

$$\frac{0.1660g BaSO_4}{233.39g} \times \frac{1mol BaSO_4}{1mol Ba^{2+}} \times \frac{137.33g}{1mol Ba^{2+}} = 0.09768g Ba^{2+}$$

$$0.1480g - 0.09768g = 0.05032g X$$

$$\frac{0.09768g Ba^{2+}}{137.33g} \times \frac{1mol Ba^{2+}}{1mol Ba^{2+}} = 7.112 \times 10^{-4} mol Ba^{2+}$$

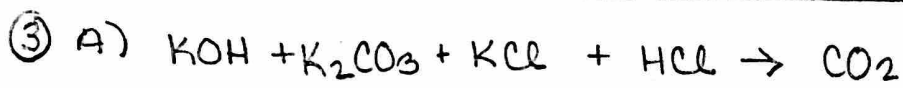
$$BaX_2 = 2x mol X + 1 mol Ba$$

$$1.423 \times 10^{-3} mol X$$

molar mass = g/mol

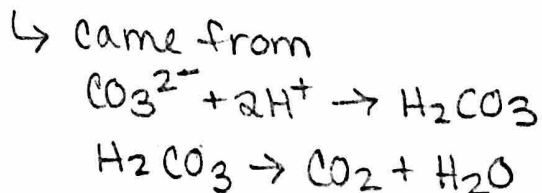
$$\therefore 0.05032g X / (1.423 \times 10^{-3} mol) = 35.36 g/mol$$

$$X = Cl$$



$$\frac{0.100L}{1L} \times \frac{2mol}{1L} = 0.200 mol HCl \text{ used}$$

$$\therefore 0.200 mol H^+$$



$$PV = nRT \quad (740)(0.2490) = n(62.4)(273+22)$$

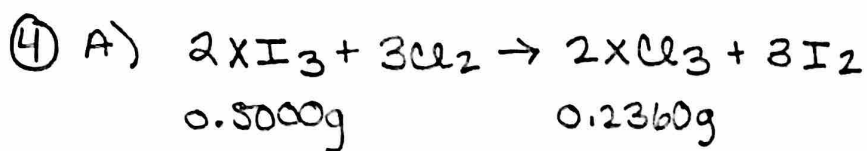
$$n = 0.0100 mol CO_2 \text{ made}$$

$$\therefore 0.0100 mol H_2CO_3 \text{ formed} \therefore 0.0100 mol K_2CO_3 \text{ used up}$$

$$\frac{0.0100 mol K_2CO_3}{1mol} \times 138.2g = 1.382g K_2CO_3$$

$$\frac{1.382g K_2CO_3}{5.00g \text{ sample}} \times 100$$

$$= 27.64\%$$



$2:2$ mole ratio $\text{g} \rightarrow \text{mol}$ $\text{g}/(\text{g}/\text{mol}) = \text{mol}$
 \therefore equal moles
 molar masses:

$$\text{XI}_3 = (x + 380.73)$$

$$\text{XCl}_3 = (x + 106.35)$$

$$\frac{0.5000\text{g}}{(x + 380.73)} = \frac{0.2360\text{g}}{(x + 106.35)}$$

moles XI_3
moles XCl_3

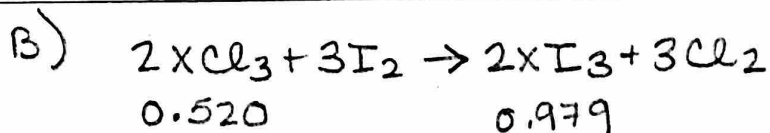
$$0.5000(x + 106.35) = 0.2360(x + 380.73)$$

$$0.5000x + 53.175 = 0.2360x + 89.852$$

$$-0.2360x \quad -53.175 \quad -0.2360x \quad -53.175$$

$$0.264x = 36.677$$

$$\boxed{x = 138.9 \text{ g/mol} = \text{Lanthanum}}$$



$$\frac{0.520}{(x + 106.35)} = \frac{0.979}{(x + 380.73)}$$

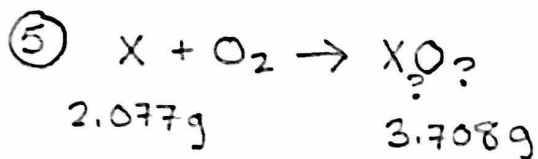
$$0.520(x + 380.73) = 0.979(x + 106.35)$$

