

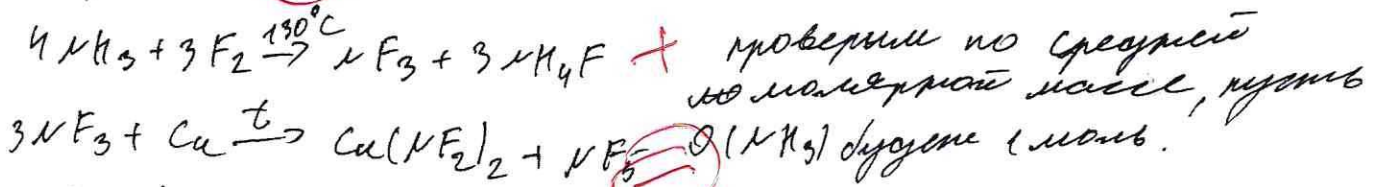
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Задача № 7.1.

- 1)  $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 + \text{CH}_3-\text{CH}_2-\text{MgBr} \rightarrow \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}(\text{CH}_3)-\text{CH}_2-\text{CH}_3$  +
- 2)  $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}(\text{CH}_3)-\text{CH}_2-\text{CH}_3 + \text{H}_2\text{O} \xrightarrow{\text{H}^+} \text{CH}_3-\overset{\text{OH}}{\mid}{\text{C}}(\text{CH}_3)-\text{CH}_2-\text{CH}_3 + \text{MgBr}_2$  +  
 (MgBrOH) Br
- 3)  $\text{CH}_3-\overset{\text{OH}}{\mid}{\text{C}}(\text{CH}_3)-\text{CH}_2-\text{CH}_3 + \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} \xrightarrow{\text{H}^+} \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}(\text{CH}_3)-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}(\text{CH}_3)-\text{CH}_2-\text{CH}_3 + \text{H}_2\text{O}$  +  
 2-метилбутанол-2 и уксусной кислоты.
- 4)  $\text{CH}_3-\overset{\text{OH}}{\mid}{\text{C}}(\text{CH}_3)-\text{CH}_2-\text{CH}_3 + \text{KCN} + \text{KCl} \rightarrow$
- 4)  $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}(\text{CH}_3)-\text{CH}_3 + \text{KCN} + \text{KCl} \rightarrow \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}(\text{CH}_3)-\text{C}\equiv\text{N} + \text{KCl}$  +  
 цианид калия
- 5)  $\text{CH}_3-\overset{\text{OH}}{\mid}{\text{C}}(\text{CH}_3)-\text{C}\equiv\text{N} + 2\text{H}_2\text{O} + \text{KCl} \xrightarrow{\text{H}^+} \text{CH}_3-\overset{\text{OH}}{\mid}{\text{C}}(\text{CH}_3)-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} + \text{KCl}$  +  
 2-гидрокси-2-метилпропановая кислота
- 6)  $\text{CH}_3-\overset{\text{OH}}{\mid}{\text{C}}(\text{CH}_3)-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} + \text{CH}_3-\overset{\text{OH}}{\mid}{\text{C}}(\text{CH}_3)-\text{CH}_2-\text{CH}_3 \xrightarrow{\text{H}^+} \text{CH}_3-\overset{\text{OH}}{\mid}{\text{C}}(\text{CH}_3)-\overset{\text{O}}{\parallel}{\text{C}}(\text{CH}_3)-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}(\text{CH}_3)-\text{CH}_2-\text{CH}_3 + \text{H}_2\text{O}$  +  
 сложный эфир 2-гидрокси-2-метилпропановой кислоты и 2-метилбутанол-2.

