

56/100

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

Зад. 4

$\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ и $\text{Ca}_{10}(\text{PO}_4)_6\text{Cl}_2$
 Пусть $n(\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}) = x$ моль, $n(\text{Ca}_{10}(\text{PO}_4)_6\text{Cl}_2) = y$ моль.
 Тогда: $N(\text{O}) = (n_1 \cdot N'(\text{O})) + (n_2 \cdot N'(\text{O})) \cdot N_A$

$$8,6688 \cdot 10^{23} = (12x + 24y) \cdot 6,02 \cdot 10^{23}$$

$$1,44 = 12x + 24y$$

$x + 2y = 0,12$ - первое уравнение

$$N(\text{P}) = (2x + 6y) \cdot 6,02 \cdot 10^{23}$$

$$2x + 6y = 0,126$$

$$x + 3y = 0,13 \quad \text{— второе уравнение}$$

Получаем систему:

$$\begin{cases} x + 2y = 0,12 \\ x + 3y = 0,13 \end{cases} \Rightarrow \begin{cases} x = 0,1 \\ y = 0,01 \end{cases}$$

$$\begin{aligned} n(\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}) &= 0,1 \text{ моль} \\ n(\text{Ca}_{10}(\text{PO}_4)_6\text{Cl}_2) &= 0,01 \text{ моль} \end{aligned}$$

$$M(\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}) = 416 \text{ г/моль} \quad m_1 = 416 \cdot 0,1 = 41,6 \text{ г}$$

$$M(\text{Ca}_{10}(\text{PO}_4)_6\text{Cl}_2) = 1041 \text{ г/моль} \quad m_2 = 1041 \cdot 0,01 = 10,41 \text{ г}$$

$$m_{\text{обр.}} = m_1 + m_2 = 41,6 + 10,41 = 52,01 \text{ г}$$

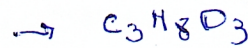
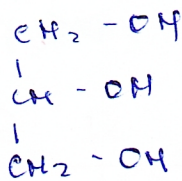
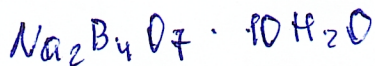
Ответ: $m_{\text{обр.}} = 52,01 \text{ г}$



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№ 2.4.



$n_2(\text{H}) = 8$

$n_1(\text{H}) = 10 \cdot 2 = 20$

$w(\text{H}) = 8\% \Rightarrow$ 1) Пусть $n(\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}) = x$ моль, глицерина) - y моль $\Rightarrow w(\text{H}) = \frac{20x + 8y}{m_{\text{смеси}}} \cdot 100\%$

$m_{\text{смеси}} = 382x + 92y$

$\frac{20x + 8y}{382x + 92y} = 0,08$

+ 60

$20x + 8y = 30,56x + 7,36y$

$0,64y = 10,56x$

$16,5x = y \Rightarrow \frac{y}{x} = 16,5$

$\Rightarrow \frac{n(\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O})}{n(\text{глицерина})} = \frac{1}{16,5}$

2) $n_1(\text{O}) = 7 + 10 = 17$

$n_2(\text{O}) = 3$

$\cdot 16 = (17x + 3 \cdot 16,5x) \cdot 16 = 1064x$

$w(\text{O}) = \frac{m(\text{O})}{m_{\text{смеси}}} \cdot 100\% = \frac{1064x}{382x + 92 \cdot 16,5x} \cdot 100\% = \frac{1064x}{1900x} \cdot 100\% = 56\%$

Ответ: $w(\text{O}) = 56\%$

№ 4.4. $m_{\text{веса}} = 0,3212$

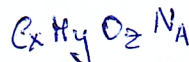
$V(\text{CO}_2) = 0,348 \text{ л}$

$V(\text{SO}_2) = 0,646 \text{ л}$

$V(\text{H}_2\text{O}) = 0,504 \cdot 10^{-3} \text{ л} \cdot n = 0,5042$

$m(\text{(NH}_4)_2\text{SO}_4) = 0,330 \text{ г}$

$p = 99,725 \text{ кПа} \quad T = 298 \text{ К}$



1) $n(\text{C}) = n(\text{CO}_2) = \frac{V_{\text{CO}_2}}{RT} = \frac{0,348 \cdot 99,725}{8,314 \cdot 298} = 0,014 \text{ моль}$

