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(64.18)



МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ  
имени М.В.ЛОМОНОСОВА

Вариант 2

Место проведения Москва  
город

ПИСЬМЕННАЯ РАБОТА

Олимпиада школьников по химии  
наименование олимпиады

по химии  
профиль олимпиады

Данилова Данила Самандовича  
фамилия, имя, отчество участника (в родительном падеже)

+ 1 лист *М.Хрущ*

*дешифр.*

Дата  
«12» февраля 2023 года

Подпись участника

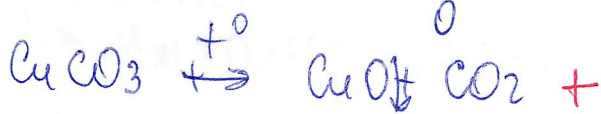
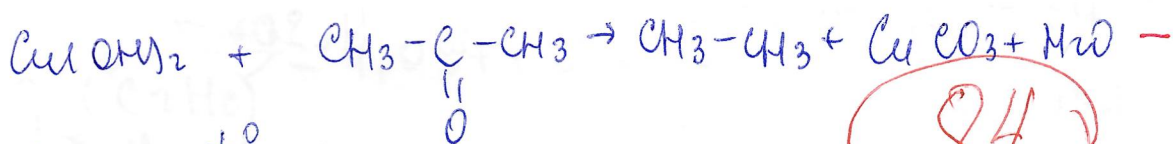
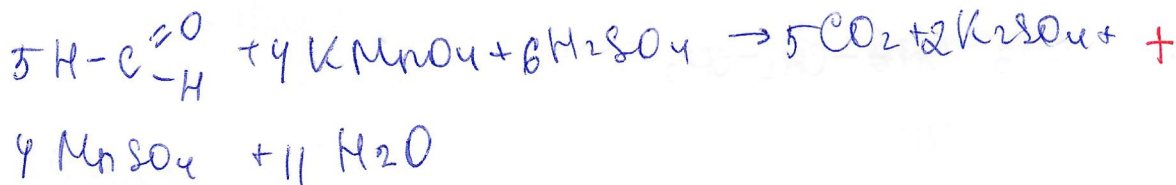
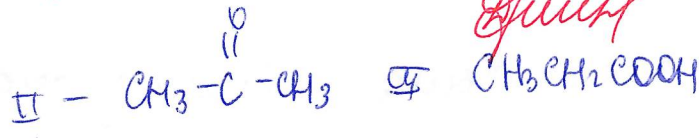
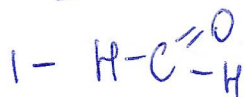
Решение

1	2	3	4	5	6	7	8	Σ
0	8	10	4	14	13	17	18	84

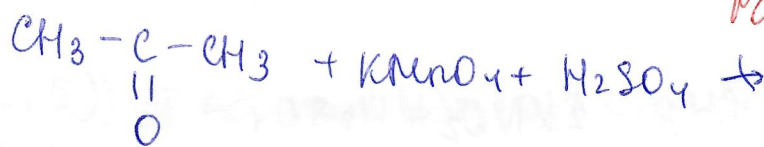
Форм

Тестовик

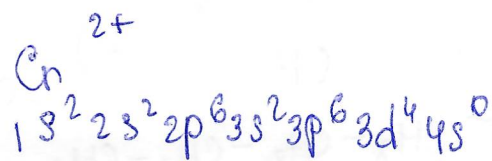
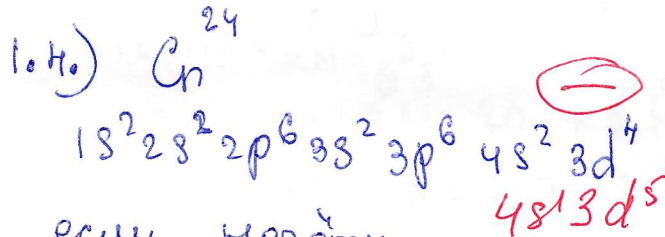
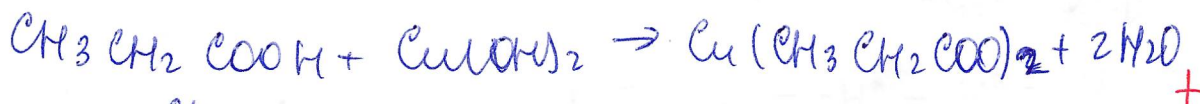
2.1.)



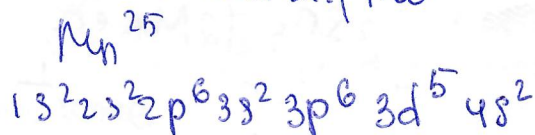
84



во все едгесе не  
генерге



не соответствует  
условию.

