

Часть 1

Олимпиада: **Химия 11 класс (1 часть)**

Шифр: **21301072**

ID профиля: **870624**

Вариант 2

рефракция

уравнение $0,6906/\text{см}^3$

температура $0,014 \text{ г/см}^3$

$1374/0,006$

$Q = 3333,7 \text{ кг/м}^3$

$0,04128 : 100\% = 0,04128\%$

уравнение ; $Q = 285,8 \text{ кг/м}^3$

$20,0008$

$285,8 \text{ кг/м}^3$

$19,6 \text{ МПа}$

$593,5$

$T = 298 \text{ К}$ / составляется $78,5 \text{ К}$

$224,0$

$1,1113$

$208,0$

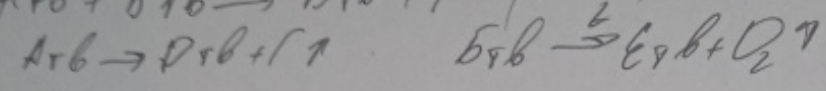
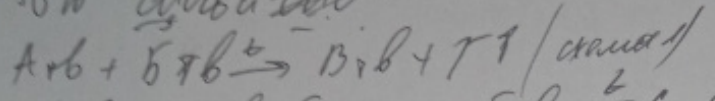
$208,0$ $224,0$

$393,5$

пересчет

12

98% CH_3COOH



$\text{Arb} = \text{Ar, Br, Bi, Dr, Er, Tr}$

$\text{Brb} = 1) \text{Ar, Dr} - \text{уче}$

$\text{Bib} = 2) V(\text{CO}) = 8,96 \text{ л (Т)}$

$\text{Tr} = 3) V(\text{O}_2) = 0,7 \text{ л}$

$\text{Dib} =$

$\text{Erb} =$

m_{Brb}

$m(\text{Tr}) = 52,82$

$52,82 \pm 56 \pm 100 = 19,568$

$m(\text{Arb}) = \text{уче} \quad (0,4)$

$W = \frac{m_{\text{Brb}}}{m_{\text{Tr}}} \cdot 100\%$

$\text{Tr} = 4,7$

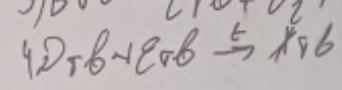
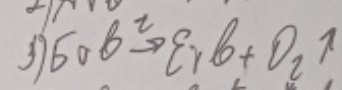
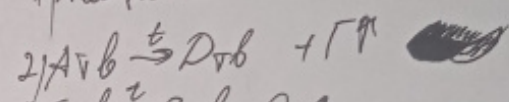
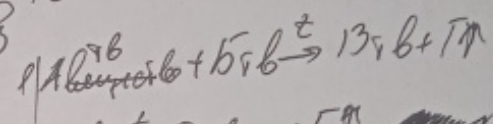
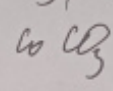
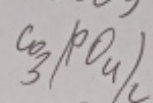
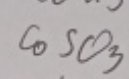
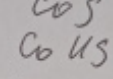
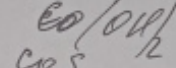
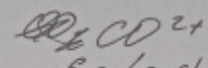
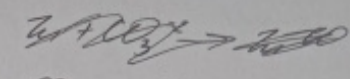
$V_{\text{Brb}} =$

$\frac{4,7}{51} \cdot 100\% = 9,2\%$

$0,92105686$

$0,4423529$

$\approx 0,4$



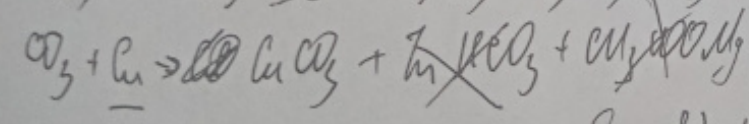
$442,38147$

12

А - соль с Y-веществом
 $\chi_{\text{пр. вещества}} = 1,45 \cdot 10^{-3} \text{ л/м}^3$

Бинарное соед уг χ_1, χ_2

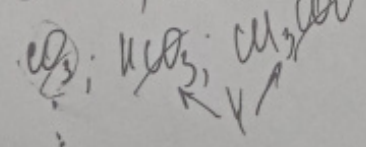
$\text{CO}_2, \text{H}_2\text{O}, \text{CH}_3\text{COOH}, \text{Li}, \text{K}, \text{C}, \text{Cl}, \text{Br}, \text{N}, \text{O}, \text{H}_2\text{O}$



