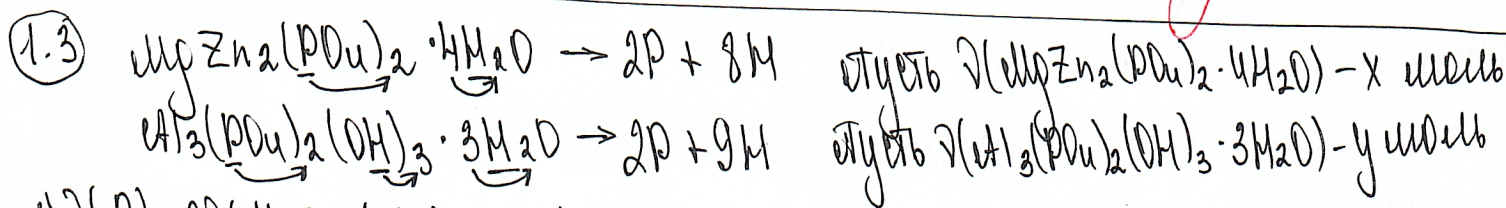


1	2	3	4	5	6	7	8	9	10
6	0	4	1	9	10	2	10	2	14

55

[Handwritten signature]



1) $\nu(\text{P})_1 = 2\nu(\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}) = 2x$
 $\nu(\text{H})_1 = 8\nu(\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}) = 8x$

2) $\nu(\text{P})_2 = 2\nu(\text{Al}_3(\text{PO}_4)_2(\text{OH})_3 \cdot 3\text{H}_2\text{O}) = 2y$
 $\nu(\text{H})_2 = 9\nu(\text{Al}_3(\text{PO}_4)_2(\text{OH})_3 \cdot 3\text{H}_2\text{O}) = 9y$

3) $\nu(\text{H}) = \frac{1,7157 \cdot 10^{24}}{6,02 \cdot 10^{23}} = \frac{17,157}{6,02} = 2,85$ моль

4) $\nu(\text{P}) = \frac{4,214 \cdot 10^{23}}{6,02 \cdot 10^{23}} = 0,7$ моль

5) $\begin{cases} 2x + 2y = 0,7 \\ 8x + 9y = 2,85 \end{cases} \Rightarrow \begin{cases} x + y = 0,35 \\ 8x + 9y = 2,85 \end{cases} \Rightarrow \begin{cases} x = 0,35 - y \\ 8(0,35 - y) + 9y = 2,85 \end{cases} \Rightarrow \begin{cases} x = 0,35 - y \\ 2,8 - 8y + 9y = 2,85 \end{cases}$

$\begin{cases} x = 0,35 - y \\ y = 0,05 \end{cases} \Rightarrow \begin{cases} x = 0,35 - 0,05 \\ y = 0,05 \end{cases} \Rightarrow \begin{cases} x = 0,3 \\ y = 0,05 \end{cases}$

35.

6) $m(\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}) = M(b-b_0) \cdot \nu = 416 \text{ г/моль} \cdot 0,3 \text{ моль} = 124,8 \text{ г}$

7) $m(\text{Al}_3(\text{PO}_4)_2(\text{OH})_3 \cdot 3\text{H}_2\text{O}) = M(b-b_0) \cdot \nu = 376 \text{ г/моль} \cdot 0,05 \text{ моль} = 18,8 \text{ г}$

8) $m \text{ пероксида} = m(\text{MgZn}_2(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}) + m(\text{Al}_3(\text{PO}_4)_2(\text{OH})_3 \cdot 3\text{H}_2\text{O}) = 124,8 \text{ г} + 18,8 \text{ г} = 143,6 \text{ г}$

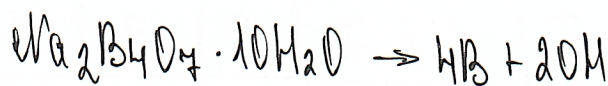
ответ: 143,6 г.