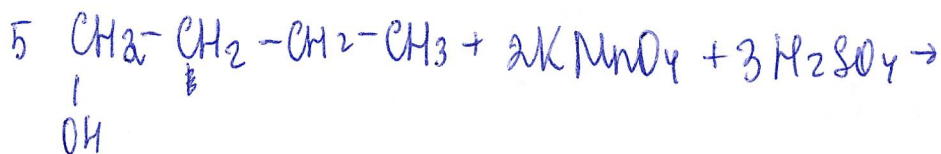
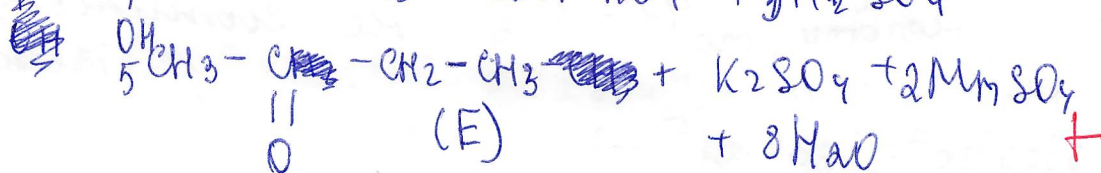
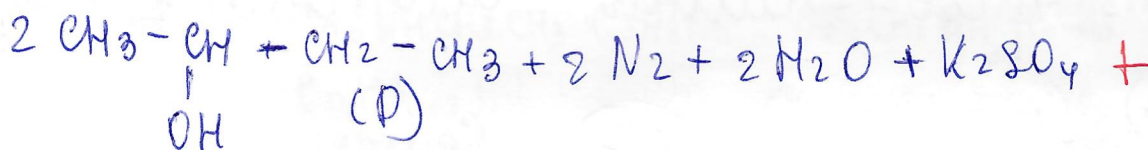
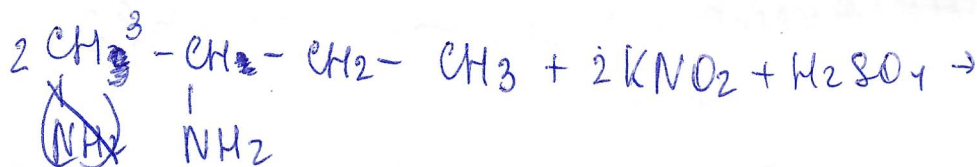
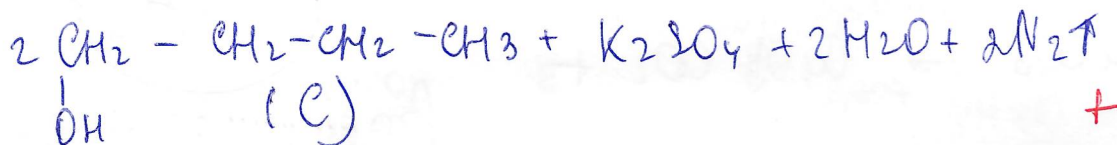
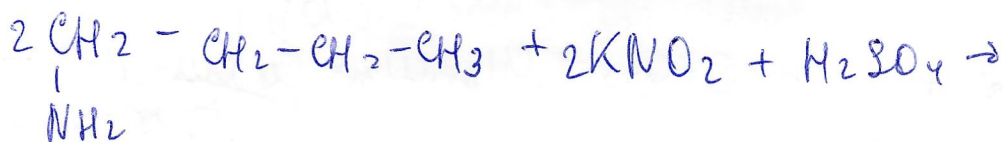
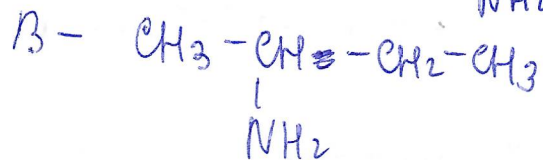
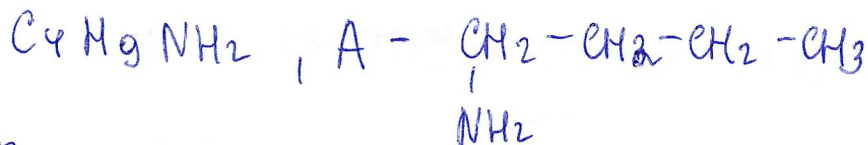


3.6)

Густовик

$$M_n = 2607 \cdot 28 \text{ ммоль} \quad 273 \text{ ммоль}$$

[ смесь была жвншмшврн, тогда это



4.2)

энетовик



$$Q(C_2H_6) = 3 \cdot 285,8 + 2 \cdot 393,5 - 84,7 = 1559,7 \text{ кДж} +$$

$$Q(\text{для } H_2O) = 75,31 \frac{\text{Дж}}{\text{к. моль}} \cdot 347 \text{ К} \cdot 65,5 \text{ моль} = 1.711.683,335 \text{ Дж} -$$

$$V(H_2O) = \frac{11797}{18 \text{ моль}} = 65,5 \text{ моль} \quad \#$$

$$\frac{Q(\text{для } H_2O)}{Q(C_2H_6)} = 1,0974 \text{ моль}$$

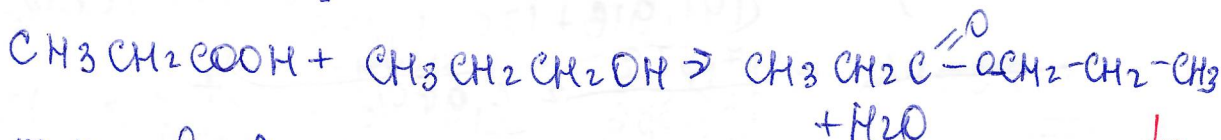
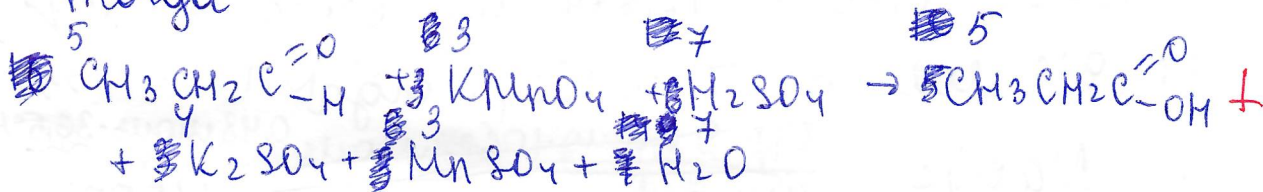
$$pV = \nu RT$$

$$V_2 = \frac{\nu RT}{p} = 25,93 \text{ л} -$$

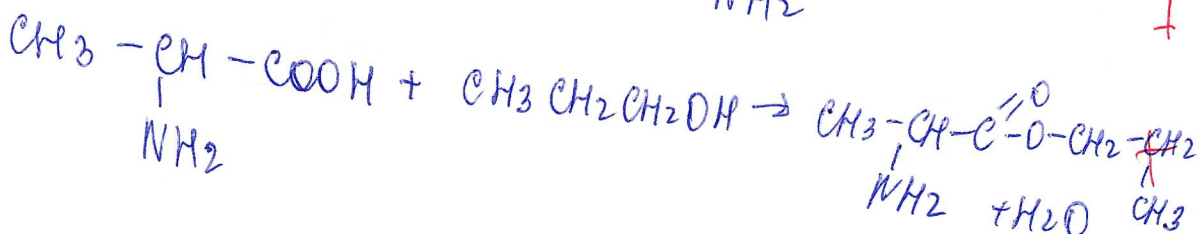
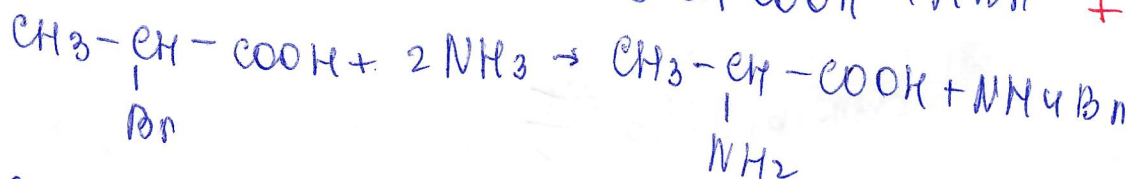
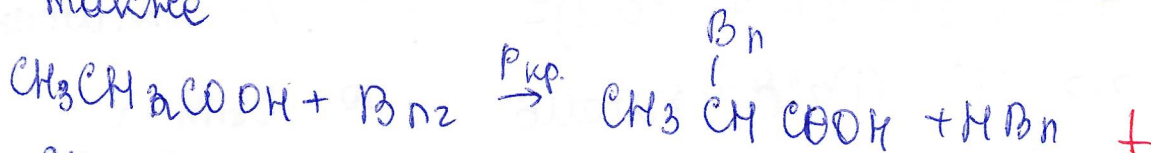