и и m

F ₂	Cl ₂	Br ₂	I ₂	S	Li	N ₂
19	35	80	127	32	7	14

$C = 12, \text{O} = 16$



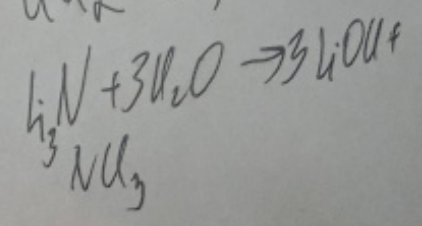
Σ

Σ

Σ

Ан Богданович Вещество
 Б просто вещество на $\chi_{\text{пр}}$
 $\text{Li} \text{ и } \text{LiCO}_2 \rightarrow \text{LiCO}_2$

$442,461,39$



чистовик

12

Ахотте, что А и Б-бисфитны соединены; в-во Х-ва, и К
маленькой р. А и Б состоят из одних и тех же элементов,
только в разных количествах.

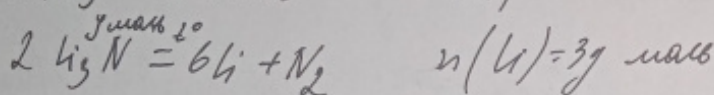
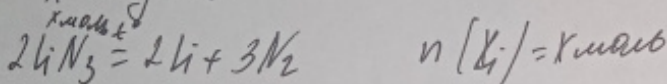
Карминово-красная окраска пламени указывает на Li
Ахотте Li и N. Тогда соединение А-это LiN_3 а
соединение Б-это Li_3N .

Х- N_2 ; Y- Li .

и что $n(LiN_3) = x \text{ моль}$; $n(Li_3N) = y \text{ моль}$

$m(LiN_3) = 149x/2$; $m(Li_3N) = (35g)/2$

$$49x + 35y = 50$$



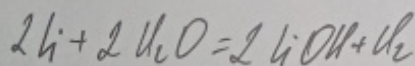
$$\Sigma = x + 3y \text{ моль}$$

740 мм. рт. ст. - 1 Ат

760 мм. рт. ст. = 101325 Па

$$pV = nRT \quad n = \frac{pV}{RT}$$

$$n = \frac{98658 \cdot 4,4848 \cdot 10^{-5}}{8,314 \cdot 293} = 1,816 \text{ моль} = n(N_2)$$



$$n(Li) = 2n(H_2)$$

$$(2) x + 3y - 2 \cdot 1,816 = 3,632$$

$$x = 3,632 - 3y$$

$$49 \cdot (3,632 - 3y) + 35y = 50$$

$$177,968 - 147y + 35y = 50$$

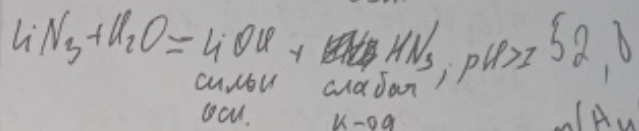
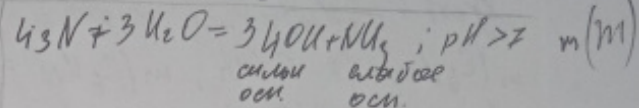
$$142y = 127,968$$

$$y = 0,899 \text{ моль}$$

$$x = 0,204 \text{ моль}$$

$$\omega(Li_3N) = \frac{40}{502} \cdot 100\% > 80\%$$

$$\omega(LiN_3) = \frac{40}{502} \cdot 100\% > 20\%$$



(1)

Условие

1/3

$$1) C_2 H_4 + \frac{1}{2} O_2 = 2 CO_2 + 2 H_2 O$$

$$2) C_2 H_6 + 1.5 O_2 = 2 CO_2 + 3 H_2 O$$

$$Q_{12} = 3 Q_1 (CO_2) + 9 Q_2 (H_2 O) - Q(C_2 H_4) = 8.393,5 + 9.285,8 - 208,0 = 5552,3 \frac{Дж}{моль}$$

$$Q_{12} = 7 Q_1 (CO_2) + 8 Q_2 (H_2 O) - Q(C_2 H_6) = 4.393,5 + 8.285,8 - 224,0 = 4716,9 \frac{Дж}{моль}$$

