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(38.10)



МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ имени М.В.ЛОМОНОСОВА

Вариант 1

Место проведения Москва
город

выпуск 14-14⁰⁴ 11

ПИСЬМЕННАЯ РАБОТА

Олимпиада школьников по химии
наименование олимпиады

по химии
профиль олимпиады

Аленинской Дианы Алексеевны
фамилия, имя, отчество участника (в родительном падеже)

Дата

«1» марта 2026 года

Подпись участника

[Signature]

ЧИСТОБЫК

1	2	3	4	5	6	7	Σ
6	4	8	16	16	20	20	97

65

1. $M(CH_4) = 16 \text{ г/моль} \Rightarrow M_{\text{в.в.}} = 2,125 \cdot 16 = 34 \text{ г/моль}$

1 в.в. : H_2S ; $M(H_2S) = 2 + 32 = 34 \text{ г/моль}$

2 в.в. : NH_3 ; $M(NH_3) = 17 \text{ г/моль}$

$H_2S - 18e$; $NH_3 - 10e$; $CH_3 - \dot{C}H_3 \Rightarrow 9e + 9e = 18e$

$PH_3 - 10e$; $CH_3 - \dot{C}H_3 \Rightarrow 9e + 9e = 18e$

2.

$\omega_{MTB} = 77 \rightarrow +3eq$. Для окт 4. 95 км/ч 40,0 км/ч. MTB

Дано: $20 \text{ м}^3 \text{ АУ-92}$.

$\rho_{MTB} = 740 \text{ кг/м}^3$

$\rho_{\text{АУ-92}} = 760 \text{ кг/м}^3$

$\rho = \frac{m}{V} \Rightarrow m(\text{АУ-92}) = 20 \cdot 760 = 15200 \text{ кг}$

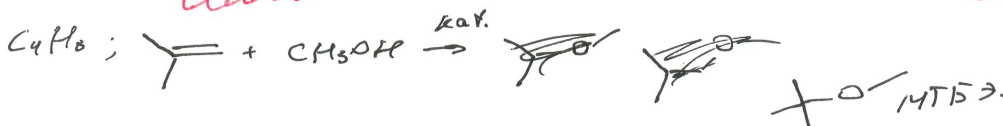
$\omega = \frac{m_{\text{в.в.}}}{m_{\text{р-р}}} ; \omega_{MTB} = \frac{m_{MTB}}{m_{\text{АУ-92}} + m_{MTB}}$

$207 = \frac{m_{MTB}}{15200 + m_{MTB}} \Rightarrow m_{MTB} = 1144,1 \text{ кг}$

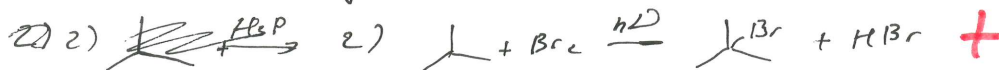
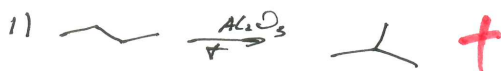
$V = \frac{m}{\rho} \Rightarrow V_{MTB} = \frac{1144,1 \text{ кг}}{740 \text{ кг/м}^3} = 1,55 \text{ м}^3$

Ответ: $V_{MTB} = 1,55 \text{ м}^3$

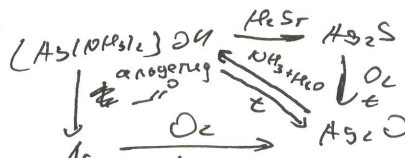
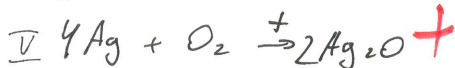
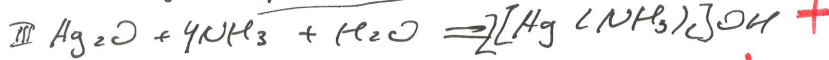
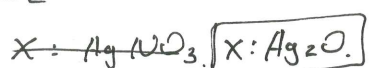
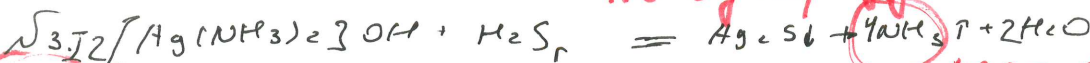
94 бензол



из C_6H_6 и C_6H_{10} .

