

1/2/3/4/5/6/7/8/9/10
6/6/6/8/10/8/12/6/14/14

$\Sigma 905$

Вариант 2
N 1.2

Дано:

$$m_{\text{ср}} = 1000 \text{ г}$$

$$w_{\text{ср}} = 0,8$$

$$w_{\text{ZnO}} = 0,15$$

$$w_{\text{Zn}} = ?$$

$$w_{\text{Zn}} = \frac{V_{\text{Zn(ср)}} \cdot M}{1000 \text{ г}}$$

$$V_{\text{Zn(ср)}} = 1,85 \text{ моль} + 3,846 \text{ моль} = 1,923 \text{ моль}$$

$$= 5,698 \text{ моль}$$

$$w_{\text{Zn}} = \frac{5,698 \text{ моль} \cdot 65,37 \text{ г/моль}}{1000 \text{ г}}$$

$$= 0,37248 = 37,25\%$$

Ответ: 37,25%

Р.

$$m_{\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}} = 1000 \cdot 0,8 = 800 \text{ г}$$

$$V_{\text{ср}} = \frac{800 \text{ г}}{M} = \frac{800 \text{ г}}{(24 + 65 \cdot 2 + 4 \cdot 16 + 190) \text{ г/моль}} =$$

$$V_{\text{Zn}} = 2 V_{\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}} = 3,846 \text{ моль}$$

$$m_{\text{ZnO}} = 1000 \text{ г} \cdot w = 1000 \text{ г} \cdot 0,15 = 150 \text{ г}$$

$$V_{\text{Zn}} = V_{\text{ZnO}} = \frac{m}{M} = \frac{150 \text{ г}}{(65 + 16) \text{ г/моль}} =$$

$$= 1,85 \text{ моль}$$

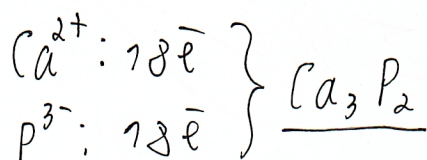
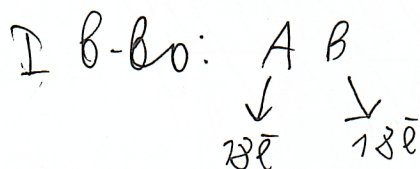
60



СЕЧЕНОВСКИЙ
УНИВЕРСИТЕТ

9 X O 5 7

N 2.2

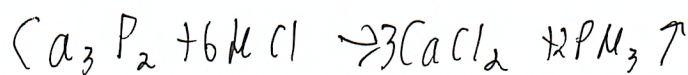


A или B - $75p^+$, тогда A или B - $70p^+$ или $20p^+$

$15p^+$ - фосфор $^{31}_{15}P$ - A или B

$10p^+$ - Ne, не подходит

$20p^+$ - $^{40}_{20}Ca$: A или B



N 4.2

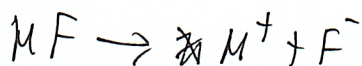
Дано:

$1,55 \mu$ | $0,1 \text{ мМ F}$

$N(\text{ион. мол} + \text{ион.}) = 1,017 \cdot 10^{23}$

α - ?

?
 $UMF = V \cdot C = 1,55 \mu \cdot 0,1 \text{ ммоль/л} = 0,155 \text{ ммоль}$



Пусть распалось $0,155 \cdot \alpha$ молекул MF

Осталось: $0,155 - 0,155 \alpha$

если распалось $0,155 \alpha$ MF, то $UM^+ = UF^- = 0,155 \alpha$

$N(\text{ион. мол} + \text{ион.}) = 1,017 \cdot 10^{23}$; $U = \frac{N}{V_A} = \frac{1,017 \cdot 10^{23}}{6,02 \cdot 10^{23}} = 0,169 \text{ ммоль}$

$(0,155 - 0,155 \alpha) + 0,155 \alpha \cdot 2 = 0,169$

$0,155 + 0,155 \alpha = 0,169$

$0,155(1 + \alpha) = 0,169 \Rightarrow 1 + \alpha = 1,09 \Rightarrow \alpha = 0,09$

