

Часть 1

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

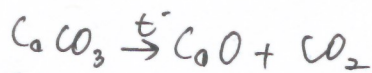
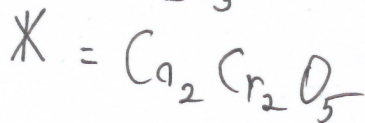
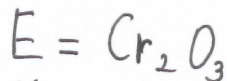
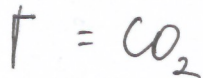
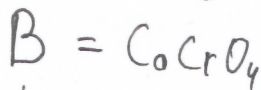
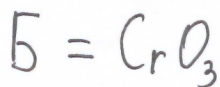
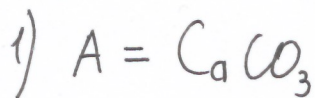
Шифр: **21301077**

ID профиля: **873015**

Вариант 2

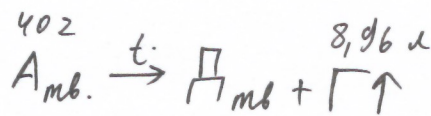
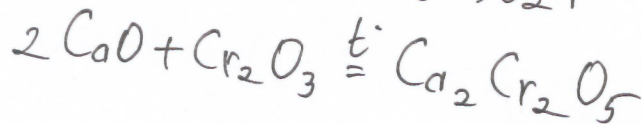
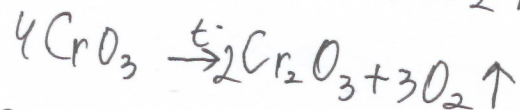
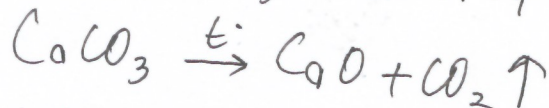
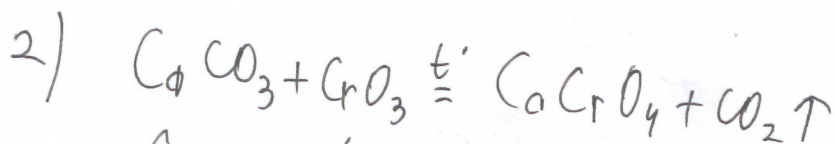
числовик

Задача 1.



$$m(CaO) = 40 - \left(\frac{8,96}{22,4} \cdot \frac{44}{44} \right) = 22,4 \text{ г}$$

$$m(Cr_2O_3)_{\text{погр-ию}} = \frac{0,4 \cdot 2}{4} \cdot 152 = 30,4 \text{ г}$$



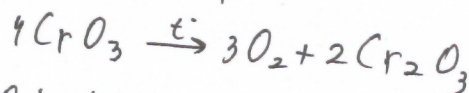
$$n(\Gamma) = \frac{8,96}{22,4} = 0,4 \text{ моль}$$

пусть $n(\Gamma) = n(A)$, тогда выходит, что

$$M(A) = \frac{40}{0,4} = 100 \text{ г/моль}$$

кол-во атомов O = $\frac{100 \cdot 0,48}{16} = 3$
оставшиеся 52 г/моль подходит Ca и C
т.е. $A = CaCO_3$

$M(B) = 100 \text{ г/моль}$ и тоже атомы O
52 г/моль соотв. Cr

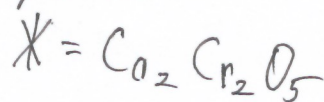


$$n(CrO_3) = \frac{40}{100} = 0,4 \text{ моль}$$

$$n(O_2)_{\text{погр-ию}} = \frac{0,4 \cdot 3}{4} = 0,3 \text{ моль}$$

$$V_{(O_2)} = 0,3 \cdot 22,4 = 6,72 \text{ л (соотв. условию)}$$

т.к. B-окисл-желтого цвета,
то это хромат



$$n(CaO) = \frac{22,4}{40+16} = 0,4 \text{ моль}$$

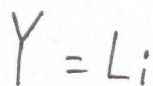
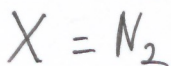
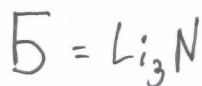
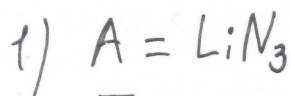
$$n(Cr_2O_3) = \frac{30,4}{152} = 0,2 \text{ моль}$$

т.е. реагируют
в соотнош-и 2:1



Задача 2.