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2.3



$$1) w(\text{H}) = \frac{m(\text{H})}{m(\text{в-ва})} = \frac{20x \cdot 1}{382x}$$

$$0,08 = \frac{20x}{382x} \Rightarrow 0,05x = 0,08 \Rightarrow x = 1,6$$

$$2) v(\text{B}) = 4 \cdot 1,6 = 6,4 \text{ моль}$$

$$3) m(\text{B}) = 6,4 \text{ моль} \cdot 11 \text{ г/моль} = 70,4 \text{ г}$$

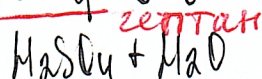
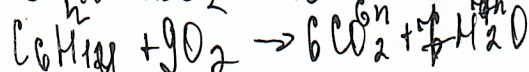
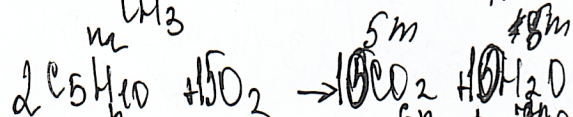
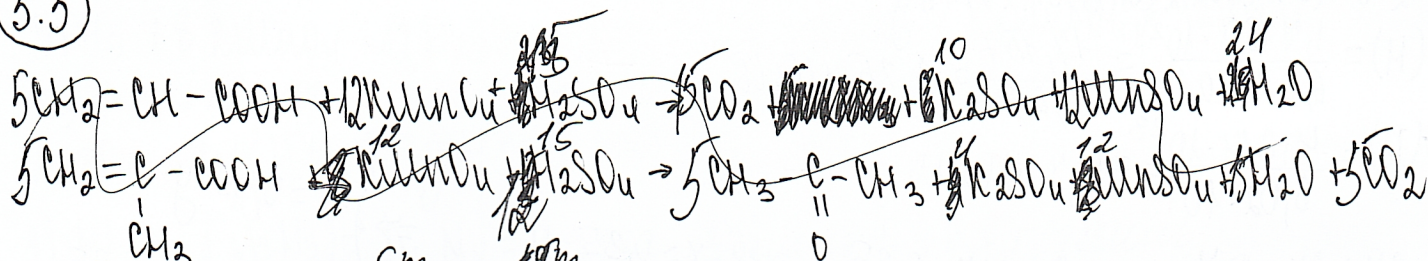
$$4) m(\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}) = 382 \text{ г/моль} \cdot 1,6 \text{ моль} = 611,2 \text{ г}$$

$$5) w(\text{B}) = \frac{m(\text{B})}{m(\text{в-ва})} \cdot 100\% = \frac{70,4}{611,2} \cdot 100\% = 0,11518 \cdot 100\% \approx 11,5\%$$

Ответ: 11,5%

Пусть $v(\text{Na}_2\text{B}_4\text{O}_7) = x$ моль,
тогда $v(\text{H}) = 20x$, $v(\text{B}) = 4x$
 $m(\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}) = 382x$

3.3



Пусть: $v(\text{CH}_2 = \text{CH} - \text{COOH}) = x$ моль
 $v(\text{CH}_2 = \text{C}(\text{CH}_3) - \text{COOH}) = y$ моль

$v(\text{C}_5\text{H}_{10}) = m$ моль

$v(\text{C}_6\text{H}_{12}) = n$ моль

$$1) m(\text{H}_2\text{O}) = 164,4 \text{ г}$$

$$v(\text{H}_2\text{O}) = \frac{164,4}{18 \text{ г/моль}} = 9,1 \text{ моль}$$

$$2) v(\text{CaCO}_3) = \frac{880 \text{ г}}{100 \text{ г/моль}} = 8,8 \text{ моль}$$

$$3) v(\text{CO}_2) = v(\text{CaCO}_3) = 8,8 \text{ моль}$$

~~$$4) \begin{cases} 5m + 6n = 8,8 \\ 5m + 6n = 9,3 \end{cases} \Rightarrow \text{невозможно}$$~~

~~$$\Rightarrow \begin{cases} 5m = \frac{8,8 - 6n}{1} \\ 5m + 6n = 9,3 \end{cases} \Rightarrow \begin{cases} 5m = 8,8 - 6n \\ 5(8,8 - 6n) + 6n = 9,3 \end{cases} \Rightarrow \begin{cases} 5m = 1,76 - 1,2n \\ 5(1,76 - 1,2n) + 6n = 9,3 \end{cases} \Rightarrow \begin{cases} 5m = 1,76 - 1,2n \\ 8,8 - 6n + 6n = 9,3 \end{cases}$$~~



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$$\Rightarrow \begin{cases} m = 1,46 - 1,2n \\ 2,8 - 6n + 6n \end{cases}$$

$$4) \begin{cases} 5m + 4n = 9,3 \\ 5m + 6n = 8,8 \end{cases} \Rightarrow \begin{cases} 5m = 9,3 - 4n \\ 9,3 - 4n + 6n = 8,8 \end{cases} \Rightarrow \begin{cases} 5m = 9,3 - 4n \\ n = 0,5 \end{cases} \Rightarrow$$

