

Часть 1

Олимпиада: **Химия 9 класс (1 часть)**

Шифр: **21300908**

ID профиля: **869439**

Вариант 1

Условик 2

$$5) \quad \overset{2}{X} + O_2 = \overset{1}{X} O_2 - 5$$

$$\overset{1}{2X} + 3O_2 = 2\overset{1}{X} O_3 - A$$

✓✓

$$6) \quad \overset{2M}{4X} + O_2 = 2\overset{1}{X}_2 O - A$$

$$2X + O_2 = 2\overset{1}{X} O - 5$$

$$\frac{2X + 16}{X + 32} = 1,289$$

$$2X + 16 = 1,289X + 41,248$$

$$0,771X = 25,248$$

✓ - ✓

$$7) \quad 4X + O_2 = 2\overset{1}{X}_2 O$$

$$X + O_2 = \overset{1}{X} O_2$$

✓✓

$$8) \quad 4X + 3O_2 = 2X_2 O_3$$

$$4X + 5O_2 = 2X_2 O_5$$

✓✓

$$9) \quad \overset{2M}{2X} + O_2 = 2\overset{1M}{X} O$$

$$\overset{2M}{4X} + 5O_2 = 2\overset{1M}{X}_2 O_5$$

$$\frac{2X + 80}{X + 16} = 1,289$$

$$2X + 80 = 1,289X + 20,624$$

$$2) \quad \overset{2M}{4X} + 3O_2 = 2\overset{1M}{X}_2 O_3$$

$$\overset{2M}{X} + O_2 = \overset{1M}{X} O_2$$

$$\frac{2X + 48}{X + 32} = \cancel{1,289} \cdot 1,289$$

$$2X + 48 = 1,289X + 41,248$$

$$0,711X = 6,752$$

$$X = 9,5$$

$$9) \quad 2X + O_2 = X_2 O$$

$$2X + O_2 = 2\overset{1}{X} O$$

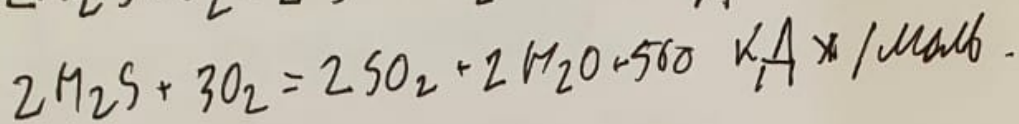
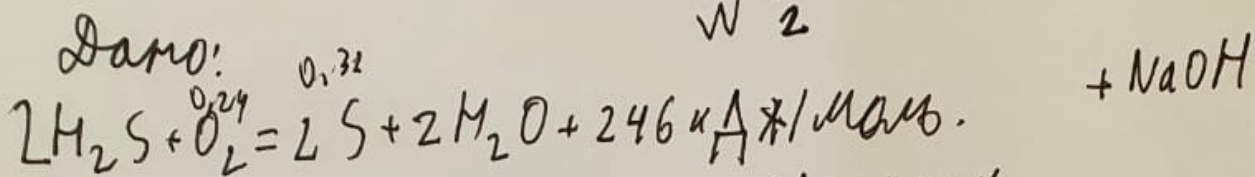
$$\frac{2X + 16}{X + 16} = 1,289$$

$$2X + 16 = 1,289X + 20,624$$

$$0,711X = 4,624$$

$$X = 6,5 - \text{L!} - \checkmark$$

Условие 3 $\sqrt{2}$



$Dim(Bozg) = 1,134$

$Q_{отж} = 192,6 \text{ кДж}$

Решим:

1) $V(H_2S) - ?$

$V(O_2)$

2) $W(H_2O)$

Решим:

I) $M(\text{анем}) =$

$M(Bozg) \cdot D =$

$29 \cdot 1,134 = 32,886$
 г/моль

$32,886 = M(H_2S) \cdot \varphi_1 + M(O_2) \cdot \varphi_2$

$\varphi_2 = 1 - \varphi_1$

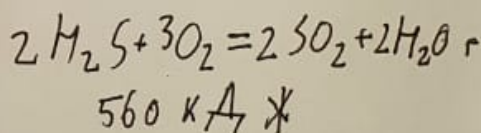
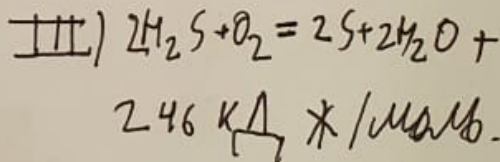
II) $32,886 = 34 \varphi_1 + 32 - 32 \varphi_1$

$2\varphi_1 = 0,886$

$\varphi_1 = 0,443 = \varphi(H_2S)$



$\varphi(O_2) = 0,557$



$2S + O_2 = 2SO_2 = 314 \text{ кДж/моль}$

$S + O_2 = SO_2 = 157 \text{ кДж/моль}$

$\varphi(S) = \varphi(SO_2)$

$192,6 = 157 \cdot \varphi(SO_2) + 246 \cdot \varphi(SO_2)$

$192,6 = 403 \cdot \varphi(SO_2)$

$\varphi(SO_2) = 0,48 = \varphi(S) = \varphi(H_2S) \Rightarrow V(H_2S) = 10,75 \text{ л} \Rightarrow$
 $V(\text{анем}) = 24,27 \text{ л}$