$$Энтальпия сгорания $V(C_2 H_4) = x \text{ моль}$, тогда $V(C_2 H_6) = (100-x) \text{ моль}$$$

$$m(C_2 H_4) = (x \cdot 0,69) \cdot 10^{-3}, m(C_2 H_6) = 0,684 \cdot (100-x) \cdot 10^{-3}$$

$$n(C_2 H_4) = \frac{x \cdot 0,69}{44} = 6,16 \cdot 10^{-3} \text{ моль}, n(C_2 H_6) = \frac{0,684 \cdot (100-x)}{100} = 6,84 \cdot 10^{-3} \cdot (100-x) \text{ моль}$$

Тогда

$$6,16 \cdot 10^{-3} \cdot 5552,3 + 6,84 \cdot 10^{-3} \cdot (100-x) \cdot 4716,9 = 3333,8$$

$$33,55x + 3294,8 - 32,948x = 3333,8$$

$$1,001x = 39$$

$$x = 38,7 \text{ моль}$$

$$Q(C_2 H_4) = 38,7 \cdot 100 = 3870 \text{ Дж}$$

Отсюда же найдем 38,7

$$2) \text{ Если сгорели } CO_2 \text{ этого же количества кислорода } \frac{40 \cdot 10^3}{100} \cdot 333,3 = 1,333 \cdot 10^6$$

$$= 1,333 \cdot 10^6 = 4664,1 \text{ моль}$$

$$n = \frac{V}{V_m}; V = n \cdot V_m = 4664,1 \cdot 22,4 = 104476,1$$

$$3) \text{ Найти массу воды этого же количества, в нем } 40 \cdot 0,381 = 15,24 \text{ г}$$

$C_2 H_6$

$$m(C_2 H_6) = 15,24 \cdot 10^3 \cdot 0,690 = 10,51 \text{ кг}$$

$$m(C_2 H_4) = 24,32 \cdot 10^3 \cdot 0,668 = 16,27 \text{ кг}$$

$$m(\text{бензина}) = 10,51 + 16,27 = 26,78 \text{ кг}$$

$$pV = \frac{m}{M} RT$$

$$m(H_2) = \frac{pV \cdot M}{RT} = \frac{19,6 \cdot 10^6 \cdot 40 \cdot 10^{-3}}{8,314 \cdot 298} = 832,82$$

$$\text{Результатом, т.е. можно увидеть 87,45 кг воды}$$

только (которое сгорело), или 7,4 кг бензина, в котором

только было 633,2 (масс бензина)

Часть 2

Олимпиада: **Химия 11 класс (2 часть)**

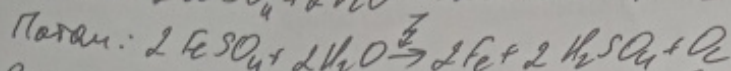
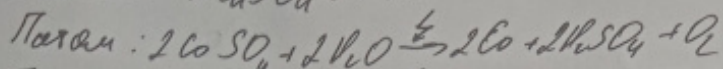
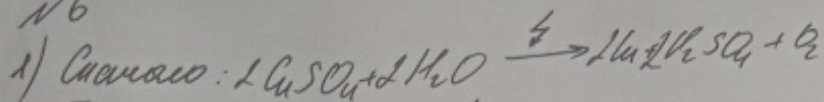
Шифр: **21301072**

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Вариант 2

(3)

№6



Сначала Cu, т.к. она стоит выше всех
2) Сначала 6 кг меди, чтобы вся Cu проэлектрилась

$$m(\text{Cu}) = \frac{64 \cdot 64}{64 + 96} = 25,6$$

$$m = \frac{M \cdot I \cdot t}{n \cdot F}; t = \frac{n \cdot F \cdot m}{I \cdot M} \Rightarrow \frac{2 \cdot 96500 \cdot 25,6}{3 \cdot 64} = 25733 \text{ с}$$

Всего электрич. мед $103600 + 45 \cdot 60 = 38580 \text{ с} \Rightarrow$ вся Cu прошла
электрич.

$$m(\text{Co}) = \frac{57,3 \cdot (38580 - 25733)}{2 \cdot 96500} = 11,382$$

$$\omega(\text{Co}) = \frac{57}{57 + 96} = 0,373 \quad m(\text{CoSO}_4) = \frac{11,38}{0,373} = 30,552 = \text{не весь } \text{CoSO}_4$$