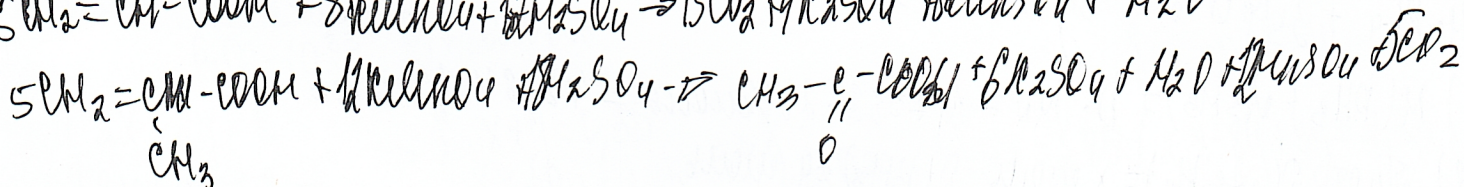
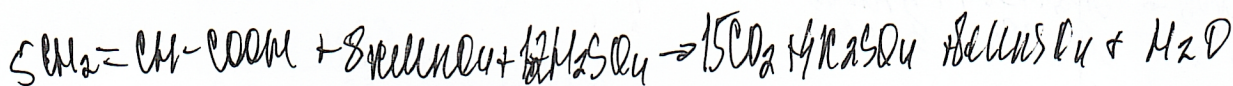
$$\Rightarrow \begin{cases} 5m = 9,3 - 3,5 \\ n = 0,5 \end{cases} \Rightarrow \begin{cases} m = 1,16 \\ n = 0,5 \end{cases}$$

$$5) m(\text{смеш}) = 135,42$$

$$m(\text{CH}_2=\text{CH}-\text{COOH}) + m(\text{CH}_2=\underset{\text{CH}_3}{\text{C}}-\text{COOH}) = m(\text{смеш}) - m(\text{C}_5\text{H}_{10}) - m(\text{C}_6\text{H}_{14}) = 135,4 - (1,16 \cdot 40) - (0,5 \cdot 86) = 135,4 - 31,2 - 43 = 11,52$$

$$6) \nu(\text{KOH}) = \frac{60,562}{158 \text{ г/моль}} = 0,32 \text{ моль}$$

$$7) \begin{cases} x + y = 11,5 \\ \frac{12}{5}x + \frac{12}{5}y = 0,32 \cdot 5 \end{cases} \Rightarrow \begin{cases} x = 11,5 - y \\ 12x + 12y = 1,6 \end{cases} \Rightarrow \begin{cases} x = 11,5 - y \\ 6x + 6y = 0,8 \end{cases} \Rightarrow \begin{cases} x = 11,5 - y \\ 6y - 6y + 6y = 0,8 \end{cases}$$



$$7) \begin{cases} x + y = 11,5 \\ \frac{8}{5}x + \frac{15}{5}y = 0,32 \end{cases} \Rightarrow \begin{cases} 42x + 84y = 11,5 \\ 8x + 15y = 1,6 \end{cases} \Rightarrow \begin{cases} 42x + 84y = 11,5 \\ 8x = 1,6 - 15y \end{cases} \Rightarrow \begin{cases} 42(0,2 - 1,875y) + 84y = 11,5 \\ x = 0,2 - 1,875y \end{cases} \Rightarrow \begin{cases} 14,4 - 135y + 84y = 11,5 \\ x = 0,2 - 1,875y \end{cases} \Rightarrow \begin{cases} 48y = 2,9 \\ x = 0,2 - 1,875y \end{cases} \Rightarrow \begin{cases} y = 0,06 \\ x = 0,2 - 0,1125 \end{cases} \Rightarrow \begin{cases} y = 0,06 \\ x = 0,0875 \end{cases}$$

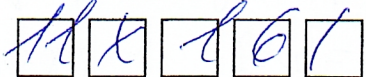
$$8) \omega(\text{C}_5\text{H}_{10}) = \frac{81,22}{135,42} \cdot 100\% \approx 59,8\% , \omega(\text{C}_6\text{H}_{14}) = \frac{43,7}{135,42} \cdot 100\% \approx 31,7\%$$

$$\omega(\text{C}_3\text{H}_4\text{O}_2) = \frac{0,0875 \cdot 72}{135,42} = \frac{6,3}{135,4} \cdot 100\% \approx 4,6\%$$