Числов 3 (процентное)

$$V(O_2) = 73,52 \text{ л.}$$

$$\text{молем. } 10,75 \text{ л.}; 13,52 \text{ л.}$$

$$IV) m(S) = 0,12 \cdot 32 = 3,842.$$

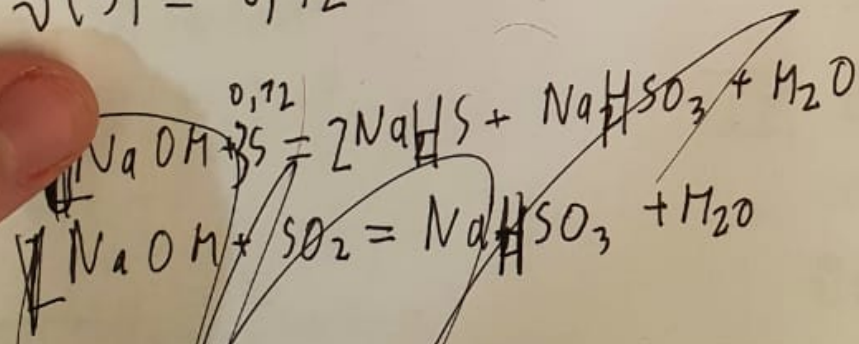
$$m(SO_2) = 0,36 \cdot 64 = 23,04$$

$$m(NaOH) = 125 \cdot 0,16 = 202$$

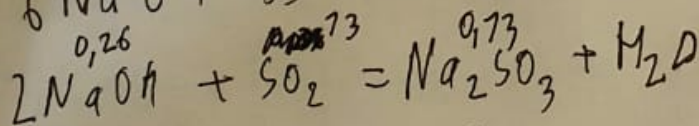
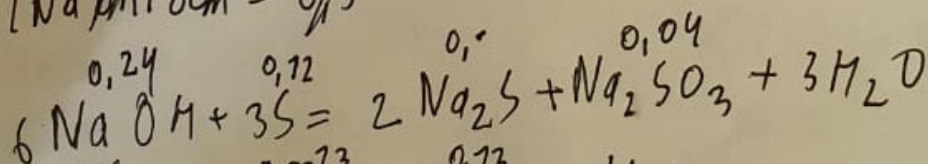
$$V(NaOH) = \frac{20}{40} = 0,5$$

$$V(NaOH) = 0,36$$

$$V(S) = 0,12$$



$$V(NaOH)_{\text{сум}} = 0,5$$



$$\omega(Na_2S) = \frac{0,08 \cdot 78}{125 + 3,84 + 23,04 - 14,72} = 4,6\%$$

$$\omega(Na_2SO_3) = \frac{0,17 \cdot 162,142}{125 + 3,84 + 23,04 - 14,72} = 15,62\%$$

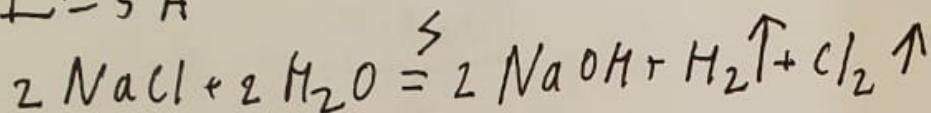
молем. 4,6%? 15,62%

Задача 4

$$m_{\text{ра}} = 500 \text{ г}$$

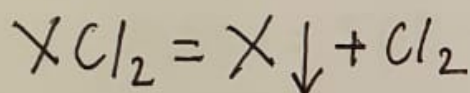
$$\omega(\text{NaCl}) = 5\%$$

$$I = 5 \text{ А}$$



$$\Delta m_{\text{катод}} = 23,62 \text{ г}$$

$$V(\text{Cl}_2) = 13,07 \text{ л}$$



Найти:

$$1) \text{X} - ?$$

$$2) \omega(\text{XCl}_2) - ?$$

$$3) \omega(\text{NaOH}) - ?$$

$$4) V(\text{H}_2) - ?$$

$$5) t - ?$$

$$\text{III)} V(\text{Cl}_2) = 0,365$$

$$\downarrow$$

$$V(\text{ZnCl}_2) = 0,365$$

$$m(\text{ZnCl}_2) = 0,365 \cdot 136 = 49,64$$

$$\omega(\text{ZnCl}_2) = \frac{49,64}{500} \cdot 100 = 9,93\%$$

Решение:

$$\text{I)} m(\text{NaCl}) = 500 \cdot 0,05 = 25 \text{ г}$$

$$V(\text{NaCl}) = \frac{25}{58,5} =$$

$$0,43 \text{ моль} \Rightarrow V(\text{Cl}_2)_1 =$$

$$\frac{0,43}{2} = 0,215 \text{ моль}$$

$$\text{II)} V(\text{Cl}_2)_{\text{одн}} = \frac{13,07}{22,4} =$$

$$0,58 \text{ моль}$$

$$V(\text{Cl}_2)_1 = 0,215 \text{ моль}$$



$$V(\text{Cl}_2)_2 = 0,58 - 0,215 = 0,365 = V(\text{X})$$

$$m(\text{X}) = \Delta m_{\text{кат}} = 23,62$$



$$M(\text{X}) = \frac{23,62}{0,365} = 64,715$$



Условие 5

$$IV) m_{p-pa} = 500 - 23,62 - m(Cl_2) - m(H_2)$$

$$m(Cl_2) = 0,58 \cdot 71 = 41,18$$

$$m(H_2) = \nu(H_2) \cdot 2$$

$$\nu(H_2) = \frac{\nu(NaCl)}{2}$$

$$m(H_2) = \frac{0,43}{2} \cdot 2 = 0,432$$

$$m_{p-pa} = 500 - 23,62 - 41,18 - 0,43 = 434,772$$

$$m(NaOH) = 40 \cdot \nu(NaOH) = 40 \cdot \nu(NaCl) = 40 \cdot 0,43 = 17,22$$

$$\nu(NaOH) = \frac{17,2}{434,77} = 3,96\%$$

$$V) \nu(H_2) = \frac{0,43}{2} = 0,215$$

$$\nu(H_2) = 0,215 \cdot 22,4 = 4,816 \text{ л.}$$

$$VI) \frac{I}{t} = \nu \cdot 96500$$

$$m = K \cdot I \cdot t$$

$$I = \frac{q}{t}$$

$$q = 96500 \cdot \nu$$

$$I = \frac{96500 \cdot \nu}{t}$$

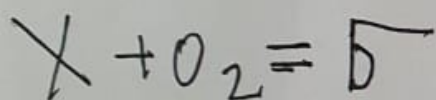
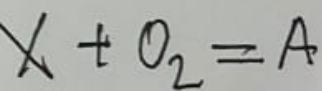
$$t = \frac{96500 \cdot 0,58 - \nu(Cl_2)}{I}$$

$$= 11194 \text{ с} = 3,11 \text{ ч.}$$

Ответ: Zn; 9,93%; 3,96%; 4,816 л; 3,11 ч.

Черновик 1
№ 1

A и B - газы.



$$\nu(X)_{\text{объ}} = \nu(O)_{\text{объ}}$$

$$\frac{A}{B} = 1,289$$

$$\frac{\nu(X+O)}{\nu(\text{мол})} = 3$$

Решение:

$$\nu(X) = \nu(O)$$

$$\frac{\nu(X)_{\text{мол}} + \nu(O)_{\text{мол}}}{\nu(\text{мол})} = 3$$

$$\frac{2 \nu(O)}{\nu(\text{молек})} = 3$$

$$2 \nu(O) = 3 \nu(\text{молек})$$

$$\nu(X) = \nu(O) = 1,5 \nu(\text{молекулы})$$

$$\nu(A) + \nu(B) = \frac{\nu(X) + \nu(O)}{1,5}$$

мемме:

м) =

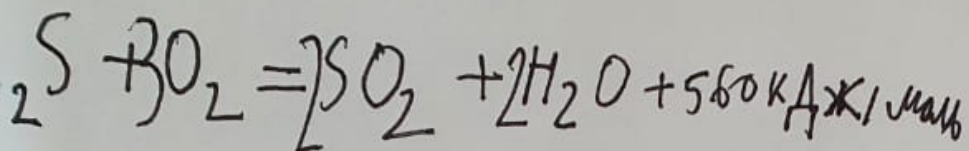
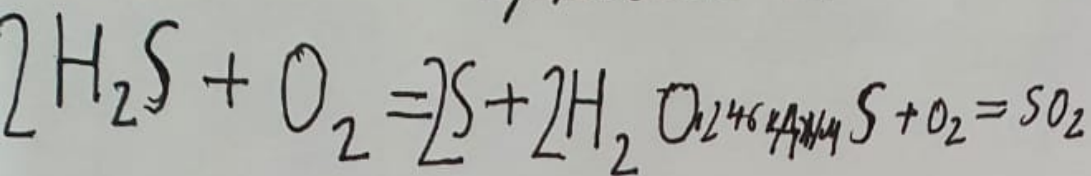
1. D =

34 =

1. малв.

32 | 1-р.