5.5)

т.к.  $w(H) = 10,35\%$  можно догадаться, что А это  $CH_3CH_2C(=O)H$

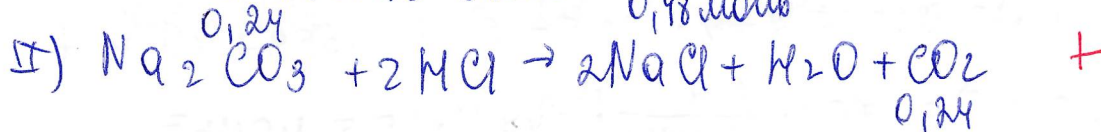
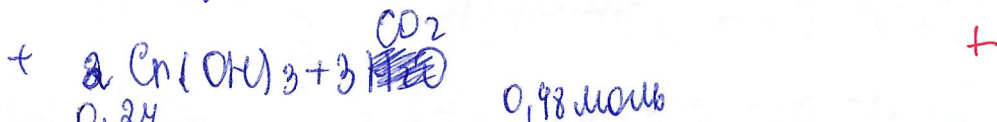


т.к. в А соотношение 3:6:1 и в D также



Эквивалент

6.6.)



$$\frac{21,3}{121,3} = 0,1789 \Rightarrow \text{в р-ре также, тогда}$$

$$\frac{106x}{110,2 + 286x} = 0,1789$$

$$54,835x = 19,714$$

$x = 0,359$  моль, так как соотношение

$\text{CO}_2 : \text{CO}_2 = 1 : 1 \Rightarrow$  это во II р-ции

было вложено в 2 раза ↑  $\text{Na}_2\text{CO}_3 \Rightarrow$

$$110,2 + 286 \cdot 0,359 = 212,874 \text{ мл-всего} \Rightarrow$$

141,916 мл во II колбе, тогда

$$w(\text{NaCl}) = \frac{0,119 \text{ моль} \cdot 106,2 \text{ моль} + 0,48 \text{ моль} \cdot 58,5 \text{ моль}}{(141,916 + 120 - 0,239 \cdot 44) \cdot 100\%}$$

$$\frac{10,264\%}{252,356} = \frac{17,522}{252,356} = \underline{6,94\%} \quad +$$

$$V(\text{Na}_2\text{CO}_3) = 0,5 V(\text{HCl}) = \frac{0,359}{3} \cdot 2 = 0,24 \text{ моль}$$

$$\Rightarrow V(\text{NaCl}) = 0,48 \text{ моль}$$

Ответ: 6,94% (+)

не берите  
молярная  
масса.

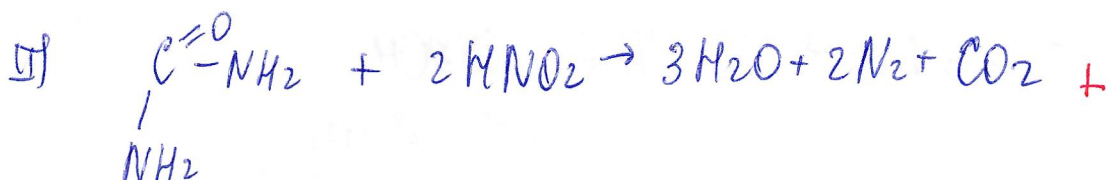
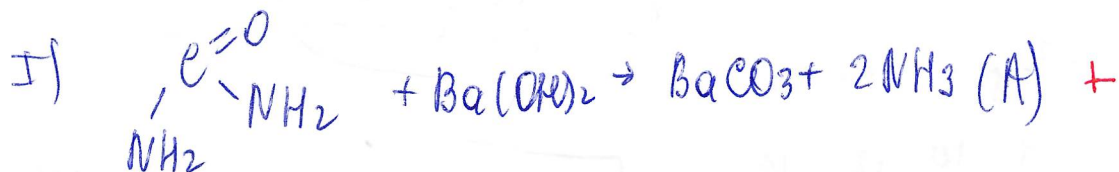
58,5

0,48 моль · 36,5 моль

Задача



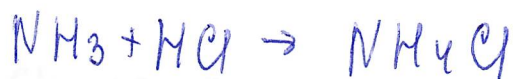
№ 1)



$$1) \quad V(\text{HCl}) = \frac{200 \cdot 1,005}{1000} \approx 0,201 \text{ моль}$$

$$2) \quad \text{по pH } 2,3 \quad 0,201 - 10^{-2,3} = 0,1959 \text{ моль} =$$

$$\text{pH} = -\lg [\text{H}^+] \quad V(\text{NH}_3)$$



так как  $V(\text{N}_2)$  в 2 раза  $\uparrow$   $V(\text{NH}_3) \Rightarrow$

$V(\text{C}_2\text{H}_4\text{N}_2\text{O})$  в 2 раза  $\uparrow$  во II р-ии.

$$V(\begin{array}{c} \text{C}=\text{O} \\ | \quad \backslash \\ \text{NH}_2 \quad \text{NH}_2 \end{array}) \text{ во I к-е} = \frac{0,1959 \text{ моль}}{2} \approx 0,09795 \text{ моль}$$

