

AP Summer KEY

11-a.

$$78.241 \text{ g} \quad 4 \text{ sf: } 78.24 \text{ g}$$
$$3 : 78.2 \text{ g}$$
$$2 : 78 \text{ g}$$
$$1 : 80 \text{ g}$$

b. 0.2983 g 0.298 g 0.30 g 0.3 g

c. $50,001 \text{ g}$ $50,000 \text{ g}$ (for all)

2

$$\text{Val} = 624 \text{ cm}^3 \quad (3 \text{ sig figs})$$

a. $D = m/v = 5627 \text{ g} / 624 \text{ cm}^3 = 9.02 \text{ g/cm}^3$

b. 13.22 mL

$$\begin{array}{r} - 0.75 \text{ mL} \\ \hline 12.47 \text{ mL} \end{array} \quad (2 \text{ places after decimal})$$

c. $V = \frac{m}{D} = 45.67 \text{ g} / 6.81 \text{ g/cm}^3 = 6.71 \text{ mL}$

d.

$$\begin{array}{r} 23.1 \text{ g} \\ 4.77 \text{ g} \\ 125.39 \text{ g} \\ + 3.581 \text{ g} \\ \hline 156.8 \text{ g} \end{array}$$

$$156.8 \text{ g}$$

pg 2

3 a. $250,000 \text{ mi} \times \frac{5280 \text{ ft}}{1 \text{ mi}} = 1320000000$
 $= 1300000000$
 $= 1.3 \times 10^9 \text{ ft}$

4 $355 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1 \text{ gal}}{3.79 \text{ L}} = 0.0937 \text{ gal}$

5 $\frac{1.00 \text{ mi}}{7.35 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ sec}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} = 12.0 \frac{\text{ft}}{\text{sec}}$

6 $60.0 \frac{\text{mi}}{\text{hr}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ hr}}{3600 \text{ sec}} = 43.0 \frac{\text{ft}}{\text{sec}}$

7 $D = 0.729 \frac{\text{g}}{\text{mL}}$ ~~steps~~ ton \rightarrow grams
 $V = \frac{\text{m}}{D}$

$$1.45 \text{ tons} \times \frac{2000 \text{ lb}}{1 \text{ ton}} \times \frac{1000 \text{ g}}{2.2 \text{ lb}} = 132000 \text{ g}$$

$$V = \frac{132000 \text{ g}}{0.729 \text{ g/mL}} = 1.81 \times 10^5 \text{ mL}$$

SYMBOL	P	N	e ⁻	#	mass #	change
⁵³ ₂₅ Cr ⁺⁴	25	28	21	25	53	+4
³¹ ₁₅ P ⁻³	15	16	18	15	31	-3
¹³ ₆ C	6	7	6	6	13	0
³⁷ ₁₇ Cl ⁻¹	17	19	18	17	36	-1
⁵⁶ ₂₆ Fe ⁺³	26	30	23	26	56	+3

~~Pg 3~~

[9]

$$0.20(10) + .80(11) = 10.8 \text{ amu}$$

$$.909(20) + 0.003(21) + .088(22) = 20.18 \text{ amu}$$

[10]

HBr hydrobromic acid

N_2O_5 dinitrogen pentoxide

BaI_2 barium iodide

SO_2 sulfur dioxide

$NiCl_2$ nickel (II) chloride

$Ni^{+2} Cl^{-1}$
($NiCl_2$)

