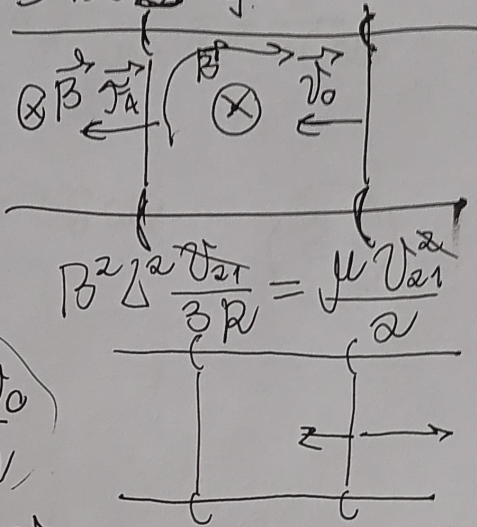
$$a_{\dot{\phi}} = - \frac{d\phi}{dt} = - \frac{B d s}{dt} = B v L \quad \text{и}$$

$$\begin{aligned} \tau_A &= B I L = \\ &= B \frac{\dot{\phi}}{3R} L = \\ &= B^2 L^2 \frac{v_0}{3R} \end{aligned}$$

$$v_{\text{yull.}} = \frac{m v_0}{3m}$$

$$m v_0 = 3m v$$

$$B^2 L^2 \frac{v_{21}}{3R} = \dots$$



$$B^2 L^2 \frac{v_{21}}{3R} = \frac{\mu v_{21}^2}{2}$$

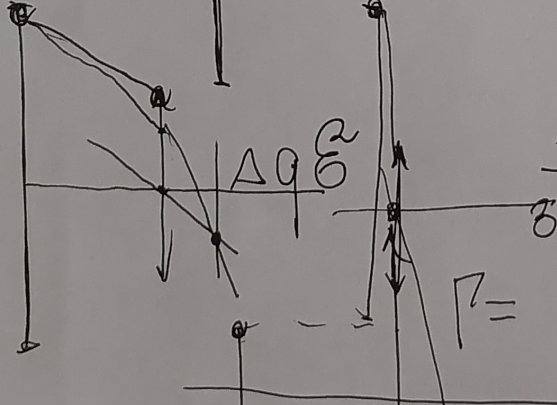
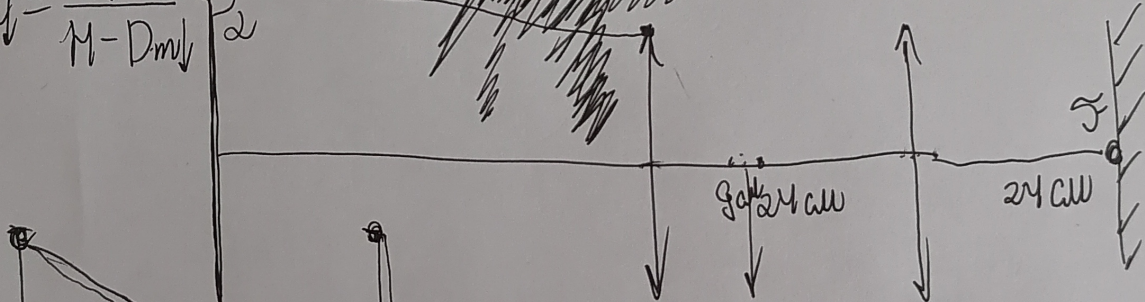
$$\dot{S} = \dot{p} = (2m v_2 + m v_1) =$$

$$\begin{aligned} & \uparrow B^2 L^2 \frac{v_2 - v_1}{3R} = 2m a_2 + m a_1 \\ & \downarrow B^2 L^2 |v_2 - v_1| = 6m R a_2 + 3m R a_1 \end{aligned}$$

$$B^2 L^2 |v_2 - v_1| = 6m R a_2 + 3m R a_1$$

и

$$\delta q dt = \frac{d}{M - D m v}$$



$$\frac{1}{36 \mu\text{H}} + \frac{1}{9 \mu\text{H}} = \frac{1}{9 \mu\text{H}} = \frac{4}{36 \mu\text{H}}$$

$$f = \frac{36}{3} = 12$$

36 μH

$$f = \frac{12}{36} = \frac{1}{3}$$

$$\frac{1}{f} = (n-1) \frac{2}{R}$$

$$R = 2(n-1) f$$