

| Общий балл | Дата | Ф.И.О. Жюри      | Подпись |
|------------|------|------------------|---------|
| 630        |      | Червильская А.С. | Жур     |
| Шифр       |      |                  | 041701  |

N1

$$\begin{cases} S = v_0 t + \frac{at^2}{2} \\ v = v_0 + at \end{cases} \Rightarrow S = \frac{v^2 - v_0^2}{2a}; a = \frac{v - v_0}{t}; t = \frac{v - v_0}{a}$$

$$S = \frac{(v - v_0)(v + v_0)t}{2(v - v_0)} = \frac{(v + v_0)t}{2}$$

Аннот:

$$\frac{1}{3} S = \frac{v}{2} t_1 \Rightarrow t_1 = \frac{2S}{3v}$$

$$t_2 = \frac{S}{3v}; t_3 = t_1 = \frac{2S}{3v}$$

$$t_A = \frac{5S}{3v}$$

Борис:

$$S_1 = \frac{v}{2} \cdot \frac{1}{3} t = \frac{v t_0}{6}$$

$$S_2 = v \cdot \frac{1}{3} t = \frac{v t_0}{3}$$

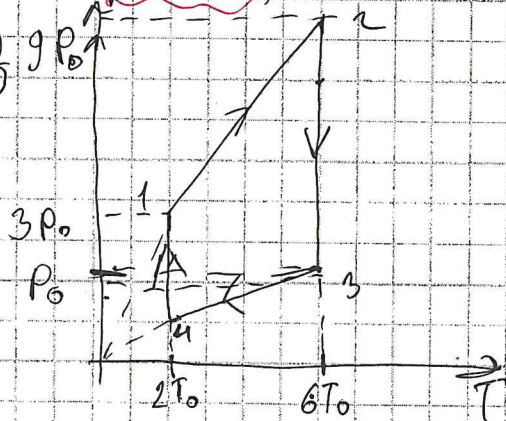
$$S_3 = S_1 = \frac{v t_0}{6}$$

$$S = S_1 + S_2 + S_3 = \frac{v t_0}{6} + \frac{v t_0}{3} + \frac{v t_0}{6} = \frac{4}{6} v t_0 = \frac{2}{3} v t_0 \Rightarrow t_0 = \frac{3S}{2v}$$

$$\Delta t = \frac{5S}{3v} t_A - t_0 = \frac{5S}{3v} - \frac{3S}{2v} = \frac{S}{6v}$$

Ответ: Аннот?  $\Delta t = \frac{S}{6v}$

N2 9P0



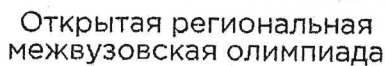
185

1-2:  $P \uparrow; T \downarrow; V = \text{const} \Rightarrow A_{12} = 0$

$T_{12} \uparrow \Rightarrow \Delta U_{12} > 0; Q_{12} = \Delta U_{12} > 0$

$Q_{12} \geq 0; V_1 = V_2; P_1 V_1 = \nu R T_1$

$V_1 = \frac{\nu R T_1}{P_1}; \Delta U_{12} = \frac{3}{2} \nu R \Delta T = \frac{3}{2} \nu R (T_2 - T_1)$

Шифр

Ombeem.  $\frac{35}{100}$   $\frac{32}{100}$   $\frac{38}{100}$

15

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N2

$$S = \frac{2v_0^2 \sin^2 \alpha \cos \alpha}{g}; H_{\max} = \frac{v_0^2 \sin^2 \alpha}{2g} \Rightarrow \sin^2 \alpha = \frac{2gH}{v_0^2}$$

$$\cos \alpha = \sqrt{1 - \sin^2 \alpha}$$

$$S = \frac{2v_0^2 \sin^2 \alpha \sqrt{1 - \sin^2 \alpha}}{g}$$

$$S^2 = \frac{4v_0^4 \sin^4 \alpha (1 - \sin^2 \alpha)}{g^2} = 4H \left( \frac{v_0^2}{g} - \frac{2v_0^2 \sin^2 \alpha}{g} \right) =$$