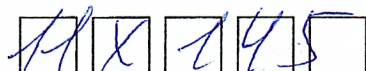
2) $n(\text{H}) = 2n(\text{H}_2\text{O}) + 8n(\text{(NH}_4)_2\text{SO}_4) = 0,005042 + 0,0025 = 0,007542 \text{ моль}$

3) $n(\text{N}) = n(\text{(NH}_4)_2\text{SO}_4) = 0,0025 \text{ моль}$

4) $n(\text{O}) = 0,3212 - 12 \cdot 0,014 - 0,007542 \cdot 4 - 0,0025 \cdot 4 = 0,0422 \text{ моль}$
 $n(\text{O}) = 0,007625$

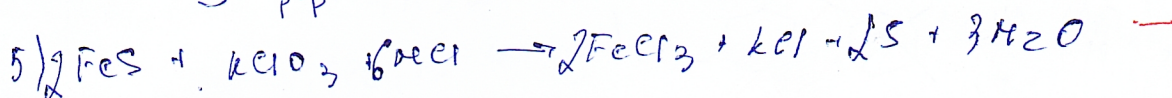
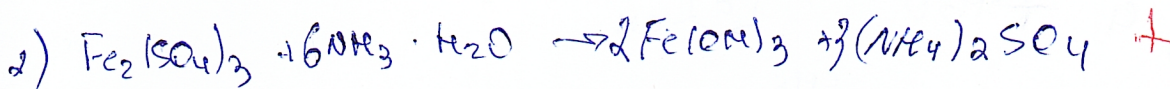
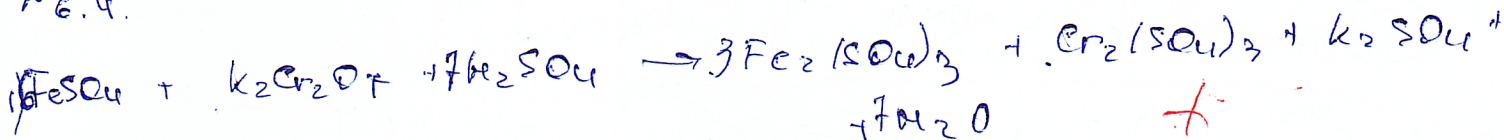


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h(C) : h(H) : h(O) : h(N)
 0,014 : 0,046 : 0,002625 : 0,0025
 30 : 4 : 1

№ 6.4.