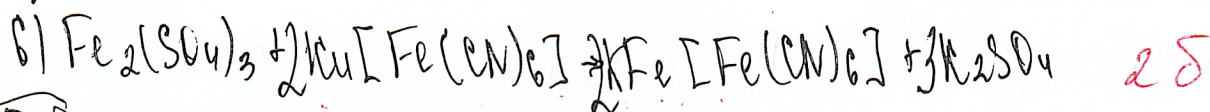
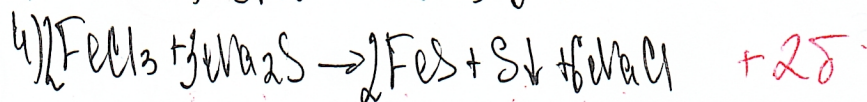
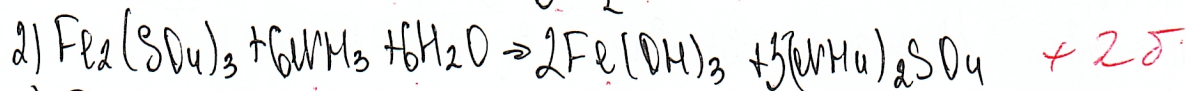
$$\omega(\text{C}_4\text{H}_6\text{O}_2) = \frac{0,06 \cdot 88}{135,4} \cdot 100\% = \frac{5,22}{135,4} \cdot 100\% \approx 3,85\%$$



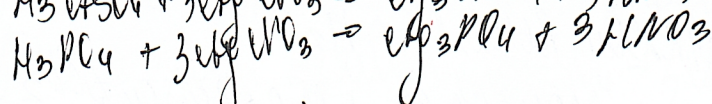
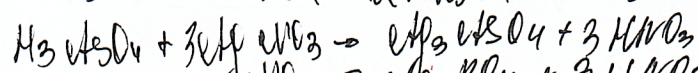
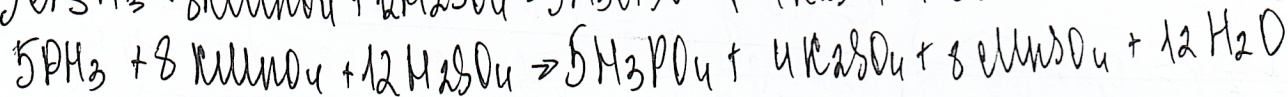
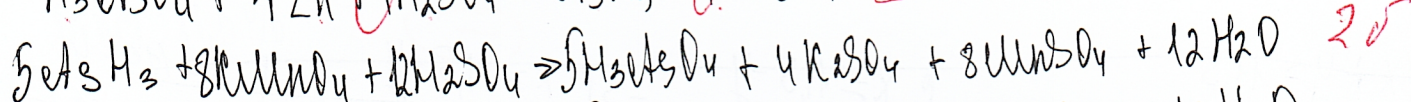
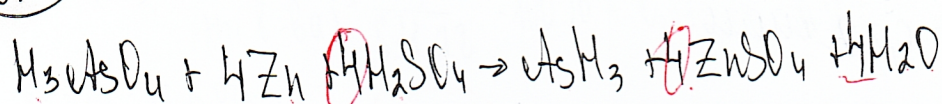
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6.3



5.3



1) $M(\text{PH}_3 + \text{AsH}_3) = D \cdot M_N = 1,4382 \cdot 28 \text{ г/моль} = 40,27 \text{ г/моль}$

2) Пусть $V(\text{AsH}_3) = x \text{ моль}$, $V(\text{PH}_3) = y \text{ моль}$

$V(\text{PH}_3 + \text{AsH}_3) = \frac{m}{M}$; $M = \frac{m}{V} \Rightarrow \frac{48x + 34y}{x + y} = 2$

3) $V(\text{HNO}_3) = V \cdot V_m = 1,45 \text{ л} \cdot \frac{22,4 \text{ л/моль}}{1} = 32,48 \text{ моль}$ (460 мм = 0,45 л)

$V(\text{HNO}_3)_1 + 3V(\text{H}_3\text{AsO}_4) = 3V(\text{AsH}_3) = 3x \text{ моль}$

$V(\text{HNO}_3)_2 + 3V(\text{H}_3\text{PO}_4) = 3V(\text{PH}_3) = 3y \text{ моль}$

4) $3x + 3y = 0,3$

$\frac{48x + 34y}{x + y} = 40,27$

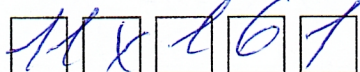
$\Rightarrow \begin{cases} x + y = 0,3 \\ 48,67x + 48,67y = 48,67x + 54y \end{cases} \Rightarrow \begin{cases} x = 0,3 - y \\ 29,33x = 14,67y \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x = 0,3 - y \\ 29,33(0,3 - y) = 14,67y \end{cases} \Rightarrow \begin{cases} x = 0,3 - y \\ 2,499 - 29,33y = 14,67y \end{cases} \Rightarrow$