H_2CO_3 CO_3^{2-} carbonate
acid! carbonic

carbonic acid

H_3PO_4

PO_4^{3-} phosphate

$K_2Cr_2O_7$

$Cr_2O_7^{2-}$

$Hg(OH)_2$

mercury (II) hydroxide

HF

hydrofluoric acid

HNO_2

nitrous acid

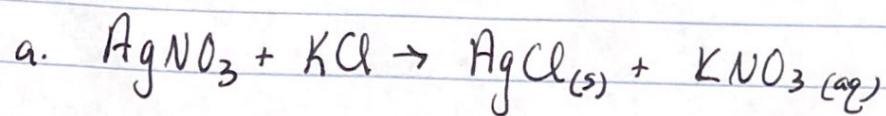
NiI_3

nickel (III) iodide

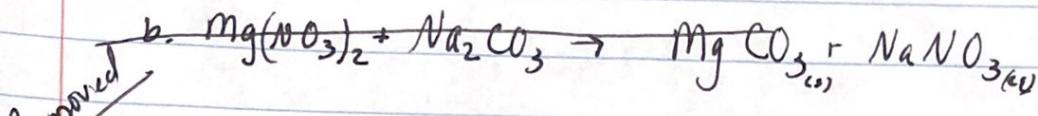
- +2 n -2

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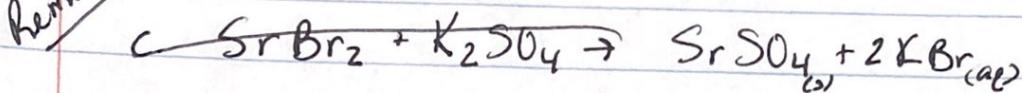
12



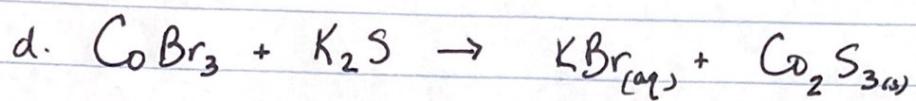
AgCl



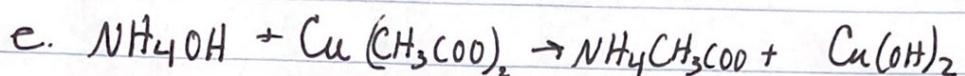
Mg CO_3



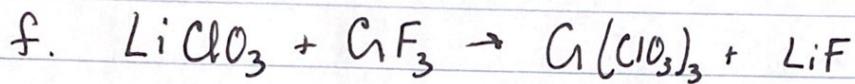
SrSO_4



Co_2S_3

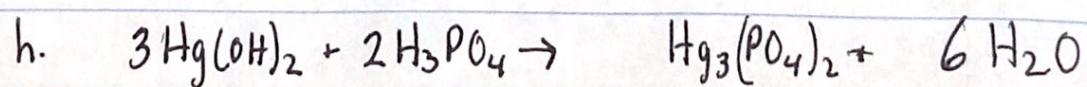
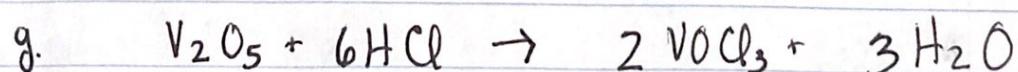
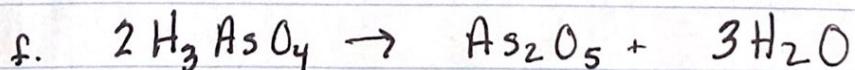
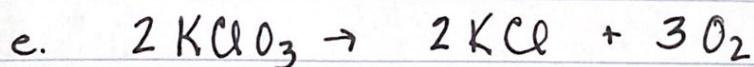
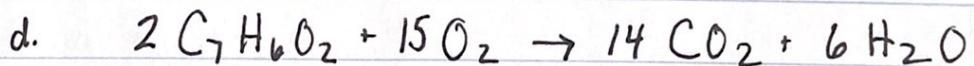
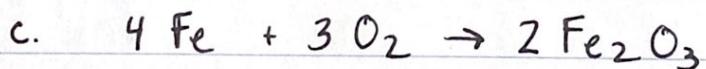
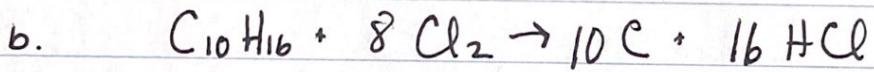
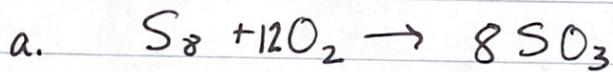