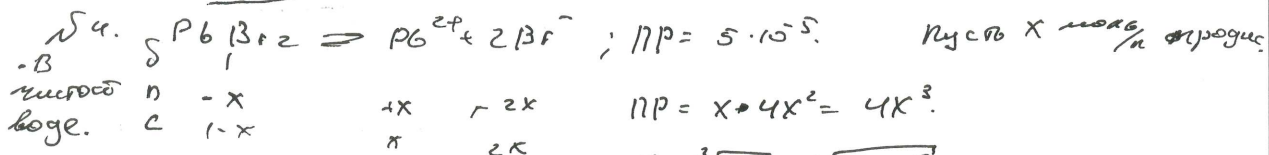


не ед. продукт



опр. Ag

Чистовик.

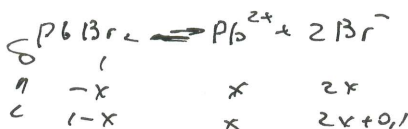
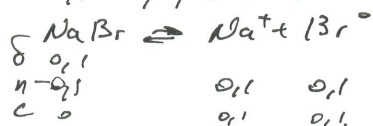


$M_{\text{PbBr}_2} = 368 \text{ г/моль}$

$x = \sqrt[3]{\frac{K_p}{4}} = \sqrt[3]{\frac{5 \cdot 10^{-5}}{4}} = 2,32 \cdot 10^{-2} \text{ моль/л}$
 $S = 2,32 \cdot 10^{-2} \text{ моль/л}$

$S_m = 2,32 \cdot 10^{-2} \cdot 368 = 8,514 \text{ г/л}$

• В 0,1 М р-ре NaBr.



по принципу
 не слабое при
 увелич. конц.
 "продукта" равна
 всем слагаемым
 в строке "реаг-
 нента"

$K_p = x \cdot 4(2x+0,1)^2 = x \cdot (4x^2 + 0,4x + 0,01) = 4x^3 + 0,4x^2 + 0,01x$

$5 \cdot 10^{-5} = x(2x+0,1)^2$

$x = 4,25 \cdot 10^{-3} \text{ моль/л}$ $x = 4,25 \cdot 10^{-3} \text{ моль/л}$

$S_{\text{NaBr}} = 4,25 \cdot 10^{-3} \text{ моль/л}$ $S_{\text{NaBr}_m} = 4,25 \cdot 10^{-3} \cdot 368 =$

$\frac{S_{\text{м.д.}}}{S_{\text{в.к.}}} = \frac{2,32 \cdot 10^{-2}}{4,25 \cdot 10^{-3}} = 5,45$

$= \frac{1,66 \text{ г/л}}{1,56 \text{ г/л}}$

т.е. $S_{\text{в.к.}}$ меньше $S_{\text{м.д.}}$ в 5,45 раз

У5 Карб кислота вида $\text{C}_x\text{H}_y\text{COOH}$

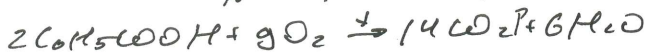
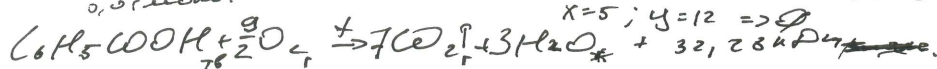
$\omega = \frac{m_{\text{в.к.}}}{m_{\text{соед}}} \Rightarrow$ Если в соед 2 атома O, то

$M_{\text{кисл}} = \frac{32}{0,2623} = 122 \text{ г/моль} \Rightarrow M(\text{C}_x\text{H}_y) = 122 - 32 =$

Если $M(\text{C}_x\text{H}_y) = 90 \text{ г/моль}$, $-12 \cdot 1 = 77 \text{ г/моль}$

то $x \leq 6$; $x=6$; $y=5 \Rightarrow \text{C}_6\text{H}_5\text{COOH}$, т.е. $\text{C}_6\text{H}_5\text{COOH}$

0,01 моль.