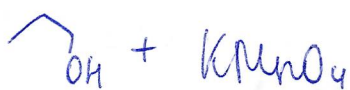
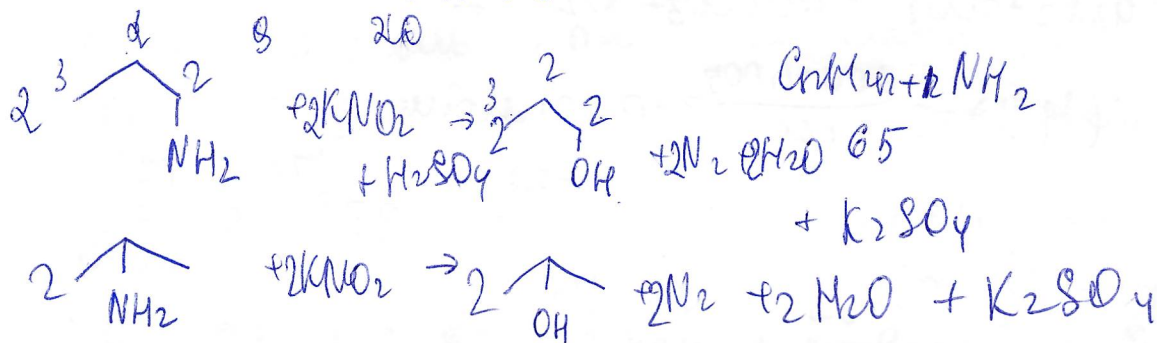
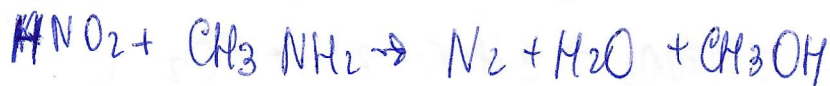
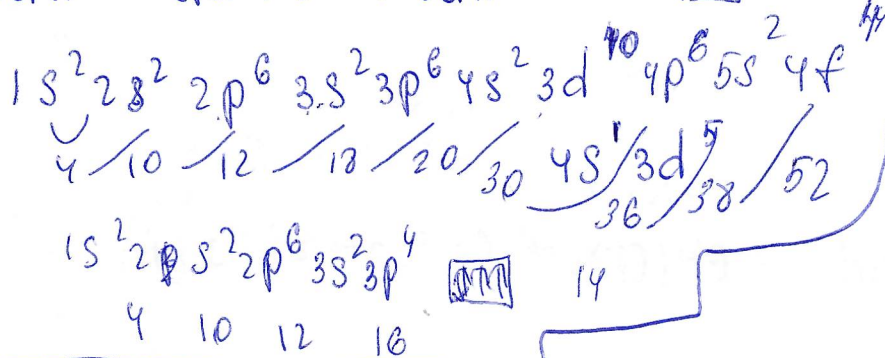
$$V(\begin{array}{c} \text{C}=\text{O} \\ | \quad \backslash \\ \text{NH}_2 \quad \text{NH}_2 \end{array}) \text{ во II к-е} = 0,1959 \text{ моль}$$

$$\text{тогда} \quad c(\begin{array}{c} \text{C}=\text{O} \\ | \quad \backslash \\ \text{NH}_2 \quad \text{NH}_2 \end{array}) = \frac{(0,1959 + 0,09795) \cdot 1000}{130} \approx 2,26 \frac{\text{моль}}{\text{л}}$$

не чистое  $\text{O}_2!$   $\pm$

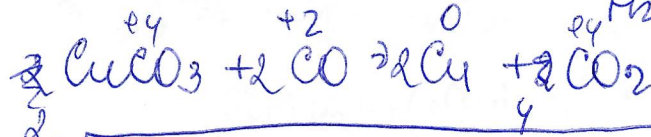
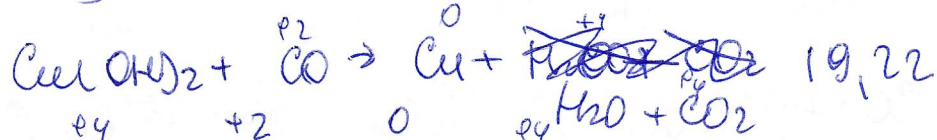
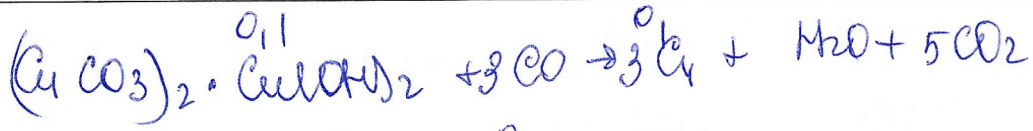
X готн.

осн. сп. ↑ 5 месп.

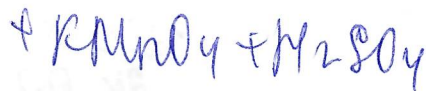
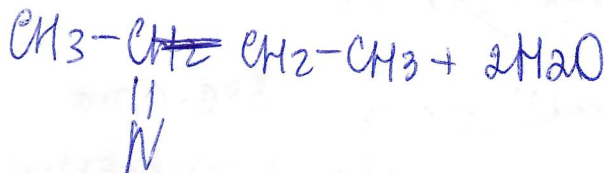
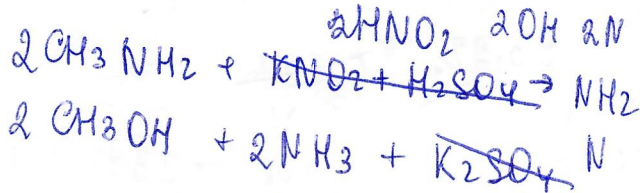
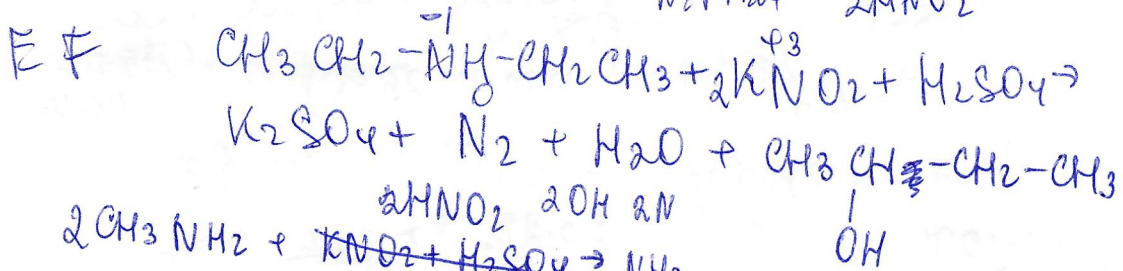
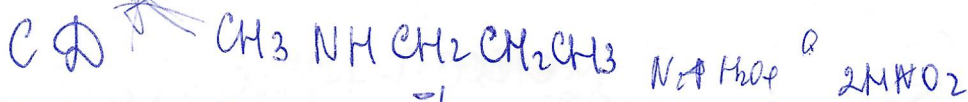
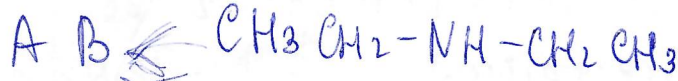