поглощает ст-г

кач. соед: CoSO_4 - погб. ст-г

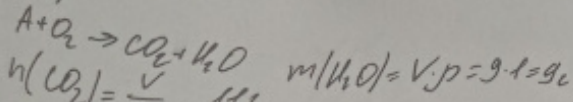
Колич. соед: $m(\text{CoSO}_4) = 62 - 30,55 = 31,452$

$$n(\text{FeSO}_4) = 60,8$$

$$m(\text{H}_2\text{SO}_4) = 98 \cdot (n(\text{H}_2\text{SO}_4) + n(\text{H}_2\text{SO}_4)) = 98 \cdot \left(\frac{25,6}{0,4} + \frac{11,38}{57} \right) = 58,77$$

$$m(\text{H}_2\text{O}) = 1250 \cdot 6 - 60,8 - 64 \cdot 22 - 18 \cdot \left(\frac{25,6}{0,4} - 11 \cdot \frac{11,38}{57} \right) = 10532$$

Учитывая



$n(CO_2) = \frac{V}{V_m} = \frac{11,2}{22,4} = 0,5 \text{ моль}$

$m(C) = M \cdot n = 12 \cdot 0,5 = 6g$

$n(H_2O) = \frac{m}{M} = \frac{9}{18} = 0,5 \text{ моль}$

$n(H) = 2 \cdot 0,5 = 1 \text{ моль}$

$m(H) = 1 \cdot 1 = 1g$

Скорее всего в А есть кислород

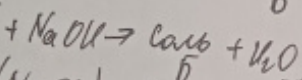
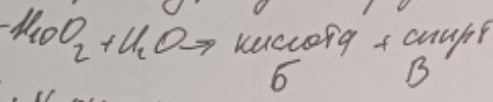
$m(O) = 10,1 - 6 - 1 = 3,2g$

$n(O) = \frac{m}{M} = \frac{3,2}{16} = 0,2 \text{ моль}$

$n(C) : n(H) : n(O) = 0,5 : 1 : 0,2 = 5 : 10 : 2$

$C_5H_{10}O_2$ - общая формула А

Т.к при гидролизе образовались кислота и спирт, то А - сложная эфир



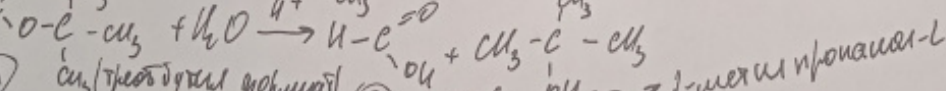
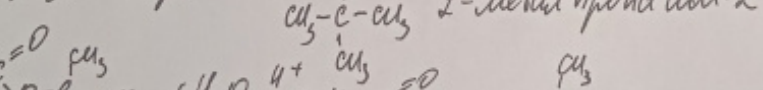
$n(NaOH) = C \cdot V = 2 \cdot \frac{50}{1000} = 0,1 \text{ моль} = n(B)$

$M(B) = \frac{m}{n} = \frac{4,6}{0,1} = 46 \text{ г/моль}$

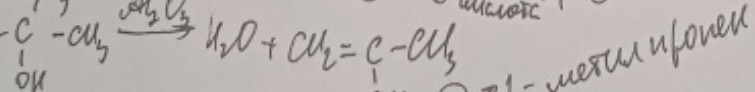
$C_3H_8O_2$ - общая формула Б; $12n + 2n + 32 = 46$