$\text{Cu}(\text{OH})_2$



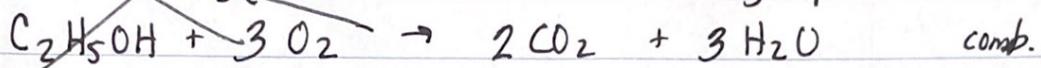
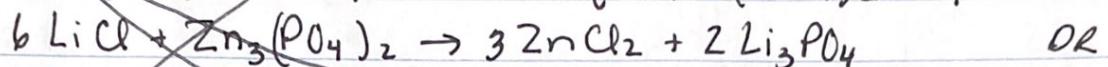
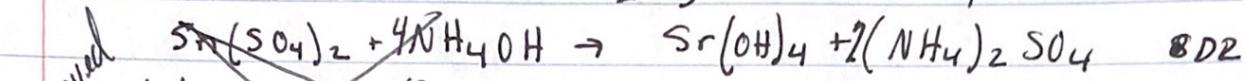
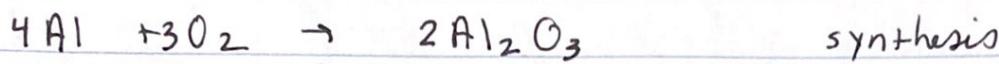
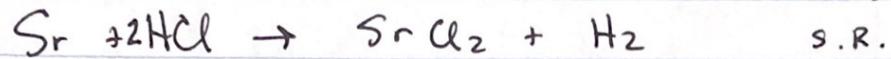
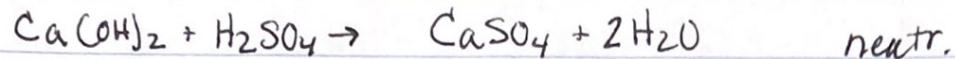
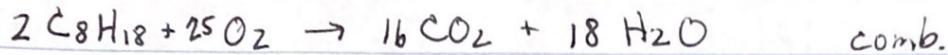
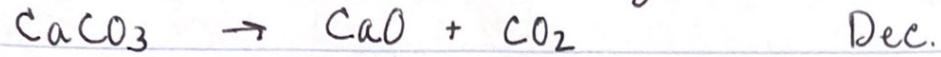
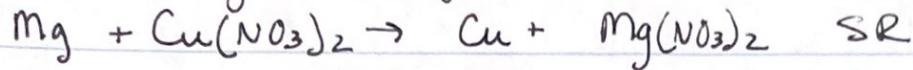
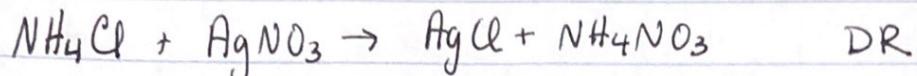
$\text{C}_n(\text{ClO}_3)_3$

13



14

Pg 5



15

molar mass Na_2O : 61.98 g/mol

$$10.0\text{g Na}_2\text{O} \times \frac{1\text{mol}}{61.98\text{g}} \times \frac{1\text{mol H}_2\text{O}}{1\text{mol Na}_2\text{O}} \times \frac{18.02\text{g}}{1\text{mol H}_2\text{O}} = 2.91\text{g H}_2\text{O}$$

16

$$45.0\text{g O}_2 \times \frac{1\text{mol O}_2}{32\text{g O}_2} \times \frac{2\text{mol NaCl}}{3\text{mol O}_2} \times \frac{58.44\text{g}}{1\text{mol NaCl}} = 54.8\text{g NaCl}$$

