N1

Дано:

$v_1 = 24$ м/с

$\alpha = 30^\circ$

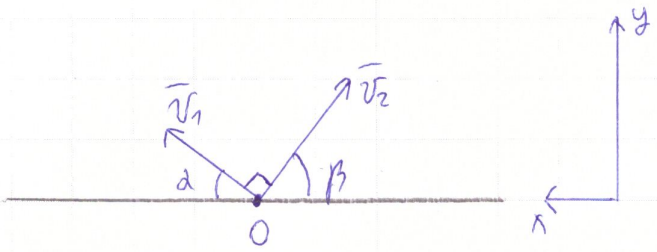
$\beta = 60^\circ$

$v_2 = 32$ м/с

$t = 1{,}5$ с

Найти:

S - ?



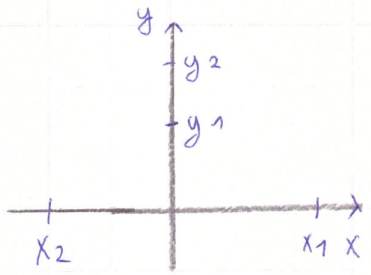
Решение:

1) $x_1 = v_1 \cos\alpha \cdot t = 24 \cdot \frac{\sqrt{3}}{2} \cdot 1{,}5 = 31{,}17$ (м)

$y_1 = v_1 \sin\alpha t - \frac{gt^2}{2} = 24 \cdot \frac{1}{2} \cdot 1{,}5 - \frac{10 \cdot 2{,}25}{2} = 18 - 11{,}25 = 6{,}25$ (м)

2) $x_2 = -v_2 \cos\beta t = -32 \cdot 0{,}5 \cdot 1{,}5 = -24$ (м)

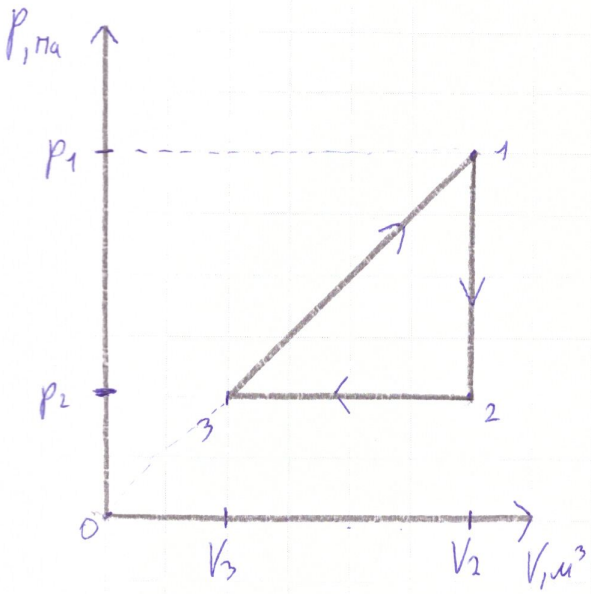
$y_2 = v_2 \sin\beta t - \frac{gt^2}{2} = 41{,}568 - 11{,}25 = 30{,}313$ (м)



3) $S = \sqrt{(x_1 - x_2)^2 + (y_2 - y_1)^2} = \sqrt{3075 + 555{,}3} \approx 60$ (м)

Ответ: $S \approx 60$ м

№2



Дано:

$p_1 = 4p_2$

$T_1 = 4T_2$

1-2 V-const

$p \downarrow T \downarrow$ $\frac{p}{T} = const$

2-3 P-const

$\frac{V}{T} = const$; $V \downarrow T \downarrow$

3-1 $pV = RT$

$P \uparrow V \uparrow T \uparrow$

Решение:

1) $\frac{PV}{T} = const$ $P_3 = P_2$, так как процесс изобарный

$\frac{P_3 V_3}{T_3} = \frac{p_1 V_1}{T_1}$; на участке 3-1 $P \sim V$

$\frac{\cancel{P_3} \cancel{V_3}}{T_3} = \frac{4\cancel{P_3} \cdot 4\cancel{V_3}}{T_1}$

