

OHM 2045
EXOM #1
FALL 89

TEST FORM CODE: (B)(C)(D)(E)

TEST FORM CODE: (A)(C)(D)(E)

A	B	C	D	E	A	B	C	D	E
1	()	()	()	()	41	()	()	()	()
2	()	()	()	()	42	()	()	()	()
3	()	()	()	()	43	()	()	()	()
4	()	()	()	()	44	()	()	()	()
5	()	()	()	()	45	()	()	()	()
6	()	()	()	()	46	()	()	()	()
7	()	()	()	()	47	()	()	()	()
8	()	()	()	()	48	()	()	()	()
9	()	()	()	()	49	()	()	()	()
10	()	()	()	()	50	()	()	()	()

A	B	C	D	E	A	B	C	D	E
1	()	()	()	()	41	()	()	()	()
2	()	()	()	()	42	()	()	()	()
3	()	()	()	()	43	()	()	()	()
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5	()	()	()	()	45	()	()	()	()
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7	()	()	()	()	47	()	()	()	()
8	()	()	()	()	48	()	()	()	()
9	()	()	()	()	49	()	()	()	()
10	()	()	()	()	50	()	()	()	()

A	B	C	D	E	A	B	C	D	E
11	()	()	()	()	51	()	()	()	()
12	()	()	()	()	52	()	()	()	()
13	()	()	()	()	53	()	()	()	()
14	()	()	()	()	54	()	()	()	()
15	()	()	()	()	55	()	()	()	()
16	()	()	()	()	56	()	()	()	()
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18	()	()	()	()	58	()	()	()	()
19	()	()	()	()	59	()	()	()	()
20	()	()	()	()	60	()	()	()	()

A	B	C	D	E	A	B	C	D	E
11	()	()	()	()	51	()	()	()	()
12	()	()	()	()	52	()	()	()	()
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18	()	()	()	()	58	()	()	()	()
19	()	()	()	()	59	()	()	()	()
20	()	()	()	()	60	()	()	()	()

A	B	C	D	E	A	B	C	D	E
21	()	()	()	()	61	()	()	()	()
22	()	()	()	()	62	()	()	()	()
23	()	()	()	()	63	()	()	()	()
24	()	()	()	()	64	()	()	()	()
25	()	()	()	()	65	()	()	()	()
26	()	()	()	()	66	()	()	()	()
27	()	()	()	()	67	()	()	()	()
28	()	()	()	()	68	()	()	()	()
29	()	()	()	()	69	()	()	()	()

A	B	C	D	E	A	B	C	D	E
21	()	()	()	()	61	()	()	()	()
22	()	()	()	()	62	()	()	()	()
23	()	()	()	()	63	()	()	()	()
24	()	()	()	()	64	()	()	()	()
25	()	()	()	()	65	()	()	()	()
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27	()	()	()	()	67	()	()	()	()
28	()	()	()	()	68	()	()	()	()
29	()	()	()	()	69	()	()	()	()

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(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)(S)
(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)(T)
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(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)(X)
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UF ID

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SECTION

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LAST NAME												FI	MI	
A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z

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	A	B	C	D	E		A	B	C	D	E
1	1	2	3	4	5	41	1	2	3	4	5
2	1	2	3	4	5	42	1	2	3	4	5
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24	1	2	3	4	5	64	1	2	3	4	5
25	1	2	3	4	5	65	1	2	3	4	5
26	1	2	3	4	5	66	1	2	3	4	5

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26	1	2	3	4	5	66	1	2	3	4	5

$$(1) (3500 \text{ mL})(1.118 \text{ g/mL})(0.280) = \boxed{1.1 \times 10^3 \text{ g}}$$

$$(2) \begin{aligned} x &= {}^{107}\text{Ag} & 107.9 \text{ amu} &= [(x)(106.905092) + (1-x)(108.904756)] \\ 1-x &= {}^{109}\text{Ag} & 107.9 &= -1.999664x + 108.904756 \\ \text{Ave mass Ag} &= 107.9 \text{ amu} & & \\ & & x &= 0.5025 \\ & & 1-x &= 0.4975 \end{aligned} \quad \left. \vphantom{\begin{aligned} x &= {}^{107}\text{Ag} \\ 1-x &= {}^{109}\text{Ag} \end{aligned}} \right\} \begin{array}{l} 50.25\% \text{ }^{107}\text{Ag} \\ 49.75\% \text{ }^{109}\text{Ag} \end{array}$$