№ 7.4

A - $C_xH_yO_{2y}N_y$

$$N(A) = 6x + 1x + 16y + 14y = 7x + 23y$$

$$M(A) = 12x + 1x + 32y + 14y = 13x + 46y$$

$$7x + 23y \cdot 100\% = 52,555$$

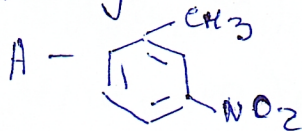
$$13x + 46y$$

$$\frac{7x + 23y}{13x + 46y} = 0,52555$$

$$7x + 23y = 6,8315x + 24,173y$$

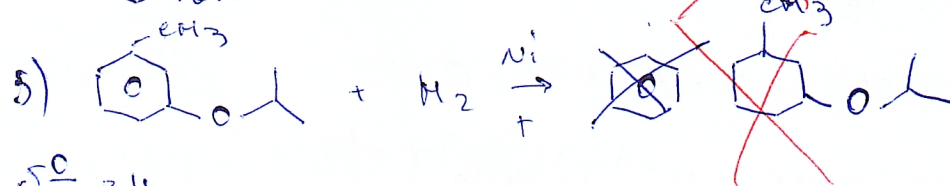
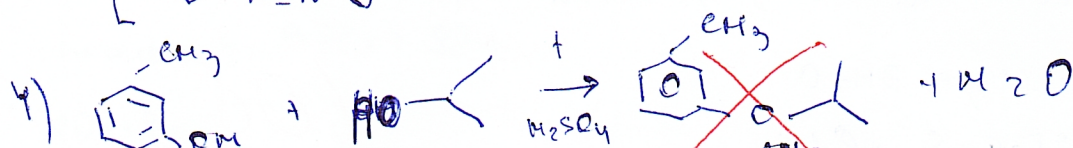
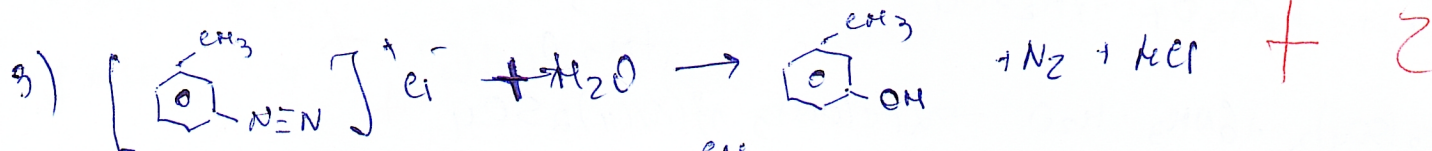
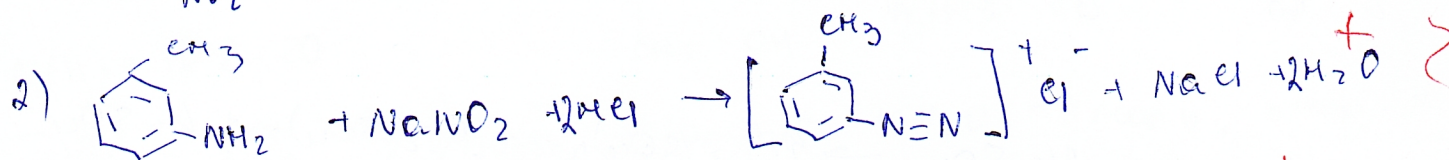
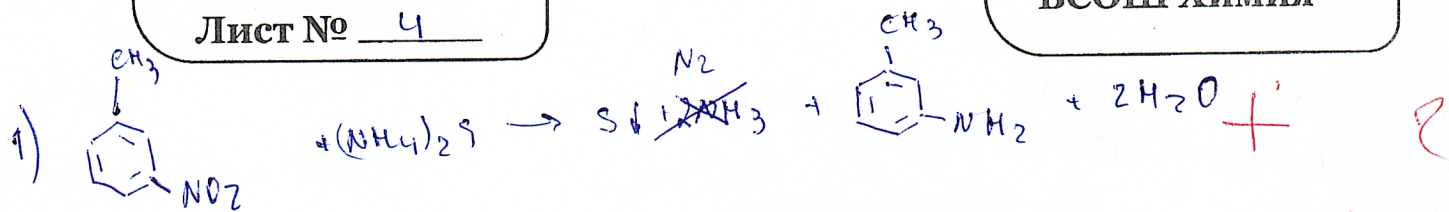
$$0,1685x = 1,173y$$