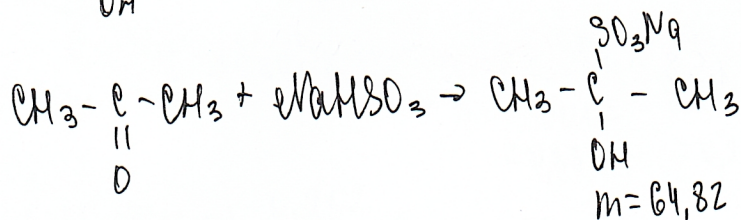
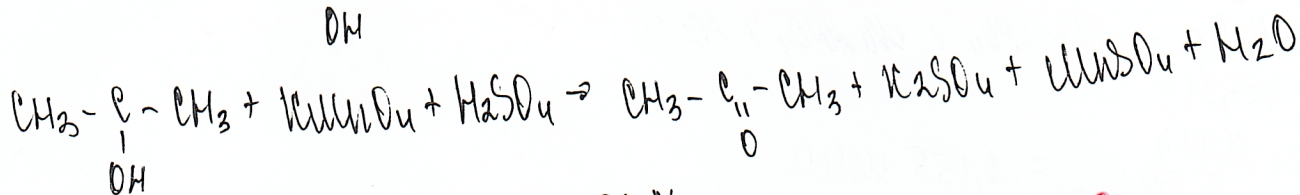
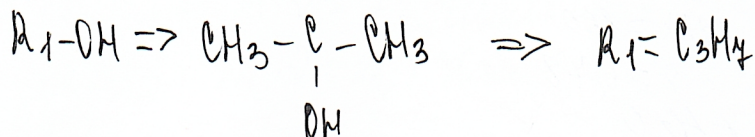
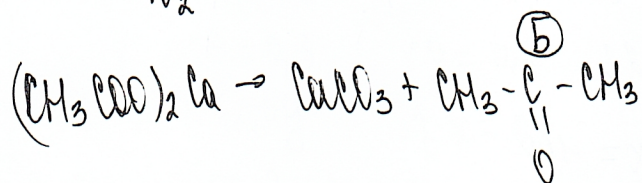
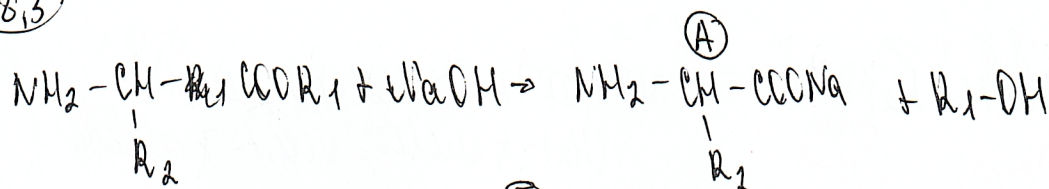
$\Rightarrow \begin{cases} x = 0,3 - y \\ 44,66y = 2,499 \end{cases} \Rightarrow \begin{cases} x = 0,3 \\ y = 0,056 \end{cases}$



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8,3



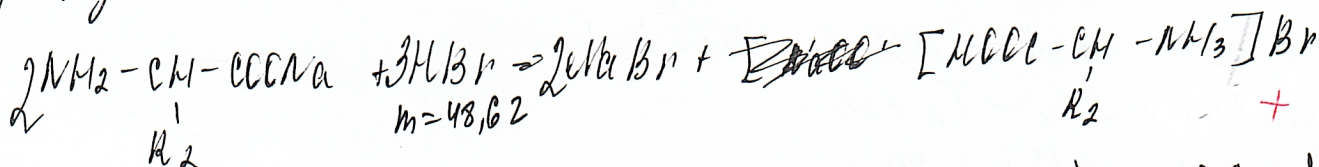
10

1) $\nu(\text{C}_3\text{H}_7\text{SO}_3\text{Na}) = \frac{64,82}{162 \text{ г/моль}} = 0,4 \text{ моль}$

2) $\nu(\text{C}_3\text{H}_8\text{O}) = \nu(\text{C}_3\text{H}_7\text{SO}_3\text{Na}) = 0,4 \text{ моль}$

3) $\nu(\text{C}_3\text{H}_8\text{O}) = \nu(\text{C}_3\text{H}_8\text{O}) = 0,4 \text{ моль}$