$$(3) (0.250 \text{ L})(0.0500 \text{ mol/L})(90.036 \text{ g/mol}) = \boxed{1.13 \text{ g}}$$

$$(4) \left[(17.60 \text{ g CO}_2) \left(\frac{1 \text{ mol CO}_2}{44.01 \text{ g}} \right) \right] = \left[(x \text{ g C}_4\text{H}_{10}) \left(\frac{1 \text{ mol C}_4\text{H}_{10}}{58.12 \text{ g}} \right) \left(\frac{8 \text{ mol CO}_2}{2 \text{ mol C}_4\text{H}_{10}} \right) \right] \\ + \left[(5.72 - x \text{ g C}_4\text{H}_8) \left(\frac{1 \text{ mol C}_4\text{H}_8}{56.10 \text{ g}} \right) \left(\frac{4 \text{ mol CO}_2}{1 \text{ mol C}_4\text{H}_8} \right) \right]$$

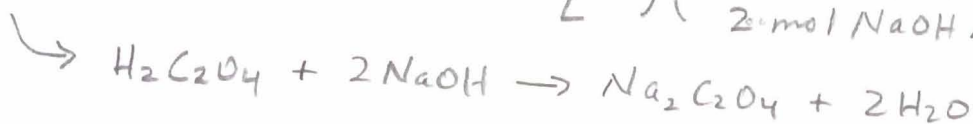
$$\begin{aligned} x &= \text{g C}_4\text{H}_{10} \\ 5.72 - x &= \text{g C}_4\text{H}_8 \end{aligned}$$

$$\text{Solve for } x: 0.3999 = 0.06882x + (0.4078 - 0.0713x) \\ -0.0079 = -0.0025x$$

$$x = 3.19 \text{ g} \quad 5.72 - x = \boxed{2.53 \text{ g C}_4\text{H}_8} \text{ butene}$$

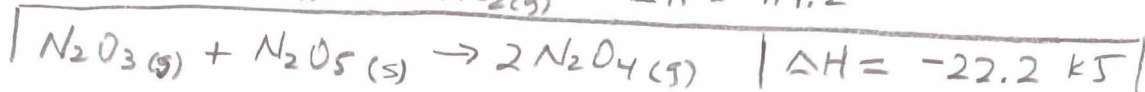
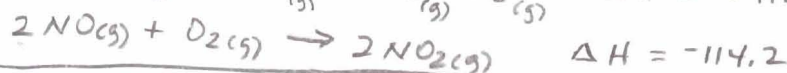
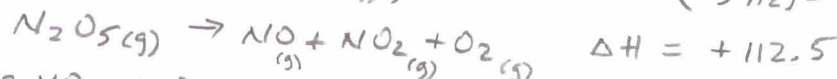
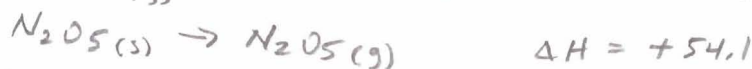
$$(5) (0.05320 \text{ L})(0.1350 \frac{\text{mol NaOH}}{\text{L}}) \left(\frac{1 \text{ mol HBr}}{1 \text{ mol NaOH}} \right) \left(\frac{1 \text{ mol C}_6\text{H}_8\text{O}_6}{2 \text{ mol HBr}} \right) \left(\frac{176.124 \text{ g}}{\text{mol}} \right) \\ = 0.6324 \text{ g} = \boxed{632.4 \text{ mg}}$$

$$(6) (0.05320 \text{ L})(0.546 \frac{\text{mol NaOH}}{\text{L}}) \left(\frac{1 \text{ mol H}_2\text{C}_2\text{O}_4}{2 \text{ mol NaOH}} \right) \left(\frac{1 \text{ L H}_2\text{C}_2\text{O}_4}{0.125 \text{ mol}} \right) = \boxed{0.116 \text{ L}}$$