$\frac{1}{T_3} = \frac{16}{T_1} \Rightarrow T_1 = 16T_3$

2) $\eta = \frac{A_{цз}}{A_{подв}} \cdot 100\%$

3) $A_{цз} = \frac{(p_1 - p_2)(V_2 - V_3)}{2}$

$A_{подв} = \Delta U + A_{цз}$

$\Delta U = U_1 - U_3 = \frac{3}{2}(p_1V_1 - p_3V_3) = \frac{3}{2} 15 p_3 V_3$

4) $A_{подв} = \frac{p_1 + p_2}{2}(V_2 - V_3) = \frac{p_1 + p_3}{2}(V_2 - V_3) =$

$= \frac{5p_3}{2}(4V_3 - V_3) = \frac{15 p_3 V_3}{2}$

5) $\eta = \frac{\frac{9\cancel{p_3}\cancel{V_3}}{2}}{\frac{3}{2}15\cancel{p_3}\cancel{V_3} + \frac{15\cancel{p_3}\cancel{V_3}}{2}} = \frac{9}{45+15} = 0{,}15 \cdot 100\% =$

$= 15\%$

Ответ: $\eta = 15\%$

№3

Дано:

$R_1 = 8$см

$R_2 = 20$см

$q_1 = 14$нКл

$q_2 = -7$нКл

Найти:

$q_1' - ?$

$q_2' - ?$

Решение:

1) Когда мы соединим шары проводом, заряд будет перемещаться пока потенциалы шаров не станут равными.

$\varphi = \frac{kq}{R}$

$\varphi_1 = \varphi_2$

2) $\begin{cases} \frac{kq_1'}{R_1} = \frac{kq_2'}{R_2} \\ q_1 + q_2 = q_1' + q_2' \text{ (закон сохр. зарядов)} \end{cases}$

$\Sigma q = q_1 + q_2 = 7$нКл

$\frac{q_1'}{R_1} = \frac{\Sigma q - q_1'}{R_2} \Rightarrow \frac{q_1'}{R_1} = \frac{7 \cdot 10^{-9} - q_1'}{R_2}$

$R_1 (7 \cdot 10^{-9} - q_1') = R_2 \cdot q_1'$

$R_2 q_1' + R_1 q_1' = R_1 \cdot 7 \cdot 10^{-9}$

$q_1' = \frac{7 \cdot 10^{-9} \cdot R_1}{R_1 + R_2} = \frac{7 \cdot 8 \cdot 10^{-11}}{28 \cdot 10^{-2}} = \frac{56 \cdot 10^{-9}}{28} = 2$нКл

3) $q_2' = \Sigma q - q_1' = 7 \cdot 10^{-9} - 2 \cdot 10^{-9} = 5 \cdot 10^{-9}$Кл

