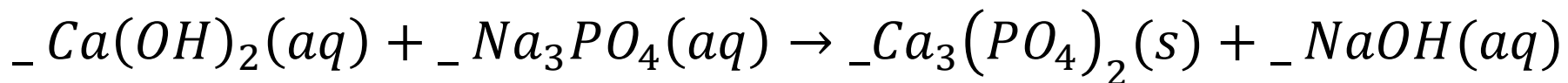
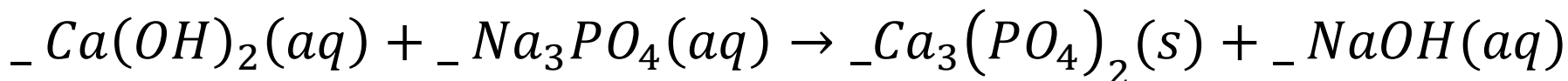


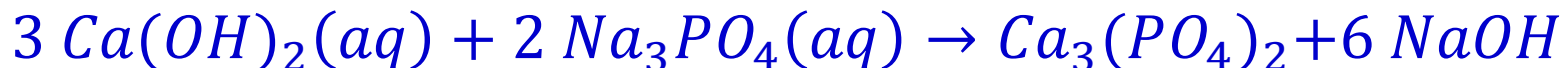
Determine the limiting reagent in a reaction where 12 grams of  $Ca(OH)_2$  is mixed with 28 grams of  $Na_3PO_4$ . Please be sure to balance the equation.



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**Solution: Step 1. Balance the chemical equation.**



**Step 2. calculate the number of moles of each reactant:**

$$n_{Ca(OH)_2} = \frac{m \text{ of } Ca(OH)_2}{M_m \text{ of } Ca(OH)_2} = \frac{12 \text{ gm}}{\left(74 \frac{\text{gm}}{\text{mol}}\right)} = 0.162 \text{ moles}$$

$$n_{Na_3PO_4} = \frac{m \text{ of } Na_3PO_4}{M_m \text{ of } Na_3PO_4} = \frac{28 \text{ gm}}{\left(164 \frac{\text{gm}}{\text{mol}}\right)} = 0.164 \text{ moles}$$

Determine the limiting reagent.

Step 3. Compare to the stoichiometric value. One way to do this is to ask whether the actual ratio of  $\text{Ca(OH)}_2:\text{Na}_3\text{PO}_4$  is greater than the stoichiometric ratio of 3:2. If it is greater than this means that there is excess  $\text{Ca(OH)}_2$  and  $\text{Na}_3\text{PO}_4$  is limiting. The ratio is:

$$\text{Actual Ratio} = \frac{n_{\text{Ca(OH)}_2}}{n_{\text{Na}_3\text{PO}_4}} = \frac{0.162}{0.164} = 0.99$$

Since this actual ratio is less than the stoichiometric ratio we conclude that  $\text{Ca(OH)}_2$  is limiting.