$$0.520x + 197.98 = 0.979x + 104.12$$

$$-0.520x \quad -104.12 \quad +0.520x \quad -104.12$$

$$93.86 = 0.459x$$

$$\boxed{x = 204.5 \text{ g/mol} = \text{Thallium}}$$



$3.708 - 2.077 = 1.631g$ Oxygen used

$\frac{1.631g O}{16g} \div 1 \text{ mol} = 0.1019 \text{ mol } O$

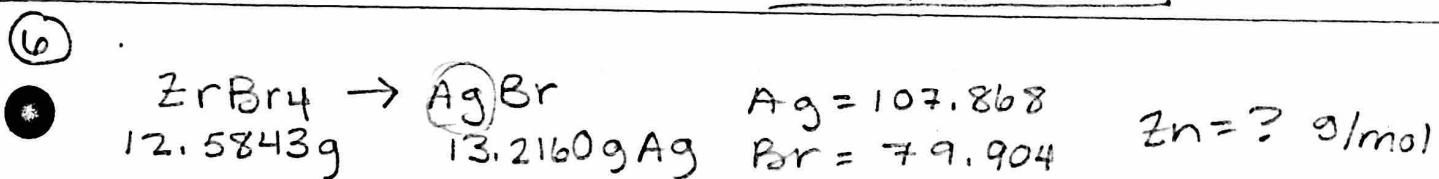
$X_?O_?$
 ↓
 mm btwn
 40-50

if XO then
 $\frac{2.077g X}{0.1019 \text{ mol}}$
 $= 20.38 \text{ g/mol}$
 too small

if XO_2 then
 $\frac{2.077g X}{0.05097 \text{ mol}}$
 $= 40.75 \text{ g/mol}$
 btwn 40-50!

* X_2O doesn't work, and X_2O_3 doesn't either. Have to Guess & Check!

∴ X_2O , closest element = K



$\frac{13.2160g Ag}{107.868g Ag} \div 1 \text{ mol } Ag = 0.1225 \text{ mol } Ag$

$\frac{0.1225 \text{ mol } Br}{4 \text{ mol } Br \text{ in } ZrBr_4}$

↳ 0.3063 mol Zn

$\frac{0.1225 \text{ mol } Br}{1 \text{ mol}} \cdot 79.904g = 9.788g Br$

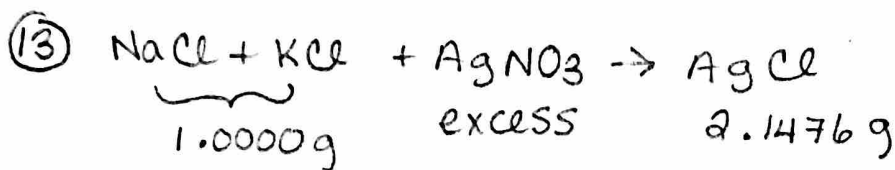
$12.5843g \text{ Sample} - 9.788g Br = 2.7963g Zn$

$\frac{2.7963g Zn}{0.3063 \text{ mol } Zn} = \boxed{91.29 \text{ g/mol}}$

$$\textcircled{12} \quad \frac{5.50 \times 10^{-3} \text{ g O} \quad | \quad 1 \text{ mol O} \quad | \quad 3 \text{ mol PO}_4^{3-} \quad | \quad 6.02 \times 10^{23} \text{ ions} =}{16 \text{ g O} \quad | \quad 13 \text{ mol O} \quad | \quad 1 \text{ mol}}$$

Ca₅(PO₄)₃OH Has
13 mol O / 3 mol PO₄³⁻

$$\boxed{4.78 \times 10^{19} \text{ PO}_4^{3-} \text{ ions}}$$



in NaCl	in KCl	2.1476 g	1 mol AgCl	1 mol Cl	35.45 g
Cl $\frac{35.45 \text{ g}}{58.4 \text{ g}}$	Cl $\frac{35.45}{74.6 \text{ g}}$	AgCl	143.32 g	1 mol AgCl	1 mol Cl