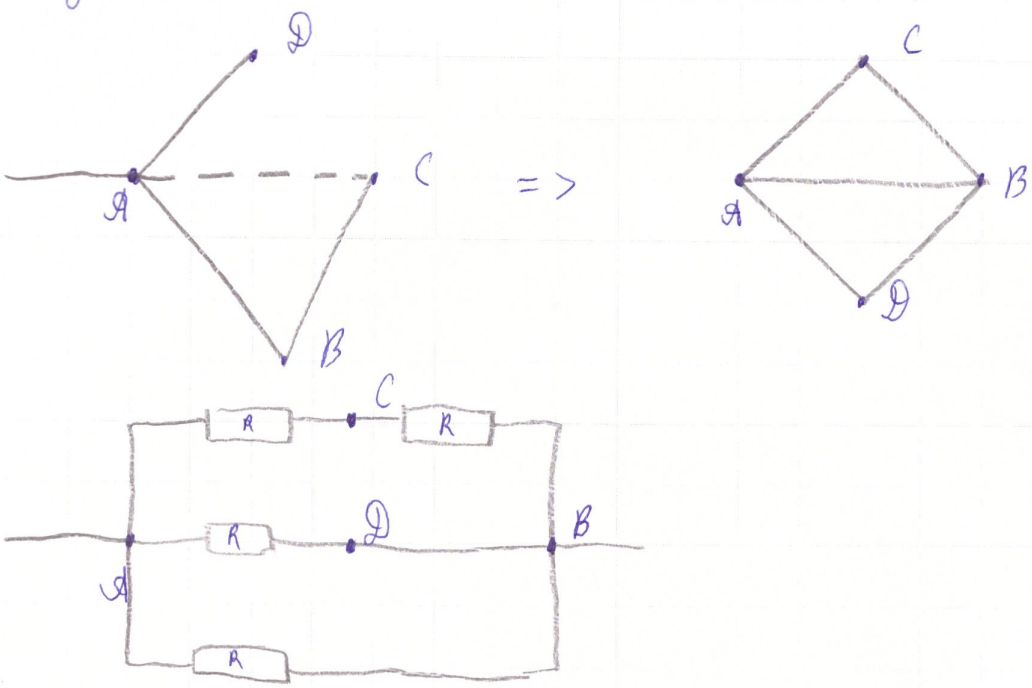
Ответ: $q_1' = 2$нКл; $q_2' = 5$нКл

$R = 10$ Ом

№4

Подключаем к точкам A и B, тогда $\varphi_D = \varphi_C$.

Тогда



1) $\frac{1}{R_{A,B}} = \frac{1}{2R} + \frac{1}{2R} + \frac{1}{R} = \frac{4}{2R}$

2) $R_{A,B} = \frac{2R}{4} = \frac{2 \cdot 20}{4} = 10$ Ом

Ответ: $R_{A,B} = 10$ Ом

№1

Берілгені:

$\alpha_1 = 30°$

$\alpha_2 = 60°$

$v_1 = 24$ м/с

$v_2 = 32$ м/с

$t = 1{,}5$ с

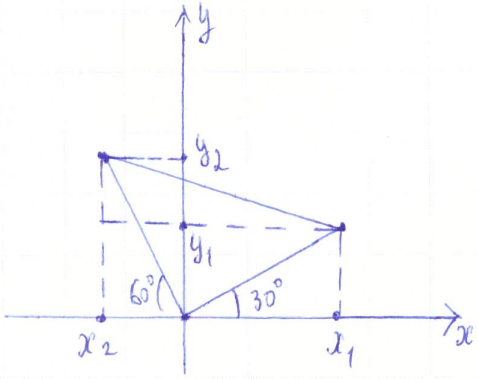
$S - ?$

Шешуі: $x_1 = v_1 \cdot \cos\alpha_1 \cdot t = 24 \cdot 0{,}866 \cdot 1{,}5 = 31{,}18$

$x_2 = -v_2 \cos\alpha_2 \cdot t = -32 \cdot 0{,}5 \cdot 1{,}5 = -24$

$y_1 = v_1 \sin\alpha_1 \cdot t - \frac{gt^2}{2} = 24 \cdot \frac{1}{2} \cdot 1{,}5 - \frac{10 \cdot 1{,}5^2}{2} = 6{,}75$

$y_2 = v_2 \sin\alpha_2 \cdot t - \frac{gt^2}{2} = 32 \cdot \frac{\sqrt{3}}{2} \cdot 1{,}5 - \frac{10 \cdot 1{,}5^2}{2} = 30{,}32$



Пифагор теоремасы бойынша:

$S^2 = (x_1 - x_2)^2 + (y_2 - y_1)^2$

$S = \sqrt{(31{,}18 + 24)^2 + (30{,}32 - 6{,}75)^2} =$

$\sqrt{3044 + 555{,}5} = 59{,}9$ м ≈ 60 м

№3

Берілгені

$q_1 = 14$ нКл

$q_2 = -7$ нКл

$r_1 = 8$ см

$r_2 = 20$ см

$q_1' - ?$

$q_2' - ?$

Шешуі: $\varphi_1 = \varphi_2 \Rightarrow \frac{k q_1'}{r_1} = \frac{k q_2'}{r_2} \Rightarrow q_2' = \frac{r_2}{r_1} \cdot q_1' = 2{,}5\, q_1'$