терпидине



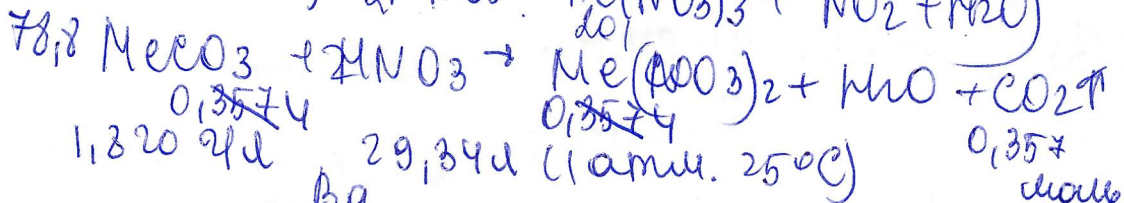
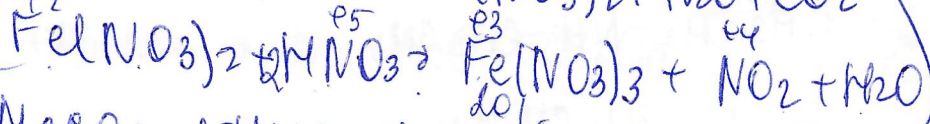
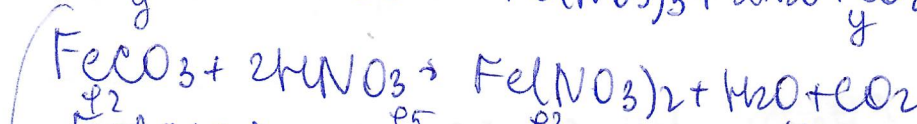
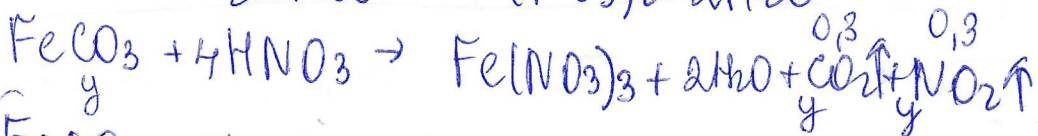
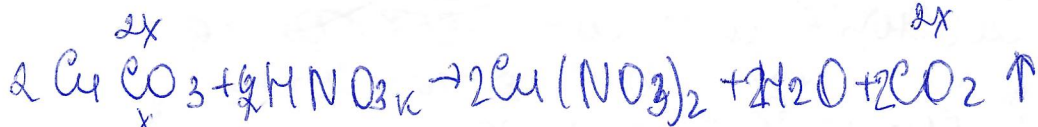
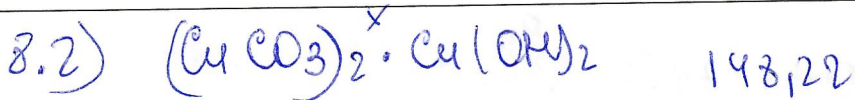


3.6.



гермовин





$\rho V = \nu RT$

$\sqrt{2} \frac{\rho V}{RT} = 1,19 \approx 1,2 \text{ моль}$

0,843

53,4

~~$2x + y = 0,843$   $y = 0,18 - 2x$~~

~~$116y + 346x = 69,4$~~

~~$116(0,18 - 2x) + 346x = 69,4$~~

~~$92,8 - 232x + 346x = 69,4$~~

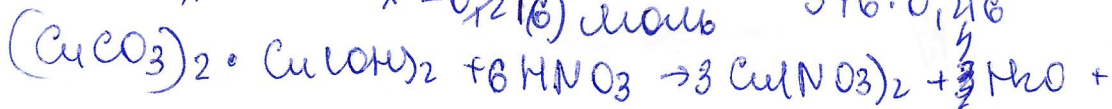
~~$108x = 23,4$~~

~~$x = 0,216 \text{ моль}$~~

~~$y = 0,366 \text{ моль}$~~

~~$116 \cdot 0,366 +$~~

~~$346 \cdot 0,216$~~



$2x + 2y = 0,8$

$x + y = 0,4$

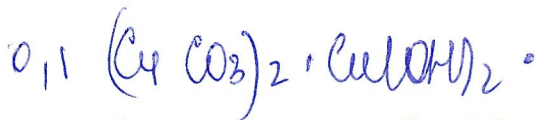
$116y + 346x = 69,4$

$116(0,4 - x)$

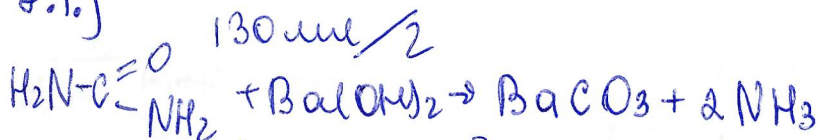
$23 = 230x$

$x = 0,1$

$y = 0,3$



7.1.)



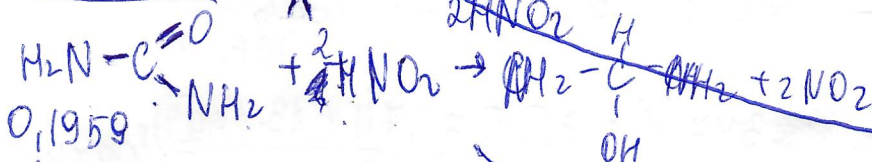
0,201 моль - 20 мм



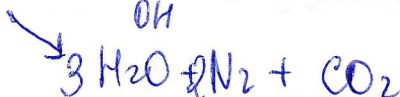
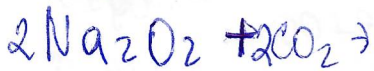
200 мм

1,005 моль

pH = 2,3



0,1959



0,3918

1)  $\sqrt{(\text{HCl})_2}$   $\frac{1,005 - 1,000}{-200} \times 2 = 0,201$  моль

$5 \cdot 10^{-3}$  - pH мм

2) 0,1959 - NH<sub>3</sub>

0,098 моль - в 1 камере

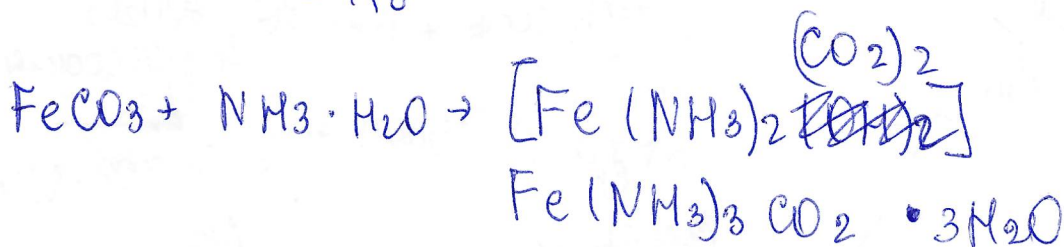
0,1959 моль - во 2 камере

0,2939 - 130

2,26 моль - 1000

$\sum$   $\uparrow$  34,8

34,8



М.2



эрговик

15°C 730 мм.рт.ст.