1	1
2	1
3	6
4	0
5	10
6	4
7	12
8	6
9	12
10	6

Задача 8.1.



$$\frac{\text{O}(\text{NH}_3)}{\text{O}(\text{F}_2)} = \frac{4}{3} \Rightarrow \text{O}(\text{F}_2) = 0,75 \text{ моль. } M(\text{см}) = \frac{m_1 + m_2}{\text{O}_1 + \text{O}_2}$$

$$M(\text{см}) = \frac{0,75 \cdot 38 + 17}{1,45} = \frac{45,5}{1,45} = 26 \frac{\text{г}}{\text{моль}} - \text{сподития}$$

недовольно ей взято в равных количествах. И две проверки. Пусть V газа выделено - объем равен 1 л  $\Rightarrow m(\text{газ}) = 3,168 \cdot 1 = 3,168 \text{ г}$ .

$$\text{O}(\text{газ}) = \frac{1}{22,4} = 0,0446 \text{ моль } m(\text{газ}) = \frac{3,168}{0,0446} = 71 \frac{\text{г}}{\text{моль}} \Rightarrow$$

$\Rightarrow$  газ это -  $\text{NF}_3$  - сподития.

$$\rho(\text{газ}) = 3,168 \cdot 1,466 = 4,644288 \frac{\text{г}}{\text{л}} \text{ пусть } V(\text{газ}) = 1 \text{ л}$$

$$\Rightarrow \text{O}(\text{газ}) = 0,0446 \text{ моль } m(\text{газ}) = 4,644288 \text{ г}$$

$$M(\text{газ}) = \frac{4,644288}{0,0446} = 104 \Rightarrow \text{газ} = \text{NF}_5$$

$$\frac{\text{O}(\text{NH}_3)}{\text{O}(\text{NH}_4\text{F})} = \frac{4}{3} \Rightarrow \text{O}(\text{NH}_4\text{F}) = 0,75 \text{ моль.}$$

$$\frac{\text{O}(\text{NH}_3)}{\text{O}(\text{NF}_3)} = \frac{4}{3} \Rightarrow \text{O}(\text{NF}_3) = 0,25 \text{ моль } \frac{\text{O}(\text{NF}_3)}{\text{O}(\text{Ca}(\text{NF}_2)_2)} = \frac{3}{1} \Rightarrow \text{O}(\text{Ca}(\text{NF}_2)_2) =$$

$$= 0,08333 \text{ моль } m(\text{Ca}(\text{NF}_2)_2) = 0,08333 \cdot 168 = 14 \frac{\text{г}}{\text{моль}} \text{ г.}$$

$$m(\text{NH}_4\text{F}) = 0,75 \cdot 37 = 27,75 \text{ г } m(\text{осад}) = 41,75 \text{ г.}$$

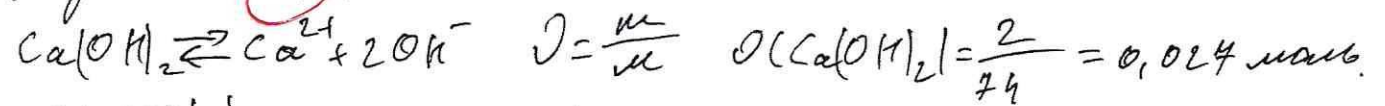
$$\omega(\text{NH}_4\text{F}) = \frac{m(\text{NH}_4\text{F})}{m(\text{осад})} \cdot 100\% = \frac{27,75}{41,75} \cdot 100\% = 66,44\%$$

$$\omega(\text{Ca}(\text{NF}_2)_2) = 100\% - 66,44\% = 33,53\%$$

Ответ:  $\omega(\text{Ca}(\text{NF}_2)_2) = 33,53\%$ .

$$\omega(\text{NH}_4\text{F}) = 66,44\%$$

Задача № 5.



$$\frac{\nu(\text{Ca(OH)}_2)}{\nu(\text{Ca}^{2+})} = \frac{1}{1} \Rightarrow \nu(\text{Ca}^{2+}) = 0,027 \text{ моль. Пусть } V_{\text{р-р}} = x \text{ л}$$

$$\frac{\nu(\text{Ca(OH)}_2)}{\nu(\text{OH}^-)} = \frac{1}{2} \Rightarrow \nu(\text{OH}^-) = 0,054 \text{ моль}$$

$$6,2 \cdot 10^{-6} = [\text{Ca}^{2+}] \cdot [\text{OH}^-]^2 \quad c = \frac{\nu}{V} \quad c(\text{Ca}^{2+}) = \frac{0,027}{x} \text{ м}$$