Черновик 2



$$D(\text{возг}) = 1,134$$

$$Q_{\text{обж}} = 192,6$$

Даны:

$$V(\text{H}_2\text{S}) = ?$$

$$V(\text{O}_2) \text{ из.}$$

Решение:

$$M(\text{мем}) =$$

$$M(\text{возг}) \cdot D =$$

$$29 \cdot 1,134 =$$

$$32,886 \text{ г/моль}$$

$$32,886 = 34\varphi_1 + 32(1 - \varphi_1)$$

$$32,886 = 34\varphi_1 + 32 - 32\varphi_1$$

$$0,886 = 2\varphi_1$$

$$\varphi_1 = 0,443 = \varphi(\text{H}_2\text{S})$$

$$\downarrow$$
$$\varphi(\text{O}_2) = 0,557$$

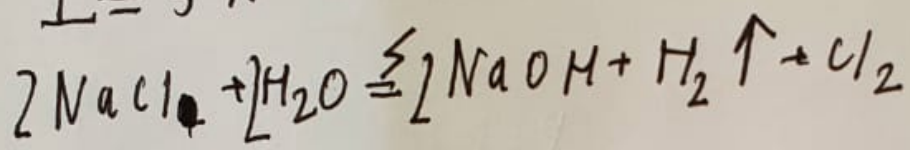
Черновик 3

Дано:

$$m_{\text{р-ра}} = 500 \text{ г}$$

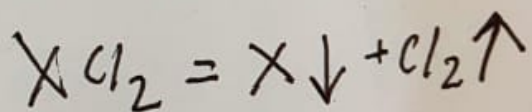
$$\omega(\text{NaCl}) = 5\%$$

$$I = 5 \text{ А}$$



$$\Delta m_{\text{рам}} = 23,62$$

$$V(\text{Cl}_2) = 13,07 \text{ л}$$

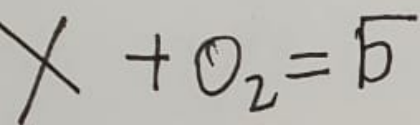
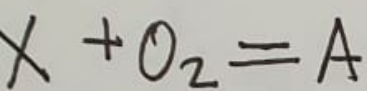


Найти:

X

Условие 1 501

A и B - газы



$$\nu(X)_{ам} = \nu(O)_{ам}$$

$$\frac{\nu(ам)}{\nu(масс)} = 3$$

$$\nu(A) = \nu(B)$$

$$\frac{M(A)}{M(B)} = 1,289 \quad A \xrightarrow{\text{участ}} B + \text{прот. в. в.}$$

Дать:

1) X; A; B - ?

2) или A и B - ?
+ NaOH - ?

3) A $\xrightarrow{\text{учт}}$ B + прот. в. в.

Решение:

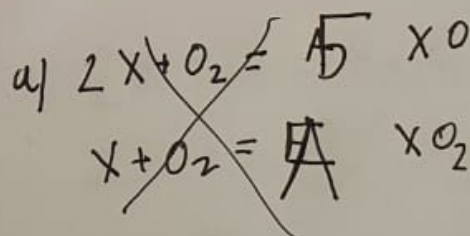
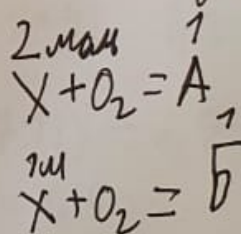
$$I) \frac{\nu(X)_{ам} + \nu(O)_{ам}}{\nu(A) + \nu(B)} = 3$$

$$\frac{2\nu(X)}{2\nu(B)} = 3$$

$$\nu(X) = 3\nu(B)$$

$$II) \text{ пусть } \nu(B) = 1$$

$$\nu(X) = 3 \text{ масс.}$$



$$\begin{aligned} \frac{X+32}{X+16} &= 1,289 \\ X+32 &= 1,289X + 20,624 \\ 11,376 &= 0,289X \\ X &= 39 - K \end{aligned}$$