$\nu_{\text{BaCO}_3} = \frac{13,8 \text{ г}}{187} = 0,07 \text{ моль} \Rightarrow \nu_{\text{CO}_2} = 0,07 \text{ моль}$

$\frac{\nu_{\text{C}_6\text{H}_5\text{COOH}}}{\nu_{\text{CO}_2}} = \frac{1}{7} \Rightarrow \nu_{\text{C}_6\text{H}_5\text{COOH}} = \frac{0,07}{7} = 0,01 \text{ моль}$

$32,28 \text{ кДж} - 0,01 \text{ моль} \Rightarrow Q_{\text{сгор}} = \frac{32,28}{0,01} = 3228 \text{ кДж/моль}$

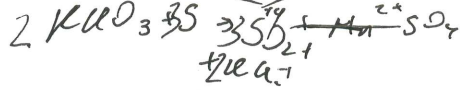
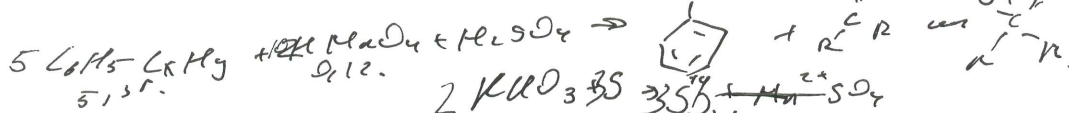
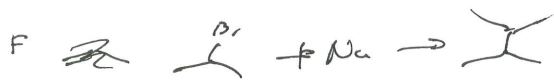
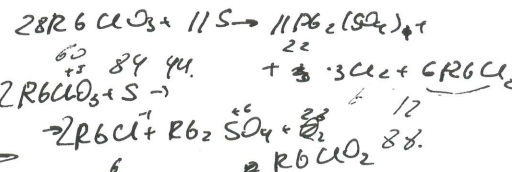
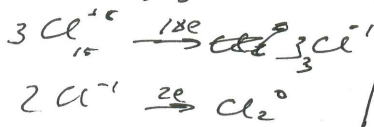
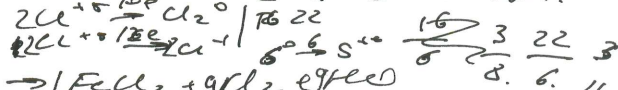
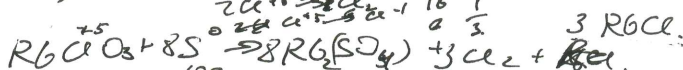
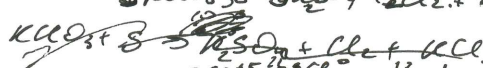
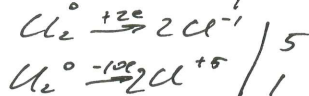
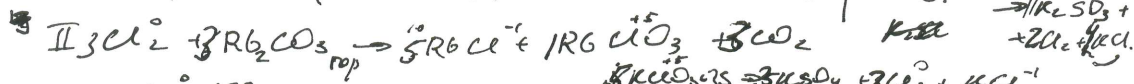
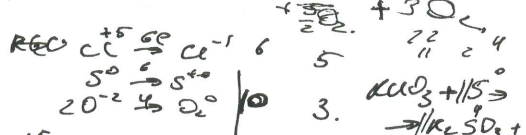
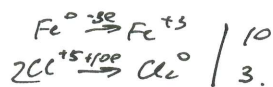
$Q_f(\text{CO}_2) = 393,5 \text{ кДж/моль}$
 $Q_f(\text{H}_2\text{O}) = 285,8 \text{ кДж/моль}$

$Q_{\text{сгор}} = 7 \cdot Q_{\text{CO}_2} + 3 \cdot Q_{\text{H}_2\text{O}} - Q_{\text{кисл.}}$