мен. 75,31 <sup>Дж</sup> моль·К

1,179 м H<sub>2</sub>O  
24-98°C

84,7

393,5

кДж/моль

285,2



3 · 285,2 + 393,5 · 2 - 84,7 · 2 = 1559,7 Q - 1 моль

$\frac{75,31 \text{ Дж}}{\text{моль} \cdot \text{К}}$

$\cdot 347 \text{ К} \cdot 65,5 = \frac{1,711,683,335}{1559,700} = 1,0974$   
моль

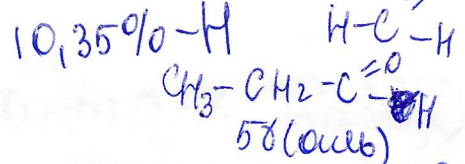
$\frac{pV = \nu RT}{V^2 \frac{\nu RT}{p}} = \frac{2,627,64}{101,325}$

2,6

25,93 л

5.5)

A ацег. 10,35% - H



6,66



53,33

37,2



10,35 = 2nx

12n + 2nx + 16x = 100

16x = 12n

62 - C

24,58 - O

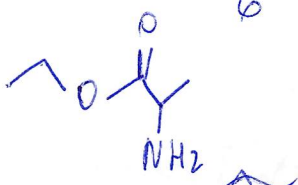
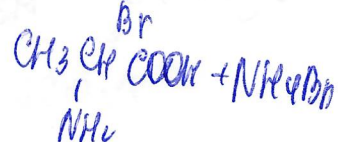
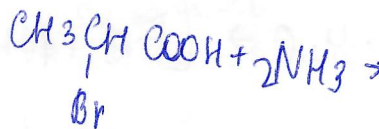
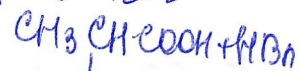
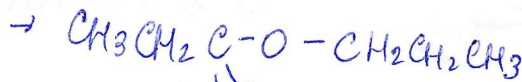
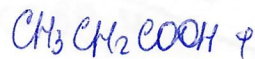


A 10,35 - H



3 : 6 : 1

6 12 2



Z

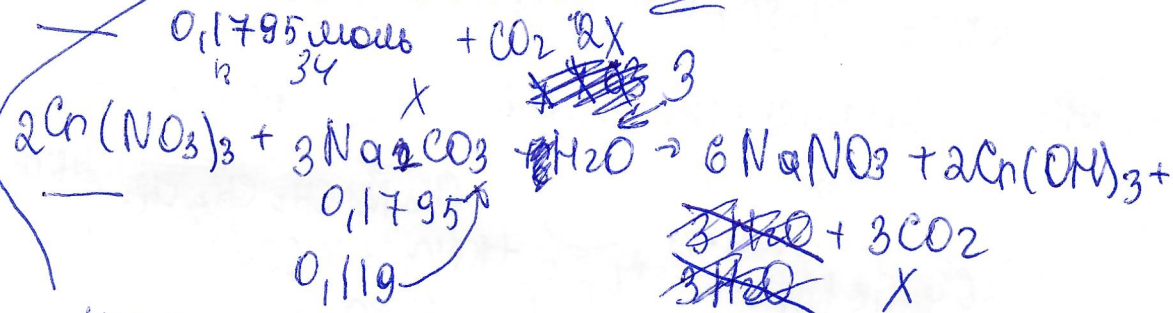
Эрмивик.

В.б. 21,8-100 110,2 мм 20°C  
 $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  +



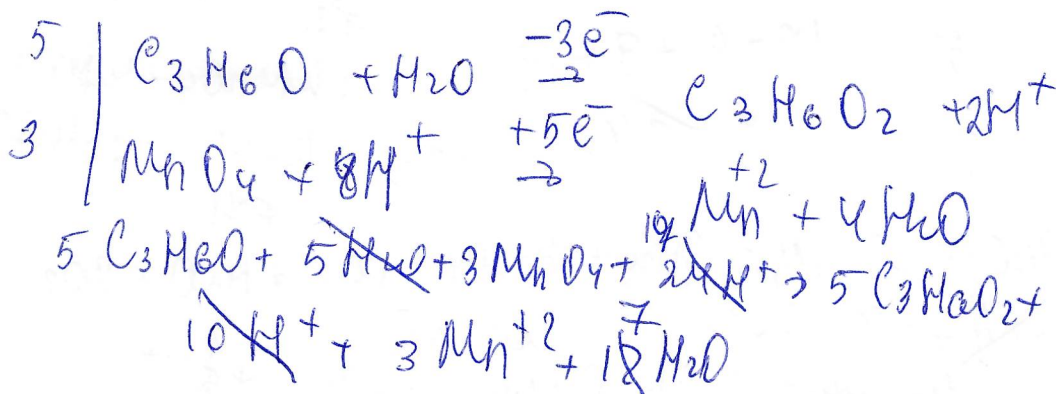
21,8-100 17,89% 106x  
 0,2056 моль  $\frac{110,20 + 180x + 106x}{19,71478 + 32,202x} = 0,1789$   
~~28,30238~~ 51,1654x  
~~212,844~~ 54,835x ~~73,782x~~ 219,7478

3,287  $\downarrow$  2,928 0,239 0,478 X = 0,267 моль  
~~106,437pp~~ ~~119~~ 0,36 моль  
 $2\text{HCl} + \text{Na}_2\text{CO}_3 \rightarrow 2\text{NaCl} + \text{H}_2\text{O}$  0,359 моль



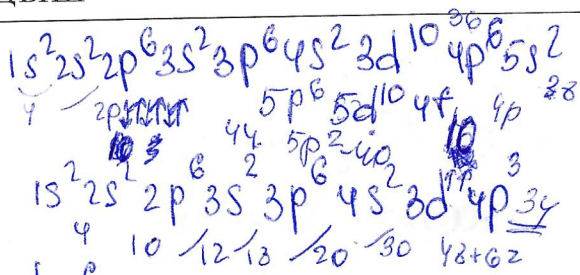
$141,916 + 120 - 0,239 \cdot 44 = 272,432$