Часть 2

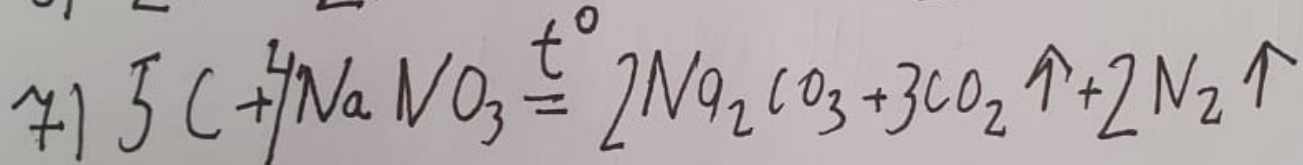
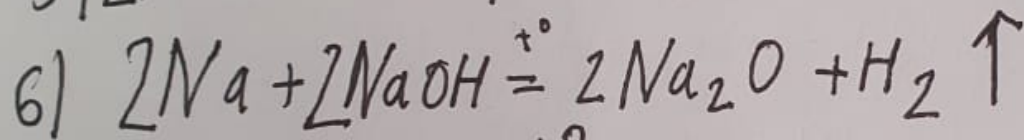
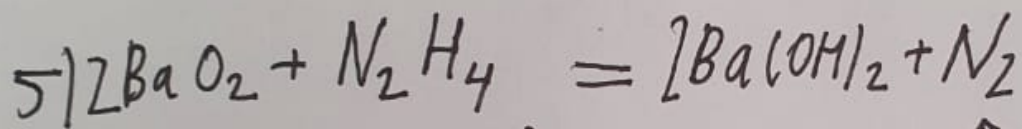
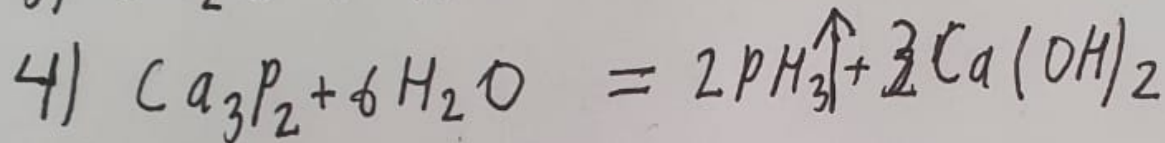
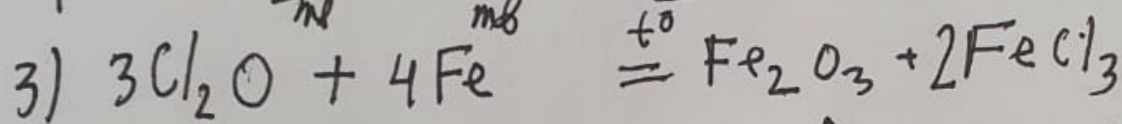
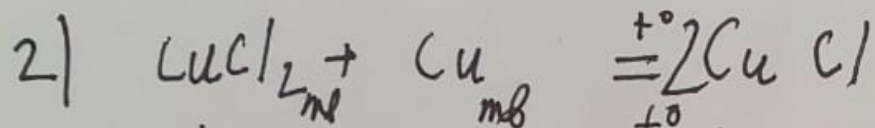
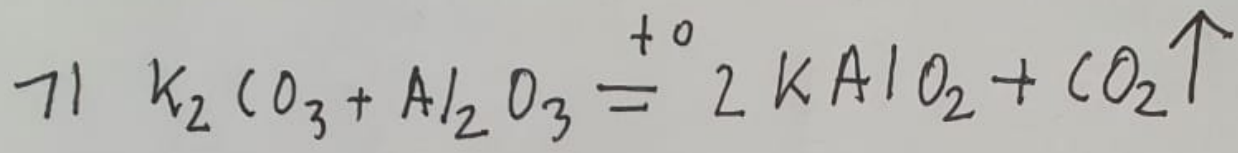
Олимпиада: **Химия 9 класс (2 часть)**

Шифр: **21300908**

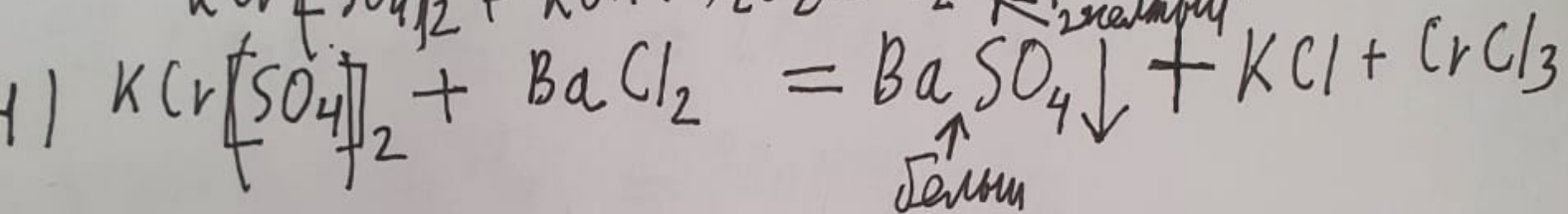
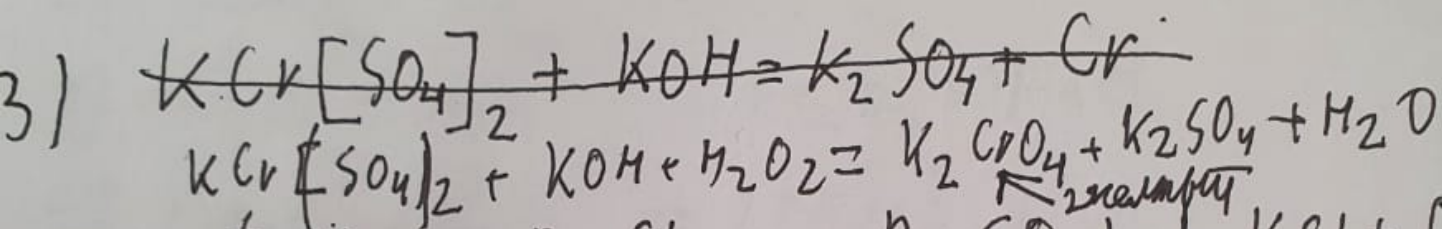
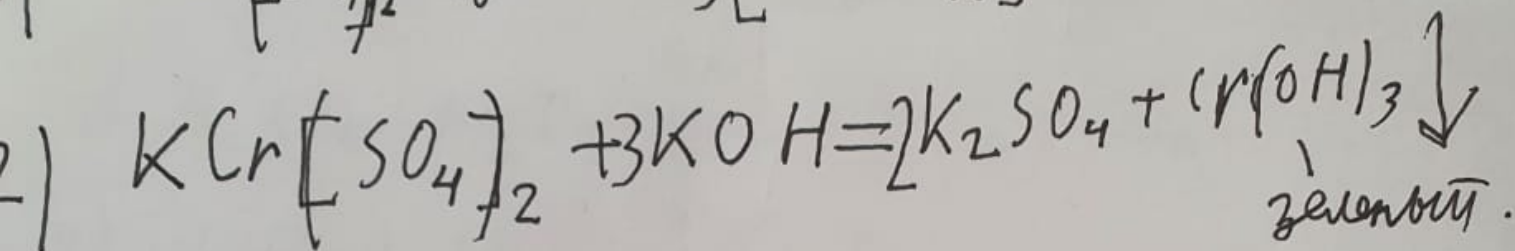
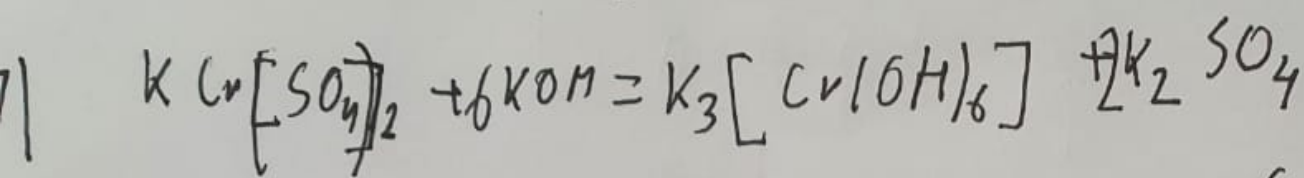
ID профиля: **869439**

