



Олимпиада школьников
Звезда - таланты
на службе обороны
и безопасности

Шифр 10-9-127

Задание	1	2	3	4	5	6	7	Всего
Баллы	14	—	20	25	15			74

Вариант N 2

1. Дано:
 $m = 4 \text{ кг}$
 $E_k = 8 \text{ Дж}$
 $v_0 = ?$

~~Поскольку температура тела равноускоренным, то скорость на половине пути~~

$$S_1 = S_2$$

$$\frac{v_0^2 - v^2}{2a} = \frac{v^2}{2a}$$

$$v_0^2 = 2v^2$$

$$v_0 = \sqrt{2v^2} = \sqrt{\frac{2 \cdot 2 E_k}{m}} = \sqrt{\frac{2 \cdot 2 \cdot 8}{4}} = \sqrt{8} \approx 2.83 \frac{\text{м}}{\text{с}}$$

Ответ: $\approx 2.83 \frac{\text{м}}{\text{с}}$

$$(E_k = \frac{mv^2}{2})$$

3. Дано:
 $H = 4 \text{ см} = 0.04 \text{ м}$
 $m = 80 \text{ кг}$
 $n = 2$
 $\rho_B = 1000 \frac{\text{кг}}{\text{м}^3}$
 $S = ?$

$$mg = \rho_B V g$$

$$m = \rho_B S \Delta H$$

$$S = \frac{m}{\rho_B \cdot \Delta H} = \frac{m}{\rho_B (H - \frac{H}{n})}$$

$$S = \frac{80}{1000(0.04 - \frac{0.04}{2})} = \frac{80}{1000 \cdot 0.02} = \frac{80}{20} = 4 \text{ м}^2$$

Ответ: 4 м^2

4. Дано:
 $m_1 = 20 \text{ кг}$
 $T_1 = 298 \text{ К}$
 $m_2 = 15 \text{ кг}$
 $T_{\text{нл}} = 600 \text{ К}$
 $\Delta m_1 = 0.1 \text{ кг}$
 $T_k = 323 \text{ К}$
 $c_1 = 1190 \frac{\text{Дж}}{\text{кг} \cdot \text{К}}$
 $c_2 = 130 \frac{\text{Дж}}{\text{кг} \cdot \text{К}}$
 $r = 2.25 \cdot 10^6$
 $\lambda = 30 \cdot 10^3 \frac{\text{Дж}}{\text{м}}$
 $T = ?$

$$\Delta_2 m_1 = m_1 - \Delta m_1 = 20 - 0.1 = 19.9 \text{ кг}$$

$$c_1 \Delta m_2 (T_k - T_1) + r \Delta m_1 + c_1 \Delta_2 m_1 (T - T_1) - m_2 \lambda - c_2 m_2 (T_{\text{нл}} - T) = 0$$

$$T = \frac{-c_1 \Delta m_1 T_k + (c_1 \Delta m_1 T_1 - r \Delta m_1 + c_1 \Delta_2 m_1 T_1 + m_2 \lambda + c_2 m_2 T_{\text{нл}})}{c_1 \Delta_2 m_1 + c_2 m_2}$$

$$T \approx 307 \text{ К}$$

5. Dano:

$$U_{V1} = 11 \text{ B}$$

$$I_{A1} = 0,2 \text{ A}$$

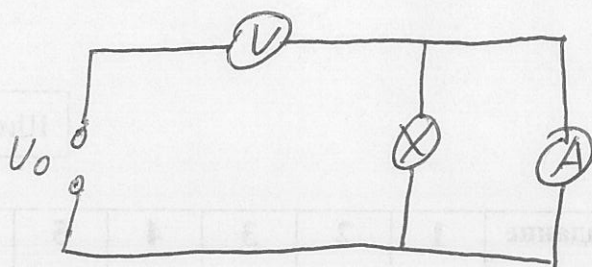
$$U_0 = 12 \text{ B}$$

$$R_V = 50 \text{ Ohm}$$

$$U_{V2} = ?$$

$$I_{A2} = ?$$

1.



$$I_{V1} = \frac{U_{V1}}{R_V} = \frac{11}{50} = 0,22 \text{ A}$$

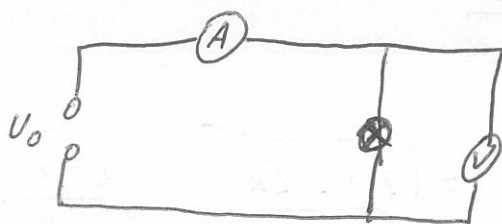
$$I_{A1} = I_{V1} - I_{A1} = 0,22 - 0,2 = 0,02 \text{ A}$$

$$U_{A1} = U_{V1} = U_0 - U_{V1} = 12 - 11 = 1 \text{ B}$$

$$R_1 = \frac{U_{A1}}{I_{A1}} = \frac{1}{0,02} = 50 \text{ Ohm}$$

$$R_A = \frac{U_{A1}}{I_{A1}} = \frac{1}{0,2} = 5 \text{ Ohm}$$

2.



$$R_{od2} = R_{A2} + \frac{1}{\frac{1}{R_{12}} + \frac{1}{R_{V2}}} = 5 + \frac{50}{2} = 30 \text{ Ohm}$$

$$I_{od2} = \frac{U_0}{R_{od2}} = \frac{12}{30} = 0,4 \text{ A}$$

$$I_{A2} = 0,4 \text{ A}$$

$$U_{A2} = I_{A2} \cdot R_A = 0,4 \cdot 5 = 2 \text{ B}$$

$$U_V = U_{V1} = U_0 - U_{A2} = 12 - 2 = 10 \text{ B}$$

Odgovor: $I_{A2} = 0,4 \text{ A}$

$$U_{V2} = 10 \text{ B}$$