

Общий балл	Дата	Ф.И.О. Жюри	Подпись
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В1

Авто

1) $t_{пртб} = \frac{S}{v}$

$a = \text{const}$

$v_0 = 0$

$\frac{S}{3} = a \cdot t^2$

$t_1 = \sqrt{\frac{2S}{3a}}$

$v_{эл} = \sqrt{\frac{2S}{3a}} = \sqrt{\frac{2 \cdot 25}{3 \cdot 50}} = \sqrt{\frac{25}{75}}$

2) $v = \text{const}$
 $t_2 = \frac{S}{v}$

3) $t_{пртб}$
 $a = \text{const}$

$\frac{S}{3} = v t_3 - \frac{a t_3^2}{2}$

$t_3 = \sqrt{\frac{2S}{3a}}$

$t_1 + t_2 + t_3 = 2\sqrt{\frac{2S}{3a}} + \frac{S}{v}$

В2

1) $t_{пртб}$

$S = \frac{1}{2} a \left(\frac{T_0}{3} \right)^2$

2) $t_{пртб}$

$v = \text{const}$

$S_2 = v \left(\frac{T_0}{3} \right)$

$\frac{S}{3} = v \left(\frac{T_0}{3} \right) - \frac{1}{2} a \left(\frac{T_0}{3} \right)^2$

$T_0 = \frac{3S}{2a}$

$t_A = 2\sqrt{\frac{2S}{3a}} + \frac{S}{v}$

$\Delta T = t_A - t_B$

$v = \sqrt{\frac{2a}{3}}$

$\Delta T = \frac{S}{6v}$

Отв. Норме магнитного поля

200

В2

$x_1 = v_0 \cos \alpha \cdot t$

$x_2 = S + v_0 \cos \alpha \cdot t$

$y_1 = v_0 \sin \alpha \cdot t - \frac{1}{2} g t^2$

$y_2 = v_0 \sin \alpha \cdot t - \frac{1}{2} g t^2$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$d = \sqrt{(S + v_0 \cos \alpha \cdot t - v_0 \cos \alpha \cdot t)^2 + (v_0 \sin \alpha \cdot t - v_0 \sin \alpha \cdot t)^2}$

$d_{min} = S \cdot (\cos 2 - \cos 3)$

60

В3

$\eta = \frac{A}{Q} \cdot 100\%$

$A = (P_2 - P_1)(v_2 - v_1)$

$Q = \rho(V \Delta T)$

$A = 2 \cdot 9 \cdot 9 = 95$

$Q_1 \approx 9$

$\eta = \frac{A}{Q_1} \cdot 100\% = \frac{95}{9} \cdot 100\% \approx 90\%$

№4

$$1) \varphi_i = k \frac{q_i}{a}$$

$$\varphi_1 = \frac{Q_1 q}{k}; \quad q_2 = \frac{Q_2 q}{k}; \quad q_3 = \frac{Q_3 q}{k}$$

$$k = \frac{1}{4\pi\epsilon_0}$$

$$2) F_{1,2} = \frac{Q_1 Q_2}{a^2}$$

$$F_{1,2} = \frac{k}{a^2} \cdot \frac{Q_1 Q_2}{k} = \frac{Q_1 Q_2}{a^2}$$

3) Так $F_{1,2}$ и $F_{1,3}$ образуют $\angle 60^\circ$

$$F_1 = \sqrt{F_{1,2}^2 + F_{1,3}^2 + 2F_{1,2}F_{1,3} \cdot \frac{1}{2}} =$$

$$= F_1 = \frac{Q_1}{ka^2} \sqrt{Q_2^2 + Q_3^2 + Q_2 Q_3}$$

Задача №5

$$\rho_{c1} = \rho_{c10} + \rho_1 \rho_{H_2O}$$

$$\rho_{c1} = 100000 - 0,1 \cdot 9000 =$$

$$= 100000 - 900 = 99100 \text{ Тка}$$

$$\rho_{H_2O} = \rho_1 \rho_{H_2O} = 0,1 \cdot 9000 = 900 \text{ Тка}$$

$$\rho_{c1} = \rho_{c1} \frac{V_1}{R_1} + \rho_{H_2O} \frac{V_2}{R_2}$$

$$R = 8,31 \text{ Дж}$$

$$T = 248 + 273 = 521 \text{ К}$$

$$\rho_{c1} = \frac{99100 \cdot 18 + 900 \cdot 18}{8,31 \cdot 521}$$

$$= \frac{2044900 + 16200}{26,26} = 1,1 \text{ Тка}$$

$$\rho_{c2} = \rho_{c10} - \rho_2 \rho_{H_2O}$$

№5

$$V = 5000 \text{ м}^3$$

$$\rho = 110 \text{ кг/м}^3$$

$$T = 42^\circ \text{C}$$

$$\rho_{H_2O} = 1000 \text{ Тка}$$

$$\rho_{H_2} = 9000 \text{ Тка}$$

$$T_{H_2} = 20 \text{ г/л}$$

$$\rho_2 = 100000 - 0,9 \cdot 9000 = 91900 \text{ Тка}$$

$$\rho_{H_2O} = \rho_2 \rho_{H_2O} = 0,9 \cdot 9000 = 8100 \text{ Тка}$$

$$\rho_2 = \frac{\rho_{c1} V_1 + \rho_{H_2O} V_2}{V_1 + V_2} = \frac{91900 \cdot 29 + 8100 \cdot 18}{29 + 18} =$$

$$\approx 1,04 \text{ Тка}$$

$$F_A = (\rho_{H_2} - \rho_{H_2O}) g V$$

$$F_A = (110 - 104) \cdot 9,81 \cdot 5000$$

$$F_A = 0,03 \cdot 981 \cdot 5000 = 1471,5 \text{ Н}$$

$$m = \frac{F_A}{g} = \frac{1471,5}{9,81} \approx 150 \text{ кг}$$