$$6,2 \cdot 10^{-6} = \frac{0,027}{x} \cdot \left(\frac{0,054}{x}\right)^2 \quad c(\text{OH}^-) = \frac{0,054}{x} \text{ м}$$

$$6,2 \cdot 10^{-6} = \frac{4,8732 \cdot 10^{-5}}{x^3} \quad 6,2 \cdot 10^{-6} = \frac{0,027}{x} \cdot \frac{2,916 \cdot 10^{-3}}{x^2}$$

$$x = 2,333 \text{ л} \quad c(\text{OH}^-) = \frac{0,054}{2,333} = 0,023146 \text{ м}$$

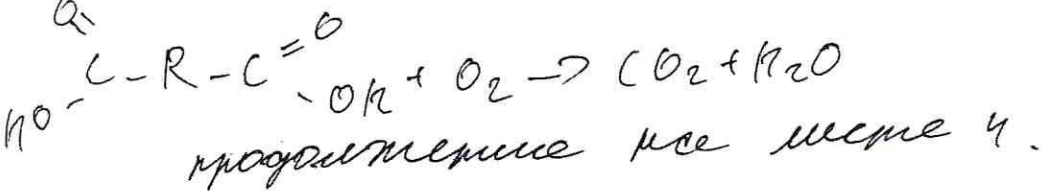
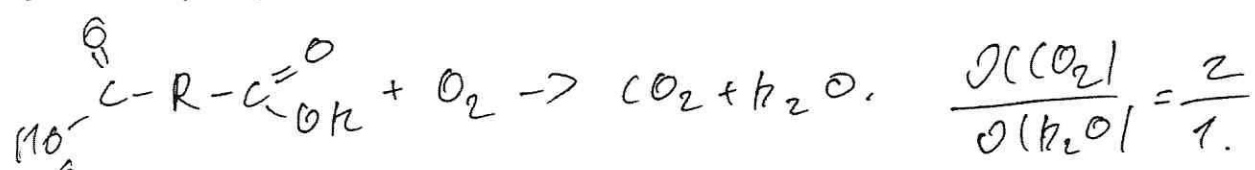
$$\text{pOH} = -\log 0,023146 \quad \text{pOH} = 1,636 \quad \text{pH} = 14 - 1,636 = 12,364$$

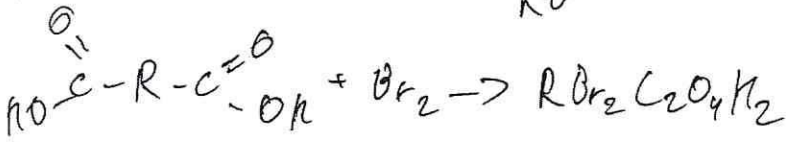
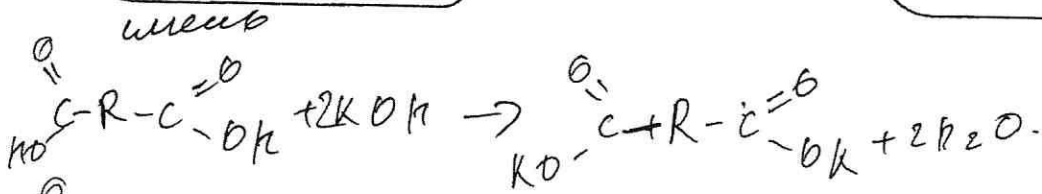
Ответ: pH = 12,364; V<sub>лик</sub> = 2,333 л.

Задача № 3.



$\nu(\text{Br}_2) = \frac{32}{160} = 0,2 \text{ моль} \Rightarrow$  у нас будет избыток  
всех веществ.





$$\frac{\nu(\text{Br}_2)}{\nu(\text{RC}_2\text{O}_4\text{H}_2)} = \frac{1}{1} \Rightarrow \nu(\text{RC}_2\text{O}_4\text{H}_2) = 0,02 \text{ моль}$$

мисль  $\nu(\text{I кинон}) = x \Rightarrow \nu(\text{II}) = 0,02 - x$

$$\omega(\text{I}) = \frac{A(\text{I}) \cdot n \cdot 100\%}{M(\text{I})} \quad \omega(\text{II}) = \frac{M(\text{II})}{M(\text{мисль})} \cdot 100\%$$