$$= 4H \left( \frac{2v_0^2}{g} - 4H \right)$$

$$S^2 = 8H \frac{v_0^2}{g} - 16H^2$$

$$16H^2 - 8H \frac{v_0^2}{g} + S^2 = 0$$

$$16H^2 - 0,8v_0^2 H + S^2 = 0$$

$$D = 0,64v_0^4 - 64S^2$$

$$H = \frac{0,8v_0^2 \pm \sqrt{0,64v_0^4 - 64S^2}}{32}$$

N4

$\alpha$  - сторона

$$\varphi = k \frac{q}{a}; E = \frac{q}{a^2}$$

$$q_1 = \frac{\varphi_1 a}{k}$$

$$q_2 = \frac{\varphi_2 a}{k}$$

$$q_3 = \frac{\varphi_3 a}{k}$$

$$E_{12} = \frac{(\varphi_2 + \varphi_3) - (\varphi_1 + \varphi_3)}{a} = \frac{\varphi_2 - \varphi_1}{a}$$

$$E_{13} = \frac{(\varphi_2 + \varphi_3) - (\varphi_1 + \varphi_2)}{a} = \frac{\varphi_3 - \varphi_1}{a}$$

по правилу суперпозиции

$$E_0 = E_{12} \cos 30^\circ + E_{13} \cos 30^\circ = \left( \frac{\varphi_2 - \varphi_1}{a} + \frac{\varphi_3 - \varphi_1}{a} \right) \cos 30^\circ = \frac{\varphi_2 + \varphi_3 - 2\varphi_1}{a}$$

$$F_1 = E_0 \cdot q_1 = \left( \frac{\varphi_2 + \varphi_3 - 2\varphi_1}{a} \right) \cdot \frac{\varphi_1 a}{k} = \frac{\varphi_1}{k} (\varphi_2 + \varphi_3 - 2\varphi_1) \cos 30^\circ$$

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N5

$$F_A = Mg; F_A = \rho g V$$

$$\rho V = \frac{M}{M} RT$$

$$M = \frac{\rho V M}{RT} = \frac{110 \cdot 10^3 \cdot 5 \cdot 10^3 \cdot 20 \cdot 10^{-3}}{8,31 \cdot 316} = 419 \text{ кг}$$

$$\rho = \frac{P}{M} RT \Rightarrow \rho = \frac{PM}{RT}; P_H = 900 \text{ Па при } V_1 = 10\%$$

$$P_1 = \frac{(100 \cdot 10^3 - 900) \cdot 29 \cdot 10^{-3}}{8,31 \cdot 316}$$

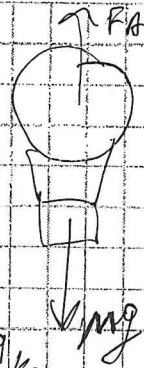
$$P_2 = \frac{(100 \cdot 10^3 - 8100) \cdot 29 \cdot 10^{-3}}{8,31 \cdot 316}$$

$$M_1 = P_1 V$$

$$M_2 = P_2 V$$

$$\Delta M = M_1 - M_2 = P_1 V - P_2 V = V(P_1 - P_2)$$

$$\Delta M = 5000 \left( \frac{(100 \cdot 10^3 - 900) \cdot 29 \cdot 10^{-3}}{8,31 \cdot 316} - \frac{(100 \cdot 10^3 - 8100) \cdot 29 \cdot 10^{-3}}{8,31 \cdot 316} \right) = 394,54 \text{ кг}$$



$$V = 5000 \text{ м}^3$$

$$\rho = 110000$$

$$T = 316 \text{ К}$$

$$V_1 = 10\%; V_2 = 90\%$$

$$P_H = 100 \text{ кПа}$$

$$P_H = 9000 \text{ Па}$$

10/5