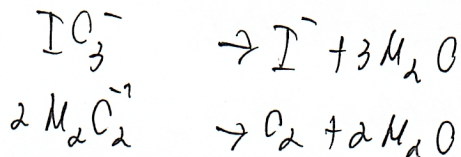
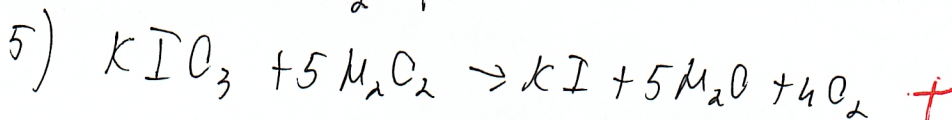
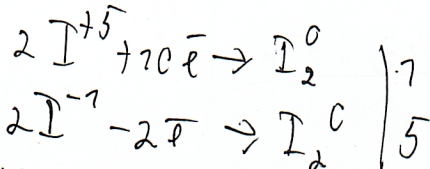
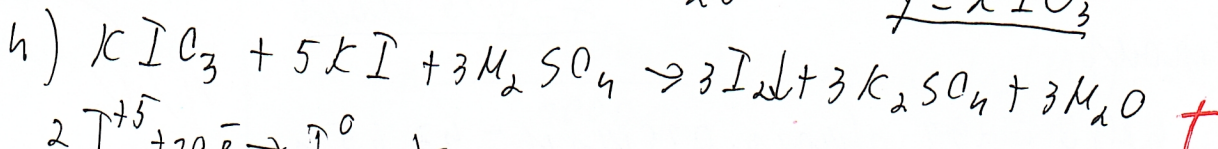
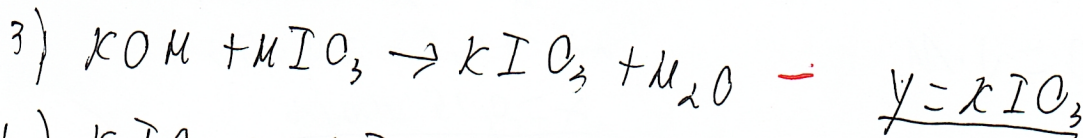
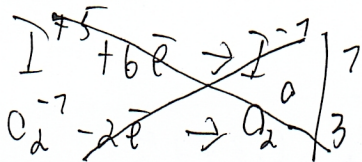
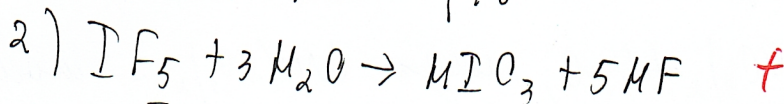
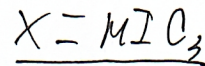
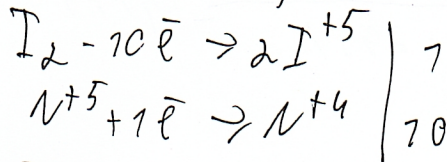
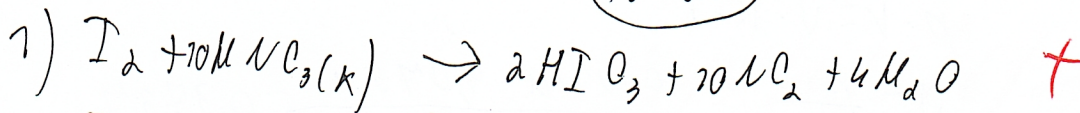
$\alpha = 0,09 = 9\%$ - степень диссоциации



СЕЧЕНОВСКИЙ
УНИВЕРСИТЕТ

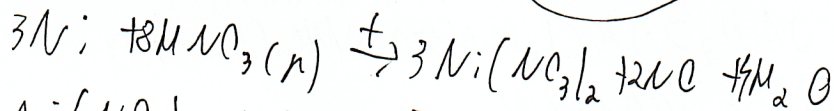
9 X 0 5 7

N 6.2



85.