17

$$100.0\text{g NH}_3 \times \frac{1\text{mol NH}_3}{17.04\text{g NH}_3} \times \frac{6\text{mol H}_2\text{O}}{4\text{mol NH}_3} \times \frac{18.02\text{g}}{1\text{mol H}_2\text{O}} = 158.6\text{g H}_2\text{O}$$

18

$$\text{NH}_3 \rightarrow \text{NO} \quad 25.0\text{g} \xrightarrow{\text{N}^{\text{H}3}} \frac{1\text{mol NH}_3}{17.04\text{g}} \times \frac{4\text{mol NO}}{4\text{mol NH}_3} = 1.47\text{mol NO}$$

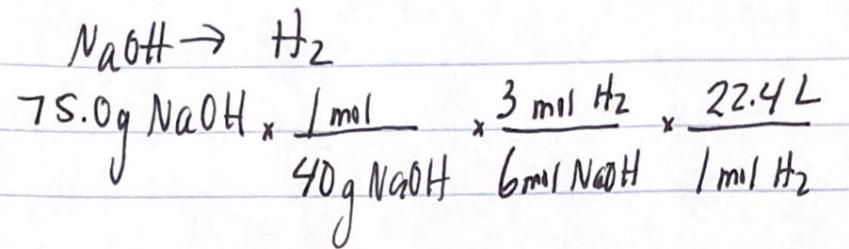
 $\text{O}_2 \rightarrow \text{NO}$

$$25.0\text{g O}_2 \times \frac{1\text{mol O}_2}{32\text{g}} \times \frac{4\text{mol NO}}{5\text{mol O}_2} = 0.625\text{mol NO}$$

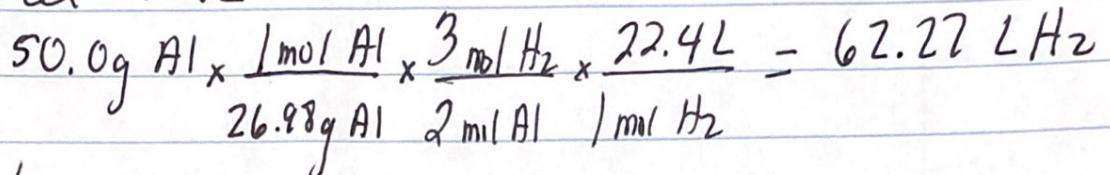
1.0000

O_2
is
lim. rct.

19



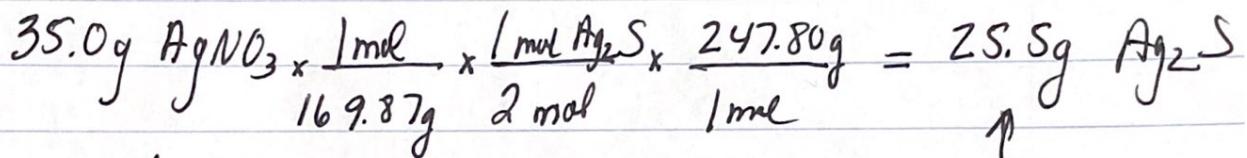
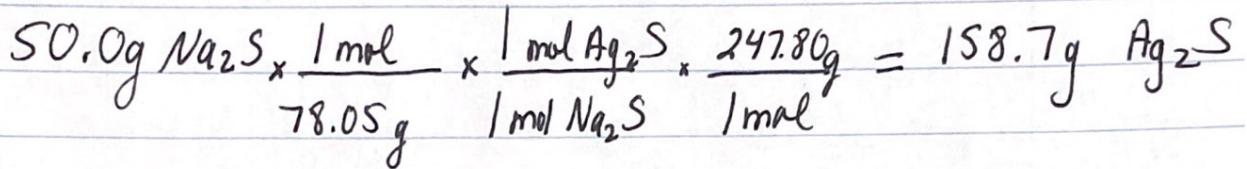
Pg b



20

ugh...