$\frac{27,963}{272,432} \cdot 100\% = 10,264\%$

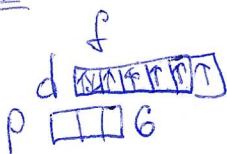


Горюшек

$\rho = 101,325$

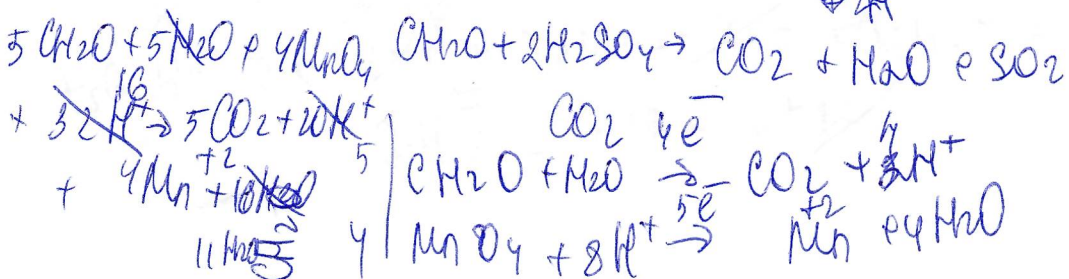
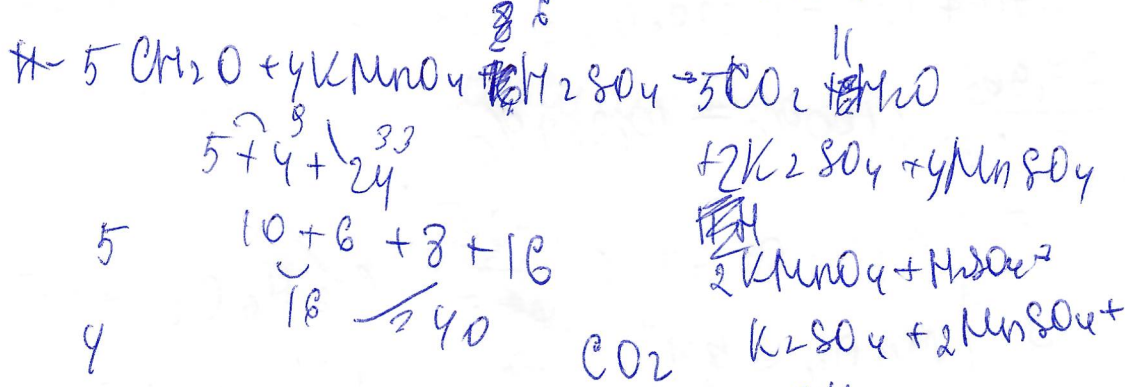
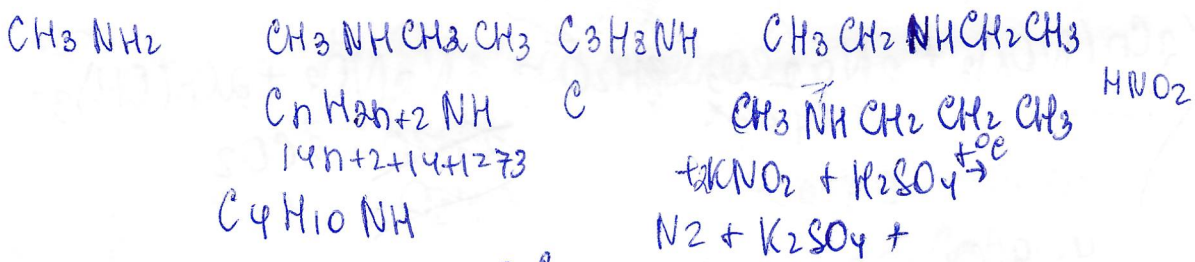
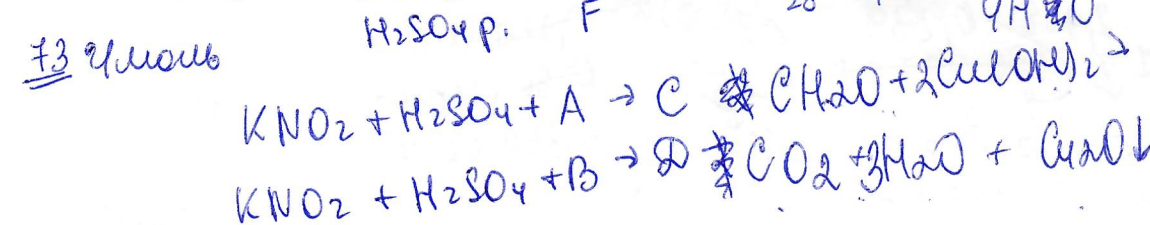
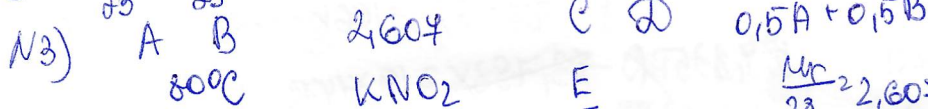
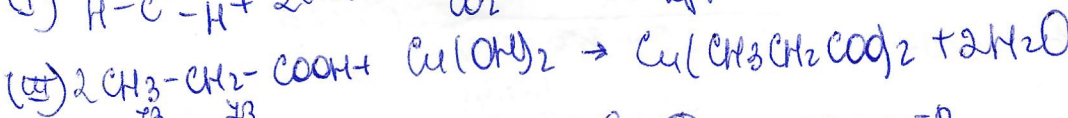
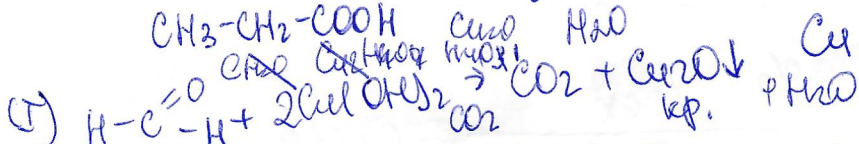
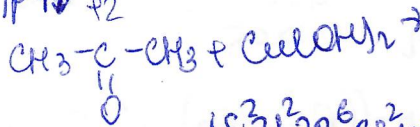
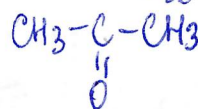
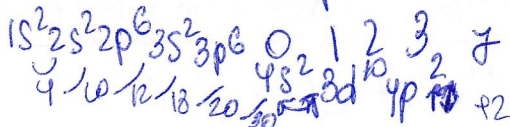


1. ч.  
 2. етт.