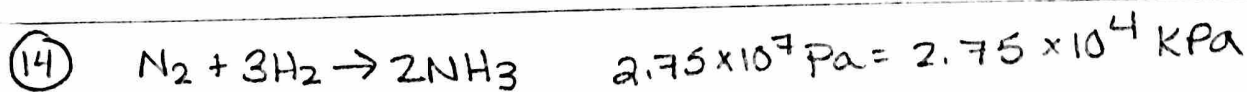
$$(X \text{ g NaCl}) \left(\frac{35.45 \text{ g Cl}}{58.4 \text{ g NaCl}} \right) + (1-X \text{ g}) \left(\frac{35.45 \text{ g Cl}}{74.6 \text{ g KCl}} \right) = 0.5312 \text{ g Cl}$$

$$0.6079x + 0.4759 - 0.4759x = 0.5312$$

$$0.132x = 0.0561$$

$$x = 0.425 \text{ g NaCl}$$

$$\frac{0.425 \text{ g NaCl}}{1.0000 \text{ g Sample}} \times 100 = \boxed{42.5\%}$$



$$PV = nRT \quad (2.75 \times 10^4) (8.75 \times 10^3) = n (8.314) (455 + 273)$$

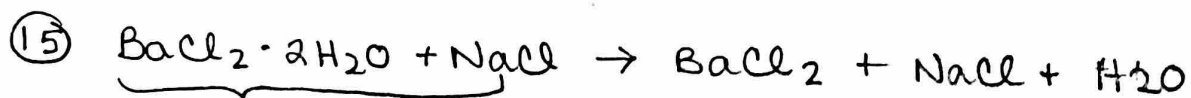
$$n = 3.98 \times 10^4 \text{ in reactor} \therefore 1.99 \times 10^4 \text{ mol N}_2$$

$$1.99 \times 10^4 \text{ mol H}_2 \rightarrow \text{limiting}$$

1.99 x 10 ⁴ mol H ₂	2 mol NH ₃	17.03 g
	3 mol H ₂	1 mol NH ₃

b/c 1 mol N₂ : 3 mol H₂

$$= \boxed{2.26 \times 10^4 \text{ g NH}_3}$$

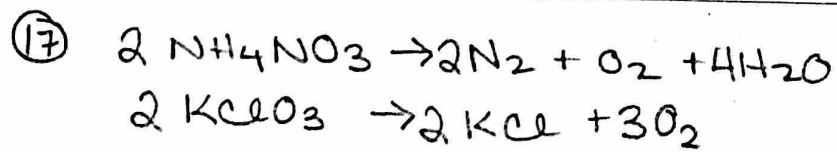


$$\begin{array}{r} 4.250 \text{ g} \\ - 0.314 \text{ g water} \\ \hline 3.936 \text{ g} \end{array} \quad \begin{array}{l} \text{driven off} \\ \text{BaCl}_2 + \text{NaCl left} \end{array}$$

$$\begin{array}{r|l|l|l} 0.314 \text{ g H}_2\text{O} & 1 \text{ mol H}_2\text{O} & 1 \text{ mol BaCl}_2 \cdot 2\text{H}_2\text{O} & 244.27 \text{ g} \\ \hline & 18.02 \text{ g} & 2 \text{ mol H}_2\text{O} & 1 \text{ mol BaCl}_2 \cdot 2\text{H}_2\text{O} \end{array}$$

$$= 2.128 \text{ g BaCl}_2 \cdot 2\text{H}_2\text{O}$$

$$2.128 \text{ g} / 4.250 \text{ g} * 100 = \boxed{50.08\%}$$

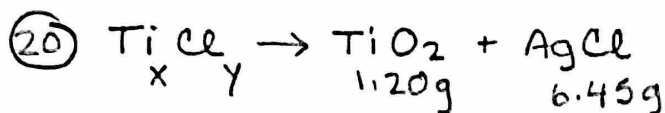


A) Per mol solid, KClO_3 will generate more $\text{O}_2(\text{g})$ b/c there is a 2:3 ratio vs a 2:1 ratio with NH_4NO_3

$$\begin{array}{l} \text{B) mm NH}_4\text{NO}_3 = 80.06 \text{ g} \rightarrow \left(\frac{1}{2}\right)(32 \text{ g O}_2) = 16 \text{ g} \\ \text{mm KClO}_3 = 122.55 \text{ g} \rightarrow \left(\frac{3}{2}\right)(32 \text{ g O}_2) = 48 \text{ g} \end{array}$$