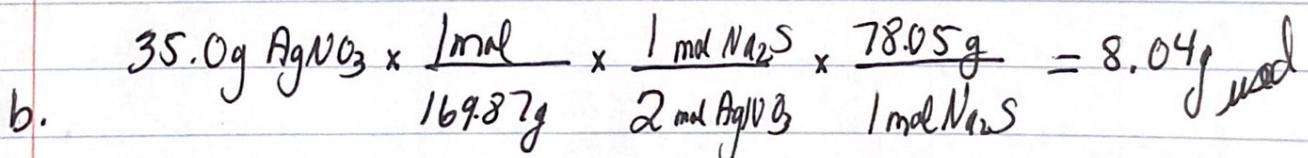
find
mass
 Ag_2S
(a)



limiting
reactant, AgNO_3

excess Na_2S

$50.0 \text{ g} - \underline{\text{used}} = \text{excess}$



$$50.0 - 8.04 = \underline{41.96 \text{ g left}}$$

c. 25.5 g Ag_2S (see part A)

21

pg 7



$$C: 7(12.01) = 84.07 \quad \frac{84.07}{362.09} = 23.2\%$$

$$Bi: 208.98 / 362.09 = 57.7\%$$

$$2 \times 0.262\text{ g} = 0.524\text{ g} (.577) = 0.302\text{ g Bi}$$

22

$$C (100 - 7.74) = 92.26 \quad 0.9226(78.1) = 72.06\text{ g}$$

$$H . 0774(78.1) = 6.04$$

$$\begin{array}{rcl} C & 72.06\text{ g} / 12.01\text{ g/mol} & = 6 \text{ mol C} & 1:1 \\ H & 6.04\text{ g} / 1.01 & = 6 \text{ mol H} & \\ & & & \text{emp} = CH \end{array}$$

$$C + H = 13$$

$$78.1 / 13 = 6 \quad C_6H_6 = \text{mol}$$

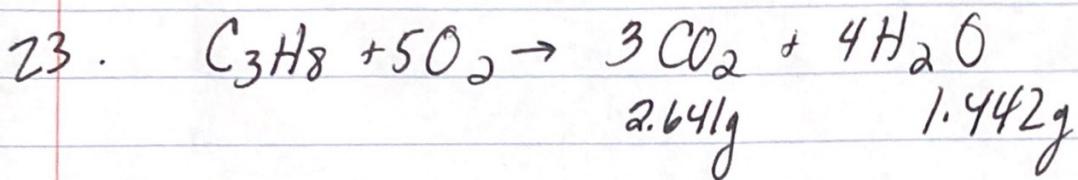
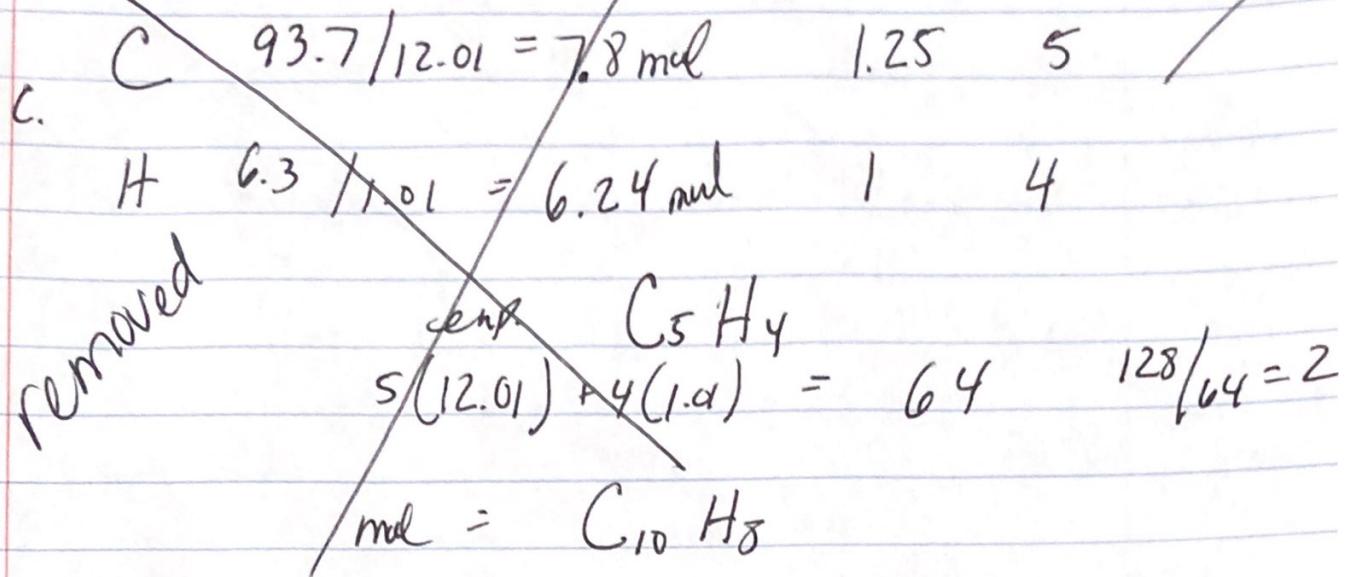
b.