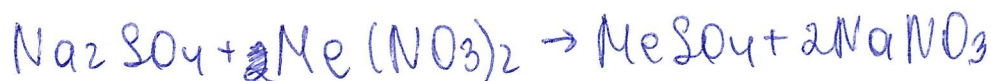
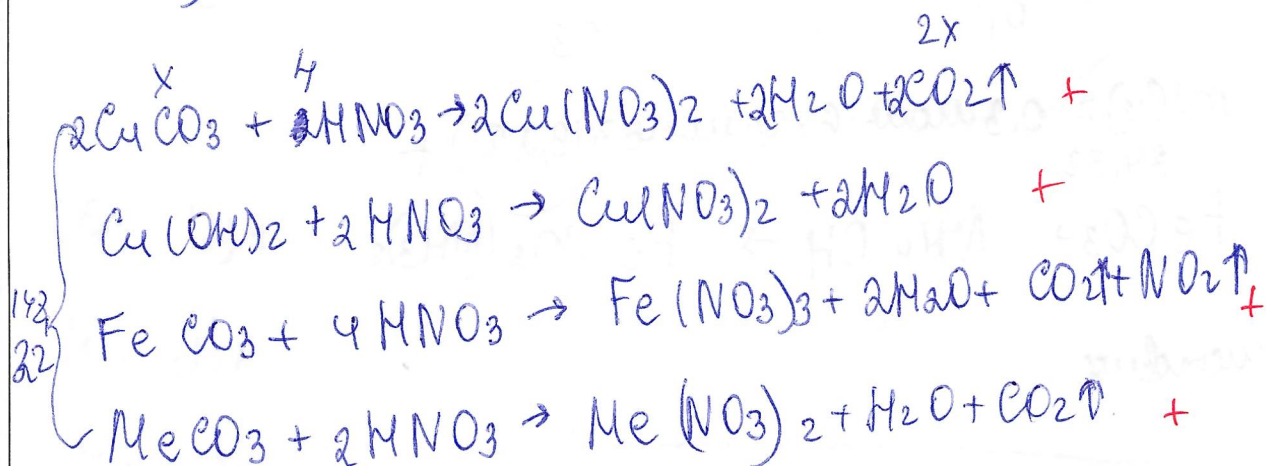
X сн. + 5. кесн.

X X+2

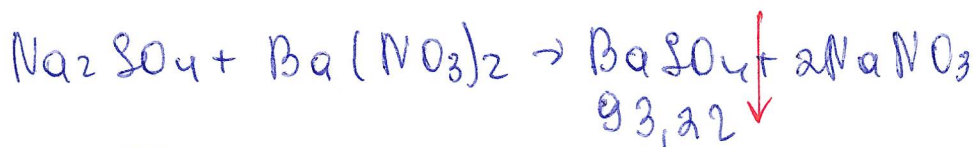


№ 2.2)

Заметки



Где Me это Ba, т.к. р-ие с  $\text{SO}_4^{2-}$   
это кар-ая на Ba<sup>2+</sup>



$$pV = \nu RT$$

$$\nu = \frac{pV}{RT} = \frac{101,325 \cdot 29,34}{8,314 \cdot (273+25)} \approx 1,2 \text{ моль}$$

$$\nu(\text{BaSO}_4) = \frac{93,22}{233} \text{ моль} \approx 0,4 \text{ моль, тогда}$$

можно составить ур-ие

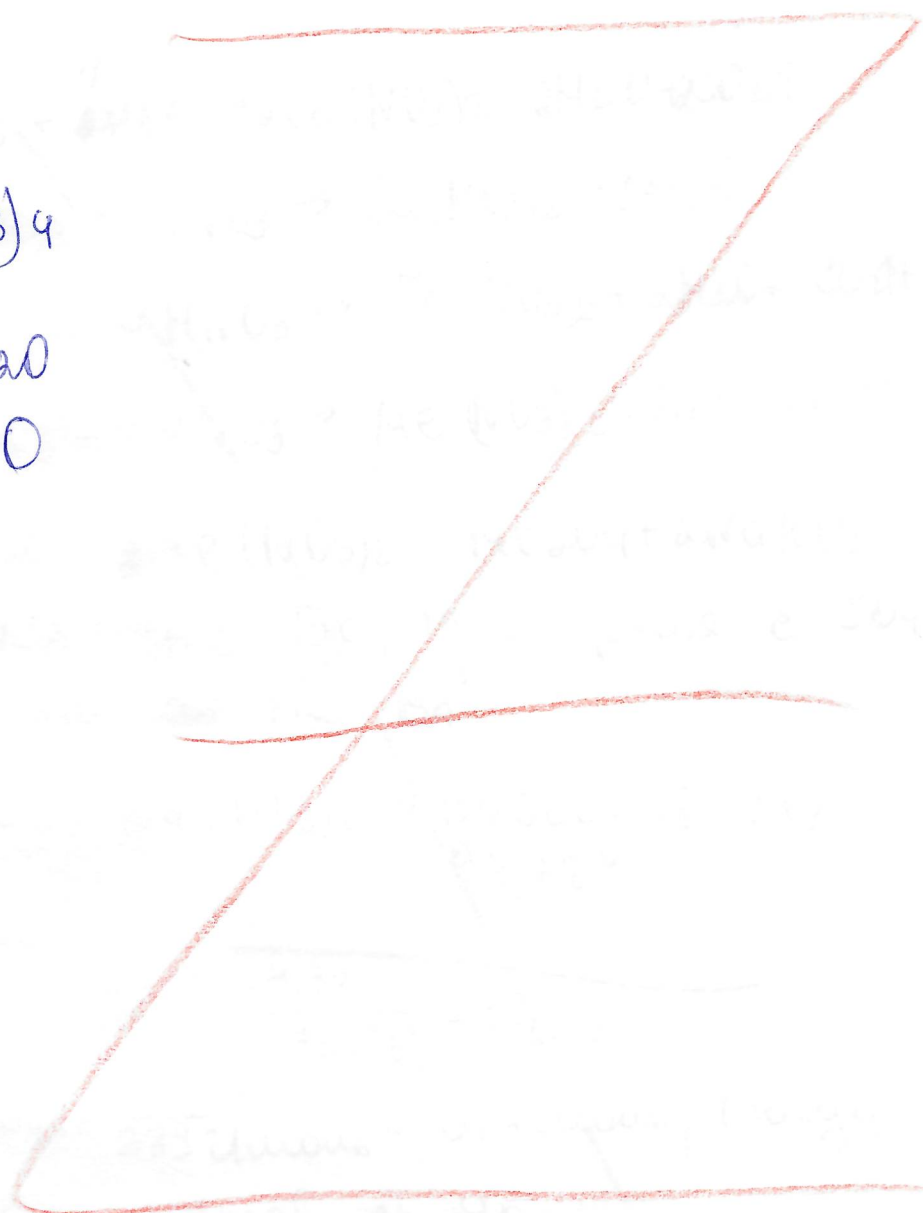
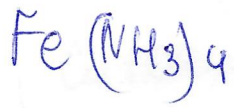
$$\begin{cases} 2x + 2y = 0,8 \\ 116y + 346x = 69,4 \end{cases} \quad \begin{cases} x = 0,1 \\ y = 0,3 \end{cases}$$

$$m(\text{навески без BaCO}_3) = 148,2 - 0,4 \cdot 197 = 69,42$$

$$0,1 (\text{CuCO}_3)_2 \cdot \text{Cu(OH)}_2 \cdot 0,3 \text{FeCO}_3 \cdot 0,4 \text{BaCO}_3 \text{ или}$$

$$(\text{CuCO}_3)_2 \cdot \text{Cu(OH)}_2 \cdot 3 \text{FeCO}_3 \cdot 4 \text{BaCO}_3$$





демар