Б - $HC(=O)OH$ (углеводородная кислота) $n=1$

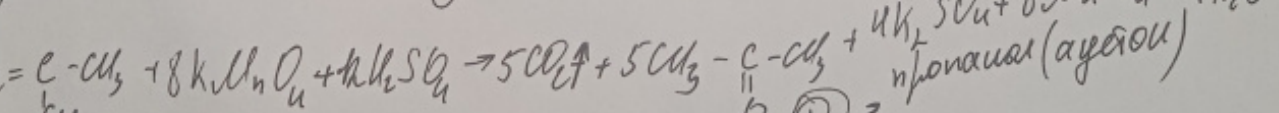
А - C_4H_8O - спирт



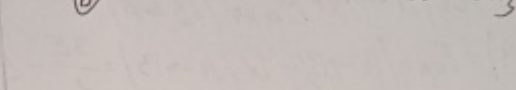
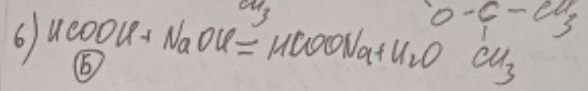
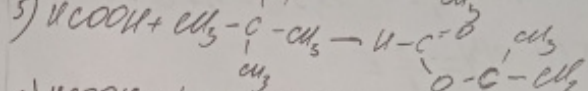
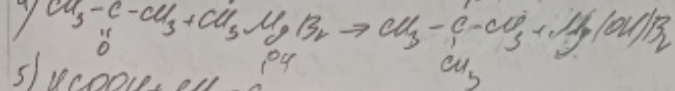
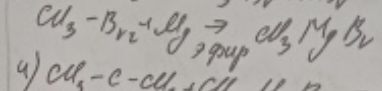
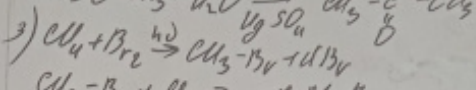
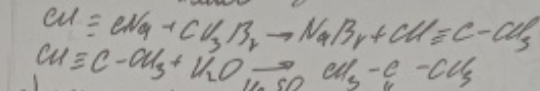
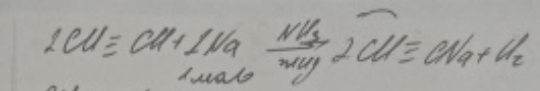
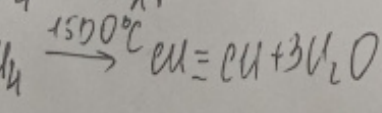
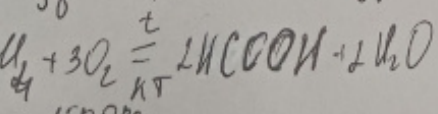
(А) $CH_3-C(=O)-O-CH_2-CH_2-CH_3$ (третичный эфир) (Б) $CH_3-C(=O)-OH$ (углеводородная кислота) (В) $CH_3-CH_2-CH_2-OH$ 2-метилпропаналь-2



(Б) $CH_2=C(CH_3)-CH_3$ (Г) 2-метилпропен

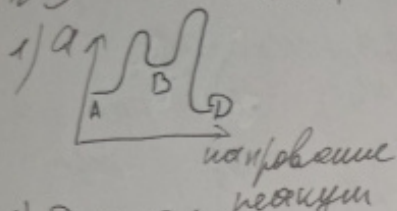


$w(O) = \frac{16}{58} \cdot 100\% = 27,59\%$ - удовлетворяет в задании D



(1)

15 часов (2)



2) Если $Q(A \rightarrow B) = -E$, тогда $Q(B \rightarrow D) = 1,5E$
 тогда $Q(A \rightarrow D) = -E + 1,5E = 0,5E > 0 \Rightarrow$ экзотермичен