N 7.2



$Ni(NO_3)_2 \cdot xH_2O$, Пусть было x моль; Тогда м.к. $\frac{m(O)}{m(N)} = 6,857$

$mO = 16 \cdot 76 = 6 \cdot 76 + x \cdot 76 = 76(x + 6)$

$mN = 58 \cdot 74 = 2 \text{ моль} \cdot 74 / \text{моль} = 281$

$\frac{76(x + 6)}{281} = 6,857 \quad | \quad x \sim 6 \Rightarrow Ni(NO_3)_2 \cdot 6H_2O$



СЕЧЕНОВСКИЙ
УНИВЕРСИТЕТ

9 X O 5 7

~~281~~ →

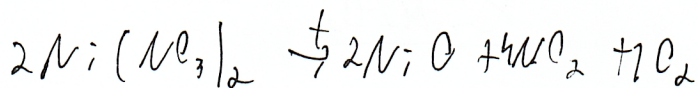
$$V_{\text{газов}} = 9,075 \text{ л}$$

$$t = 22^\circ \text{C} \mid 295 \text{ K}$$

$$p = 101 \text{ кПа}$$

$$p \cdot V = \nu \cdot R \cdot T$$

$$\nu = \frac{p \cdot V}{R \cdot T} = \frac{101 \text{ кПа} \cdot 9,075 \text{ л}}{8,314 \cdot 295 \text{ K}} = 0,3737$$



Пусть было x моль $\text{N}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, тогда $\nu \text{N}_2(\text{NO}_3)_2 = x$ моль

$$\nu(\text{NO}_2) = 2x \text{ моль}; \nu \text{O}_2 = 0,5x \text{ моль}$$

$$\text{И. к. } V_{\text{газов}} = 0,3737, \text{ то: } \nu \text{NO}_2 + \nu \text{O}_2 = 0,3737$$

$$m \text{N}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O} = \nu \cdot M$$

$$2x + 0,5x = 0,3737$$

$$x = 0,15 \text{ моль}$$

$$M = 297 \text{ г/моль}$$

$$m \text{N}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O} = 297 \text{ г/моль} \cdot 0,15 \text{ моль} = 43,65 \text{ г}$$

(N 3.2)

$$20 \text{ л} (\text{N}_2 + \text{NH}_3)$$

$$\nu \text{HCl} = 10 \text{ л}$$

$$\rho_{\text{газ}} = 1,334 \text{ г/л}$$

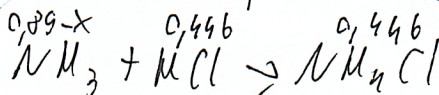
м. у

$$\rho_{\text{газ}}(\text{исх}) - ?$$

Д.

$$\nu (\text{N}_2 + \text{NH}_3) = \frac{V}{V_m} = 0,89 \text{ моль}$$

$$\nu \text{HCl} = 0,446 \text{ моль}$$



Пусть $\nu \text{NH}_3 > \nu \text{HCl}$, тогда $\nu \text{NH}_4\text{Cl} = \nu \text{HCl}$

Пусть было x моль N_2 ; $(0,89-x)$ моль NH_3 ,
прореагировало $0,446$ моль NH_3 , тогда $(0,446-x)$ моль NH_3 остал.

$$\rho_1 = \frac{m}{V_m} = M_1 = V_m \cdot \rho_1 = 22,4 \frac{\text{л}}{\text{моль}} \cdot 1,334 \frac{\text{г}}{\text{л}} = 29,88 \text{ г/моль}$$

$$M = \nu_1 \cdot M_1 + \nu_2 \cdot M_2 + \dots$$



СЕЧЕНОВСКИЙ
УНИВЕРСИТЕТ

9 X O 5 7

(N3.2) - продолжение

В газовой смеси осталось: x моль N_2 ; $(0,444-x)$ моль NH_3
для газов: $\varphi = x$ (x - мольная доля)

$$V_{\text{смеси}} = 0,444 \text{ моль} \Rightarrow x_{N_2} = \frac{x}{0,444}; \quad x_{NH_3} = \frac{0,444-x}{0,444}$$

$$M_{\text{см}} = 29,88 \text{ г/моль} = M_{N_2} \cdot x_{N_2} + M_{NH_3} \cdot x_{NH_3}$$

$$29,88 \text{ г/моль} = 28 \text{ г/моль} \cdot \frac{x}{0,444} + 17 \text{ г/моль} \cdot \frac{0,444-x}{0,444}$$