$$\begin{array}{l} 16 / 80.06 = 0.20 \\ 48 / 122.55 = 0.39 \end{array} \quad \begin{array}{l} \\ \text{mole ratios} \end{array}$$

per gram solid, KClO_3 will generate more grams of O_2

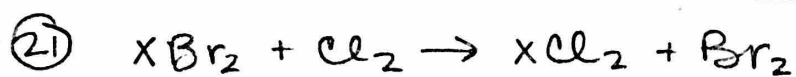
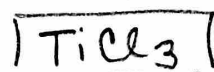


$$\frac{1.20\text{g TiO}_2}{79.90\text{g}} \left| \frac{1\text{mol TiO}_2}{1\text{mol Ti}} \right| = 0.0150\text{mol Ti}$$

$$\frac{6.45\text{g AgCl}}{143.32\text{g}} \left| \frac{1\text{mol AgCl}}{1\text{mol Cl}} \right| = 0.0450\text{mol Cl}$$

$$0.0450\text{mol} / 0.0150\text{mol} = 3 \text{ Cl}$$

$$0.0150\text{mol} / 0.0150\text{mol} = 1 \text{ Ti}$$



$$1.50\text{g}$$

$$0.8897\text{g}$$

$$\text{g} \rightarrow \text{mol} \quad \text{g} / (\text{g/mol}) = \text{mol}$$

1:1 ratio

∴ equal moles:

$$\begin{aligned} x\text{Br}_2 &= (x + 159.8) & \frac{1.50\text{g}}{(x + 159.8)} &= \frac{0.8897\text{g}}{(x + 70.9)} \\ x\text{Cl}_2 &= (x + 70.9) \end{aligned}$$

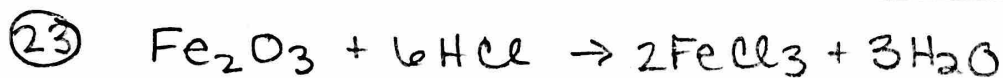
$$1.50(x + 70.9) = 0.8897(x + 159.8)$$

$$1.50x + 106.35 = 0.8897x + 142.17$$

$$-0.8897x - 106.35 \quad -0.8897x \quad -106.35$$

$$0.6103x = 35.82$$

$$\boxed{x = 58.69 \text{ g/mol} = \text{Ni}}$$



$$(525\text{cm}^2)(0.0021\text{cm}) = 1.1025\text{cm}^3 \quad \frac{1.1025\text{cm}^3}{1\text{cm}^3} = 1.1025\text{cm}^3$$

$$\frac{5.733\text{g Fe}_2\text{O}_3}{159.7\text{g}} \left| \frac{1\text{mol}}{6\text{mol HCl}} \right| = 0.2154\text{mol HCl needed}$$

$$\frac{0.2154\text{mol}}{4.11\text{mol}} \left| \frac{1\text{L}}{1} \right| = 0.0524\text{L} = 52.4\text{mL}$$

$$\frac{5.733\text{g}}{159.7\text{g}} = 0.0359\text{mol Fe}_2\text{O}_3$$

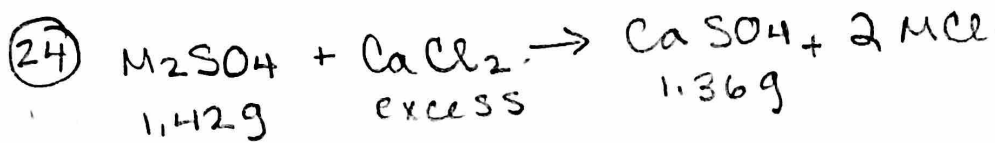
$$\frac{3.84}{0.9346} = 4.11\text{M HCl}$$

$$1000\text{g Sol'n} \times 0.14 = 140\text{g HCl}$$

$$\frac{140\text{g}}{36.46\text{g}} = 3.84\text{mol HCl}$$

$$\frac{1000\text{g}}{11.07\text{g}} = 90.34\text{mL}$$

$$= 4.11\text{M HCl}$$



$\text{g} \rightarrow \text{mol}$

$$\frac{\text{g}}{\text{g/mol}} = \text{mol}$$

$$\frac{1.36\text{g CaSO}_4}{136.14\text{g}} \Bigg| \frac{1\text{mol CaSO}_4}{136.14\text{g}} = 9.99 \times 10^{-3} \text{ mol CaSO}_4$$