Зарядтың сақталу заңы бойынша: $q_1 + q_2 = q_1' + q_2'$

7 нКл $= 3{,}5\, q_1'$

$q_1' = 2$ нКл

$q_2' = 2{,}5 \cdot q_1' = 2{,}5 \cdot 2$ нКл $= 5$ нКл

№2

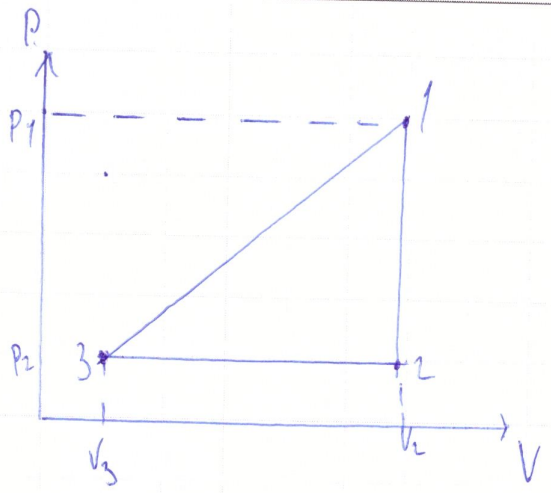
$p_2 = \frac{p_1}{4}$

$i = 3$

$\eta = ?$

$p \sim V (3-1)$

Шешуі:



$\frac{P_3 V_3}{T_3} = \frac{P_1 V_1}{T_1}$; $P_3 = P_2$ $\frac{1}{T_3} = \frac{16}{T_1} \Rightarrow T_1 = 16 T_3$

$\frac{P_3 V_3}{T_3} = \frac{4P_3 \cdot 4V_3}{T_1}$ $\eta = \frac{A_n}{A_m}$ $A_n = \frac{1}{2}(P_1 - P_2)(V_2 - V_3) =$

$\frac{1}{2}(4P_2 - P_2)(4V_3 - V_3) =$

$\frac{9 P_2 V_2}{2} = \frac{9 P_3 V_3}{2}$

$A_m = \Delta U + A_m$

$\Delta U = U_1 - U_3 = \frac{3}{2}(P_1 V_1 - P_3 V_3) = \frac{3}{2} 15 P_3 V_3$

$A_m = \frac{P_1 + P_2}{2}(V_2 - V_3) = \frac{P_1 + P_3}{2}(V_2 - V_3) = \frac{5 P_3}{2}(4V_3 - V_3) =$

$\frac{15 P_3 V_3}{2}$

$\eta = \frac{A_n}{A_m} = \frac{\frac{9 P_3 V_3}{2}}{\frac{3}{2} \cdot 15 P_3 V_3 + 15 \frac{P_3 V_3}{2}} = \frac{9}{45+15} = \frac{9}{60} = 0{,}15 =$

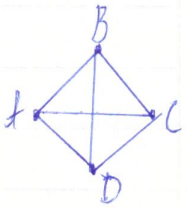
15 %

№4

Берілгені

$R_0 = 20$ Ом

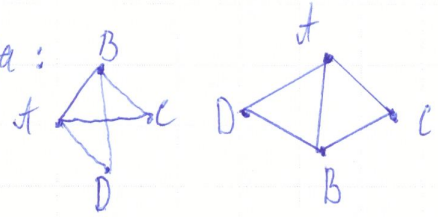
Шешуі:



Егер AB-дан қоссақ

$\varphi_D = \varphi_C \Rightarrow v_{DC} = 0.$

Онда:



$$\frac{1}{R_{AB}} = \frac{1}{R} + \frac{1}{2R} + \frac{1}{2R} = \frac{4}{2R}$$

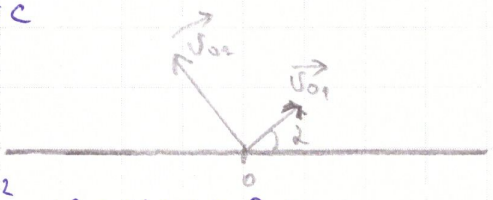
$$R_{AB} = \frac{2R}{4} = \frac{2 \cdot 20}{4} = 10 \text{ ом}$$

1-тапсырма

Берілгені

$\alpha_1 = 30°$ $V_{01} = 24 м/с$ $\alpha_2 = 60°$ $\Delta t = 1,5 с$

$S - ?$



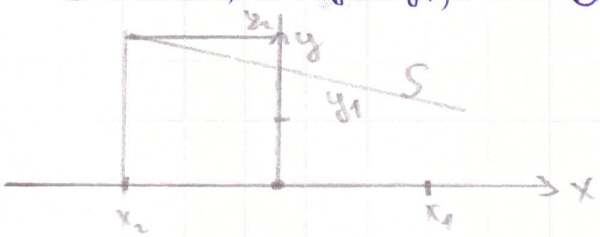
$x_1 = V_{01} \cdot \cos\alpha \cdot t = 24 \cdot 0,866 \cdot 1,5 = 31,176$

