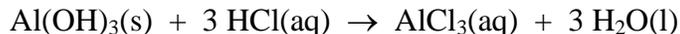


## 4 • Chemical Equations and Stoichiometry

### SIX STOICHIOMETRY PROBLEMS

#### General Stoichiometry

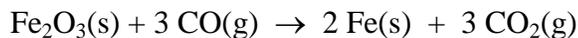
13. Several brands of antacid tablets use aluminum hydroxide to neutralize excess acid.



[Molar masses:        78.01            36.46            133.4            18.02]

What quantity of HCl, in grams, can a tablet with 0.750 g of Al(OH)<sub>3</sub> consume? What quantity of water is produced?

17. The equation for one of the reactions in the process of reducing iron ore to the metal is



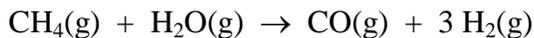
[Molar masses:        159.7            28.01            55.85            44.01]

- (a) What is the maximum mass of iron, in grams, that can be obtained from 454 g (1.00 lb) of iron(III) oxide?

- (b) What mass of CO is required to reduce the iron(III) oxide to iron metal?

#### Limiting Reactants

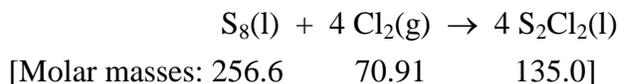
23. The reaction of methane and water is one way to prepare hydrogen:



[Molar masses:    16.04        18.02        28.01        2.02]

If you begin with 995 g of CH<sub>4</sub> and 2510 g of water, what is the maximum possible yield of H<sub>2</sub>?

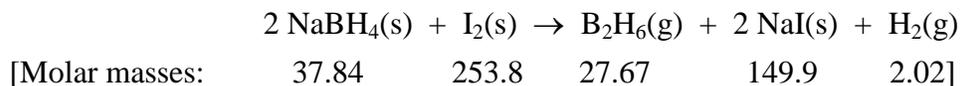
25. Disulfur dichloride,  $S_2Cl_2$ , is used to vulcanize rubber. It can be made by treating molten sulfur with gaseous chlorine:



Starting with a mixture of 32.0 g of sulfur and 71.0 g of  $Cl_2$ , which is the limiting reactant? What mass of  $S_2Cl_2$  (in grams) can be produced? What mass of the excess reactant remains when the limiting reactant is consumed?

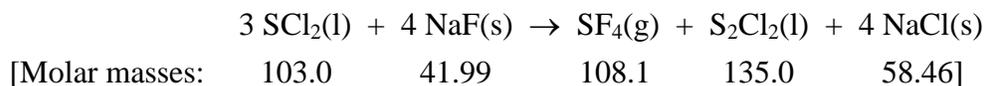
### Percent Yield

29. Diborane,  $B_2H_6$ , is a valuable compound in the synthesis of new organic compounds. One of several ways this boron compound can be made is by the reaction



Suppose you use 1.203 g of  $NaBH_4$  with an excess of iodine and obtain 0.295 g of  $B_2H_6$ . What is the percent yield of  $B_2H_6$ ?

31. Disulfur dichloride, which has a revolting smell, can be prepared by directly combining  $S_8$  and  $Cl_2$ , but it can also be made by the following reaction:



Assume you begin with 5.23 g of  $SCl_2$  and excess  $NaF$ . What is the theoretical yield of  $S_2Cl_2$ ? If only 1.19 g of  $S_2Cl_2$  is obtained, what is the percent yield of the compound?