$$29,88 \text{ г/моль} = 63,06x + 38,29(0,444-x)$$

$$29,88 - 38,29 \cdot 0,444 = 63,06x - 38,29x$$

$$12,88 = 24,77x \quad | \quad x = 0,52 = V_{N_2}$$

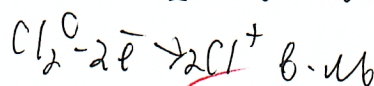
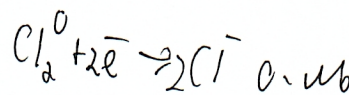
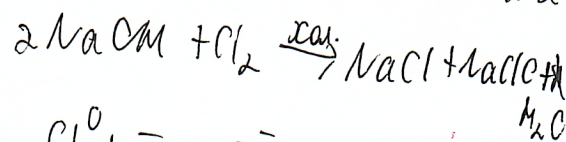
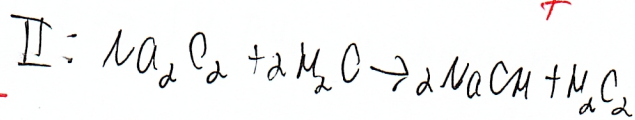
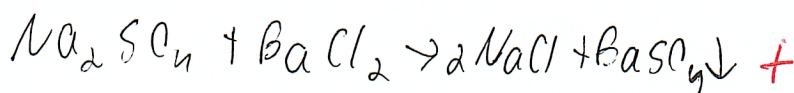
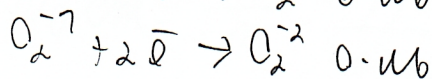
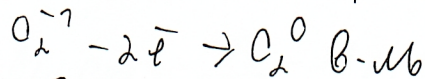
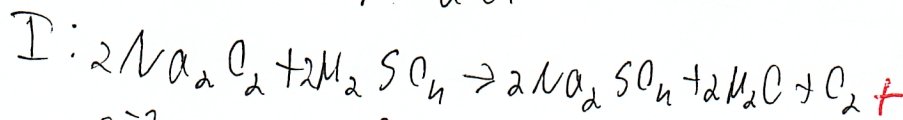
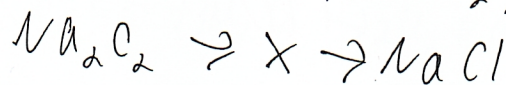
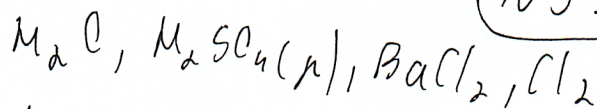
$$x_{N_2} = \frac{0,52 \text{ моль}}{0,89 \text{ моль}} = 0,58 \text{ моль} = \varphi_{N_2}$$

$$x_{NH_3} = 1 - 0,58 = 0,42 = \varphi_{NH_3}$$

мол. смеси.

80

(N5.2)



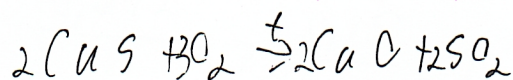
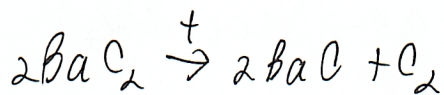
100



СЕЧЕНОВСКИЙ
УНИВЕРСИТЕТ

9 10 5 7

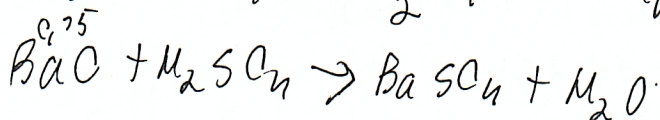
19.2



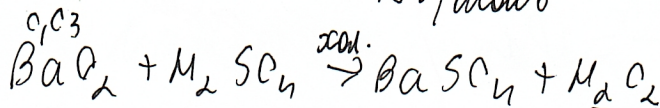
$$\frac{V_{\text{CuS}}}{2} = \frac{V_{\text{O}_2}}{3} \quad \left| \quad V_{\text{O}_2} = \frac{V_{\text{CuS}} \cdot 3}{2} \right| \quad V_{\text{CuS}} = \frac{m}{n} = \frac{4,81}{(64+32)/1/\text{моль}} = 0,05 \text{ моль}$$

$$V_{\text{O}_2} = 0,075 \text{ моль}$$

$$\frac{V_{\text{BaC}_2}}{2} = \frac{V_{\text{O}_2}}{2} = \frac{V_{\text{BaO}}}{2} \quad \left| \quad V_{\text{BaC}_2} (\text{разложили}) = 0,15 \text{ моль} = V_{\text{BaO}} (\text{одн.}) \right|$$



$$V_{\text{M}_2\text{SO}_4} = \frac{m}{n} = \frac{m_{\text{грав.}} \cdot \omega}{931/\text{моль}} = 0,18 \text{ моль} \quad \left| \quad \text{было } 0,15 \text{ моль BaO} \Rightarrow 0,03 \text{ моль BaC}_2 \text{ осталось} \right|$$