$$x = 7y \Rightarrow A - C_7H_7O_2N$$



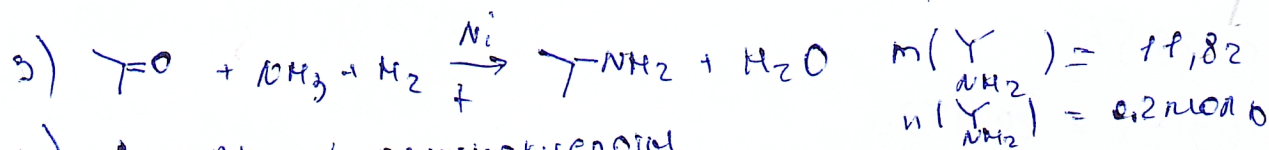
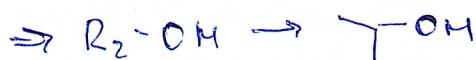
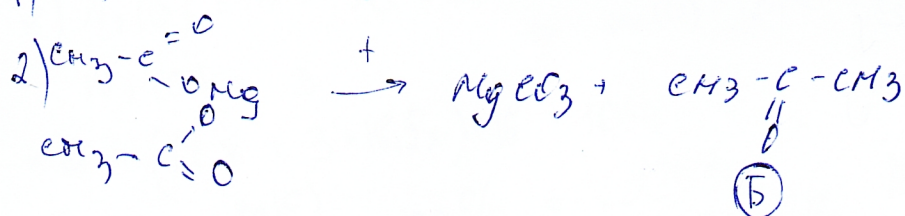
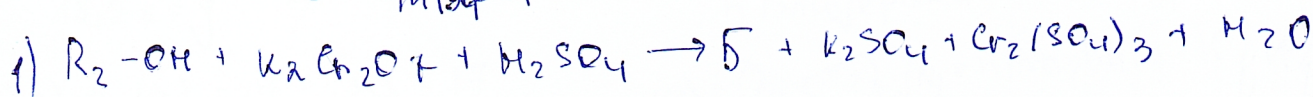
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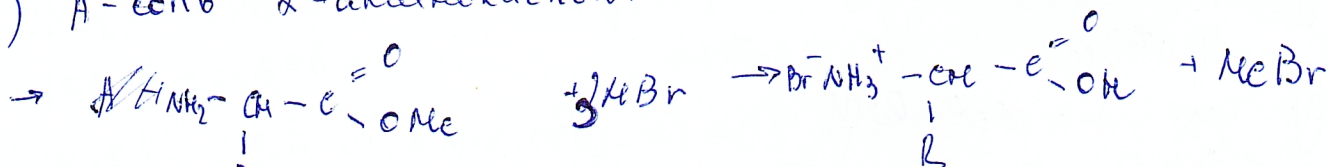


$\text{R}_1 - \text{C} - \text{O} - \text{R}_2$ $\frac{8.4}{100} = 0$

$\text{R}_1 - \text{C} - \text{O} - \text{R}_2$ $\frac{m(\text{H}_2\text{O})}{m(\text{продукта})} = 21,72$



4) А - соль α-аминокислоты



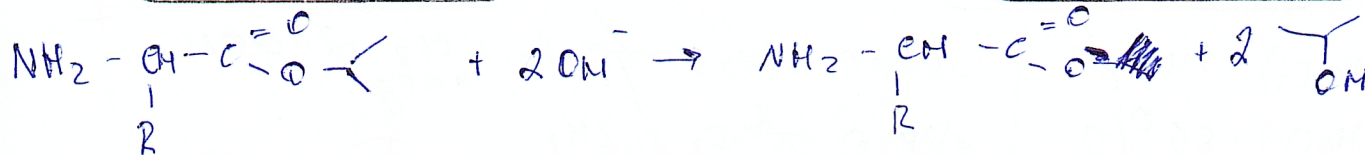
$n(\text{HBr}) = \frac{R \cdot 24,3}{81} = 0,3 \text{ моль} \Rightarrow n(\text{A}) = 0,3 \text{ моль}$

$n(\text{Y}_{\text{OH}}) = n(\text{Y}_{\text{NH}_2}) = 0,2 \text{ моль, (по ур-нию)}$