1:1 ratio \therefore equal to
mol M_2SO_4

molar mass M_2SO_4

$$= (2x + 96.06)$$

$$\frac{1.42\text{g}}{(2x + 96.06)} = 9.99 \times 10^{-3}$$

$$1.42 = 9.99 \times 10^{-3} (2x + 96.06)$$

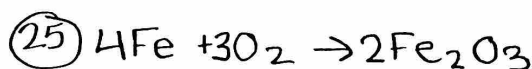
$$1.42 = 1.998 \times 10^{-2}x + 0.9596$$

$$-0.9596 \qquad \qquad -0.9596$$

$$0.4604 = (1.998 \times 10^{-2})x$$

$$x = 23.04 \text{ g/mol}$$

$$= \text{Sodium}$$



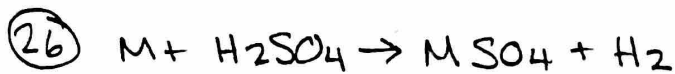
$$\frac{7.787\text{g}}{\text{cm}^3}$$

$$\frac{5.24\text{g}}{\text{cm}^3}$$

1cm^3 Fe	7.787g Fe	1mol Fe	$2\text{mol Fe}_2\text{O}_3$	159.69g	1cm^3	$= 2.125$
1cm^3	55.845 g Fe	4mol Fe	1mol Fe ₂ O ₃	5.24g Fe ₂ O ₃	cm^3	cm^3

Volume changes from $1\text{cm}^3 \rightarrow 2.125\text{cm}^3$

$\therefore \Delta V = 1.125\text{cm}^3$ for every 1cm^3 Fe used.



0.204g

V = 213 mL

mm = 9 / mol

P = 756 wet gas

- 23.756 H₂O vapor

= 732.24 dry gas

PV = nRT

T = 25 + 273 = 298 K

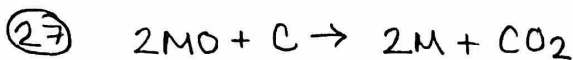
(732.24)(0.213) = n(62.36)(298)

$n_{H_2} = 8.387 \times 10^{-3}$
mol

1:1 ratio
∴ same as
mol M

$\frac{0.204g}{8.387 \times 10^{-3}}$
mol

= $\boxed{24.32 \text{ g/mol}}$
= Mg



5.00g excess

V = 738 mL

mm = 9 / mol

P = 0.978 atm

T = 200 + 273

= 473 K

PV = nRT

(0.978)(0.738) = n(0.08206)(473) n = 0.0186
mol CO₂

2 mol : 1 mol
MO CO₂

$\frac{5g}{0.03719 \text{ mol}} = 134.4 \text{ g/mol}$

∴ 0.03719
mol MO

$\frac{134.4g}{\text{mol MO}} - \frac{16g}{\text{mol O}} = \boxed{118.4 \text{ g/mol}}$
M = Tin



0.2324g

V = 0.378

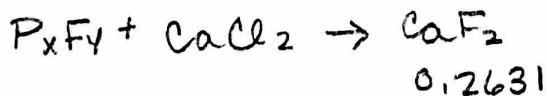
T = 77 + 273

PV = nRT

P = 97.3
mmHg

= 350 K

(97.3)(0.378)
= n(62.4)(350)



$\frac{0.2324g}{1.684 \times 10^{-3} \text{ mol}}$

$1.684 \times 10^{-3} \text{ mol}$

0.2631

= 138 g/mol

P_xF_y

0.2631g CaF ₂	1mol	2mol F	19g	= 0.128g F
	78.08g	1mol	1mol F	

0.2324g - 0.128g
= 0.1044g P

$\frac{0.128g \text{ F}}{19g}$
1mol

$\frac{0.1044g \text{ P}}{30.97g}$
1mol

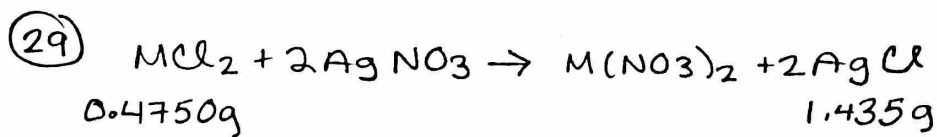
$\frac{6.74 \times 10^{-3}}{3.37 \times 10^{-3}} = \sim 2 \text{ F}$

