

« »-2012 ( 11 )

1.

$$v_x(t) = v_{0x} + a_x t.$$

$$v_{0x} = 2 \text{ (м/с)}$$

$$a_x = \frac{\Delta v}{\Delta t} = \frac{0-2}{4} = -0,5 \left(\frac{\text{м}}{\text{с}^2}\right)$$

$$v(t) = 2 - 0,5t.$$

2.

3.

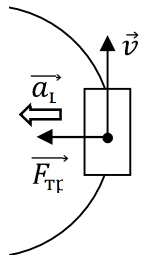
4.

$$g = G \frac{M}{(R+H)^2} = 6,67 \cdot 10^{-11} \cdot \frac{13,34 \cdot 10^{24}}{(6 \cdot 10^6 + 0,67 \cdot 10^6)^2} =$$

$$= 20 \text{ (м/с}^2\text{)}.$$

5.

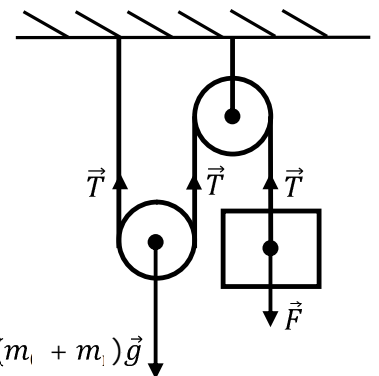
$$m a_{\text{ц}} = F_{\text{тр}} \Rightarrow m \frac{v^2}{R} = \mu m g \Rightarrow v = \sqrt{\mu g R} = \sqrt{0,2 \cdot 10 \cdot 200} = 20 \text{ (м/с)}.$$



6.

$$\begin{cases} F = T \\ 2T = (m_6 + m_7)g \end{cases} \Rightarrow 2F = (m_1 + m_1)g \quad m_1 = \frac{2F}{g} - m =$$

$$= \frac{2 \cdot 2,75}{10} - 0,5 = 0,05 \text{ ( )} = 50 \text{ ( )}.$$



7.

$$N = F_T \cdot v \quad F_1 \cdot v_2 = \frac{N_2}{v_2} = \frac{8N_1}{2v_1} = 4F_1$$

8.

$$A = E_1 \quad -\mu m g S = 0 - \frac{mv^2}{2} \quad S = \frac{v^2}{2\mu g} = \frac{30^2}{2 \cdot 0,3 \cdot 10} = 150 \text{ ( )}.$$

9.

$$: p_1 = p_2 \quad \rho_1 g h_1 = \rho_2 g h_2 \quad \rho_2 = \frac{\rho_1 h_1}{h_2} =$$

$$= \frac{1000 \cdot 0,045}{0,05} = 900 \left( \frac{\text{г}}{\text{см}^3} \right).$$

10.

$$x(t) = A \cos(\omega t + \varphi_0). \quad , \omega = \frac{\pi}{2}. T = \frac{2\pi}{\omega} = 4 ( ).$$

11.

$$l = 4AN. \quad : v = \frac{N}{t} \quad N = tv. \quad :$$

$$l = 4Atv = 4 \cdot 0,002 \cdot 3 \cdot 500 = 12 ( ).$$

12.

13.

$$l = \frac{l_0}{\sqrt{1 - \left(\frac{v}{c}\right)^2}} \quad l =$$

14.

$$+ 2 \cdot 16 \cdot 10^{-3} = 44 \cdot 10^{-3} ( \text{---} ). \quad ( \quad ): M = 12 \cdot 10^{-3} +$$

$$: v = \frac{m}{M} = \frac{1,1}{44 \cdot 10^{-3}} = 25 ( \quad ).$$

15.

$$: \overline{E_k} \sim kT - ,$$

16.

$$: \frac{V}{T} = const,$$

17.

$$pV = \frac{m}{M} RT \quad T = \frac{pVM}{mR} = \frac{830 \cdot 10^3 \cdot 2 \cdot 10^{-3} \cdot 20 \cdot 10^{-3}}{0,0283} = 200 ( ) = -73^\circ C .$$

18.

p-V , :

$$A = \frac{1}{2} \cdot 3 \cdot 10^{-3} \cdot 4 \cdot 10^6 = 6 \cdot 10^3 ( \quad ) = 6 ( \quad ).$$

19.

$$( \quad ) , ,$$

20.

$$\sigma = E \cdot |\varepsilon| \quad E = \frac{\sigma}{|\varepsilon|} = \frac{475 \cdot 10^6}{0,005} = 95 \cdot 10^9 ( \quad ) = 95 ( \quad ).$$

21.

22.

$$q'_1 = q'_2 = q'_3 = \frac{q_1 + q_2 + q_3}{3} = \frac{1,5 + 5 - 2}{3} = 1,5 ( \quad ).$$

23.

24.

$$Q = I^2 R t \quad R = \frac{Q}{I^2 t} = \frac{1800}{0,3^2 \cdot 20} = 1000 ( \quad ) = 1 ( \quad ).$$

25.

26.

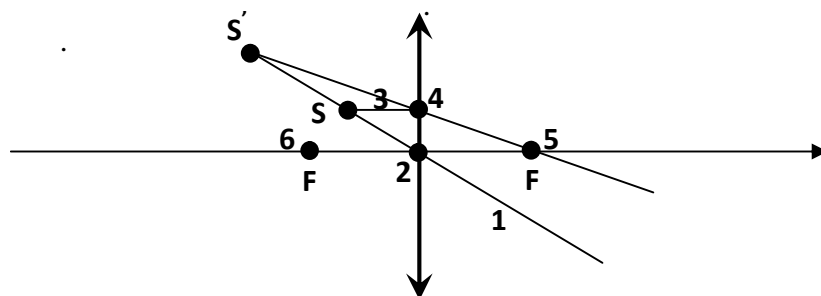
(1)

(2), ... , ( ) , (3),

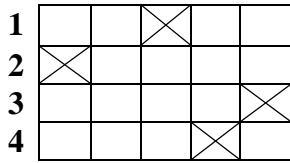
(4)

(5) -

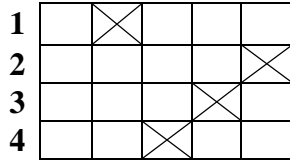
(6)



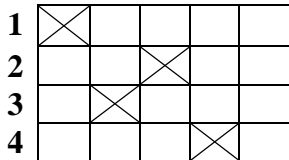
27.