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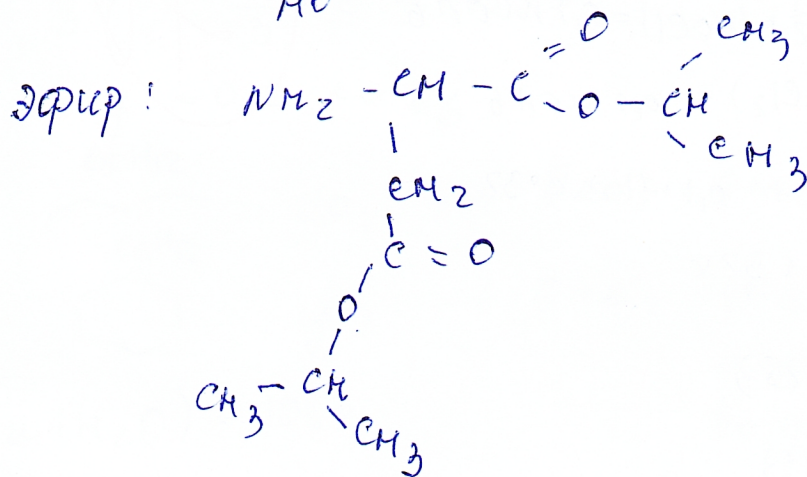
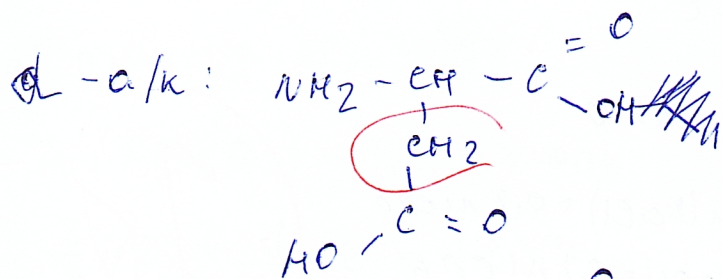
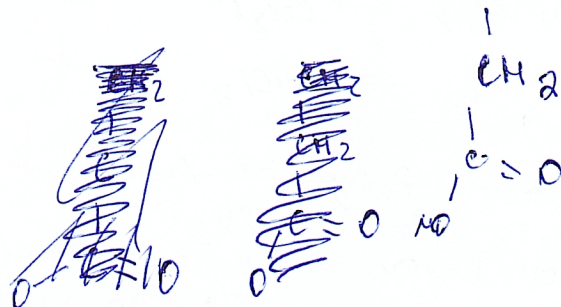




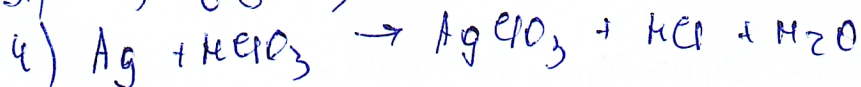
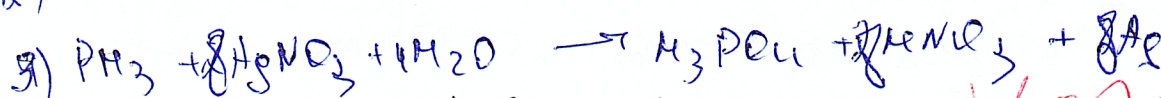
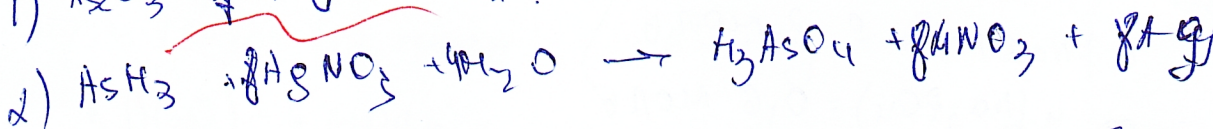
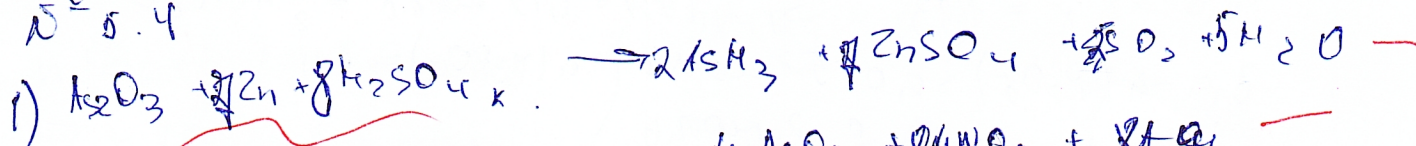
$$M_{\text{эфир}} = \frac{21,7}{0,1} = 217,2 / \text{моль}$$