~~Уравнение~~ химический



$$M(X) = \rho V_m = 22400 \cdot 1,257 \cdot 10^{-3} = 28 \text{ г/моль,}$$

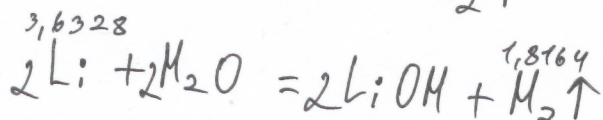
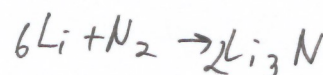
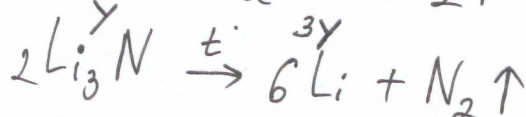
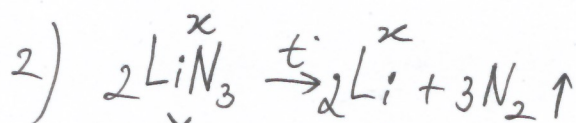
это соотв. $N_2 \Rightarrow X = N_2$

карминово-красное пламя горелки
говорит о том, что речь идет о соединениях

Li в LiN_3 и в Li_3N число атомов
одинаковое

м.к. А соль, но это азид лития

Б не будет азидом лития, м.к. напрямую
азиды не получают



$pV = nRT$

$n(H_2) = \frac{pV}{RT} = \frac{98,6586 \cdot 44,848}{8,314 \cdot (273+20)} = 1,8164 \text{ моль}$

101,325 кПа — 760 мм рт.ст.

98,6586 кПа — 740 мм рт.ст.

по ур-ию р-и $n(Li) = 1,8164 \cdot 2 = 3,6328 \text{ моль}$

$m(Li) = 7 \cdot 3,6328 = 25,4296 \text{ г}$

(только выделилось лития при разложении)

Пусть в смеси было x моль LiN_3 и y моль Li_3N

$m(LiN_3) = 49x \text{ г}, m(Li_3N) = 35y \text{ г}$

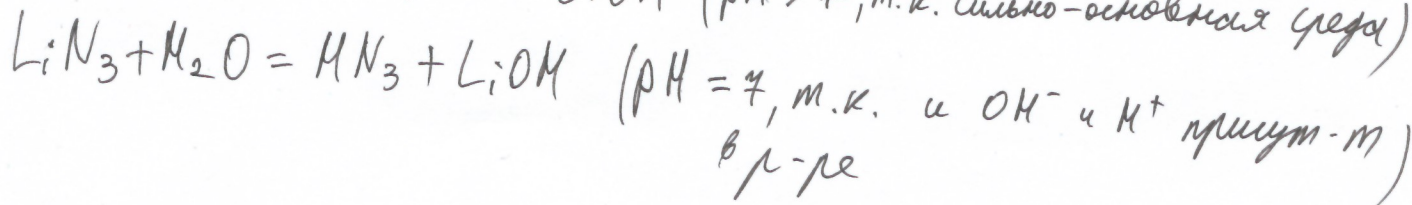
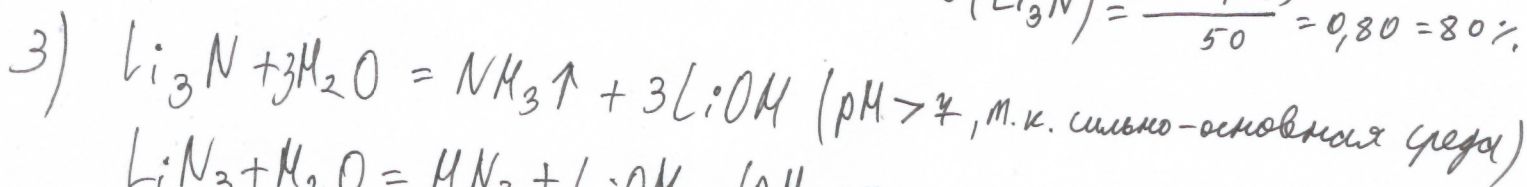
$\begin{cases} 49x + 35y = 50 \\ x + 3y = 3,6328 \end{cases}$