28.



29.

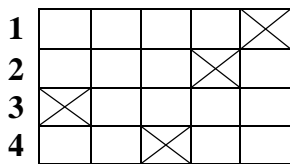


0)  $Q = A.$

$U + A = -U.$

$U.$

30.



« ».

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

$$E_p = mgh$$

$: Q = U + A.$

$: U = \frac{i}{2}vR. T = 0 ( \dots T =$

$: Q = 0 ( \dots ) 0 =$

$: A = p. V = 0 ( \dots V = 0) Q =$

$: Q = U + A, \dots$

( « »

), ...

31. 2 ( ).

$$: S = v_0 t + \frac{at^2}{2} \quad \frac{a}{2} \cdot t^2 + v_0 t - S = 0.$$

$$t_{1,2} = \frac{-v_0 \pm \sqrt{v_0^2 + 2aS}}{a} = \frac{-2 \pm \sqrt{2^2 + 2 \cdot 2 \cdot 8}}{2} = \left| -4 \right. \quad 2 (c) -$$

32. 27 ( ).

$$T = 60\pi \cdot 10^{-3} (c).$$

$$2\pi \sqrt{\frac{m}{k}} = m = \frac{T^2}{4\pi^2} \cdot k = \frac{3600\pi^2 \cdot 10^{-6}}{4\pi^2} \cdot 30 = 0,027 ( ) = 27 ( ).$$

33. 1,2 ( / <sup>3</sup> ).

$$p = \frac{1}{3} \rho \bar{v}^2$$

$$\begin{cases} p = \frac{1}{3} n m_0 \bar{v}^2 \\ n = \frac{N}{V} \\ m_0 = \frac{M}{N_a} \end{cases} \quad p = \frac{1}{3} \cdot \frac{N}{V} \cdot \frac{M}{N_a} \cdot \bar{v}^2.$$

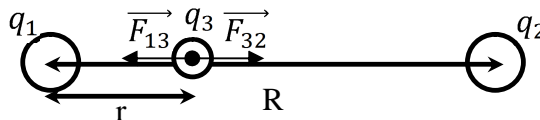
$$\frac{N}{N_a} = \frac{m}{M} \quad m = \frac{N \cdot M}{N_a}$$

$$p = \frac{1}{3} \cdot \frac{m}{V} \cdot \bar{v}^2 = \frac{1}{3} \rho \bar{v}^2 \quad \rho = \frac{3p}{\bar{v}^2} = \frac{3 \cdot 10^5}{500^2} = 1,2 \left( \frac{г}{м^3} \right).$$

34. 504 ( ).

$$\frac{Q_1 - Q_2}{Q_1} \cdot 100\% = \frac{T_1 - T_2}{T_1} \cdot 100\% \quad 1 - \frac{Q_2}{Q_1} = 1 - \frac{T_2}{T_1} \quad T_1 = \frac{Q_1 T_2}{Q_2} = \frac{24000 \cdot 210}{10000} = 504 ( ).$$

35. 16 ( ).



$$\begin{cases} F_{13} = k \frac{|q_1| \cdot |q_3|}{r^2} \\ F_{32} = k \frac{|q_3| \cdot |q_2|}{(R-r)^2} \end{cases} : \frac{|q_1|}{r^2} = \frac{|q_2|}{(R-r)^2} \quad \frac{\sqrt{|q_1|}}{r} = \frac{\sqrt{|q_2|}}{R-r} \quad r = \frac{\sqrt{|q_1|}}{\sqrt{|q_1|} + \sqrt{|q_2|}} \cdot R = \frac{4 \cdot 10^{-9}}{4 \cdot 10^{-9} + 9 \cdot 10^{-9}} \cdot 0,4 =$$

$$= 0,16 ( ) = 16 ( ).$$

36. 0,3 ( ).

$$R_{34} = \frac{R_3 R_4}{R_3 + R_4} = \frac{2 \cdot 3}{2 + 3} = 1,2 ( \quad )$$

$$R_{234} = R_2 + R_{34} = 0,8 + 1,2 = 2 ( \quad )$$

$$R_{1234} = \frac{R_{234} R_1}{R_{234} + R_1} = \frac{2 \cdot 2}{2 + 2} = 1 ( \quad )$$

$$R_1 = R_5 + R_{1234} = 4 + 1 = 5 ( \quad )$$

$$I_1 = \frac{U_1}{R_1} = \frac{5}{5} = 1 ( \quad ) = I_{1234} ( \quad )$$

1234:

$$U_{1234} = I_{1234} \cdot R_{1234} = 1 \cdot 1 = 1 ( \quad ) = U_{234} ( \quad )$$

234

$$I_{234} = \frac{U_{234}}{R_{234}} = \frac{1}{2} = 0,5 ( \quad ) = I_{34} ( \quad )$$

34:

$$U_{34} = I_{34} \cdot R_{34} = 0,5 \cdot 1,2 = 0,6 ( \quad ) = U_3 ( \quad )$$

$$I_3 = \frac{U_3}{R_3} = \frac{0,6}{2} = 0,3 ( \quad ).$$