Вариант 1

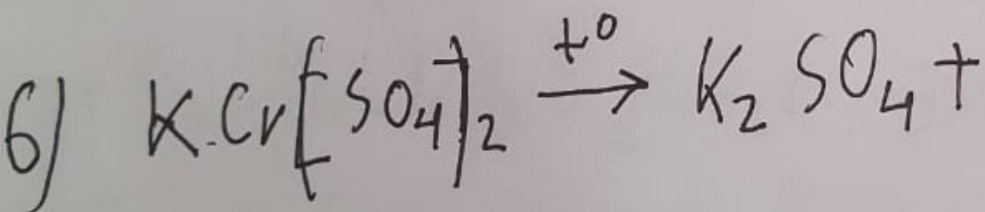
Условие 6.
w⁰₄

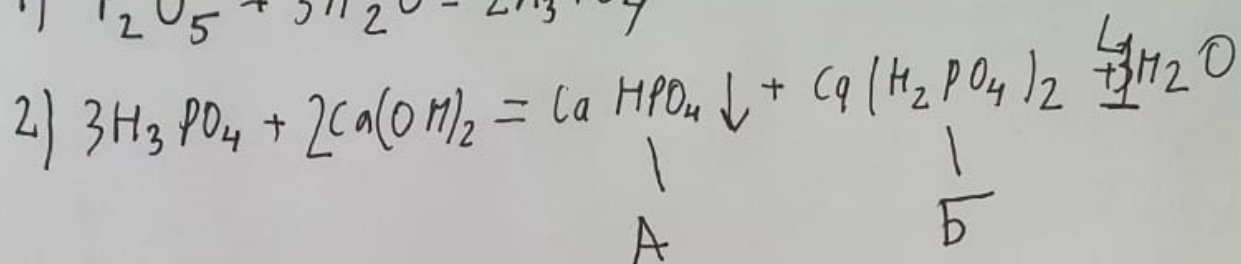


Учетовик 7



5)





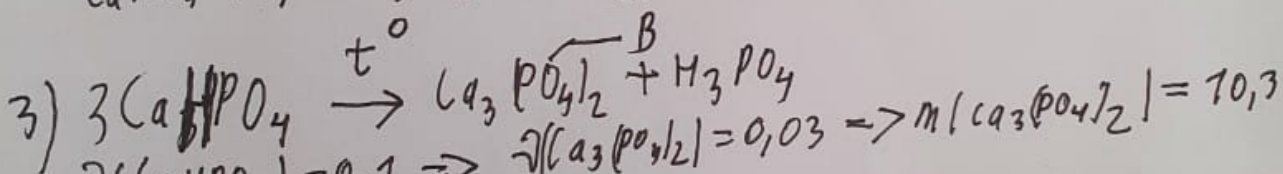
Док. во:

$$\nu(P_2O_5) = \frac{27,3}{142} = 0,15 \Rightarrow \nu(H_3PO_4) = 0,3 \text{ моль.}$$

$$\nu(Ca(OH)_2) = \frac{14,8}{74} = 0,2 \text{ моль.}$$

$$\nu(H_3PO_4) : \nu(Ca(OH)_2) = 0,3 : 0,2 = 3 : 2 \Rightarrow \text{имея продукты}$$