4) етред положим, что $\nu(\text{в-ва A}) = \nu(\text{C}_3\text{H}_8\text{O}) = 0,4 \text{ моль}$



5) $\nu(\text{HBr}) = \frac{48,62}{81 \text{ г/моль}} = 0,6 \text{ моль}$, тогда $\nu(\text{A}) : \nu(\text{HBr}) = 0,4 : 0,6 = 1 : 1,5 = 2 : 3$

$\Rightarrow$ в в-ве А 2 группы -COOH

6) $\nu(\text{NH}_2-\underset{\text{R}_1}{\underset{|}{\text{CH}}}-\text{COONa}) = \frac{1}{2} \nu(\text{C}_3\text{H}_8\text{O}) = 0,2 \text{ моль} \Rightarrow \nu(\text{NH}_2-\underset{\text{R}_1}{\underset{|}{\text{CH}}}-\text{COOCH}_3) = \nu(\text{в-ва A}) = 0,2 \text{ моль}$

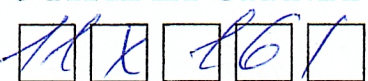
7) $\nu(\text{NH}_2-\underset{\text{R}_1}{\underset{|}{\text{CH}}}-\text{COOCH}_3) = \frac{1}{2} \nu(\text{C}_3\text{H}_8\text{O}) = 0,2 \text{ моль}$

8) $\nu(\text{NH}_2-\underset{\text{R}_1}{\underset{|}{\text{CH}}}-\text{COOCH}_3) = 0,2 \text{ моль} \Rightarrow \nu(\text{NH}_2-\underset{\text{R}_1}{\underset{|}{\text{CH}}}-\text{COOCH}_3) = 0,2 \text{ моль}$

9) $\nu(\text{X}) = 214 \text{ г/моль} - 203 \text{ г/моль} = 11 \text{ г/моль} (\text{CH}_2)$

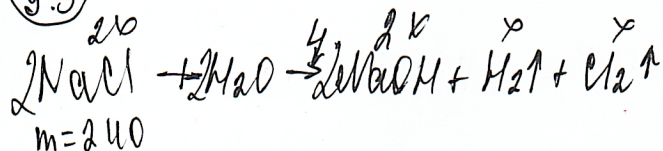


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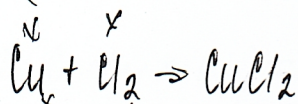
от вет: $\text{NH}_2-\underset{\text{R}_1}{\underset{|}{\text{CH}}}-\text{COOCH}_3$
 $\text{CH}_2-\text{COOCH}_3$

9.3



Итого $n(\text{NaCl}) - 2x$ моль
 $n(\text{H}_2) - x$ моль, $n(\text{Cl}_2) - x$ моль

$$m(\text{NaCl})_{\text{чист}} = 240 \cdot (1 - 0,05) = 240 \cdot 0,95 = 122$$

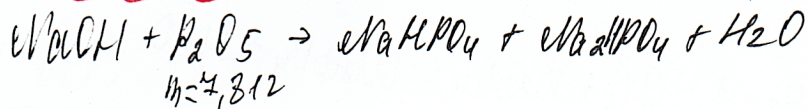


$$64 \cdot 2x = 100$$



$$128x = 100$$

$$x = 0,78$$



$$n(\text{P}_2\text{O}_5) = \frac{4,812}{142 \text{ г/моль}} = 0,034 \text{ моль}$$

$$n(\text{NaOH}) = n(\text{H}_2) = n(\text{Cu}) = 2x = 0,78 \cdot 2 = 1,58$$

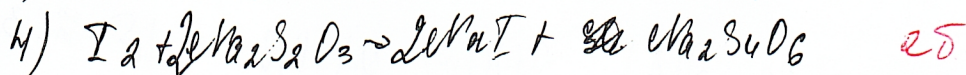
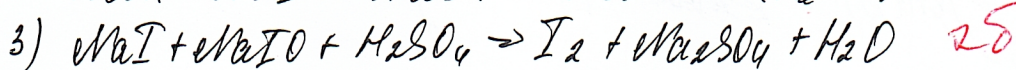
$$n(\text{NaOH}) : n(\text{P}_2\text{O}_5)$$

$$1,58 : 0,034$$

$$46 : 1$$

$$1,58 : 0,034$$

10.3



$$n(\text{Na}_2\text{S}_2\text{O}_3) = 0,015 \text{ м} \cdot 0,1 \text{ моль/л} = 0,0015 \text{ моль}$$