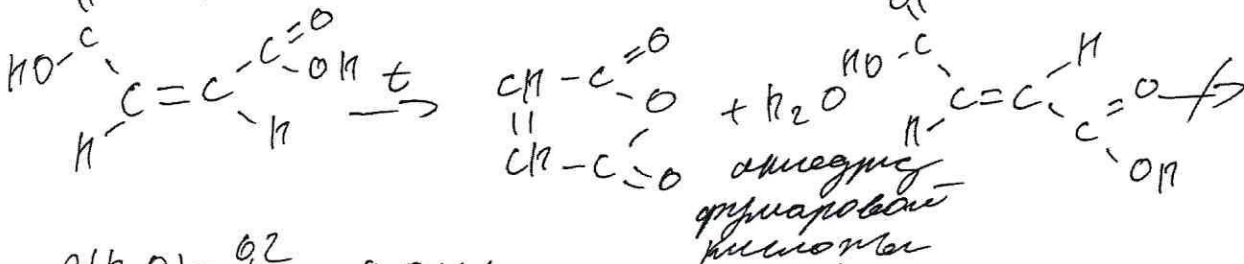
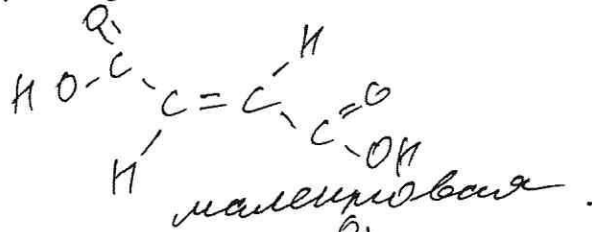
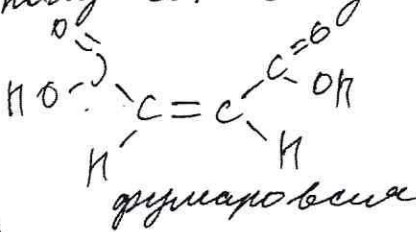
$$0,5517 = \frac{64x + 1,28z - 64x}{(90+x)x + 1,8 + 0,02R - (90+x)x}$$

$$0,5517 = \frac{1,28}{1,8 + 0,02R}$$

$$1,28 = 0,99506 + 0,11094R$$

$$R = \frac{0,28694}{0,11094} = 26 \Rightarrow R \text{ это } -\text{CH}=\text{CH}-$$

наименее две кинонь.

