1. $2Al(NO_3)_3 + 3Na_2S \rightarrow Al_2S_3 + 6NaNO_3$

450 mL

0.2 M

? (mass)

$n = ?$

$C = 0.2M$

$V = 450mL \rightarrow 0.450L$

$n = CV$

$n = 0.2 mol/L \times 0.450\ L$

$n = 0.09\ mol\ Na_2S$

$$0.09\ mol\ Na_2S \times \frac{1\ mol\ Al_2S_3}{3\ mol\ Na_2S} \times \frac{150.15\ g\ Al_2S_3}{1\ mol\ Al_2S_3} = 4.50\ g\ Al_2S_3$$

2. $3Ag + Au(NO_3)_3 \rightarrow 3AgNO_3 + Au$

0.400 g

250 mL

? (concentration)

$$0.400\ g\ Ag \times \frac{1\ mol\ Ag}{107.87\ g\ Ag} \times \frac{3\ mol\ AgNO_3}{3\ mol\ Ag} = 0.00371\ mol\ AgNO_3$$

$n = 0.00371\ mol$

$C = ?$

$V = 250mL \rightarrow 0.250L$

$C = \frac{n}{V}$

$C = \frac{0.00371\ mol}{0.250L}$

$C = 0.0148M$

3. $Na_2SO_4 + 2HCl \rightarrow H_2SO_4 + 2NaCl$

$Na_2SO_4$: 50.0 mL, 0.25 M

$H_2SO_4$: 75.0 mL, ? M (concentration)

$n = ?$

$C = 0.25\ M$

$V = 50.0\ mL \rightarrow 0.050\ L$

$n = C\,V$

$n = 0.25\ mol/L \times 0.050\ L$

$n = 0.0125\ mol\ Na_2SO_4$

$$0.0125\ mol\ Na_2SO_4 \times \frac{1\ mol\ H_2SO_4}{1\ mol\ Na_2SO_4} = 0.0125\ mol\ H_2SO_4$$

$n = 0.0125\ mol$

$C = ?$

$V = 75.0\ mL \rightarrow 0.075\ L$

$C = \frac{n}{V}$

$C = \frac{0.0125\ mol}{0.075\ L}$

$C = 0.167\ M$

4. $Na_3PO_4 + 3NH_4Cl \rightarrow (NH_4)_3PO_4 + 3NaCl$

125mL
?(concentration)

3.5M
250mL

$n = ?$
$C = 3.5M$
$V = 250mL \rightarrow 0.250L$

$n = CV$
$n = 3.5\ mol/L \times 0.250L$
$n = 0.875\ mol\ (NH_4)_3PO_4$

$$0.875\ mol\ (NH_4)_3PO_4 \times \frac{1\ mol\ Na_3PO_4}{1\ mol\ (NH_4)_3PO_4} = 0.875\ mol\ Na_3PO_4$$

$n = 0.875\ mol$
$C = ?$
$V = 125mL \rightarrow 0.125L$

$C = \frac{n}{V}$

$C = \frac{0.875\ mol}{0.125L}$

$C = 7.0M$

5. $Pb(NO_3)_2 + 2NaCl \rightarrow PbCl_2 + 2NaNO_3$

$Pb(NO_3)_2$: 100mL, 0.1M

$NaCl$: 100mL, 0.1M

$PbCl_2$: ? mass

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consider $Pb(NO_3)_2$

$n = ?$ $\quad n = CV$

$C = 0.1M$ $\quad n = 0.1 mol/L \times 0.1L$

$V = 100mL \rightarrow 0.1L$ $\quad n = 0.01 mol\ Pb(NO_3)_2$

$$0.01 mol\ Pb(NO_3)_2 \times \frac{1 mol\ PbCl_2}{1 mol\ Pb(NO_3)_2} \times \frac{278.10 g\ PbCl_2}{1 mol\ PbCl_2} = 2.78 g\ PbCl_2$$

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consider $NaCl$

$n = ?$ $\quad n = CV$

$C = 0.1M$ $\quad n = 0.1 mol/L \times 0.1L$

$V = 100mL \rightarrow 0.1L$ $\quad n\ 0.01 mol\ NaCl$

$$0.01 mol\ NaCl \times \frac{1 mol\ PbCl_2}{2 mol\ NaCl} \times \frac{278.10 g\ PbCl_2}{1 mol\ PbCl_2} = 1.39 g\ PbCl_2$$ *

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* the correct answer is $1.39 g\ PbCl_2$

When doing a limiting excess reagent problem, the problem must be done twice - the lowest answer is always the correct one!