

Challenge Problem (a)

The white limestone cliffs of Dover, England contain a large percentage of calcium carbonate (CaCO_3). A sample of limestone with a mass of 84.4 grams reacts with an excess of hydrochloric acid to form calcium chloride.



The mass of calcium chloride formed is 81.8 grams. What is the percentage of calcium carbonate in the limestone?

$$81.8\text{g CaCl}_2 \left(\frac{1\text{mol CaCl}_2}{110.98\text{g}} \right) \left(\frac{1\text{mol CaCO}_3}{1\text{mol CaCl}_2} \right) \left(\frac{100.09\text{g}}{1\text{mol CaCO}_3} \right) = 73.77\text{g CaCO}_3$$

$$\frac{73.77\text{g CaCO}_3}{84.4\text{g limestone}} (100) = 87.4\% \text{ CaCO}_3 \text{ in the Limestone}$$