$$\begin{array}{rcl} C & 75.69 / 12.01 = 6.30 \text{ mol C} & 6.3 / .97 = 6.5 \rightarrow 26 \\ H & 8.88 / 1.01 = 8.7 \text{ mol H} & 8.7 / .97 = 8.9 \rightarrow 33 \\ O & 15.51 / 16 = 0.97 \text{ mol O} & 0.97 / .97 = 1 \rightarrow 4 \end{array}$$

$$\text{emp} = C_{13}H_{18}O_2$$

$$13(12.01) + 18(1.01) + 2(16) = 206$$

$$\text{mol} = C_{13}H_{18}O_2$$



$$2.641g CO_2 \times \frac{1 \text{ mol } CO_2}{44.01g} \times \frac{1 \text{ mol } C}{1 \text{ mol } CO_2} = .06 \text{ mol } C$$

$$1.442g H_2O \times \frac{1 \text{ mol } H_2O}{18.02g} \times \frac{2 \text{ mol } H}{1 \text{ mol } H_2O} = 0.16 \text{ mol } H$$

$$\begin{array}{rcl} C & .06 \text{ mol } / .06 \text{ mol } & = 1 \times 3 = 3 \text{ mol } C \\ H & .16 \text{ mol } / .06 \text{ mol } & = 2.67 \times 3 = 8 \text{ mol } H \end{array}$$

C_3H_8

28 + 29 are difficult

pg 10

$$\text{Molarity} = \frac{\text{mol solute}}{\text{L solution}}$$

25

$$6.73\text{ g Na}_2\text{CO}_3 \times \frac{1\text{ mol}}{105.99\text{ g}} = 0.0635\text{ mol}$$

$$M = \frac{0.0635\text{ mol}}{0.2500\text{ L}} = 0.254\text{ M}$$

26

$$V \cdot M = \text{mol} \quad (0.250\text{ L})(0.0125\text{ mol}) = 0.03125\text{ mol KMnO}_4$$

$$0.03125\text{ mol}(158.03\text{ g/mol}) = 0.494\text{ g KMnO}_4$$

27

$$25.0\text{ g NaOH} \times \frac{1\text{ mol}}{40\text{ g}} = 0.625\text{ mol NaOH} \quad \text{vol} = \frac{0.625\text{ mol}}{0.123\text{ M}} = 5.08\text{ L}$$

28

$$M_1 V_1 = M_2 V_2$$

$$(4.00\text{ mL})(0.0250\text{ M}) = (10.00\text{ mL})(M_2) \quad M_2 = 0.01\text{ M}$$