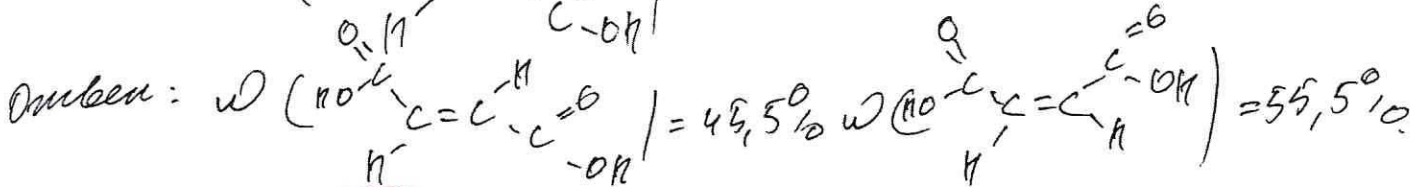
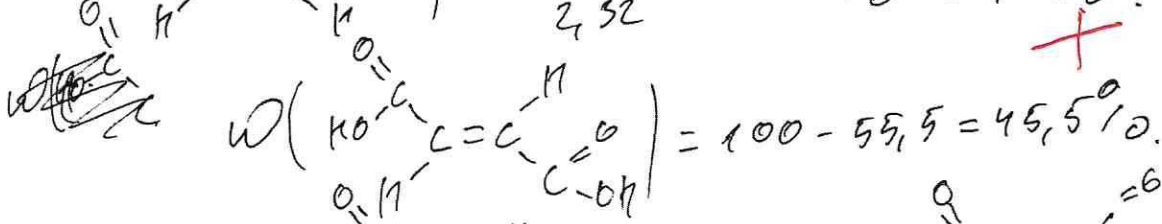
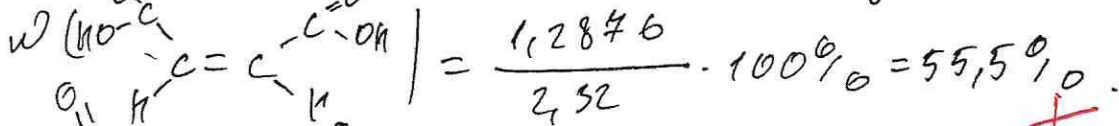
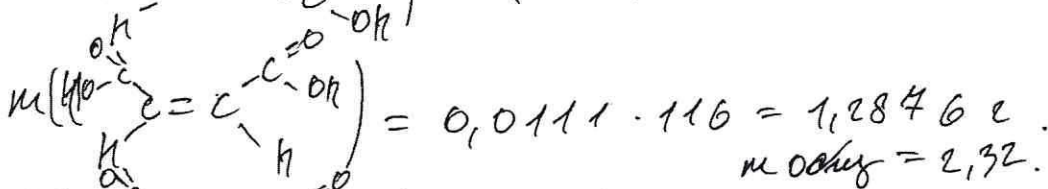
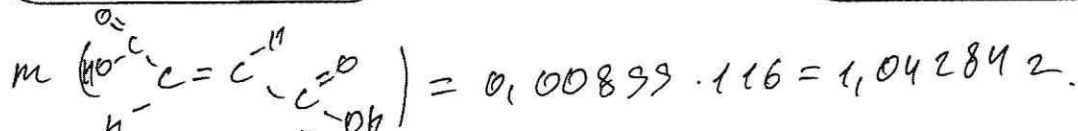


$$\nu(\text{H}_2\text{O}) = \frac{0,2}{18} = 0,0111 \text{ моль}$$

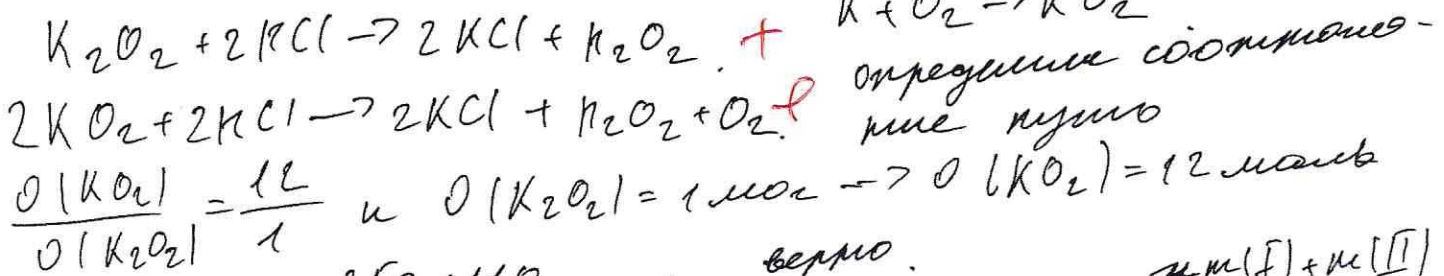
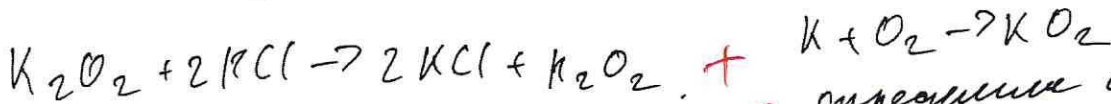
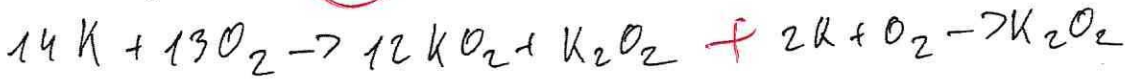
$$\frac{\nu(\text{H}_2\text{O})}{\nu(\text{фумар})} = \frac{1}{1} \Rightarrow \nu(\text{фумар}) = 0,0111 \text{ моль}$$

$$\nu(\text{малеиновая}) = 0,02 - 0,0111 = 0,0089 \text{ моль}$$

процентное все мисль 5.