$y_1 = V_{01} \sin\alpha_1 \cdot t - \frac{gt^2}{2} = 24 \cdot 0,5 \cdot 1,5 - \frac{10 \cdot 1,5^2}{2} = 18 - 11,25 = 6,75 м$

$x_2 = -V_{02} \cos\alpha_2 t = -32 \cdot 0,5 \cdot 1,5 = -24 м$

$y_2 = V_{02} \sin\alpha t - \frac{gt^2}{2} = 41,568 - 11,25 = 30,313 м$

$S = \sqrt{(x_1 - x_2)^2 + (y_2 - y_1)^2} = \sqrt{3025 + 555,3} = 59,8 м \approx 60 м$



3-тапсырма

Берілгені

$r_1 = 8 см$

$r_2 = 20 см$

$q_1 = 14 мКл$

$q_2 = -7 мКл$

Шешуі

$\varphi_1' = \varphi_2'$

$\frac{k q_1'}{r_1} = \frac{k q_2'}{r_2}$

$q_2' = \frac{r_2}{r_1} q_1' = 2,5 q_1'$

$q_1 + q_2 = q_1' + q_2'$

$7 мКл = 3,5 q_1'$ $q_1' = 2 мКл$

$q_2' = 5 мКл$

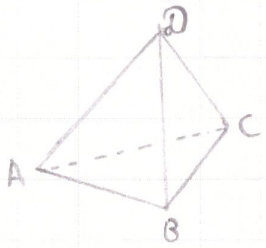
4-тапсырма

Берілгені

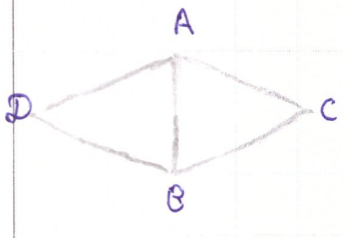
$R_0 = 20$ Ом

$R = ?$

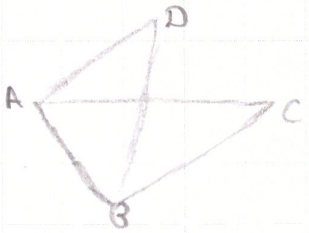
Шешуі



$\varphi_D = \varphi_C$



егер



$$\frac{1}{R_{AB}} = \frac{1}{R} + \frac{1}{2R} + \frac{1}{2R} = \frac{4}{2R}$$

$$R_{AB} = \frac{2R}{4} = \frac{2 \cdot 20}{4} = 10 \text{ Ом}$$

2-тапсырма

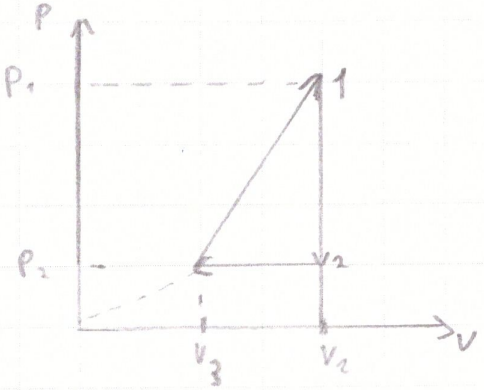
Берілгені

$P_2 = \frac{P_1}{4}$ $\quad i = 3$ $\quad p \sim V\ (3-1)$ $\quad \eta - ?$

$$\frac{P_3 V_3}{T_3} = \frac{P_1 V_1}{T_1} \quad P_3 = P_2$$

$$\frac{P_3 V_3}{T_3} = \frac{4P_3 \cdot 4V_3}{T_1}$$

$$\frac{1}{T_3} = \frac{16}{T_1} \quad T_1 = 16 T_3$$



$$\eta = \frac{A_n}{A_T} \quad A_n = \frac{1}{2}(P_1 - P_2)(V_2 - V_3)$$

$$= \frac{1}{2}(4P_2 - P_2)(4V_3 - V_3) = \frac{9P_2V_2}{2} = \frac{9P_2V_3}{2}$$

