## Answers for Practice Problems E in page 314

## Answers to Practice Problems E

1. $\mathrm{PCl}_{3}$ is excess, $\mathrm{H}_{2} \mathrm{O}$ is limiting, thecretical yield is 109 g HCl
2. $\mathrm{H}_{2} \mathrm{O}$ is excess, $\mathrm{PCl}_{3}$ is limiting, theoretical yield is 59.7 g HCl
3. $\mathrm{PCl}_{3}$ is excess, $\mathrm{H}_{2} \mathrm{O}$ is limiting, theoretical yield is 101 g HCl

## Homework -- Gevirat

Additional Practice Write a balanced chemical equation for each of the following problems, and then determine the excess reactant, the limiting reactant, and the theoretical yield (in grams) of the first product mentioned.

1. Zinc citrate, $\mathrm{Zn}_{3}\left(\mathrm{C}_{6} \mathrm{H}_{5} \mathrm{O}_{7}\right)_{2}$, an ingredient in toothpaste, is made by reacting zinc carbonate and citric acid, $\mathrm{C}_{6} \mathrm{H}_{3} \mathrm{O}_{7}$. The other products are $\mathrm{H}_{2} \mathrm{O}$ and $\mathrm{CO}_{2}$. There are $6.00 \mathrm{~mol} \mathrm{ZnCO}_{3}$ and $10.0 \mathrm{~mol} \mathrm{C}_{5} \mathrm{H}_{8} \mathrm{O}_{7}$. Ans. $3 \mathrm{ZnCO}_{3}$ $+2 \mathrm{C}_{6} \mathrm{H}_{8} \mathrm{O}_{7} \rightarrow \mathrm{Zn}_{3}\left(\mathrm{C}_{6} \mathrm{H}_{5} \mathrm{O}_{7}\right)_{2}+$ $3 \mathrm{H}_{2} \mathrm{O}+3 \mathrm{CO}_{2} ; \mathrm{C}_{6} \mathrm{H}_{8} \mathrm{O}_{7}$ is in excess, $\mathrm{ZnCO}_{3}$ is limiting, and the theoretical yield is $1.15 \times 10^{3} \mathrm{~g}$ $\mathrm{Zn}_{3}\left(\mathrm{C}_{6} \mathrm{H}_{5} \mathrm{O}_{7}\right)_{2}$.
