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80. $4NH_{3(g)} + 5O_{2(g)} \longrightarrow 4NO_{(g)} + 6H_2O_{(g)}$

a) $2.00g\ NH_3 \times \frac{1\ mol\ NH_3}{17.0g\ NH_3} \times \frac{4\ mol\ NO}{4\ mol\ NH_3} = 0.118\ mol\ NO$

$2.50g\ O_2 \times \frac{1\ mol\ O_2}{32.0g\ O_2} \times \frac{4\ mol\ NO}{5\ mol\ O_2} = 0.0625\ mol\ NO$

$\boxed{\text{Limiting reactant} = O_2}$

b) $0.0625\ mol\ NO \times \frac{30.0g\ NO}{1\ mol\ NO} = \boxed{1.88g\ NO}$

$0.0625\ mol\ NO \times \frac{6\ mol\ H_2O}{4\ mol\ NO} \times \frac{18.0g\ H_2O}{1\ mol\ H_2O} = \boxed{1.69\ g\ H_2O}$

c) $0.118 - 0.0625 = 0.056\ mol\ NO$

$0.056\ mol\ NO \times \frac{4\ mol\ NH_3}{4\ mol\ NO} \times \frac{17.0g\ NH_3}{1\ mol\ NH_3} = \boxed{0.94\ g\ NH_3}$

d) $\underbrace{2.00 + 2.50}_{\text{start}} = \underbrace{1.69 + 1.88}_{\text{end}} + 0.94$

$4.50 = 4.51$ ✓

left over reactant!

82. $H_2SO_{4(aq)} + Pb(C_2H_3O_2)_{2(aq)} \rightarrow PbSO_{4(s)} + 2HC_2H_3O_{2(aq)}$

$$5.00g\ H_2SO_4 \times \frac{1\ mol\ H_2SO_4}{98.1g\ H_2SO_4} \times \frac{1\ mol\ PbSO_4}{1\ mol\ H_2SO_4} \times \frac{303.3g\ PbSO_4}{1\ mol\ PbSO_4} = 15.5g\ PbSO_4$$

$$5.00g\ Pb(C_2H_3O_2)_2 \times \frac{1\ mol\ Pb(C_2H_3O_2)_2}{325.3g\ Pb(C_2H_3O_2)_2} \times \frac{1\ mol\ PbSO_4}{1\ mol\ Pb(C_2H_3O_2)_2} \times \frac{303.3g\ PbSO_4}{1\ mol\ PbSO_4} = \boxed{4.66g\ PbSO_4}$$

$Pb(C_2H_3O_2)_2$ = LR → so $\boxed{0g\ Pb(C_2H_3O_2)_2\ \text{remain}}$

$15.5g\ PbSO_4 - 4.66g = 10.84g\ PbSO_4$

$$10.84g\ PbSO_4 \times \frac{1\ mol\ PbSO_4}{303.3g\ PbSO_4} \times \frac{1\ mol\ H_2SO_4}{1\ mol\ PbSO_4} \times \frac{98.1g\ H_2SO_4}{1\ mol\ H_2SO_4} = \boxed{3.51\ g\ H_2SO_4}$$

$$5.00g\ Pb(C_2H_3O_2)_2 \times \frac{1\ mol\ Pb(C_2H_3O_2)_2}{325.3g\ Pb(C_2H_3O_2)_2} \times \frac{2\ mol\ HC_2H_3O_2}{1\ mol\ Pb(C_2H_3O_2)_2} \times \frac{60.0g\ HC_2H_3O_2}{1\ mol\ HC_2H_3O_2} = \boxed{1.84g\ HC_2H_3O_2}$$