$A_T = \Delta U + A_T$

$\Delta U = U_1 - U_2 = \frac{3}{2}(P_1V_1 - P_3V_3) = \frac{3}{2} 15 P_3 V_3$ $\quad A_T = \frac{P_1 + P_2}{2}(V_2 - V_3) =>$

$$A_T = \frac{P_1 + P_3}{2}(V_2 - V_3)$$

$$A_T = \frac{5P_3}{2}(4V_3 - V_3) = \frac{15P_3V_3}{2}$$

$$\eta = \frac{\frac{9P_3V_3}{2}}{\frac{3}{2}15P_3V_3 + \frac{15P_3V_3}{2}} = \frac{9}{45+15} = \frac{9}{60} = 0,15 = 15\%$$

1. $v_1 = 24$ м/с

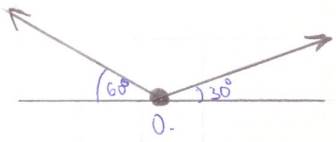
$v_2 = 32$ м/с

$\Delta t = 1{,}5$ с

$\alpha_1 = 30°$

$\alpha_2 = 60°$

$S - ?$



$x_1 = v_1 \cos\alpha_1 \cdot \Delta t = 24 \cdot \frac{\sqrt{3}}{2} \cdot 1{,}5 = 31{,}176$ м

$y_1 = v_1 \sin\alpha_1 \Delta t - \frac{g t^2}{2} = 24 \cdot \frac{1}{2} \cdot 1{,}5 - \frac{10 \cdot (1{,}5)^2}{2} = 18 - 11{,}25 = 6{,}75$ м

$x_2 = -v_2 \cos\alpha_2 \Delta t = -32 \cdot \frac{1}{2} \cdot 1{,}5 = -24$ м

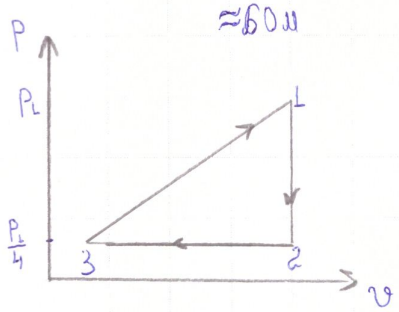
$y_2 = v_2 \sin\alpha_2 \Delta t - \frac{g t^2}{2} = 32 \cdot \frac{\sqrt{3}}{2} \cdot 1{,}5 - \frac{10 \cdot (1{,}5)^2}{2} = 41{,}568 - 11{,}25 = 30{,}31$ м

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

$S = \sqrt{(31{,}17 - (-24))^2 + (30{,}31 - 6{,}75)^2} = \sqrt{(55{,}48)^2 + (23{,}56)^2} = \sqrt{3078 + 555} = \sqrt{3633} \approx$

≈ 60 м

2.



$P_2 = \frac{P_1}{4}$ | $T_2 = \frac{T_1}{4}$

$\eta = \frac{A_н}{A_т}$

$A_н = \frac{1}{2}(P_1 - P_2)(v_2 - v_3) = \frac{1}{2}\left(P_1 - \frac{P_1}{4}\right)(v_2 - v_3) = \frac{1}{2} \cdot \frac{3P_1}{4}(v_2 - v_3)$

$= \frac{3P_1}{8}(v_2 - v_3) = \frac{3P_1}{8}(4v_3 - v_3) = \frac{3P_1}{8} \cdot 3v_3 = \frac{9 v_3 P_3}{8}$

$A_т = \frac{P_1 + P_2}{2}(v_2 - v_3) = \frac{P_1 + P_2}{2} \cdot 3v_3 = \frac{P_2 + 4P_2}{2} \cdot 3v_3 = \frac{15 P_2 v_3}{2}$

$\eta = \frac{9 v_3 P_3}{\frac{3}{2} 15 P_3 v_3 + \frac{15}{2} P_3 v_3} = \frac{9}{45 + 15} = \frac{9}{60} = 15\%$.