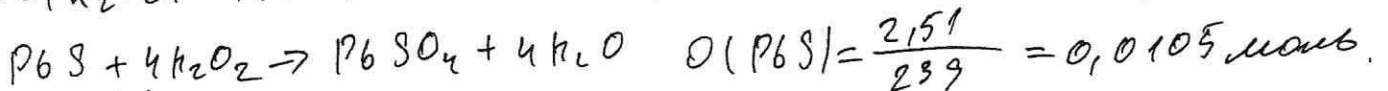
№9. Задача 19



$$\frac{\nu(\text{KO}_2)}{\nu(\text{K}_2\text{O}_2)} = \frac{12}{1} \text{ и } \nu(\text{K}_2\text{O}_2) = 1 \text{ моль} \rightarrow \nu(\text{KO}_2) = 12 \text{ моль}$$

$$M(\text{смеси}) = \frac{852 + 110}{13} = 74 \Rightarrow \text{верно. } M(\text{смеси}) = \frac{M(I) + M(II)}{\nu(I) + \nu(II)}$$

$$M(\text{K}_2\text{O}_2) = 110 \cdot 1 = 110 \text{ г} \quad M(\text{KO}_2) = 12 \cdot 71 = 852 \text{ г}$$



$$\frac{\nu(\text{PbS})}{\nu(\text{PbSO}_4 \text{ H}_2\text{O}_2)} = \frac{1}{4} \Rightarrow \nu(\text{H}_2\text{O}_2) = 0,042 \text{ моль}$$

нужно  $\nu(\text{H}_2\text{O}_2)$  будет  $x \Rightarrow \nu(\text{KO}_2)$  будет  $12x$ .  
пропорции все вместе  $1:6$ .



$$\frac{\nu(\text{K}_2\text{O}_2)}{\nu(\text{K}_2\text{O}_2)} = \frac{1}{1} \Rightarrow \nu(\text{K}_2\text{O}_2) = x \text{ моль} \quad \frac{\nu(\text{KO}_2)}{\nu(\text{K}_2\text{O}_2)} = \frac{2}{1} \Rightarrow \nu(\text{KO}_2) = 2x \text{ моль}$$

$$x + 6x = 0,042 \text{ моль} \quad x = \frac{0,042}{7} \quad x = 0,006 \text{ моль}$$

$$\nu(\text{K}_2\text{O}_2) = 6 \cdot 0,006 = 0,036 \text{ моль} \quad V = 0,224$$

$$\frac{\nu(\text{K}_2\text{O}_2)}{\nu(\text{O}_2)} = \frac{1}{1} \Rightarrow \nu(\text{O}_2) = 0,036 \text{ моль} \quad V(\text{O}_2) = 0,036 \cdot 22,4 = 0,8064 \text{ л}$$

$$\nu(\text{K}_2\text{O}_2) = 0,006 \text{ моль} \quad \frac{\nu(\text{K}_2\text{O}_2)}{\nu(\text{K})} = \frac{1}{4} \Rightarrow \nu(\text{K}) = 0,084 \text{ моль}$$

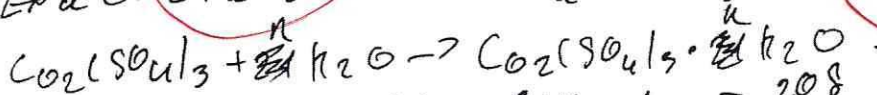
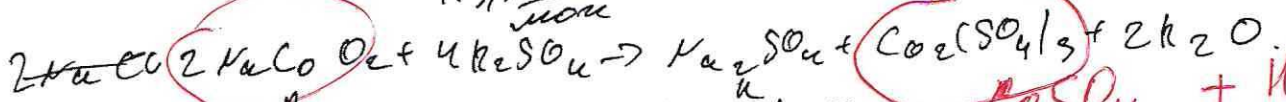
$$m(\text{K}) = 0,084 \cdot 39 = 3,276 \text{ г}$$

Ответ:  $m(\text{K}) = 3,276 \text{ г}$ ;  $V(\text{O}_2) = 0,8064 \text{ л}$ .