30

molar mass $\text{Ba}(\text{OH})_2$ 171.34 g/mol

Pg 11

$$1.30 \text{ g } \text{Ba}(\text{OH})_2 \times \frac{1 \text{ mol}}{171.34 \text{ g}} \times \frac{2 \text{ mol HNO}_3}{1 \text{ mol } \text{Ba}(\text{OH})_2} = 0.0152 \text{ mol}$$

$$\text{vol} = \frac{\text{mol}}{M} = \frac{0.0152 \text{ mol}}{1.125 \text{ M}} = 0.121 \text{ L}$$

31

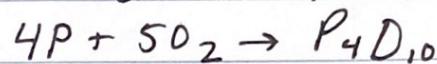
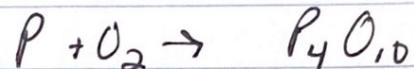
$$1.27 \text{ M} \times 0.128 \text{ L} = 0.0163 \text{ mol Na}_2\text{CO}_3$$

$$= 0.0328 \text{ mol HCl}$$

$$\text{vol} = \frac{0.0328}{0.955} = .034 \text{ L} = 34 \text{ mL}$$

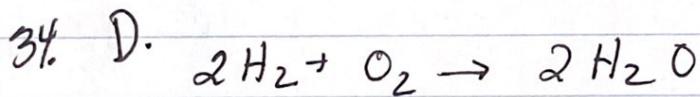
32. A $18 e^-$

33. D



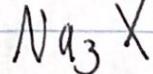
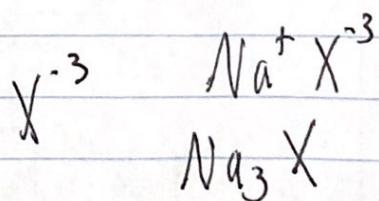
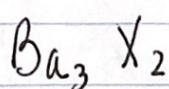
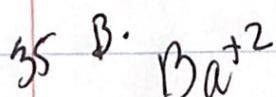
$$\frac{14.2 \text{ g P}_4\text{O}_{10}}{284 \text{ g}} \times \frac{142}{284} = \frac{5}{50} = .05 \text{ mol}$$

$$.05 \text{ mol P}_4\text{O}_{10} \times \frac{5}{1} = .25 \text{ mol}$$



2	2
MED	MED
0	1 M/L

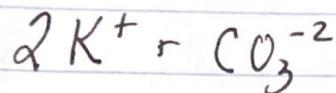
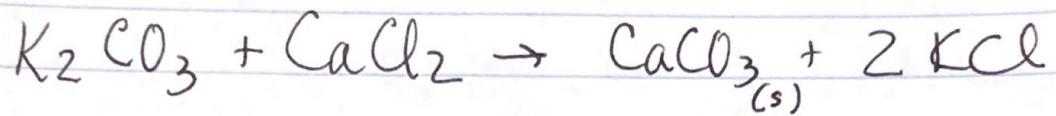
2 form



Pg 12

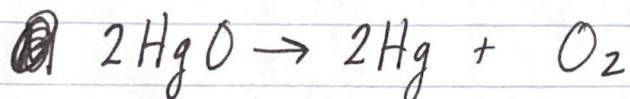
36. A can't be reduced.

37. B.



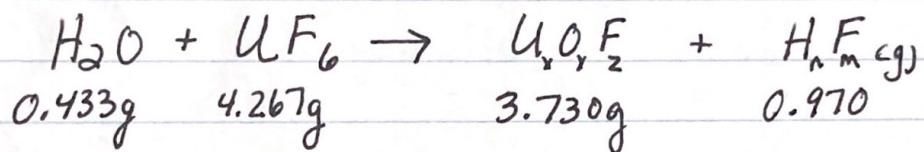
all carbonate gone

39



b. less because $O_2(g)$ max is gone

38



$$F \cdot .95(.970g) = 0.9215g / 19 = .0485 \text{ mol F}$$

1:1

$$H \cdot .05 (.970g) = .0485g / 1.01 = .048 \text{ mol H}$$

HF