$\frac{3.37 \times 10^{-3}}{3.37 \times 10^{-3}} = 1 \text{ P}$

= 6.74×10^{-3}
mol F

= 3.37×10^{-3}
mol P

empirical $\frac{138g/mol}{69g/mol} = \times 2$ ∴ $\boxed{P_2F_4}$



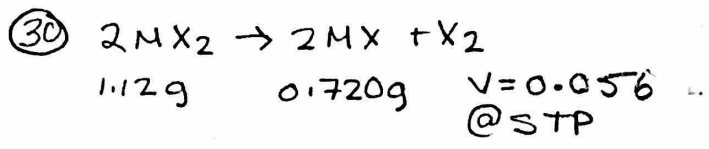
mm =
 g/mol
 g → mol
 $g / (g/mol) = mol$

$\frac{1.435g}{143.32g} = 0.01001$ mol AgCl
 2:1 ratio
 $\therefore 0.005006$ mol MCl_2

$\frac{0.4750g}{(x + 70.9)} = 0.005006$

$0.4750 = 0.005006(x + 70.9)$
 $0.4750 = 0.005006x + 0.3549$
 -0.3549

$0.1201 = 0.005006x$
 $x = 23.99 \text{ g/mol}$
 $= \text{Magnesium}$



$\frac{0.056L}{22.4L} = 2.5 \times 10^{-3}$ mol X_2
 2:1 ratio
 $\therefore 5 \times 10^{-3}$ mol MX & MX_2

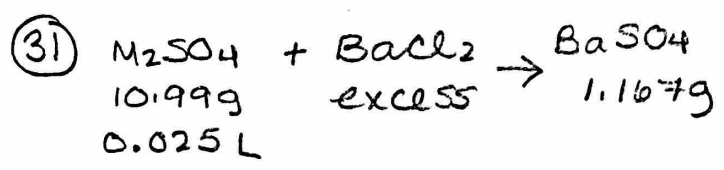
$1.12g MX_2 - 0.720g MX = 0.4g X_2$

mm $X_2 = 0.4g / (2.5 \times 10^{-3} \text{ mol}) = 160 \text{ g/mol } X_2$

$\frac{0.720g}{(5 \times 10^{-3} \text{ mol})} = 144 \text{ g/mol}$ MX
 $- 80 \text{ g/mol Br}$

$M =$
 $x = 80 \text{ g/mol}$
 $\therefore \text{Bromine}$

 $64 \text{ g/mol} = \text{Copper}$



$\frac{1.167g}{233.36g} = 5.00 \times 10^{-3}$ mol $BaSO_4$

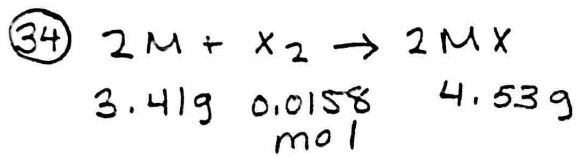
$[M_2SO_4] = \frac{(5 \times 10^{-3})}{(0.025)} = 0.20 \text{ M}$

1:1 ratio \therefore mol $BaSO_4 =$ mol M_2SO_4

$\frac{10.99g}{0.025L} = 21.98 \frac{g}{L}$ $\frac{0.025L}{1L} \times 21.98g = 0.5495g$ M_2SO_4 used

$\frac{0.5495g}{(5 \times 10^{-3}) \text{ mol}} = 109.9 \text{ g/mol } M_2SO_4$
 $- 96.06 \text{ g/mol } SO_4^{2-} = 13.84 \text{ g/mol } M_2$

$= 6.92 \text{ g/mol}$
 $= \text{lithium}$



$mm = g/mol$
 $g \rightarrow mol$

$g/(g/mol)$

2:1 ratio \therefore 0.0316 mol M & MX

$$\frac{3.41g M}{0.0316 mol} = \boxed{\frac{107.9 g/mol}{M}} \quad \frac{4.53g MX}{0.0316 mol} = 143.4 g/mol$$

$$143.4 g/mol - 107.9 g/mol = \boxed{\frac{35.45 g/mol}{X}}$$

$\begin{matrix} M X & & M & & X \end{matrix}$

$M = \text{Silver}, X = \text{Bromine}$