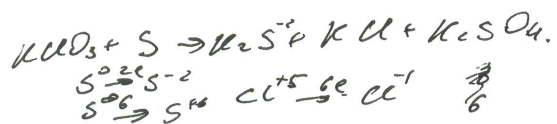
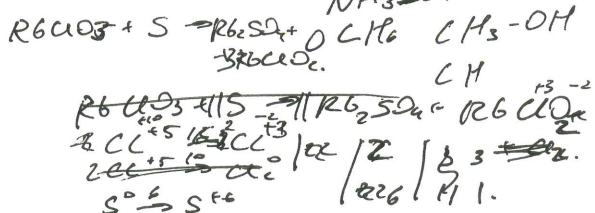
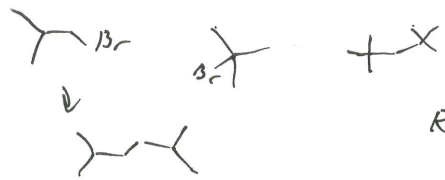
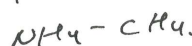
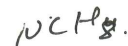
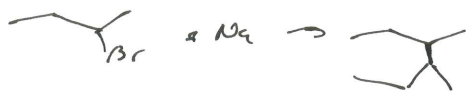
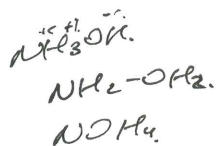
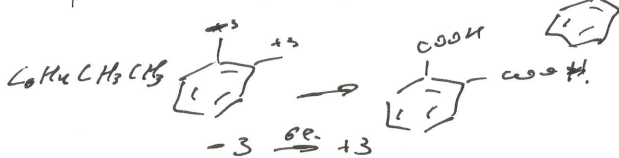
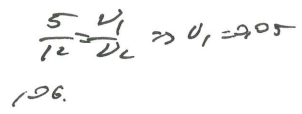
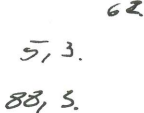
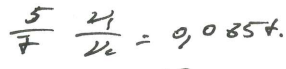
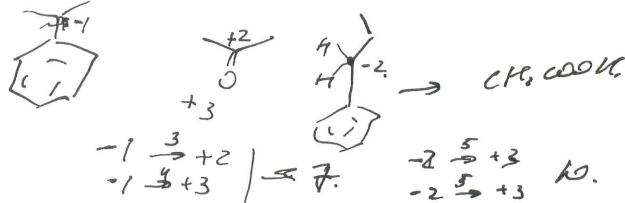
$Q_{\text{кисл.}} = 7 \cdot Q_{\text{CO}_2} + 3 \cdot Q_{\text{H}_2\text{O}} - Q_{\text{сгор}}$

$Q_{\text{кисл.}} = 7 \cdot 393,5 + 3 \cdot 285,8 - 3228$

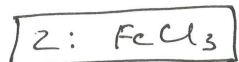
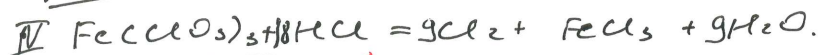
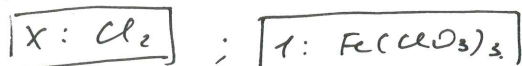
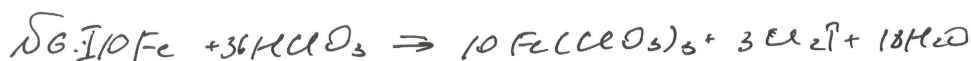
$Q_{\text{кисл.}} = 383,9 \text{ кДж/моль}$



$$C = \frac{V}{V_1} = 0.4 \cdot 0.5 = 0.1$$



ЧИСТОВИК



$$\nu_{\text{Cu}} = \frac{19,2}{64} = 0,3 \text{ моль.}$$

$$\text{по IV п. } \frac{\nu_{\text{FeCl}_3}}{\nu_{\text{Cu}}} = \frac{2}{1} \Rightarrow \nu_{\text{FeCl}_3} = 0,6 \text{ моль}$$

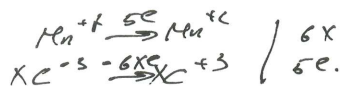
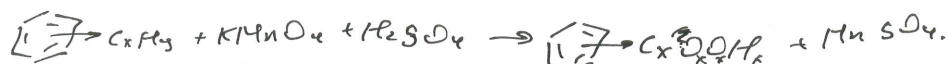
$$\text{по II ур-ю: } \nu_{\text{Fe}(\text{ClO}_3)_3} = \nu_{\text{FeCl}_3} = 0,6 \text{ моль}$$

$$\text{по I ур-ю } \nu_{\text{Fe}(\text{ClO}_3)_3} = \nu_{\text{Fe}} = 0,6 \text{ моль}$$

$$m_{\text{Fe}} = \nu M = 0,6 \cdot 56 = 33,6 \text{ г}$$

$$\text{ответ: } 33,6 \text{ г} = m(\text{Fe})$$

С7 Установили F: $\text{C}_6\text{H}_8\text{L}_x\text{H}_y \Rightarrow$ ароматическое соединение, не насыщенный