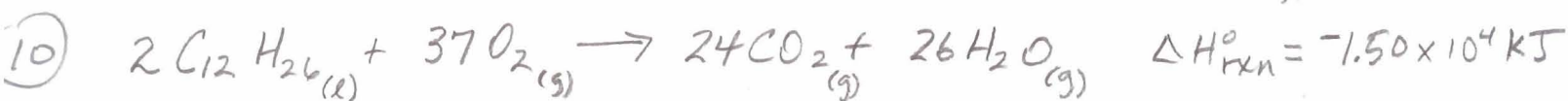
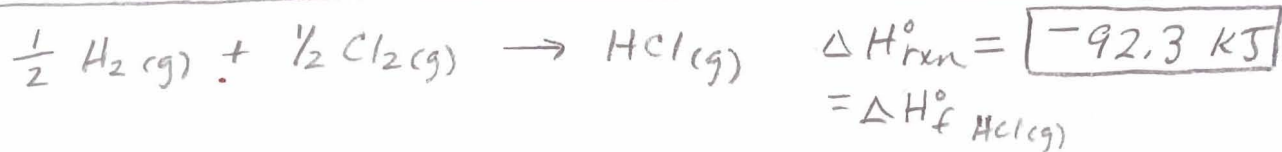
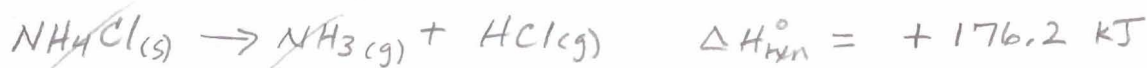


$$(7) \left[(0.0500 \text{ L})(0.0782 \frac{\text{mol H}_2\text{SO}_4}{\text{L}}) \left(\frac{2 \text{ mol NaOH}}{1 \text{ mol H}_2\text{SO}_4} \right) \right] \div 0.0184 \text{ L NaOH} = \boxed{0.425 \text{ M NaOH}}$$

$$\left[(0.0275 \text{ L})(0.425 \frac{\text{mol NaOH}}{\text{L}}) \left(\frac{1 \text{ mol HCl}}{1 \text{ mol NaOH}} \right) \right] \div 0.100 \text{ L HCl} = \boxed{0.117 \text{ M HCl}}$$



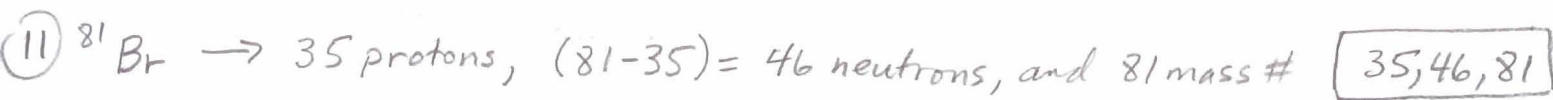
9) Target equation for ΔH_f° of $\text{HCl}(g) \Rightarrow \frac{1}{2} \text{H}_2(g) + \frac{1}{2} \text{Cl}_2(g) \rightarrow \text{HCl}(g)$



$$\Delta H_{\text{rxn}}^\circ = \sum m \Delta H_f^\circ \text{ prod} - \sum m \Delta H_f^\circ \text{ react}$$

$$-1.50 \times 10^4 \text{ kJ} = [(24 \times -395.5) + (26 \times -241.83)] - [2 \times \Delta H_f^\circ \text{ C}_{12}\text{H}_{26}]$$

$$780 = -2 \times \Delta H_f^\circ \text{ C}_{12}\text{H}_{26} \quad \Delta H_f^\circ \text{ C}_{12}\text{H}_{26} = -390 = \boxed{-390 \text{ kJ/mol}}$$



12) $(0.882 \text{ g CO}_2) \left(\frac{1 \text{ mol CO}_2}{44.01 \text{ g}} \right) \left(\frac{1 \text{ mol C}}{1 \text{ mol CO}_2} \right) = 0.0200 \text{ mol C} (= 0.241 \text{ g C})$

$$(0.360 \text{ g H}_2\text{O}) \left(\frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g}} \right) \left(\frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} \right) = 0.0400 \text{ mol H} (= 0.0403 \text{ g H})$$

$$(0.440 \text{ g acid} - (0.241 \text{ g C} + 0.0403 \text{ g H})) = 0.159 \text{ g O}$$

$$(0.159 \text{ g O}) \left(\frac{1 \text{ mol O}}{16.00 \text{ g}} \right) = 0.00994 \approx 0.0100 \text{ mol O}$$