$CaHPO_4$ - морам $\Rightarrow A$; $B - Ca(H_2PO_4)_2$



$$\nu(CaHPO_4) = 0,1 \Rightarrow \nu(Ca_3(PO_4)_2) = 0,03 \Rightarrow m(Ca_3(PO_4)_2) = 10,3$$

$$\text{масса} = \frac{13,6 - 10,3}{136}$$

$$III) \nu(Ca(OH)_2) = 0,2 \text{ моль} \Rightarrow \nu(CaHPO_4) = \nu(CaH_2PO_4)$$

$$= 0,1 \text{ моль.}$$

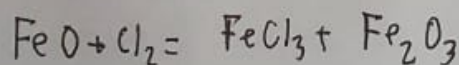
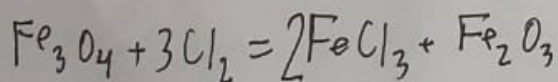
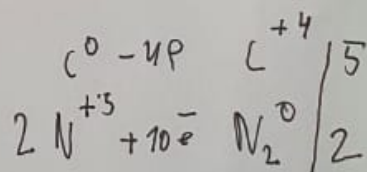
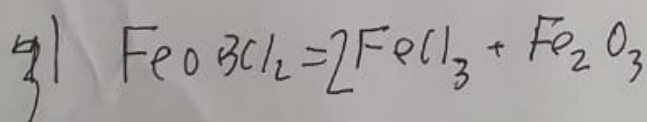
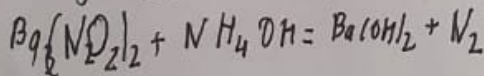
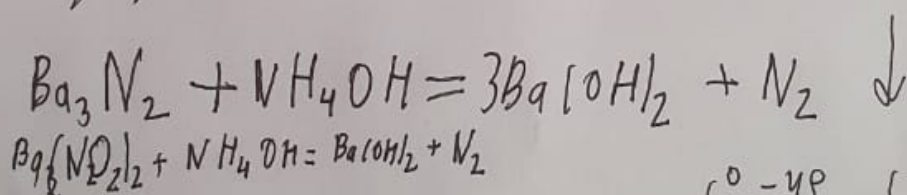
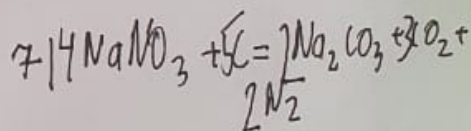
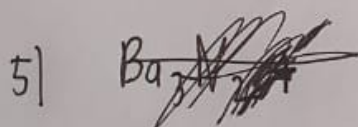
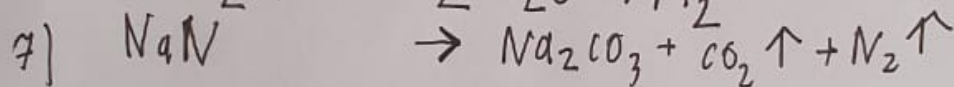
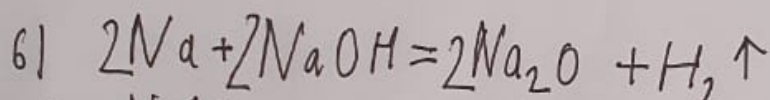
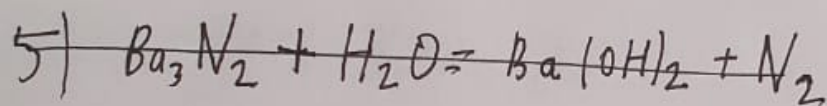
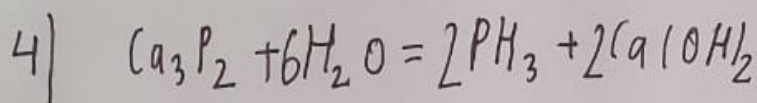
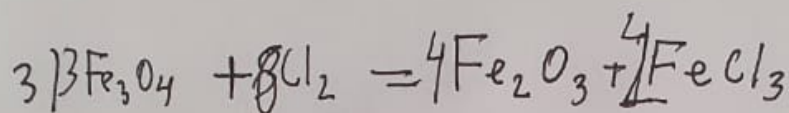
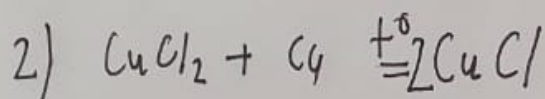
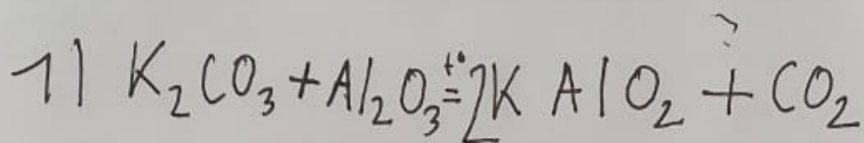
$$m(Ca(H_2PO_4)_2) = 0,1 \cdot 234 = 23,4$$