~~IR = 89~~

IR = 89



№ 5.4



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$$m(\text{NaCl}) = 24 \text{ г}$$

$$\omega(\text{H}_2\text{O}) = 85\%$$

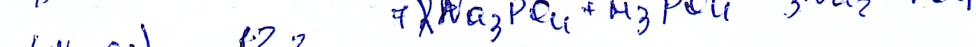
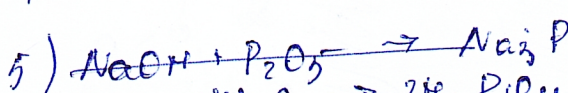
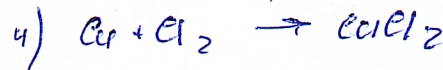
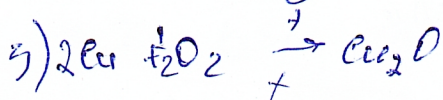
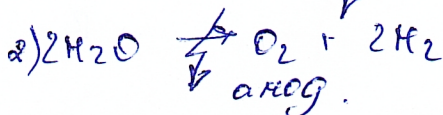
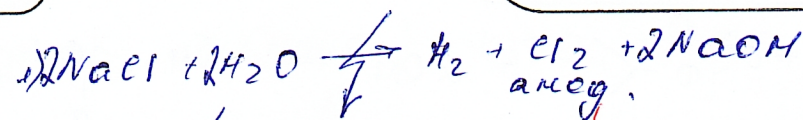
$$m(\text{Cu}) = 100 \text{ г}$$

$$\omega(\text{O}) = 12,63\%$$

$$m(\text{P}_2\text{O}_5) = 7,81 \text{ г}$$

$$m(\text{O}) = ?$$

$$\omega(\text{NaOH}) = ?$$



$$\textcircled{1} m(\text{NaCl}) = 12 \text{ г}$$

т.ч.

$$n(\text{NaCl}) = 0,2 \text{ моль}$$

$$\Rightarrow n(\text{NaOH}) = n(\text{NaCl}) = 0,2 \text{ моль}$$

$$n(\text{Cl}_2) = \frac{1}{2} n(\text{NaCl}) = 0,1 \text{ моль}$$

$$\Rightarrow n(\text{CuCl}_2) = 0,1 \text{ моль}$$

$$M_{\text{осн}} = 100 \text{ г} + 0,1 \cdot 71 + x \cdot 32$$

$$m_{\text{осн}} = 107,1 + 32x$$

$$\frac{x \cdot 18}{107,1 + 32x} = 0,1263$$

$$12x = 13,5263$$

$$x = 1,13 \Rightarrow n(\text{O}_2) = 1,13 \text{ моль} = \frac{1}{2} n(\text{H}_2\text{O})$$

$$n(\text{P}_2\text{O}_5) = 0,055 \text{ моль} \quad n(\text{H}_3\text{PO}_4) = 0,11$$

$$n(\text{NaOH}) = 0,2 \text{ моль}$$

$$\Rightarrow n(\text{Na}_3\text{PO}_4) = 0,06 \text{ моль}$$

$$n(\text{H}_3\text{PO}_4) = 0,11 - 0,0667 = 0,0433 \text{ моль}$$

ост.

$$\Rightarrow n(\text{Na}_2\text{HPO}_4) = 3n(\text{H}_3\text{PO}_4) = 0,13 \text{ моль}$$

ост.