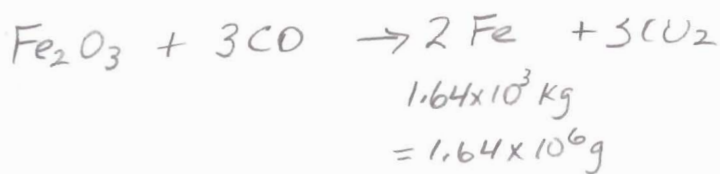
$$\Rightarrow \text{empirical fm} = \text{C}_{0.0200} \text{H}_{0.0400} \text{O}_{0.0100} = \boxed{\text{C}_2\text{H}_4\text{O}}$$

13) $(0.500 \text{ L}) \left(0.25 \frac{\text{mol NO}_3^-}{\text{L}} \right) = 0.125 \text{ mol NO}_3^- \text{ in flask (desired)}$

$$\text{From NaNO}_3: (5 \text{ g NaNO}_3) \left(\frac{1 \text{ mol NaNO}_3}{85 \text{ g}} \right) \left(\frac{1 \text{ mol NO}_3^-}{1 \text{ mol NaNO}_3} \right) = 0.059 \text{ mol NO}_3^-$$

$$\text{So } 0.125 \text{ mol} - 0.059 \text{ mol} = 0.066 \text{ mol NO}_3^- \text{ needed from Mg(NO}_3)_2$$

$$\therefore (0.066 \text{ mol NO}_3^-) \left(\frac{1 \text{ mol Mg(NO}_3)_2}{2 \text{ mol NO}_3^-} \right) \left(\frac{148.33 \text{ g}}{\text{mol}} \right) = \boxed{4.9 \text{ g Mg(NO}_3)_2}$$



$$= 2.62 \times 10^6 \text{ g ore}$$

$$\left[(1.64 \times 10^6 \text{ g Fe}) \left(\frac{1 \text{ mol Fe}}{55.85 \text{ g}} \right) \left(\frac{1 \text{ mol Fe}_2\text{O}_3}{2 \text{ mol Fe}} \right) \left(\frac{159.7 \text{ g Fe}_2\text{O}_3}{\text{mol}} \right) \right] \div 2.62 \times 10^6 \text{ g ore} \times 100\% = \boxed{89.5\% \text{ Fe}_2\text{O}_3}$$

$$(48.2 \text{ g HCl}) \left(\frac{1 \text{ mol HCl}}{36.46 \text{ g}} \right) = 1.32 \text{ mol HCl}$$

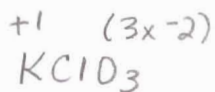
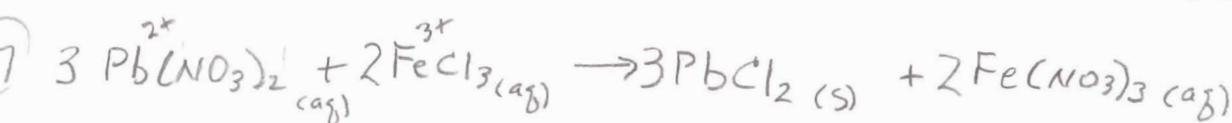
Which is limiting reactant? $(0.86 \text{ mol MnO}_2) \left(\frac{4 \text{ mol HCl}}{1 \text{ mol MnO}_2} \right) = 3.44 \text{ mol HCl needed}$

∴ HCl is limiting reactant

$$(1.32 \text{ mol HCl}) \left(\frac{1 \text{ mol Cl}_2}{4 \text{ mol HCl}} \right) \left(70.9 \text{ g/mol} \right) = \boxed{23.4 \text{ g Cl}_2}$$

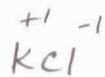
$$(1.864 \text{ g BaSO}_4) \left(\frac{1 \text{ mol BaSO}_4}{233.37 \text{ g}} \right) \left(\frac{1 \text{ mol BaCl}_2}{1 \text{ mol BaSO}_4} \right) \left(\frac{208.2 \text{ g BaCl}_2}{\text{mol}} \right) = 1.663 \text{ g BaCl}_2 (= 0.008 \text{ mol BaCl}_2)$$

$$1.951 \text{ g hydrate} - 1.663 \text{ g BaCl}_2 = 0.288 \text{ g H}_2\text{O} = 0.016 \text{ mol H}_2\text{O} \quad \frac{0.016 \text{ mol H}_2\text{O}}{0.008 \text{ mol BaCl}_2} = \boxed{2}$$