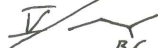
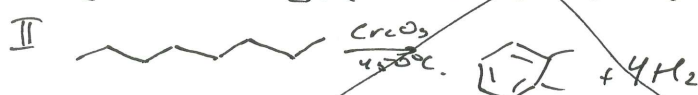
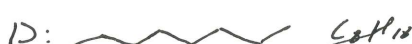
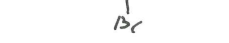
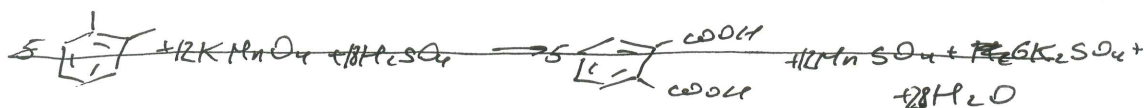
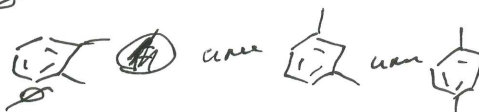


$$\nu_{\text{KMnO}_4} = 0,4 \cdot 0,3 = 0,12 \text{ моль.} \Rightarrow \frac{\nu_{\text{F}}}{\nu_{\text{KMnO}_4}} = \frac{6}{6x} \Rightarrow \nu_{\text{F}} = \frac{0,12 \cdot 5}{6x} = \frac{0,1}{x} \text{ моль}$$

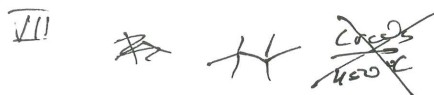
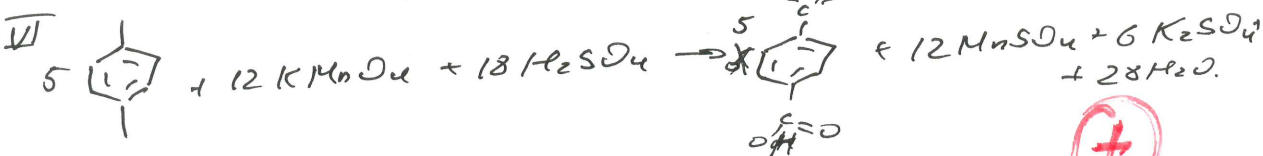
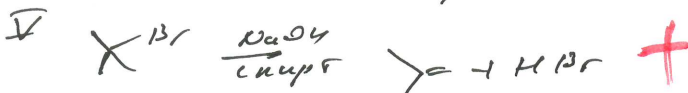
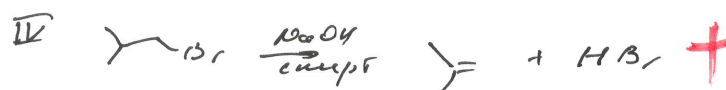
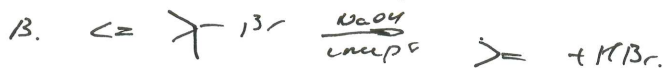
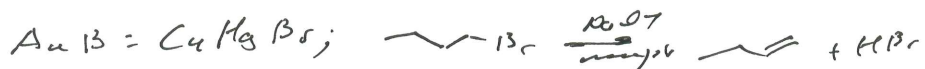
$$x=1 \Rightarrow \nu=0,1 \text{ моль } M=53 \text{ г/моль}$$

$$x=2 \Rightarrow \nu=0,05 \text{ моль } M=106 \text{ г/моль}$$

$$x=3 \Rightarrow \nu=0,033 \text{ моль } M = \frac{5,3}{0,033} = 160,6$$



ИСТОРИЯ
Продолжение



(+)