3) $E_{акт}(A \rightarrow B) = \frac{3}{2} E$

$$E_{акт}(A \rightarrow B) = Q(A \rightarrow B) + E_{акт}(B \rightarrow A)$$

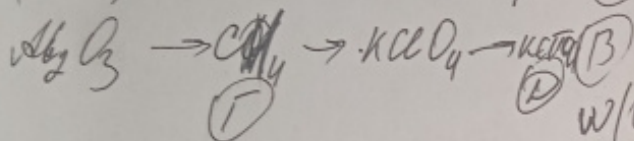
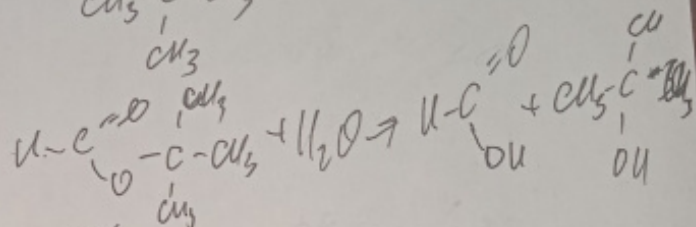
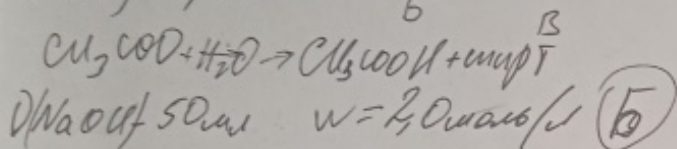
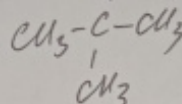
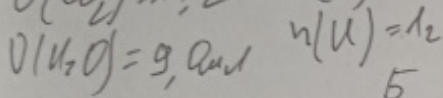
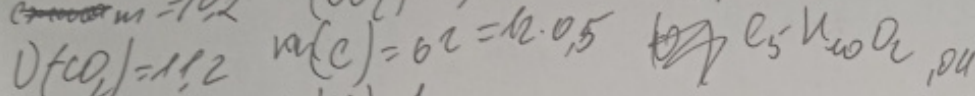
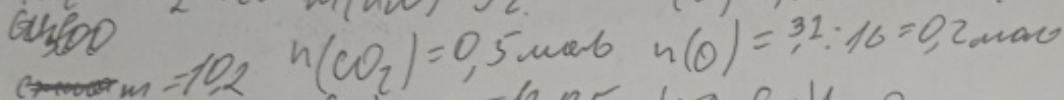
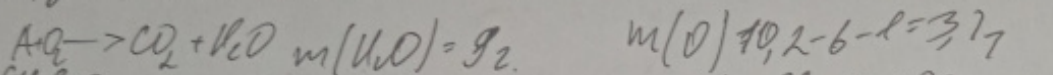
$$E_{акт}(B \rightarrow A) = E_{акт}(A \rightarrow B) - Q(A \rightarrow B) = \frac{3E}{2} - E - 0,5E$$

$$\frac{E_{акт}(A \rightarrow B)}{E_{акт}(B \rightarrow A)} = \frac{1,5E}{0,5E} = 3$$

$$K_2 = A \cdot e^{-\frac{E_{акт}(B \rightarrow A)}{RT}}; K_3 = A \cdot e^{-\frac{E_{акт}(A \rightarrow B)}{RT}}$$

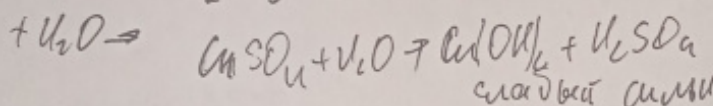
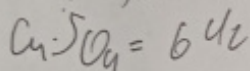
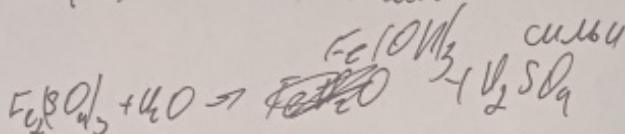
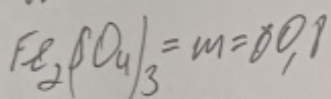
$$\frac{K_2}{K_3} = \frac{e^{-\frac{0,5E}{RT}}}{e^{-\frac{1,5E}{RT}}} = e^{\frac{E}{RT}} > 1 \Rightarrow K_2 > K_3$$

серьезно
А-заток машин, нулевой градиент

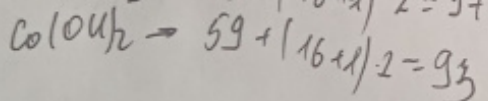
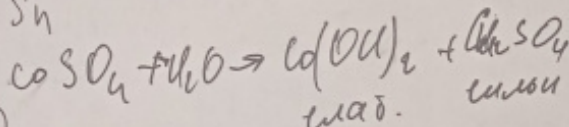
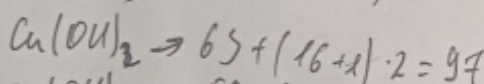
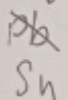
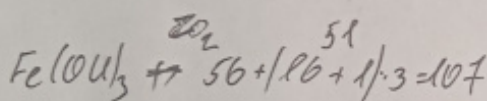
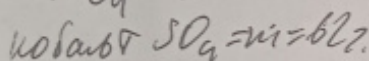


$w(O) = 27,59\%$

$w = 250,6$



(+3A)?



W? . 100

2) 2, 3) 2, 2

$k = A \cdot e^{-\frac{E_a}{RT}}$

$R = 8,31 \text{ Дж/моль} \cdot K$

$\frac{1}{T} = 2,2$