Ит. к. разложились $0,15$ моль BaC_2 ; осталось $0,03$ моль BaO , то было $0,18$ моль BaC_2

$$\alpha = \frac{V_{\text{разл.}}}{V_{\text{обш.}}} = \frac{0,15 \text{ моль}}{0,18 \text{ моль}} = 0,8333 = 83,33\%$$

145



№ 10.2

3.

$$m = 72,25 \text{ г}$$

$$\omega_{\text{Cl}} = 28,98\%$$

$$\omega_{\text{K}} = 37,84\%$$

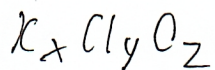
$$\omega_{\text{P}} = 3,72\%$$

$$\omega_{\text{O}} = 39,78\%$$

$$m_{\text{гидрат}} = 120 \text{ г}$$

$$\omega = 0,05$$

Иногда - ?



$$m_{\text{Cl}} = m_{\text{гидрат}} \cdot \omega_{\text{Cl}} = 3,55 \text{ г}$$

$$m_{\text{K}} = 3,91 \text{ г}$$

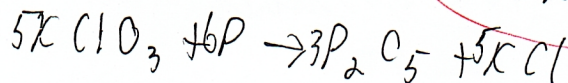
$$m_{\text{O}} = 4,81 \text{ г}$$

$$x : y : z = \nu_{\text{K}} : \nu_{\text{Cl}} : \nu_{\text{O}} = \frac{m_{\text{K}}}{M_{\text{K}}} : \frac{m_{\text{Cl}}}{M_{\text{Cl}}} : \frac{m_{\text{O}}}{M_{\text{O}}} =$$

$$= \frac{3,91}{39 \text{ г/моль}} : \frac{3,55}{35,5 \text{ г/моль}} : \frac{4,81}{16 \text{ г/моль}} = 0,1 : 0,1 : 0,3 = 1 : 1 : 3$$

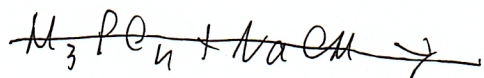
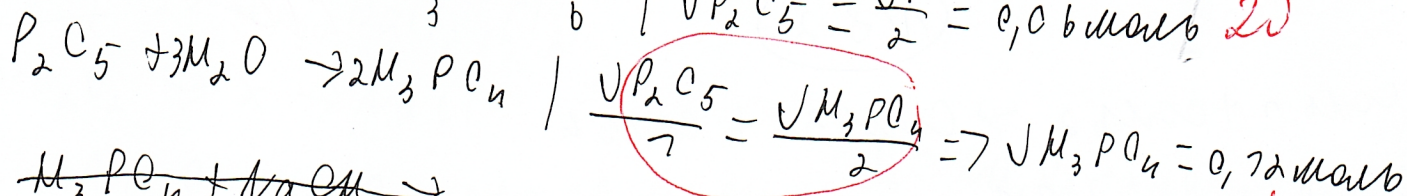


$$\nu_{\text{P}} = \frac{m_{\text{P}}}{M} = \frac{3,72 \text{ г}}{31 \text{ г/моль}} = 0,12 \text{ моль}$$



$$\frac{\nu_{\text{KClO}_3}}{5} = \frac{\nu_{\text{P}}}{4} \quad \left| \quad \nu_{\text{KClO}_3} = \frac{m}{M} = \frac{72,25 \text{ г}}{(39 + 35,5 + 16 \cdot 3) \text{ г/моль}} = 0,1 \text{ моль}$$

$$\frac{0,1}{5} = \frac{0,12}{4} \Rightarrow \frac{\nu_{\text{P}_2\text{O}_5}}{3} = \frac{\nu_{\text{P}}}{4} \quad \left| \quad \nu_{\text{P}_2\text{O}_5} = \frac{\nu_{\text{P}}}{2} = 0,06 \text{ моль} \quad 25$$