$$n(\text{I}_2) = 0,0015 : 2 = 0,00075 \text{ моль}$$

$$n(\text{I}_2) = n(\text{NaI}) = n(\text{NaOH}) = 0,00075 \text{ моль}$$

$$500 \text{ мл} - x \text{ моль}$$

$$10 \text{ мл} - 0,00075 \text{ моль}$$

$$x = \frac{500 \cdot 0,00075}{10} = 0,0375$$

$$n(\text{NaOH})_{500 \text{ мл}} = 0,0375 \text{ моль}$$

$$m(\text{NaOH}) = 0,0375 \text{ моль} \cdot 30 = 1,125 \text{ г}$$

$$\text{Ответ: } 1,125 \text{ г}$$



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5.3

$$\Rightarrow \begin{cases} x+y=0,3 \\ 48,67x+48,67y=48x+80y \end{cases} \Rightarrow \begin{cases} x+y=0,3 \\ 29,33x=14,67y \end{cases} \Rightarrow \begin{cases} y=0,3-x \\ x=\frac{14,67y}{29,33} \end{cases} \Rightarrow \begin{cases} y=0,3-0,5y \\ x=0,5y \end{cases} \Rightarrow \begin{cases} y=0,2 \\ x=0,1 \end{cases}$$

$$\Rightarrow \begin{cases} 1,5y=0,3 \\ x=0,5y \end{cases} \Rightarrow \begin{cases} y=0,2 \\ x=0,1 \end{cases}$$

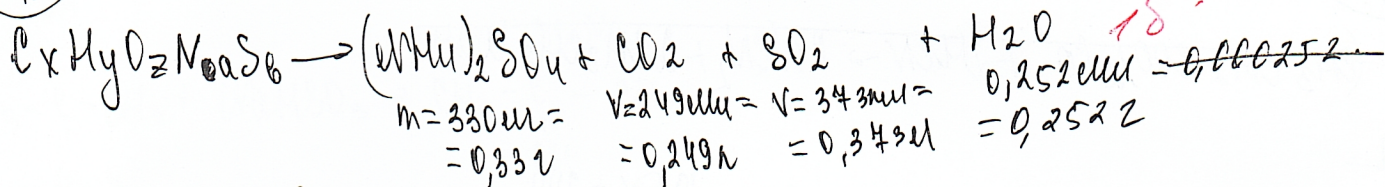
28

5) $m(\text{NH}_3) = M \cdot \nu = 17 \text{ г/моль} \cdot x = 17 \text{ г/моль} \cdot 0,1 \text{ моль} = 1,7 \text{ г}$

6) $V(\text{NH}_3) = V_M \cdot \nu = 22,4 \text{ л/моль} \cdot x = 22,4 \text{ л/моль} \cdot 0,1 \text{ моль} = 2,24 \text{ л}$

ответ: 1,7 г ; 2,24 л.

6.3 4.3



$$\nu(\text{H}) = 2\nu(\text{H}_2\text{O}) = \frac{0,252}{18} \cdot 2 = 0,028 \text{ моль}$$

$$\nu(\text{S}) = \nu(\text{SO}_2) = \frac{0,343 \text{ л}}{22,4 \text{ л/моль}} = 0,0153 \text{ моль}$$

$$\nu(\text{C}) = \nu(\text{CO}_2) = \frac{0,249 \text{ л}}{22,4 \text{ л}} = 0,0111 \text{ моль}$$

$$\nu(\text{S}) = \nu((\text{NH}_4)_2\text{SO}_4) = \frac{0,332}{132 \text{ г/моль}} = 0,0025 \text{ моль}$$

$$\nu(\text{N}) = 2\nu((\text{NH}_4)_2\text{SO}_4) = 0,0025 \cdot 2 = 0,005 \text{ моль}$$

$$\nu(\text{H}) = 8\nu((\text{NH}_4)_2\text{SO}_4) = 0,0025 \cdot 8 = 0,02 \text{ моль}$$

$$\nu(\text{O}) = 4\nu((\text{NH}_4)_2\text{SO}_4) = 0,0025 \cdot 4 = 0,01 \text{ моль}$$