$$m(CaHPO_4) = 0,1 \cdot 136 = 13,6$$

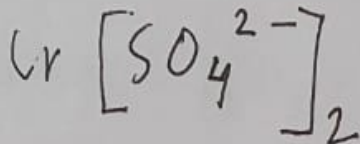
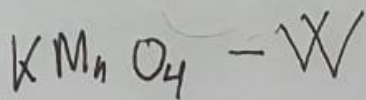
$$\omega(Ca(H_2PO_4)_2) = \frac{23,4}{2002 + 27,3 + 14,8 - 13,6} = \frac{23,4}{222,5} = 10,52\%$$

Ответ: $CaHPO_4$; $Ca(H_2PO_4)_2$; $Ca_3(PO_4)_2$

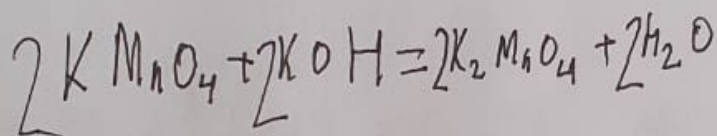
Черновик 4
№ 4



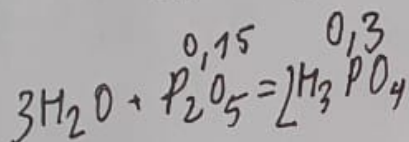
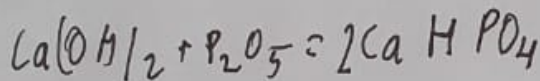
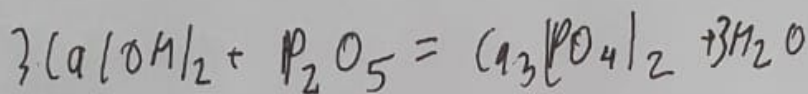
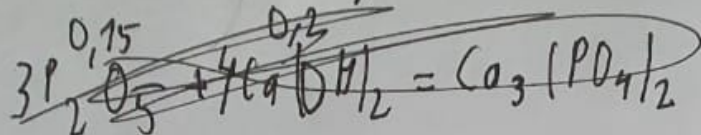
Черновик 5



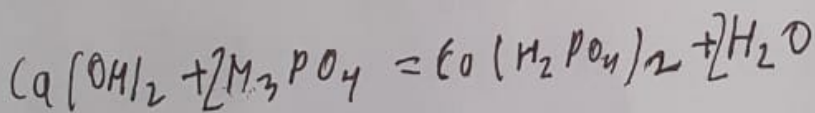
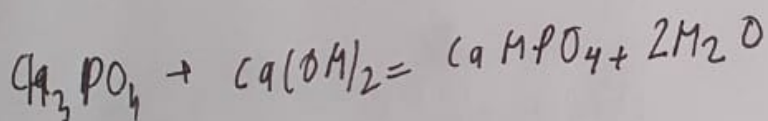
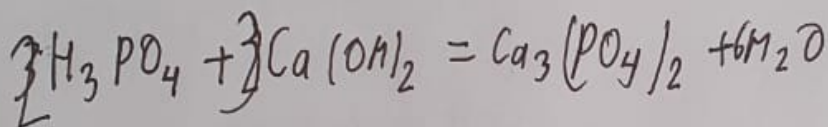
зеленый - Cr^{3+}



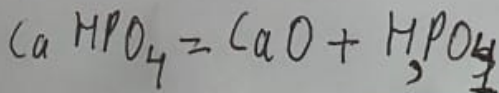
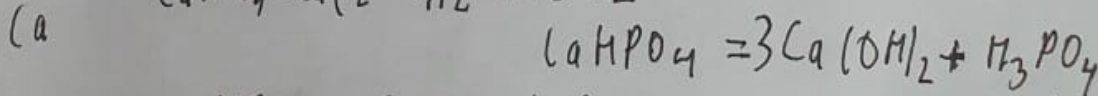
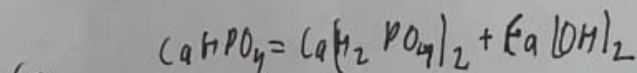
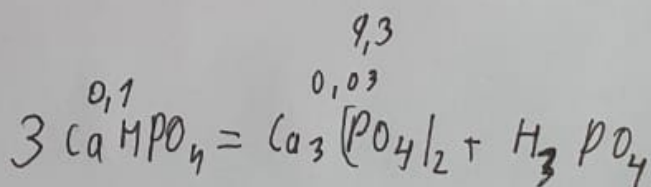
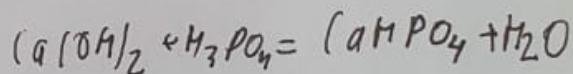
Черновик 6



0,1



$$\frac{12,69968}{13,6} = \frac{12,7}{13,6} =$$



Черновик 7

