5. Calculate the mass of precipitate and the concentration of sodium nitrate solution the forms when 200 mL of 0.5 M strontium nitrate solution and 300 mL of 0.3 M sodium carbonate solution are mixed togther (assume a total volume of 500 mL)

$$\underset{\substack{0.5\text{ M}\\200\text{ mL}}}{Sr(NO_3)_2(aq)} + \underset{\substack{0.3\text{ M}\\300\text{ mL}}}{Na_2CO_3(aq)} \longrightarrow \underset{\substack{?\text{ g}}}{SrCO_3(s)} + \underset{\substack{?\text{ M}\\500\text{ ML}}}{2\,NaNO_3(aq)}$$

Consider $Sr(NO_3)_2$:

$n = ?$
$C = 0.5$ mol/L
$V = 200$ mL $\rightarrow 0.200$ L

$n = CV$
$n = 0.5$ mol/L x 0.200 L
$n = 0.100$ mol $Sr(NO_3)_2$ avaiable
EXCESS

$$0.100 \text{ mol } Sr(NO_3)_2 \text{ x } \frac{1 \text{ mol } Na_2CO_3}{1 \text{ mol } Sr(NO_3)_2} = 0.100 \text{ mol } Na_2CO_3 \text{ required}$$

Consider Na_2CO_3 :

$n = ?$
$C = 0.3$ mol/L
$V = 300$ mL $\rightarrow 0.300$ L

$n = CV$
$n = 0.3$ mol/L x 0.300 L
$n = 0.0900$ mol Na_2CO_3 avaiable
LIMITING

$$0.0900 \text{ mol } Na_2CO_3 \text{ x } \frac{1 \text{ mol } Sr(NO_3)_2}{1 \text{ mol } Na_2CO_3} = 0.0900 \text{ mol } Sr(NO_3)_2 \text{ required}$$

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therefore the limiting reagent is Na_2CO_3

$$0.0900 \text{ mol } Na_2CO_3 \text{ x } \frac{1 \text{ mol } SrCO_3}{1 \text{ mol } Na_2CO_3} \text{ x } \frac{147.63 \text{ g } SrCO_3}{1 \text{ mol } SrCO_3} = 13.3 \text{ g } SrCO_3$$

$$0.0900 \text{ mol } Na_2CO_3 \text{ x } \frac{2 \text{ mol } NaNO_3}{1 \text{ mol } Na_2CO_3} = 0.180 \text{ mol } NaNO_3$$

$n = 0.1800$ mol
$C = ?$
$V = 0.200 \text{ L} + 0.300 \text{ L} = 0.500 \text{ L}$

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

$$C = \frac{0.180 \text{ mol}}{0.500 \text{ L}}$$

$$C = 0.360 \text{ M } NaNO_3$$