$x = 0,204$

$y = 1,143$

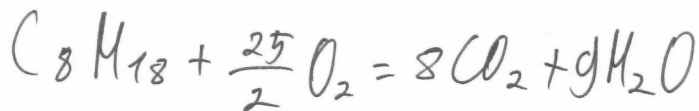
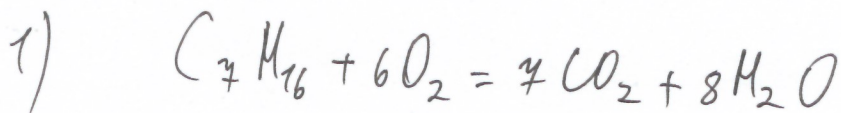
$w(LiN_3) = \frac{49 \cdot 0,204}{50} = 0,20 = 20\%$

$w(Li_3N) = \frac{35 \cdot 1,143}{50} = 0,80 = 80\%$



Задача 3.

читовик



$$\begin{cases} x - \text{моль } C_7H_{16} & y - \text{моль } C_8H_{18} \\ 5040,9x + 3680y = 3333,8 \\ \frac{100x}{0,684} + \frac{114y}{0,690} = 100 \end{cases}$$

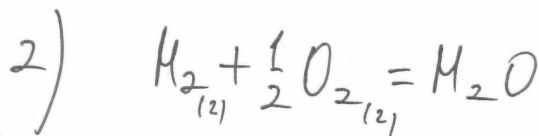
$$\Delta H_c(C_7H_{16}) = 7 \cdot 393,5 + 8 \cdot 285,8 = 5040,9 \text{ кДж/моль}$$

$$\Delta H_c(C_8H_{18}) = 8 \cdot 208,0 + 9 \cdot 224,0 = 3680 \text{ кДж/моль}$$

$$x = 0,62 \quad V(C_8H_{18}) = 0,54 \cdot 22,4 = 12,768 \text{ л}$$

$$y = 0,057 \quad V(C_7H_{16}) = 13,888 \text{ л}$$

$$\text{окм. число} = \frac{12,768}{12,768 + 13,888} = 0,479 = 47,9\% \cdot \frac{12,768}{15,1648} = 8,42\%$$



1 моль (22,4 л) — 285,8 кДж

0,1 л бензина — 3333,8 кДж

$40x - 1333520 \text{ кДж}$

40 л — 1333520 кДж

$$x = V(H_2) = \frac{1333520 \cdot 22,4}{285,8} = 104516,6 \text{ л}$$

3) $pV = nRT$

$$n = \frac{pV}{RT} = \frac{19600 \cdot 40}{8,314 \cdot 298} = 316,439 \text{ моль}$$

$$m(H_2) = 316,439 \cdot 2 = 632,878 \text{ г}$$

приведем V_{H_2} к н.у.

$$\frac{p_1 V_1}{T_1} = \frac{p_0 V_0}{T_0}$$

$$\frac{19600 \cdot 40}{298} = \frac{101,325 \cdot V_0}{273}$$

$$V_0 = 701 \text{ л}$$

нецелесообразно, т.к. мало H_2 помещается в т.к. нужен слишком большой баллон

Часть 2

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

Шифр: **21301077**

ID профиля: **873015**

Вариант 2

Задача 4.

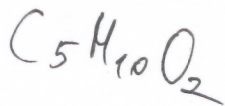
$$1. n(C) = n(CO_2) = \frac{11,2}{22,4} = 0,5 \text{ моль } (m = 0,5 \cdot 12 = 6 \text{ г})$$

$$n(H) = 2n(H_2O) = 2 \cdot \frac{9}{18} = 1 \text{ моль } (1 \text{ г})$$

$$m(O) = 10,2 - 6 - 1 = 3,2 \text{ г} \quad n(O) = \frac{3,2}{16} = 0,2 \text{ моль}$$

