Answer on Question #39880, Chemistry, Inorganic Chemistry

A mixture, weighing 6.000 grams, contains 41.50 % Na3PO4 and 58.50 % BaCl2 of the mixture, by weight. When dissolved in water, a precipitate forms via the double displacement reaction:

BaCl2(aq) + Na3PO4(aq)  NaCl(aq) + Ba3(PO4)2(s)

If the reaction is quantitative, the yield of the solid barium phosphate should be

Solution:

Balanced reaction is:

$$3BaCl_2 + 2Na_3PO_4 = 6NaCl + Ba_3(PO_4)_2$$

We need to know the limiting reagent. So we have to find which of reagents is in less quantity (the mass of each reactant we can find from percentage ratio; the amount of substance from dividing mass on molar mass:

n($BaCl_2$) (mole) = 6.000*0.415/208.23 = 0.012;

n($Na_3PO_4$) (mole) = 6.000*0.585/163.94 = 0.021;

As we see, the limiting reagent is barium chloride. To find the yield of the solid barium phosphate we need to multiply its molar mass on its amount of substance (from the reaction we can see the amount of barium phosphate is three times less then barium chloride):

m($Ba_3(PO_4)_2$) (g) = 602.08*0.012/3 = 2.408;

Answer: 2.408 g