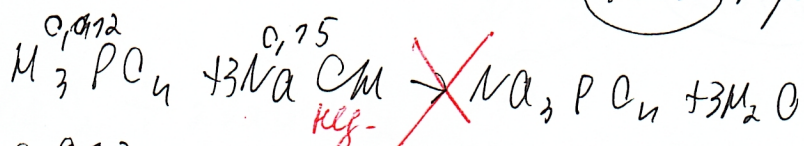
$$\nu_{\text{NaOH}} = \frac{m}{M} = \frac{m_{\text{гидрат}} \cdot \omega}{40 \text{ г/моль}} = 0,15 \text{ моль} \quad 25$$



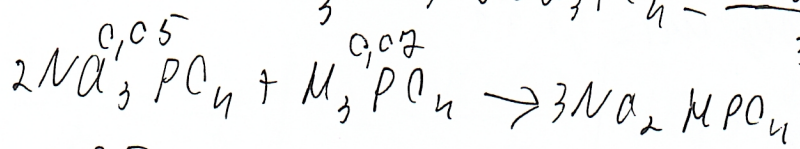
СЕЧЕНОВСКИЙ
УНИВЕРСИТЕТ

9 X O S Z

10.2 пр-е



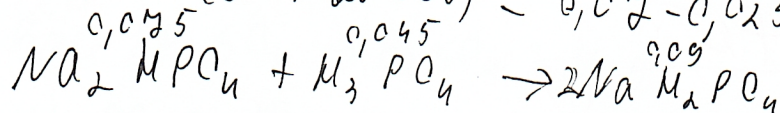
$$\frac{0,012}{1} > \frac{0,15}{3} \Rightarrow V_{Na_3PO_4} = \frac{V_{NaOH}}{3} = 0,05 \text{ моль} \quad (0,07 \text{ моль } M_3PO_4 \text{ осталось})$$



$$\frac{0,05}{2} < \frac{0,07}{2} \Rightarrow V_{Na_2MPO_4} = \frac{V_{Na_3PO_4}}{2} \cdot 3 = 0,075 \text{ моль}$$

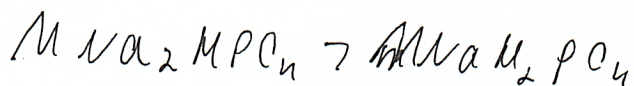
$$V_{M_3PO_4}(\text{прореаг.}) = \frac{0,05}{2} = 0,025$$

$$V_{M_3PO_4}(\text{осталось}) = 0,07 - 0,025 = 0,045$$



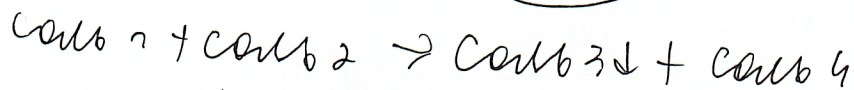
$$V_{Na_2MPO_4}(\text{осталось}) = 0,075 - 0,045 = 0,03 \text{ моль}$$

$$V_{NaM_2PO_4} = 0,09 \text{ моль}$$

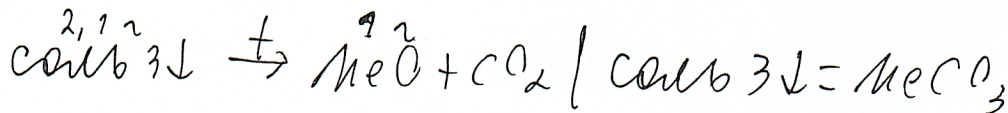
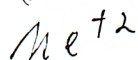


$$m_{Na_2MPO_4} = V \cdot M = 0,03 \text{ моль} \cdot (23 \cdot 2 + 7 + 31 + 16 \cdot 4) = 4,26 \text{ г}$$