$$(+1) + ? + (-6) = 0$$

$$\text{Cl} = +5$$



$$\text{Cl} = -1$$

$$\boxed{+5 \text{ to } -1}$$



$$\text{mass, soln} = 2 \times 200 \text{ mL} \times 1.00 \text{ g/mL} = 400 \text{ g}$$

$$\text{mol H}^+ = \text{mol OH}^-$$

$$= \text{mol H}_2\text{O formed}$$

$$= 0.172 \text{ mol}$$

$$(0.200 \text{ L}) \left(\frac{0.862 \text{ mol HCl}}{\text{L}} \right) \left(\frac{1 \text{ mol H}^+}{1 \text{ mol HCl}} \right) = 0.172 \text{ mol}$$

$$(0.200 \text{ L}) \left(\frac{0.431 \text{ mol Ba(OH)}_2}{\text{L}} \right) \left(\frac{2 \text{ mol OH}^-}{1 \text{ mol Ba(OH)}_2} \right) = 0.172 \text{ mol}$$

$$\text{So } (0.172 \text{ mol}) (-56.2 \text{ kJ/mol})$$

$$= -9.67 \text{ kJ/mol} = -9,670 \text{ J/mol} = q_{\text{rxn}}$$

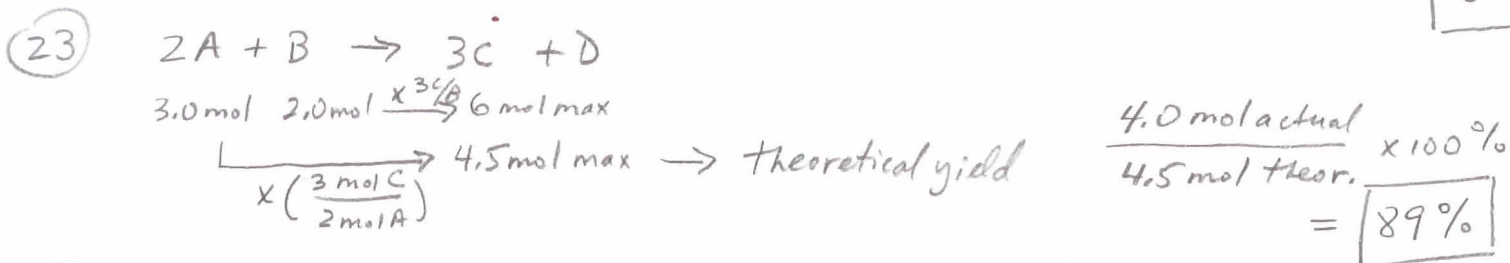
$$q_{\text{H}_2\text{O}} = -q_{\text{rxn}} = m c \Delta T$$

$$+9,670 \text{ J} = (400 \text{ g}) (4.184 \text{ J/g}^\circ\text{C}) (T_f - 20.48^\circ\text{C}) \quad \boxed{T_f = 26.3^\circ\text{C}}$$

$$(20) \quad (1026.57 \text{ g H}_2\text{SO}_4 - 78.23 \text{ g flask}) \div [(593.63 - 78.23 \text{ g})(1 \text{ cm}^3/1.00 \text{ g})] = \boxed{1.840 \text{ g/cm}^3}$$



$$(22) \quad (29.34 \text{ g}) \left(\frac{1 \text{ mol Na}_2\text{SO}_4}{142.05 \text{ g}} \right) \left(\frac{4 \text{ mol O}}{1 \text{ mol Na}_2\text{SO}_4} \right) (6.022 \times 10^{23} \text{ atoms/mol}) = \boxed{4.975 \times 10^{23} \text{ O atoms}}$$



$$(24) \quad (2.50 \text{ cm})^3 = 15.625 \text{ cm}^3$$

$$(15.625 \text{ cm}^3)(8.90 \text{ g/cm}^3) \left(\frac{1 \text{ mol Co}}{58.93 \text{ g}} \right) (6.022 \times 10^{23} \text{ atoms/mol}) = \boxed{1.42 \times 10^{24} \text{ Co atoms}}$$

(25) only answer (5) has all elements in std. state that properly form $\text{C}_2\text{H}_5\text{OH}$ ($\text{C}_{\text{(graphite)}}$ $\text{H}_{2(\text{g})}$ $\text{O}_{2(\text{g})}$)