$$m_{\text{пр-р}} = m_{\text{исх}} - 0,1 \cdot 2 \cdot 0,1 \cdot 71 + 7,81 -$$

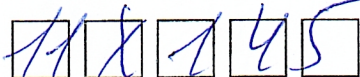
$$- 1,13 \cdot 2 \cdot 18 = 199,83 \text{ г}$$

$$\omega(\text{Na}_2\text{HPO}_4) = \frac{199,83}{199,83} = 100\%$$

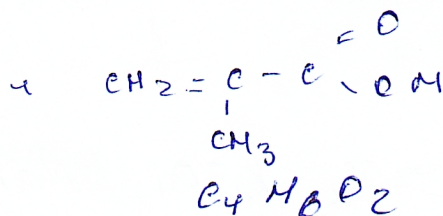
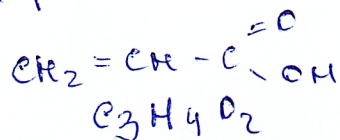
$$\text{ответ: } 9,24\%$$



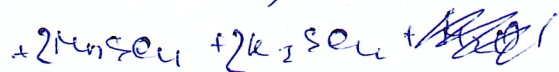
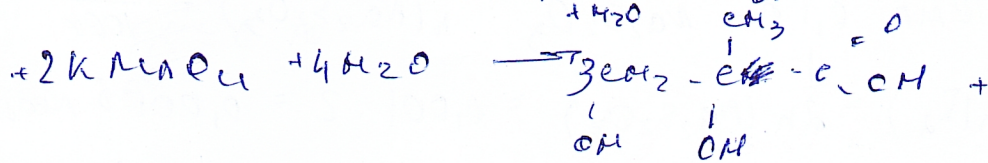
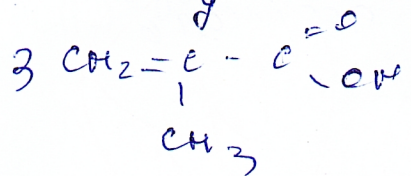
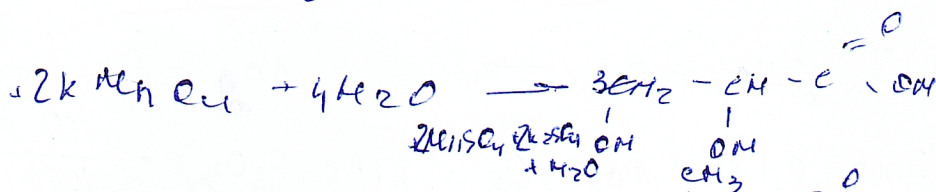
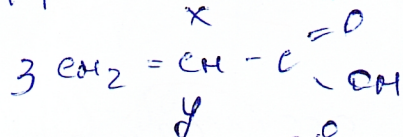
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№ 3.4



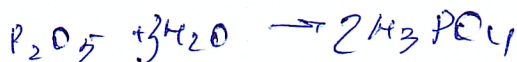
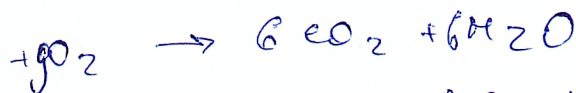
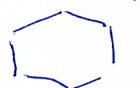
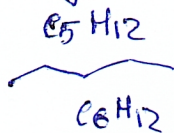
$m_{\text{пр-ра}} = 96,61 \text{ г}$



$n(\text{KMnO}_4) = 1,333 \text{ моль}$

$$\frac{x}{3} \cdot 2 + \frac{y}{3} \cdot 2 = 1,333$$

$x + y = 0,2 \text{ моль}$



$m(\text{H}_2\text{O}) = 108,2$

$m(\text{BaCO}_3) = 1083,5 \text{ г}$

$n(\text{BaCO}_3) = 5,5 \text{ моль}$

$\Rightarrow n(\text{CO}_2) = 5,5 \text{ моль}$

$n(\text{H}_2\text{O}) = 6 \text{ моль}$

$$\begin{cases} 5x + 6y = 5,5 \\ 6x + 6y = 6 \end{cases} \quad \begin{matrix} x = 0,5 \\ y = 0,5 \end{matrix}$$