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

$$\times 2 = 5 : 10 : 2$$



$$R\text{COOH} + NaOH = RCOONa + H_2O$$

$$n(NaOH) = CV = 0,05 \cdot 2 = 0,1 \text{ моль}$$

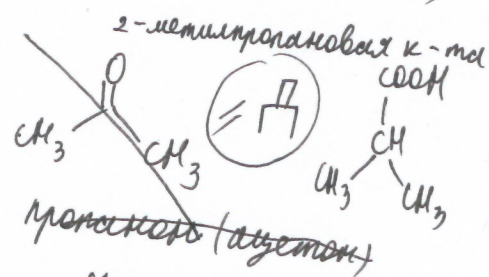
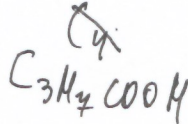
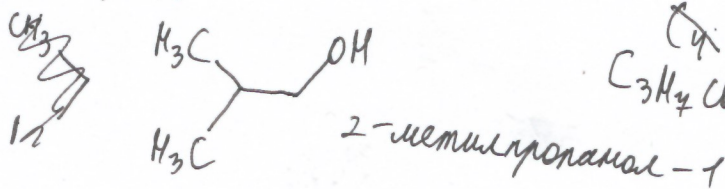
$$n(R\text{COOH}) = 0,1 \text{ моль}$$

$$M(R\text{COOH}) = \frac{4,6}{0,1} = 46 \text{ г/моль} \Rightarrow \text{B: } CH_3COOH$$

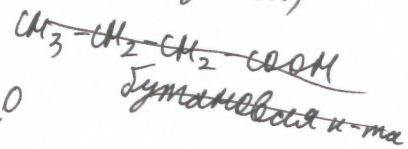
(уравновешенная к-та)

$$M(D) = \frac{16 \cdot 2}{0,2459} = 88 \text{ г/моль, что соотв. } C_3H_6O$$

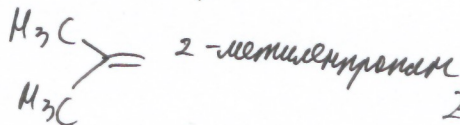
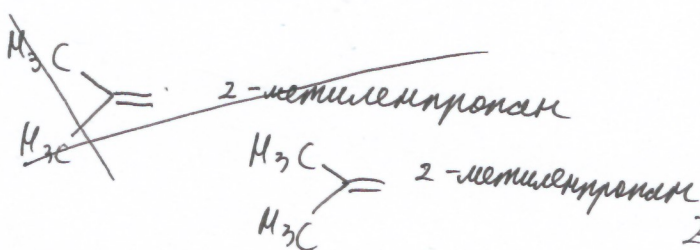
B =



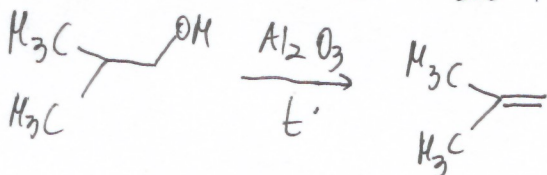
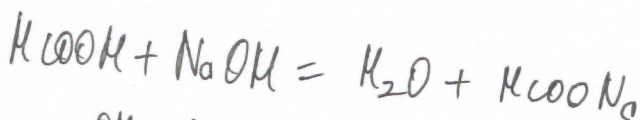
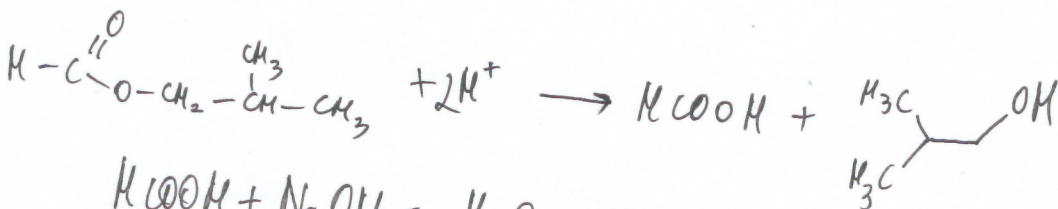
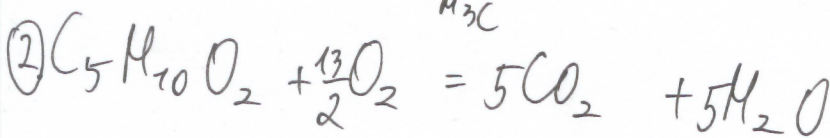
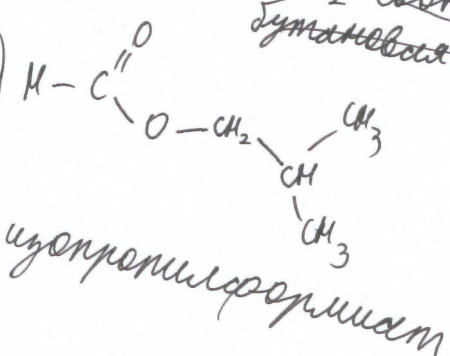
пропанон (ацетон)