Задача № 6.1.

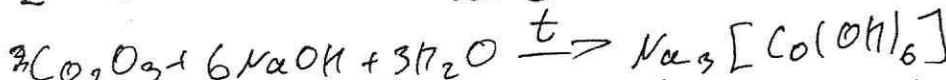
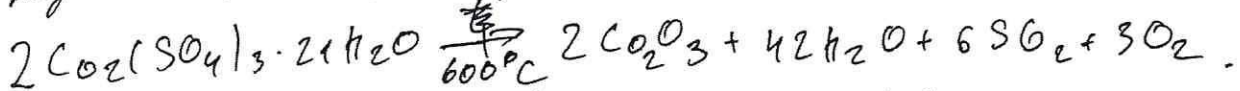
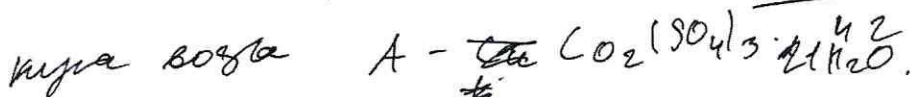
$$m(\text{CaCO}_3) = 100 - 51,75 = 48,25 \text{ г} \quad m(\text{O}) = \frac{Ar(\text{O}) \cdot n \cdot 100\%}{8 \cdot \nu(\text{O})}$$

$$m(\text{BaCO}_3) = \frac{55}{0,4825} = 114,2 \text{ моль} \quad n = \frac{114,2}{117,9} - 23 - 32 = 5,9 \text{ моль} \Rightarrow \text{CO}$$



$$\frac{m(\text{O})}{m(\text{K})} = 12,57 \quad \begin{array}{l} \text{моль} \text{ правки} - 1 \Rightarrow \frac{208}{2} = 104 - \text{не} \\ \text{моль} \text{ правки} - 2 \Rightarrow \frac{224}{4} = 56 \\ \text{моль} \text{ правки} - 21 \Rightarrow \frac{(21+12) \cdot 16}{4} = 12,57 \Rightarrow 21 \text{ моль} \end{array}$$

$\text{CoSO}_4 + \text{K}_2$   
простое в. в. о  
 $+ \text{H}_2\text{SO}_4 \text{ Co} + \text{K}_2\text{S}$



$$PV = ORT \quad I = \frac{101,3 \cdot (25 + 245)}{8,31}$$

$$Q_{\text{крит}} = \frac{101,3 \cdot 4,4}{8,31 \cdot 298} = 0,18 \text{ моль}$$

критическая температура на моль 4



моль  $O(O_2)$   $\rightarrow$  моль  $\Rightarrow O(SO_2) = 2 \cdot n = 2 \cdot 0,06 = 0,12$  моль,  
 $n \cdot n \frac{O(O_2)}{O(SO_2)} = \frac{1}{2} \quad 1n + 2n = 0,18$

