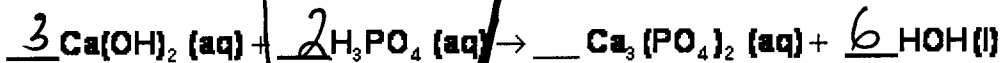


General Chemistry
Mr. MacGillivray
Teach Yourself Solution Stoichiometry!

 $\text{Ca(OH)}_2 \text{ (aq)} + \text{ }$ $\text{H}_3\text{PO}_4 \text{ (aq)} \rightarrow \text{ }$ $\text{Ca}_3(\text{PO}_4)_2 \text{ (aq)} + \text{ }$ HOH (l)
PROBLEM: What volume of 0.250 M phosphoric acid (H_3PO_4) is required to neutralize 35.2 ml of 0.338 M calcium hydroxide, Ca(OH)_2 ?

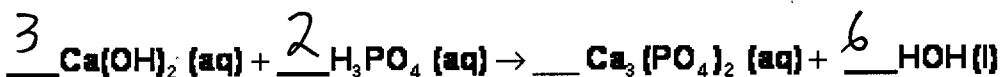
1. Balance the equation above.
2. Fill in the blanks to set up your knowns and unknowns.



35.2 ml \rightarrow ? ~~35.2~~ ml

0.338 $\frac{\text{mol}}{\text{L}}$ 0.250 $\frac{\text{mol}}{\text{L}}$

3. Find the number of moles of calcium hydroxide. Use $M=n/V$. Show calculations. Units have to cancel, so use liters! Fill in the answer in the "mol" box under Ca(OH)_2 .



35.2 ml 31.7 ml ^(c)

0.338 $\frac{\text{mol}}{\text{L}}$ 0.250 $\frac{\text{mol}}{\text{L}}$

^(a) 0.0119 mol 0.00793 mol ^(b)

$$\textcircled{a} M = \frac{n}{V}$$

$$MV = n$$

$$(0.338)(0.0352) = n$$

$$0.0119 \text{ mol} = n$$

4. Convert from mol of calcium hydroxide to moles of phosphoric acid. Show your calculations. Fill in the answer above in the "mol" box under phosphoric acid.

$$\textcircled{b} 0.0119 \text{ mol Ca(OH)}_2 \times \frac{2 \text{ mol H}_3\text{PO}_4}{3 \text{ mol Ca(OH)}_2} = 0.00793 \text{ mol H}_3\text{PO}_4$$

5. Use $M=n/V$ to find the number of liters of H_3PO_4 . Convert to ml and fill in the answer ^(c)!

$$\textcircled{c} M = \frac{n}{V} \quad 0.250 \frac{\text{mol}}{\text{L}} = \frac{0.00793 \text{ mol}}{V} \quad V = \frac{0.00793 \text{ mol}}{0.250 \frac{\text{mol}}{\text{L}}} = 0.0317 \text{ L}$$

$$= 31.7 \text{ ml}$$

6. Repeat the above procedure for the following problem: How many ml of a 0.312 M solution of $\text{Pb(NO}_3)_2$ are needed to react completely with 75.0 ml of 0.500 M NaI?



$$\textcircled{a} 0.0750 \text{ L} \times \frac{0.500 \text{ mol}}{\text{L}} = 0.0375 \text{ mol NaI}$$

$$\textcircled{b} 0.0375 \text{ mol NaI} \times \frac{1 \text{ mol Pb(NO}_3)_2}{2 \text{ mol NaI}} = 0.01875 \text{ mol Pb(NO}_3)_2$$

$$0.312 \text{ M} = \frac{0.01875 \text{ mol}}{V}$$

$$V = \frac{0.01875 \text{ mol}}{0.312 \frac{\text{mol}}{\text{L}}}$$

$$= 0.0601 \text{ L}$$

$$= 60.1 \text{ ml}$$