$\Rightarrow n(\text{пентан}) = 0,5 \text{ моль}$

$n(\text{циклогексан}) = 0,5 \text{ моль}$

$m_{\text{мелк. к-та}} = 96,61 - 0,5 \cdot 72 -$

$- 0,5 \cdot 84 = 18,61 \text{ г}$

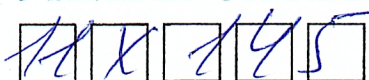
$$72x + 84y = 18,61$$

$$x + y = 0,2$$

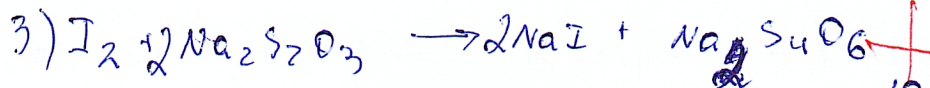
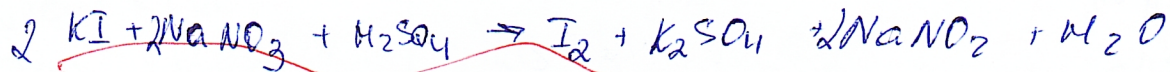
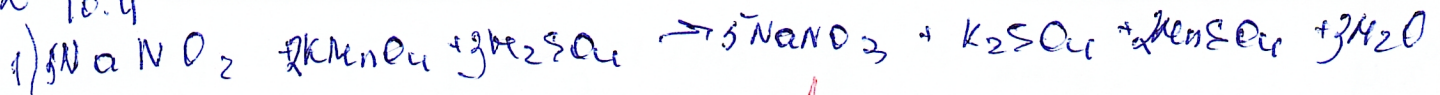
см. лист № 9



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20.10.4



10 мл 0,1 м $\text{Na}_2\text{S}_2\text{O}_3$ $n(\text{Na}_2\text{S}_2\text{O}_3) = \frac{10 \cdot 0,1}{1000} = 0,001 \text{ моль}$

$n(\text{I}_2) = \frac{1}{2} n(\text{Na}_2\text{S}_2\text{O}_3) = 0,001 : 2 = 0,0005 \text{ моль}$

$n(\text{I}_2) = \frac{1}{2} n(\text{KI}) \Rightarrow n(\text{KI}) = n(\text{Na}_2\text{S}_2\text{O}_3) = 0,001 \text{ моль}$

$n(\text{KI}) = n(\text{NaNO}_3) = 0,001 \text{ моль}$

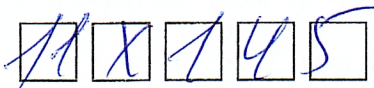
$n(\text{NaNO}_2) = n(\text{NaNO}_3) = 0,001 \text{ моль}$

$\Rightarrow m(\text{NaNO}_2) = 69 \cdot 0,001 = 0,069 \text{ г} = 69 \text{ мг}$

Ответ: 69 мг



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$$\omega = 3.4$$

$$\begin{cases} 42x + 86y = 18,61 \\ x + y = 0,2 \end{cases}$$

$$x = 0,008924$$

$$y = 0,1911$$

$$\rightarrow \omega(\text{акриловой к-ты}) = \frac{0,0089 \cdot 42 \cdot 100\%}{56,61} = 0,67\% +$$

$$\omega(\text{метакр. к-ты}) = \frac{0,191 \cdot 86}{56,61} \cdot 100\% = 17\% +$$

68

$$\omega(\text{C}_5\text{H}_{12}) = \frac{0,5 \cdot 72}{56,61} \cdot 100\% = 37,3\% +$$

$$\omega(\text{C}_6\text{H}_{12}) = \frac{0,5 \cdot 84}{56,61} \cdot 100\% = 45,4\% +$$

$$n(\text{Br}_2) = 0,2 \text{ моль} +$$

$$m(\text{Br}_2)_{\text{р-р}} = \frac{0,2 \cdot 80 \cdot 2}{0,08} = 400 \text{ г}$$

