

Цыбик Леонид, 11а

З1 Дано:

$$\omega = 33 \text{ мин}^{-1}$$

$$a_y = 3g$$

$$R = ?, \mu = ?$$

Решение:

$$1) a_y = \frac{v^2}{R}$$

$$a_y = \omega^2 R$$

$$\omega = 2\pi \cdot \omega$$

$$a_y = 4\pi^2 \omega^2 R$$

$$R = \frac{a_y}{4\pi^2 \omega^2} = \frac{3g}{4\pi^2 \omega^2} \approx 2,5 \text{ м.}$$

$$m \vec{a}_y = \vec{F}_{\text{тр}} + \vec{N} + m \vec{g}$$

$$O_x: m a_y = N$$

$$O_y: F_{\text{тр}} = mg$$

$$N \cdot \mu = mg$$

$$m a_y \cdot \mu = mg$$

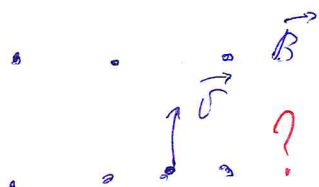
$$a_y \cdot \mu = g$$

$$\mu = \frac{g}{a_y} = \frac{g}{3g} = \frac{1}{3}$$

$$\text{Ответ: } R \approx 2,5 \text{ м; } \mu = \frac{1}{3}$$

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З2



$$F_n = g \cos \beta$$

$$\frac{mv^2}{R} = g \cos \beta$$

$$\frac{mv^2}{R} = g \cos \beta$$

$$R = \frac{mv^2}{g \cos \beta}$$

$$S_{\text{max}} = 2R = \frac{2mv^2}{g \cos \beta}$$

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Дано:

$$a = 0,1 \text{ м}$$

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

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

$$\rho_K = 800 \frac{\text{кг}}{\text{м}^3}$$

$$1) h = ?$$

$$2) h = ?$$

Решение:

$$1) m g = \rho_b g V_h$$

$$V \cdot \rho_1 = \rho_b V_h$$

$$a^3 \cdot \rho_1 = \rho_b \cdot a^2 (a - h)$$

$$\frac{\rho_1}{\rho_b} = \frac{a^2 (a - h)}{a^3} = \frac{a - h}{a} = 1 - \frac{h}{a}$$

$$\frac{h}{a} = 1 - \frac{\rho_1}{\rho_b}$$

мне?

$$h = a \left( 1 - \frac{\rho_1}{\rho_b} \right)$$

$$h = 0,1 \left( 1 - \frac{900}{1000} \right) = 0,01 \text{ м}$$

$$2) m g = F_{Ab} + F_{AK}$$

$$m g = \rho_b g V_1 + \rho_K g V_2$$

$$m = \rho_b V_1 + \rho_K V_2$$

$$a^3 \cdot \rho_1 = \rho_b \cdot a^2 (a - h) + \rho_K \cdot a^2 \cdot h$$

$$a \rho_1 = \rho_b (a - h) + \rho_K h$$

$$a \rho_1 = \rho_b a - h \rho_b + \rho_K h$$

$$h \rho_b - \rho_K h = \rho_b a - \rho_1 a$$

$$h (\rho_b - \rho_K) = a (\rho_b - \rho_1)$$

$$h = \frac{a (\rho_b - \rho_1)}{\rho_b - \rho_K} = \frac{0,1 \cdot (1000 - 900)}{1000 - 800} = 0,05 \text{ м}$$

§ 3 Дано:

$$V = 30 \text{ м}^3$$

$$T_1 = 283 \text{ К}$$

$$T_2 = 293 \text{ К}$$

$$\mu = 29 \cdot 10^{-3} \frac{\text{кг}}{\text{моль}}$$

$$P = 100 \cdot 10^3 \text{ Па}$$

$$R = 8,3 \text{ Дж/моль} \cdot \text{К}$$

$$\Delta m = ?$$

Решение

$$P \cdot V = \frac{m_1}{\mu} R T_1 ; m_1 = \frac{P V \mu}{R T_1}$$

$$P V = \frac{m_2}{\mu} R T_2 ; m_2 = \frac{P V \mu}{R T_2}$$

$$\Delta m = m_2 - m_1 =$$

$$= \frac{P V \mu}{R T_2} - \frac{P V \mu}{R T_1} =$$

$$= \frac{P V \mu}{R} \left( \frac{1}{T_2} - \frac{1}{T_1} \right) =$$

$$= \frac{P V \mu}{R} \left( \frac{T_1 - T_2}{T_2 \cdot T_1} \right)$$

$$\Delta m = \frac{100 \cdot 10^3 \cdot 30 \cdot 29 \cdot 10^{-3}}{8,3} \left( \frac{283 - 293}{293 \cdot 283} \right) =$$

106.

$$= -1,26 \text{ кг}$$

$$m_1 - m_2 = 1,26 \text{ кг}$$

Ответ: масса воздуха уменьшилась на 1,26 кг.

§ 4

$$E = 100 \text{ В}$$

$$\epsilon = 2$$

$$\epsilon_0 = 100 \cdot 10^{-6} \text{ Ф/м}$$

$$A = ?$$

$$Q = ?$$

Решение:

$$1) A = W_2 - W_1$$

$$A = \frac{C_2 U_2^2}{2} - \frac{C_1 U_1^2}{2}$$

$$C_1 = \frac{\epsilon \epsilon_0 S}{d}$$

$$C_1 = 5 C_0$$

$$C_2 = \frac{\epsilon S}{d}$$

$$A = \frac{C_0 U_2^2}{2} - \frac{5C_0 U_1^2}{2}$$

$$U_2 = \frac{Q}{C_0}$$

$$U_1 = \frac{Q}{5C_0}$$

$$\frac{U_1}{U_2} = \frac{C_0}{5C_0}$$

$$U_2 = \frac{Q}{C_0}$$

$$U_2 = 5U_1$$

$$\begin{aligned} A &= \frac{C_0 \cdot 25U_1^2}{2} - \frac{5C_0 U_1^2}{2} \\ &= \frac{20C_0 U_1^2}{2} = 10 D_{\text{m}} \end{aligned}$$

$$2) \quad W_1 = Q + W_2$$

$$\frac{C_0 \cdot 25U_1^2}{2} = Q + \frac{C_0 \cdot U_1^2}{2} \quad 26$$

$$Q = \frac{24C_0 U_1^2}{2} = 12 D_{\text{m}} \quad \text{~~12 D_{\text{m}}~~}$$