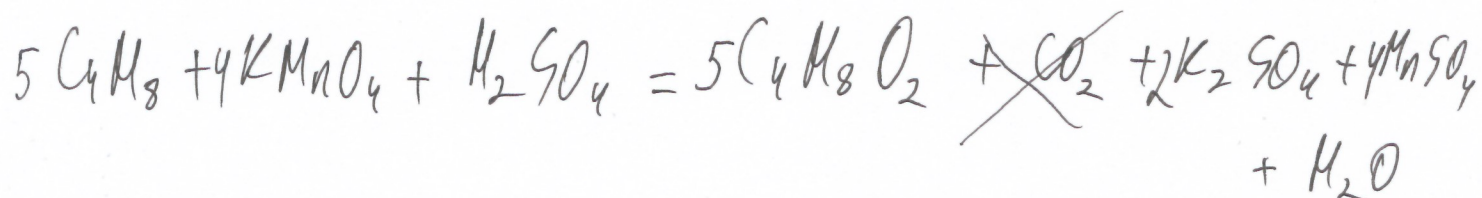
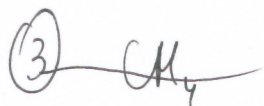
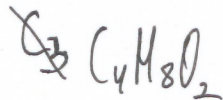
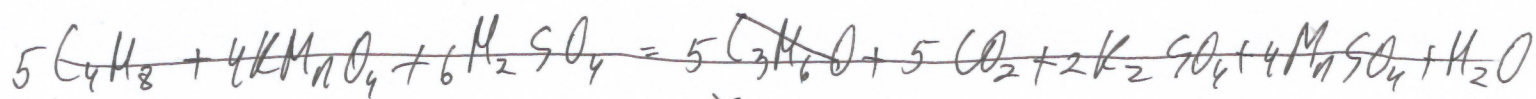
Г =



A =

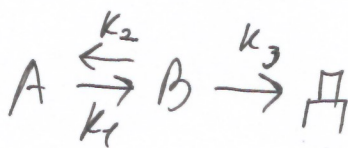
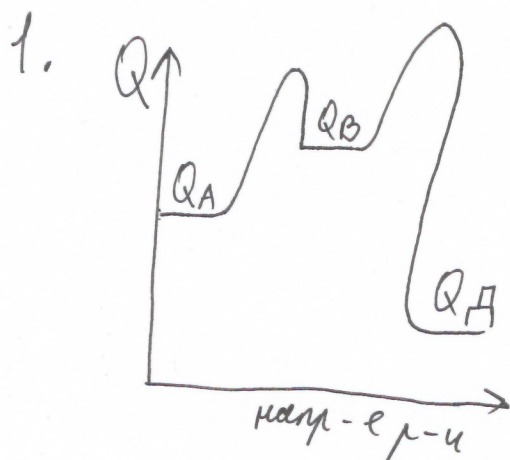


сумма

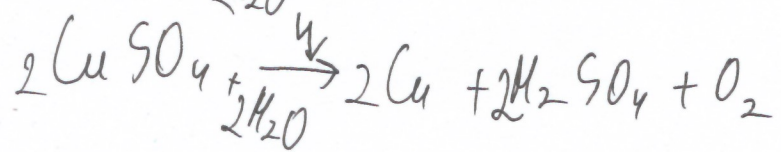
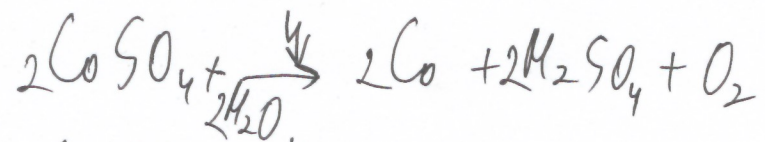
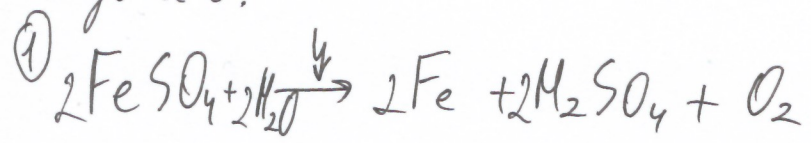