3. $r_1 = 8$ см

$r_2 = 20$ см

$q_1 = 14$ нКл

$q_2 = -7$ нКл

$q_2' - ?$

$q_2' - ?$

$\varphi_1' = \varphi_2'$

$\frac{k q_1'}{r_1} = \frac{k q_2'}{r_2}$

$q_2' = \frac{r_2 q_1'}{r_1} = \frac{20 \cdot 10^{-3} q_1'}{8 \cdot 10^{-3}} = 2{,}5 q_1'$

$q_1 + q_2 = 14 + (-7) = 7$ нКл

$q_1 + q_2 = q_1' + q_2'$

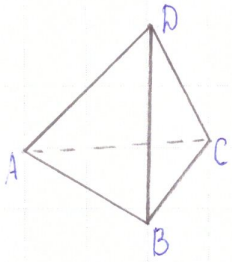
$7 = q_1' + 2{,}5 q_1'$

$7 = 3{,}5 q_1'$

$q_1' = 2$ нКл

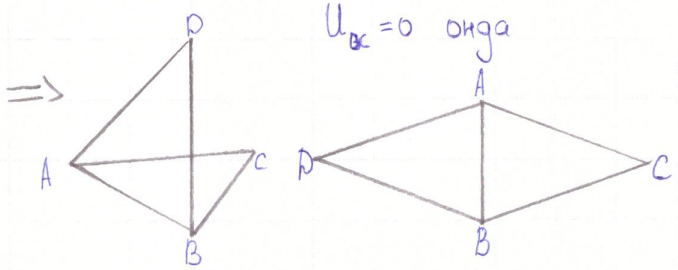
$q_2' = 7 - 2 = 5$ нКл

4. $R_0 = 20$ Ом



Егер AB дан қосса $\varphi_D = \varphi_C$

$U_{BC} = 0$ онда

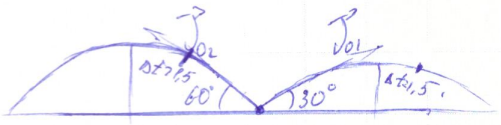


$\frac{1}{R_{AB}} = \frac{1}{R} + \frac{1}{2R} + \frac{1}{2R} = \frac{4}{2R}$

$R_{AB} = \frac{2R}{4} = \frac{2 \cdot 20}{4} = 10$ Ом

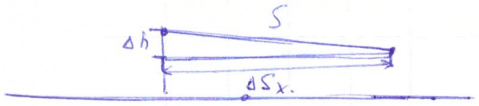
№1.

$\alpha_1 = 30°$ $v_{01} = 24$ м/с. $\alpha_2 = 60°$ $v_{02} = 32$ м/с. $\Delta t = 1{,}5$ с. S - ?



$t_{T1} = \frac{2v_{01}\sin\alpha_1}{g} = \frac{2 \cdot 24 \cdot \frac{1}{2}}{10} = 2{,}4$ $\quad t_{T2} = \frac{2v_{02}\sin\alpha_2}{g} = \frac{2 \cdot 32 \cdot \frac{\sqrt{3}}{2}}{10} \approx 5{,}54$

$S_{x_1} = v_{01}\cos\alpha_1 t = 24 \cdot \frac{\sqrt{3}}{2} \cdot 1{,}5 = 31$



$h_1 = v_{01}\sin\alpha_1 t - \frac{gt^2}{2} = 24 \cdot \frac{1}{2} \cdot 1{,}5 - \frac{10 \cdot (1{,}5)^2}{2} = 6{,}75$

$S_{x_2} = -v_{02}\cos\alpha_2 t = 32 \cdot \frac{1}{2} \cdot 1{,}5 = -24$ м.

$h_2 = v_{02}\sin\alpha_2 t - \frac{gt^2}{2} = 32 \cdot \frac{\sqrt{3}}{2} \cdot 1{,}5 - \frac{10 \cdot (1{,}5)^2}{2}$

$h_2 = 30{,}313$

$\Delta h = h_2 - h_1$

$\Delta S_x = S_{x_1} - S_{x_2}$ $\rightarrow$ $S = \sqrt{(\Delta S_x)^2 + (\Delta h)^2} = \sqrt{(S_{x_1} - S_{x_2})^2 + (h_2 - h_1)^2}$

$\Delta S = \sqrt{(31 + 25)^2 + (30{,}313 - 6{,}75)^2} = \sqrt{3025 + 555{,}2} = 59{,}83$ м.

Жауабы: 1,5с екі тастың ара қашықтығы 59,83м болады

№3.

$q_1 = 14 \cdot 10^{-9}$ Кл. $R_1 = 0{,}08$ м $q_2 = 7 \cdot 10^{-9}$

$R_2 = 0{,}2$ м.

