

Рубежная контрольная работа
по дополнительной общеразвивающей программе
«Олимпиадная физика.2026» 10 класс
(очно-заочная форма обучения с применением дистанционных
образовательных технологий)

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1 Дано:

$$k = 1/2$$

h

$\tau = ?$

Решение:



$$t_1 = \sqrt{\frac{2gh}{g}}$$



t_1 — первая падение.
 t_2 — промежуток между падением.
 t_3 — второе падение.

$$\frac{1}{k} = \frac{1}{1/2} \text{ после удара}$$

$$\frac{2v}{k} = \frac{2v}{k/2} \quad 2gv = \frac{2v}{k} - kv$$

$$\tau = t_1 + \frac{2v}{g} \left(1 + \frac{1}{k} + \frac{1}{k^2} + \dots \right) =$$

$$= \sqrt{\frac{2h}{g}} + \frac{2\sqrt{2gh}}{g} \cdot \frac{1}{k-1}$$

$$\tau = \sqrt{\frac{2h}{g}} + \frac{2\sqrt{2h}}{g} = \sqrt{\frac{2h}{g}} \cdot (1 + 2) =$$

$$= 3\sqrt{\frac{2h}{g}}$$

2

Дано:

$$h = 12 \text{ м}$$

$$\rho_A = 900 \frac{\text{кг}}{\text{м}^3}$$

$$\rho_B = 1000 \frac{\text{кг}}{\text{м}^3}$$

$L_{\text{изог}} = ?$

Решение:

$$L_{\text{изог}} = h \cdot \frac{\rho_A}{\rho_B}$$

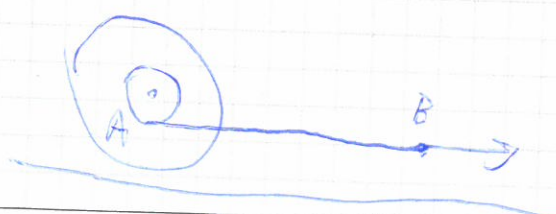
$$L = 12 \cdot \frac{900}{1000} = 10,8 \text{ м}$$

3

Дано:

D, d

$v, u = ?$





$$w = \frac{2u}{D}$$

~~Умножим на 0.5~~ $\frac{wD}{2} = \frac{4D}{D}$, $v = u + \frac{4D}{D} =$
 $= u(1 + \frac{4}{D})$ $u = \frac{v}{1 + \frac{4}{D}} = \frac{vD}{D+4}$ $u = \frac{vD}{D+4}$

6

Дано:

$$t = 100^\circ\text{C}$$

$$p = 120000 \text{ Па}$$

$$p_2 = 2p_1 = 240000$$

$$V_2 = \frac{V_1}{3.5}$$

$p_{\text{атм}} = ?$

$$p_{\text{атм}} = 101300 \text{ Па}$$

Решение:

~~используем~~ $p_2 = p_1 \cdot \frac{V_1}{V_2} = 120000 \cdot 3.5 = 300000 \text{ Па}$

$$Q = p_1 - (p_{2\text{исп}} - p_2) = p_{\text{атм}}$$

$$= 120000 - (300000 - 240000)$$

$$= 101300$$

$$= 0.992 = 99.2\%$$

7 Дано:

$$t_n = 10^\circ\text{C} \quad t_k = 100^\circ\text{C}$$

$$\tau_1 = \tau_{\text{свобод}} = 300 \text{ с}$$

$$c = 4200 \frac{\text{Дж}}{\text{кг} \cdot \text{К}}$$

$$L = 2.3 \cdot 10^6 \frac{\text{Дж}}{\text{кг}}$$

$$p = \text{const}$$

$\tau_2 = ?$

Решение:

$$Q_1 = cm\Delta t = cm(t_k - t_n)$$

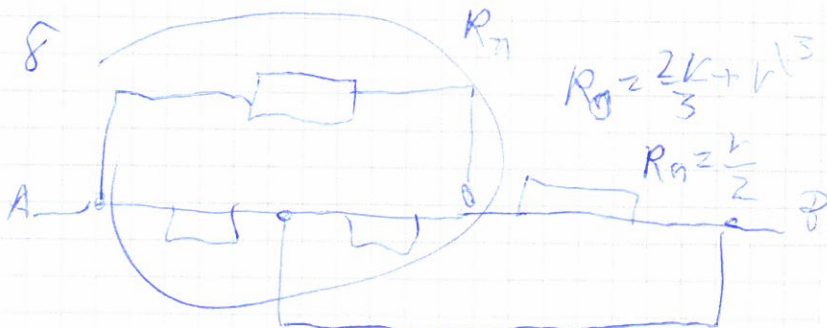
$$= 338000 \text{ Дж}$$

$$p = \frac{Q_1}{\tau_1} = \frac{338000}{300} = 1126 \text{ Вт}$$

$$Q_2 = Lm = 2300000 \text{ Дж}$$

$$\tau_2 = \frac{Q_2}{p} = \frac{2300000}{1126} = 2043 \text{ с}$$

8



$$R_0 = \frac{2R + R}{3}$$

$$R_n = \frac{R}{2}$$

$$\frac{1}{R_n} = \frac{1}{2R} + \frac{1}{R}$$

$$\frac{1}{R_n} = \frac{3}{2R} \quad R_0 = \frac{5R}{3}$$



СТУПЕНИ
УСПЕХА



9 Dano:

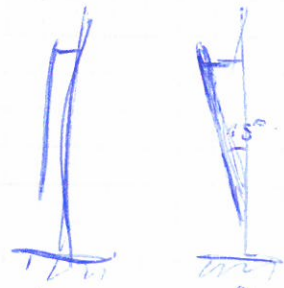
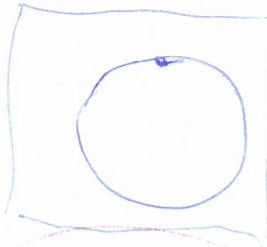
$$k = 0,5 \text{ m}$$

$$\alpha = 15^\circ$$

$$t = ?$$

$$g = 10 \frac{\text{m}}{\text{s}^2}$$

Решение:



$$T = 2\pi \sqrt{\frac{2R}{g}}$$

$$t = \frac{T}{2} = \frac{2\pi}{2} \sqrt{\frac{2R}{g}}$$

$$t = \frac{3,14}{2} \sqrt{\frac{2 \cdot 0,5}{10}} = 1,57 \cdot 0,316 = 0,496 \text{ c}$$

10

Dano:

$$1 \text{ B} = 1,6 \cdot 10^{-19} \text{ Dne}$$

$$10^9 \text{ B}$$

$$B = 1 \text{ T}$$

4

Dano:

$$t_c = 100 \text{ c}$$

$$t_n = 360 \text{ c}$$

$$r = ?$$

Решение:

$$1 \text{ B} = 1,6 \cdot 10^{-19} \text{ Dne}$$

$$m_p = 1,67 \cdot 10^{-27} \text{ kg}$$

Решение:

$$U_n = \frac{2\pi R}{360} = \frac{\pi R}{180}$$

$$U_c = \frac{2\pi R}{100} = \frac{\pi R}{50}$$

$$U_c - U_n = \frac{\pi R}{50} - \frac{\pi R}{180} = \frac{2\pi R}{100} - \frac{2\pi R}{360}$$

$$r = \frac{2\pi R}{U_c - U_n} = \frac{2\pi R}{\frac{\pi R}{50} - \frac{\pi R}{180}} =$$

$$\frac{180\pi R - 50\pi R}{9000} = \frac{13500\pi R}{9000} = \frac{\pi R}{5,143}$$

$$U_c - U_n = 2\pi R \left(\frac{1}{100} - \frac{1}{360} \right)$$

$$r = \frac{1}{\frac{1}{100} - \frac{1}{360}} = \frac{360 \cdot 100}{360 - 100} = 138,46 \text{ c}$$

$$= 2,31 \text{ mm}$$

СТУПЕНИ
УСПЕХА