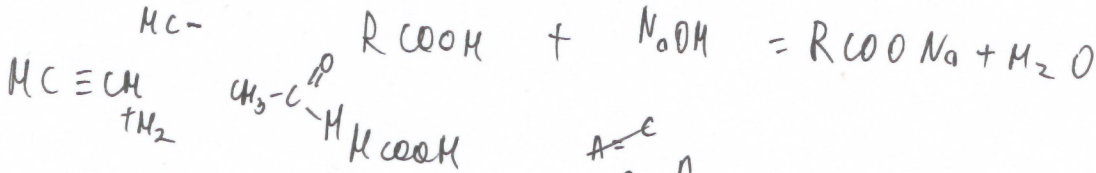
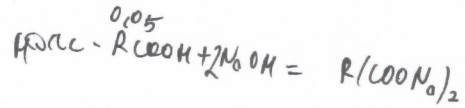
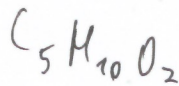
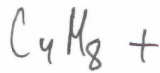
Задача 5

итовик

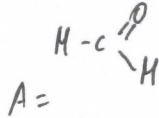


Задание 6.



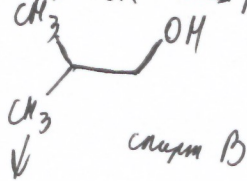
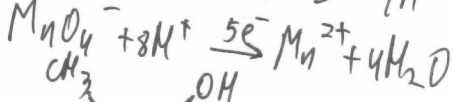
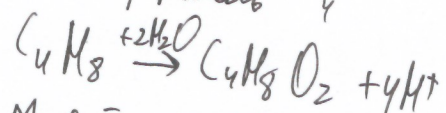
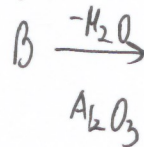


$$K = A e^{-\frac{E_a}{RT}}$$



$$C = \frac{n}{V} = \frac{0,05}{0,05}$$

$$n = 0,05 \cdot 2 = 0,1 \text{ моль}$$



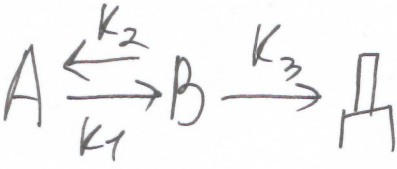
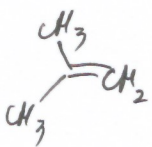
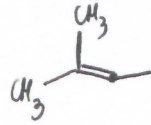
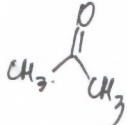
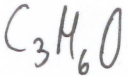
спирт B



$$\frac{\ln(K_1)}{\ln(K_2)}$$

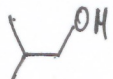
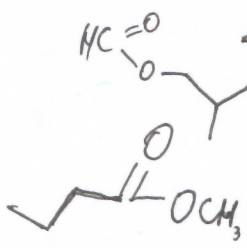
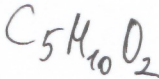
58

42



$$k_1 = k_3$$

$$Q(B \rightarrow D) = 1,5 Q(A \rightarrow B)$$

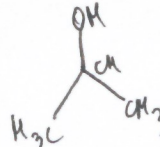
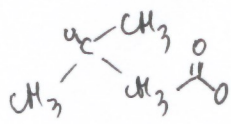
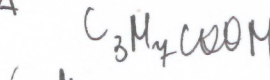
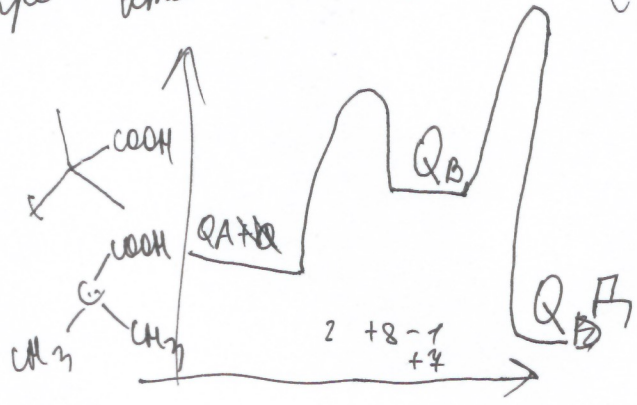


$$w(O) = 36,36\%$$

$$Q(A \rightarrow B) = \frac{2}{3} E_A$$

1 килограмм
премиальный
стандарт C

88



станд.