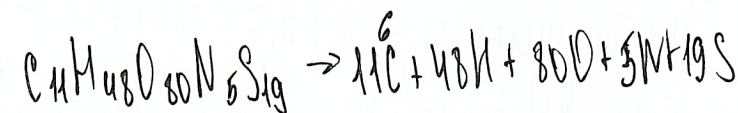
$$\nu(\text{O}) = 2\nu(\text{CO}_2) = 0,0111 \text{ моль} \cdot 2 = 0,0222 \text{ моль}$$

$$\nu(\text{O}) = 2\nu(\text{SO}_2) = 0,0153 \cdot 2 = 0,0306 \text{ моль}$$

$$\nu(\text{O}) = \nu(\text{H}_2\text{O}) = 0,014 \text{ моль}$$

$$\nu(\text{H})_{\text{общ}} = 0,048 \text{ моль}$$

$$\nu(\text{S})_{\text{общ}} = 0,0192 \text{ моль}$$



C-6e; H-1e, O-8e, N-7e, S-16e

$$(\text{общ. н-бо e}) = (6 \cdot 11) + (48 \cdot 1) + (80 \cdot 8) + (5 \cdot 7) + (16 \cdot 19) = 66 + 48 + 640 + 35 + 304 = 1093 \text{ e}$$

необходимо и сложить - 16
ур - е неукрепленная - втягивается

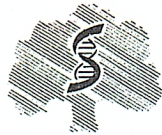
$$\nu(\text{O})_{\text{общ}} = 0,0494 \text{ моль} \approx 0,08 \text{ моль}$$

$$\nu(\text{C}) : \nu(\text{H}) : \nu(\text{O}) : \nu(\text{N}) : \nu(\text{S}) = 0,011 : 0,048 : 0,08 : 0,005 : 0,0192 =$$

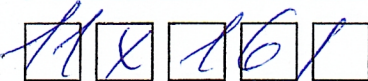
$$= 22 : 9,6 : 16 : 1 : 3,8 = 11 : 4,8 : 8 : 0,5 : 1,9$$



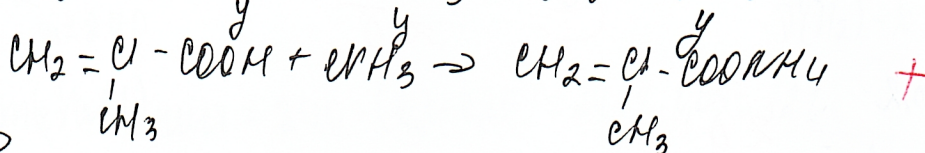
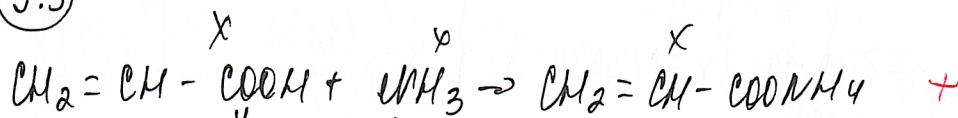
ответ: $\text{C}_{11}\text{H}_{48}\text{O}_{80}\text{N}_5\text{S}_{19}$; 1093 e



СЕЧЕНОВСКИЙ
УНИВЕРСИТЕТ



3.3



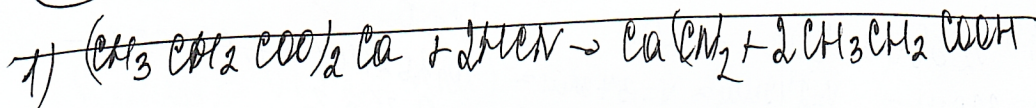
⇒

$$m(\text{C}_3\text{H}_7\text{NO}_2) = 89\text{X} = 89\% \text{моль} \cdot 0,0345 \text{моль} \approx 4,82$$

$$m(\text{C}_4\text{H}_9\text{O}_2\text{N}) = 163\text{Y} = 103\% \text{моль} \cdot 0,06 \text{моль} = 6,182$$

ответ: 59,8%, 31,4%, 4,6%, 3,25%, 4,82, 6,182

4.3



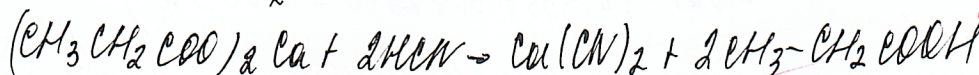
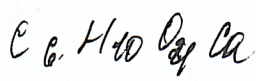
2)

$$1) \text{Общ. число } p = 9x + 2,5x + 20y + 8x = 19,5x + 20y$$

$$2) m(b-ba) = \frac{m(p)}{u} = \frac{19,5x + 20y}{0,52688} \approx 37x + 38y$$

$$3) m(b-ba)$$

$$v(\text{C}) : v(\text{H}) : v(\text{Ca}) : v(\text{O}) = 1,5x : 2,5x : y : x = 1,5 : 2,5 : \frac{y}{x} : 1 \quad | \cdot x \cdot 2 = 3 : 5 : \frac{2y}{x} : 2$$



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11 X 16 1