$\varphi_1' = \varphi_2'$. $\varphi = \frac{kq}{R}$

$\frac{kq_1'}{R_1} = \frac{kq_2'}{R_2}$

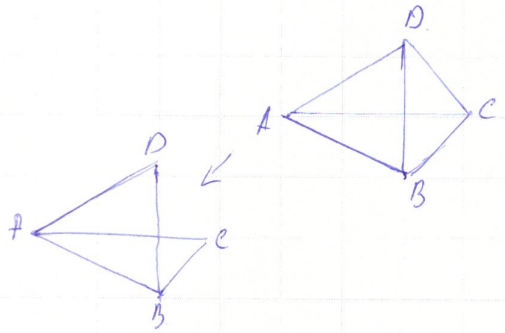
$q_2' = \frac{R_2 q_1'}{R_1} = \frac{0{,}2 q_1'}{0{,}08} = 2{,}5 q_1'$

$q_1 + q_2 = q_1' + q_2' \rightarrow (14 - 7) \cdot 10^{-9} = q_1' + 2{,}5 q_1' = 3{,}5 q_1'$

$q_1' = \frac{7 \cdot 10^{-9}}{3{,}5} = 2 \cdot 10^{-9}$ Кл. $q_2' = (7 - 2) \cdot 10^{-9} = 5 \cdot 10^{-9}$ Кл.

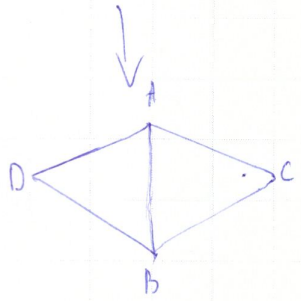
№4.

$R_0 = 20$ Ом R_{AB} - ?



$\varphi_D = \varphi_C$.

$U_{DC} = 0$.



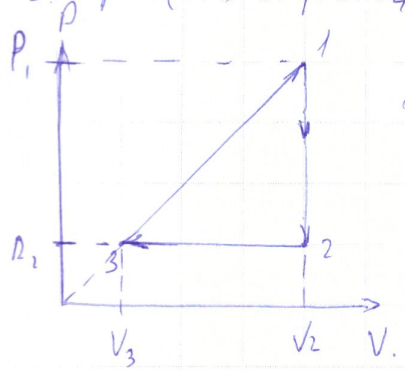
$$\frac{1}{R_{AB}} = \frac{1}{R} + \frac{1}{2R} + \frac{1}{2R} = \frac{4}{2R}.$$

$$R_{AB} = \frac{2R}{4} = \frac{2 \cdot 20}{4} = 10 \text{ Ом}.$$

Жауабы: $R_{AB} = 10$ Ом

№2.

$i = 3$ $p = V(3-1)$ $p_2 = \frac{p_1}{4}$.



$\frac{p_3 V_3}{T_3} = \frac{p_2 V_2}{T_2} \rightarrow p_3 = p_2$.

$p_2 = p_3 = \frac{p_1}{4}$.

$\frac{p_3 V_3}{T_3} = \frac{p_1 V_1}{T_1} =$

$\frac{p_3 V_3}{T_3} = \frac{4p_3 4V_3}{T_1} \rightarrow \frac{1}{T_3} = \frac{16}{T_1} \rightarrow T_1 = 16 T_3$

$\eta = \frac{A_n}{A_T} \cdot 100\%$ $A_n = \frac{1}{2}(p_1 - p_2)(V_2 - V_3) = \frac{1}{2}(4p_2 - p_2)(4V_3 - V_3) = \frac{1}{2} p_2 V_2 \cdot 9 = \frac{1}{2} p_3 V_3 9$

$A_T = \Delta U + A_T \rightarrow \Delta U = U_1 - U_3 = \frac{3}{2}(p_1 V_1 - p_3 V_3) = \frac{45}{2} p_3 V_3$.

$A_T = \frac{p_1 + p_2}{2} \cdot (V_2 - V_3) = \frac{p_1 + p_3}{2}(V_2 - V_3) \Rightarrow A_T = \frac{15 p_3 V_3}{2}$.

$\eta = \frac{\frac{9 p_3 V_3}{2}}{\frac{3}{2} 15 p_3 V_3 + \frac{15 p_3 V_3}{2}} = \frac{9}{45 + 15} = \frac{9}{60} \cdot 100\% = 15\%$.