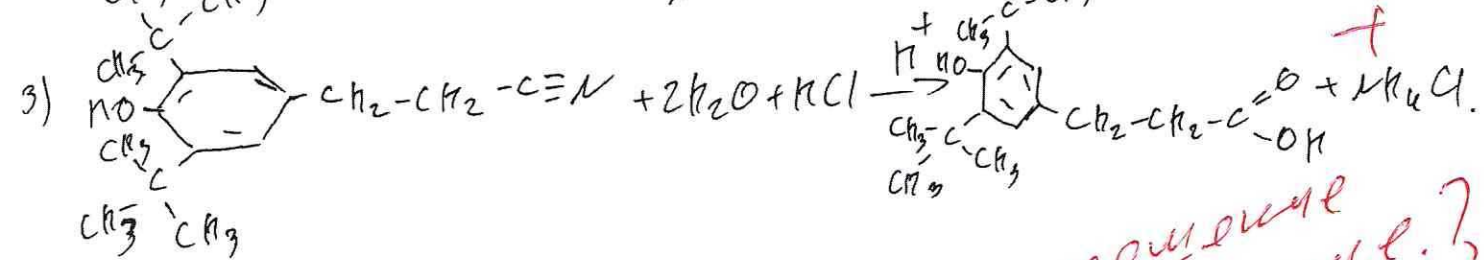
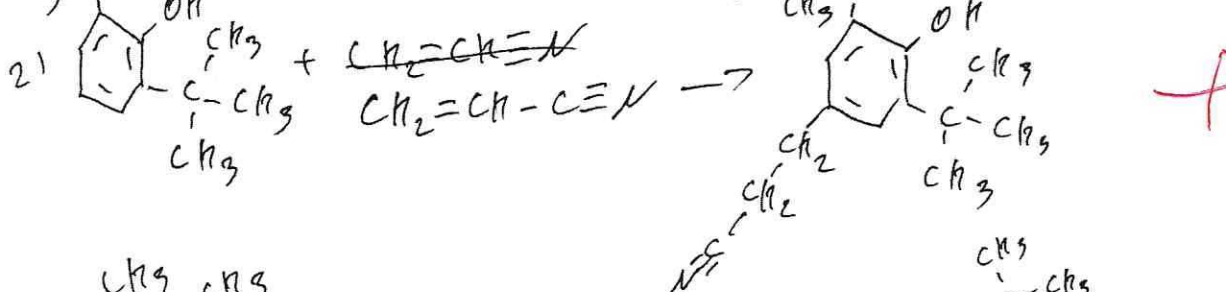
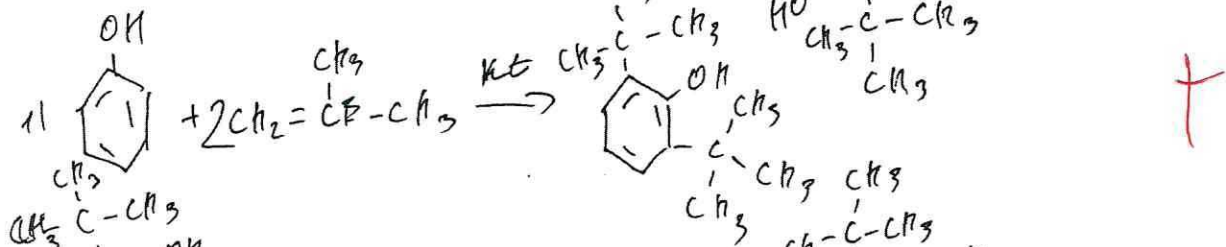
$n = 0,06$  моль  
 $O(SO_2) = 0,12$  моль.  
 $\frac{O(SO_2)}{O(CO_2(SO_4)_3 \cdot 2H_2O)} = \frac{3}{1} \Rightarrow O(CO_2(SO_4)_3 \cdot 2H_2O) = 0,04$  моль.

$m(CO_2(SO_4)_3 \cdot 2H_2O) = 0,04 \cdot 483,8 = 31,352$  г

Ответ:  $m(CO_2(SO_4)_3 \cdot 2H_2O) = 31,352$  г.

Задача 10.1

Ремонтольевая кислота  $\rightarrow$



решение  
 гальше?

Задача № 4.



$\text{C}_n\text{H}_m\text{I}_2$

$$\omega(\text{C}) = 3,05$$

$$\omega(\text{H}) = 0,25\%$$

$$\omega(\text{I}_2) = 96,7\%$$

$$\omega(\%) = \frac{A \cdot n \cdot 100\%}{M(\text{B})}$$

моль  $M(\text{B}) = 100 \frac{\text{г}}{\text{моль}}$

$$n = \frac{3,05}{12} \approx 0,25$$

$$y = 0,25$$

$$z = \frac{96,7}{127} = 0,76$$

$n:y:z = 0,25; 0,25; 0,76 \approx 1:1:3 \Rightarrow \text{C}_1\text{H}_1\text{I}_3$



СЕЧЕНОВСКИЙ  
УНИВЕРСИТЕТ

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