**Answer on Question#39143 - Chemistry - Inorganic Chemistry**

Question

Calcium carbonate will react with phosphoric acid to produce calcium phosphate, water, and carbon dioxide. Determine the amount of water in grams produced by 187.6 grams of calcium carbonate react with phosphoric acid.

Answer:

Reaction between calcium carbonate and phosphoric acid:

$$3CaCO_3(s) + 2H_3PO_4(aq) = Ca_3(PO_4)_2(aq) + 3CO_2(g) + 3H_2O(l)$$
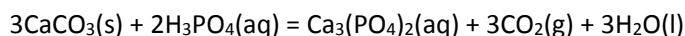
Molar mass of $CaCO_3$ equals:

$$M(CaCO_3) = M(Ca) + M(C) + 3M(O) = 40 + 12 + 3 \cdot 16 = 40 + 12 + 48 = 100 \frac{g}{mole}$$

Mass of 3 moles of calcium carbonate equals:

$$3 \cdot 100 = 300g$$

Molar mass of H_2O equals:

$$M(H_2O) = 2M(H) + M(O) = 2 \cdot 1 + 16 = 18 \frac{g}{mole}$$

Mass of 3 moles of water equals:

$$3 \cdot 18 = 54g$$

Then we make a proportion:

300 g of $CaCO_3$ produce 54 g of H_2O

187.6 g of $CaCO_3 - x$ g of H_2O

$$x = \frac{187.6 \cdot 54}{300} = 33.768 \, g$$

Answer: m(H_2O) = 33.768 g.