10.2



$$n(\text{соль 3} \downarrow) = 2,71$$



$$V_{MeCO_3} = V_{MeO} \quad ; \quad \frac{2,71}{M(Me) + 16 + 31 + 12} = \frac{1}{M(Me) + 16} \quad | \quad x + 60 = 2,71x + 33,6$$

$$\text{Пусть } M(Me) = x \text{ г/моль}$$

$$2,71x = 26,4$$

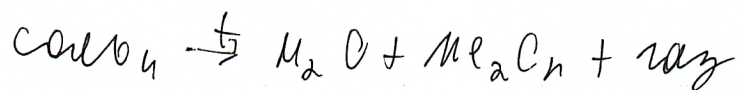
$$x = 24 \text{ г/моль}$$

$$Me = Mg + 35$$

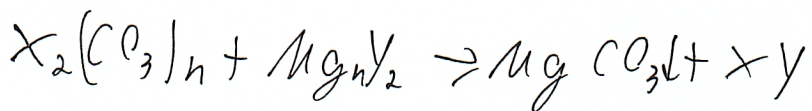


СЕЧЕНОВСКИЙ
УНИВЕРСИТЕТ

9 X 0 5 7

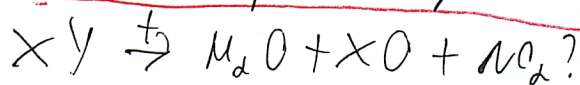


$$V_{\text{M}_2\text{O}} : V_{\text{газ}} = 2 : 7$$

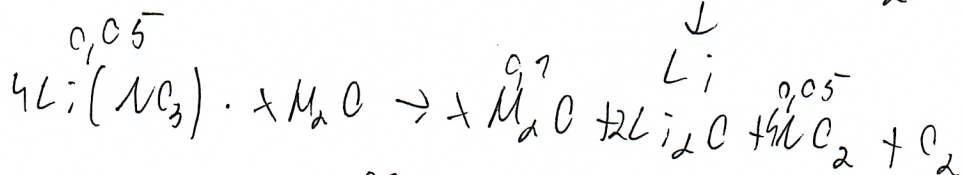
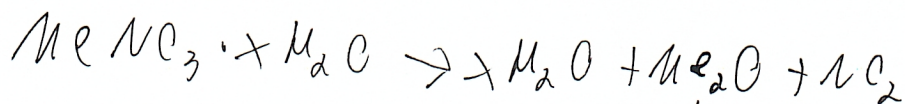


Mg_nY_2 — растворим | $\text{Y} \in [\text{Cl}^-, \text{Br}^-, \text{I}^-, \text{HS}^-, \text{HSO}_3^-, \text{SO}_4^{2-}, \text{NO}_3^-, \text{NO}_2^-, \text{PO}_4^{3-}]$

$x_2(\text{CO}_3)_n$ — растворим | x — целочисл. ме или Mg^{2+} .



$$V_{\text{M}_2\text{O}} = \frac{m}{M} = 0,7 \text{ моль} \Rightarrow V_{\text{CO}_2} = 0,05 \text{ моль}$$



$$m \text{ Li}(\text{CO}_3) \cdot x\text{M}_2\text{O} = 4 \text{ г} / V = 0,05 \text{ моль}$$

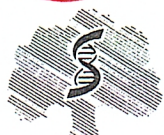
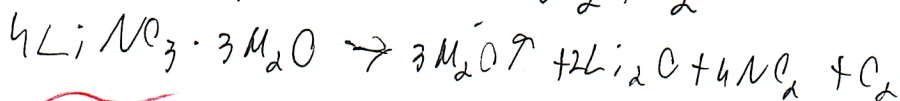
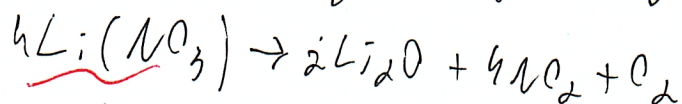
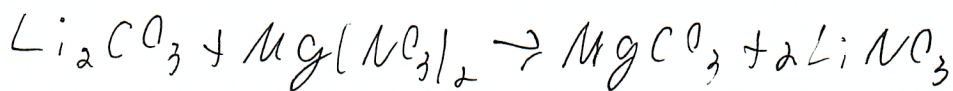
$$m\text{M}_2\text{O} = 4 - 0,05 \cdot (7 + 14 + 16 \cdot 7) = 0,55$$

$$V_{\text{M}_2\text{O}} = 0,0306 \text{ моль}$$

$$78x =$$

$$\frac{0,05}{7} \neq \frac{0,0306}{x}, \text{ как целые}$$

$$0,0306 = 0,05 \cdot n \cdot x / x = 3$$



СЕЧЕНОВСКИЙ
УНИВЕРСИТЕТ

9 X O 5 7

± 60