1. Bismuth oxide reacts with carbon to form bismuth metal:

\[ \text{Bi}_2\text{O}_3 \text{ (s)} + 3 \text{ C (s)} \rightarrow 2 \text{ Bi (s)} + 3 \text{ CO (g)} \]

352 g of \( \text{Bi}_2\text{O}_3 \) reacts with excess carbon

a) How many moles does the 352 g of \( \text{Bi}_2\text{O}_3 \) represent?

b) How many moles of Bi would form from that much starting material?

c) How many moles of carbon monoxide would form from 252 g of \( \text{Bi}_2\text{O}_3 \)?

2. Chromium (III) oxide reacts with hydrogen sulfide (H\(_2\)S) gas to form chromium (III) sulfide and water:

\[ \text{Cr}_2\text{O}_3 \text{ (s)} + 3 \text{ H}_2\text{S (g)} \rightarrow \text{Cr}_2\text{S}_3 \text{ (s)} + 3 \text{ H}_2\text{O (l)} \]

In a given reaction 421 g of \( \text{Cr}_2\text{S}_3 \) are produced.

a) How many moles of \( \text{Cr}_2\text{O}_3 \) must have reacted to give the 421 g of \( \text{Cr}_2\text{S}_3 \)?

b) How many grams of \( \text{Cr}_2\text{O}_3 \) must have reacted?
3. Solid silver sulfide reacts with aqueous hydrochloric acid to yield silver chloride and hydrogen sulfide gas.

   a) Write a balanced equation for the process.

   b) How many grams of silver chloride are produced from the reaction of 174 g of silver sulfide?

4. Gaseous butane \((C_4H_{10})\) is used as a liquid fuel in disposable lighters. Butane burns (reacts with oxygen gas) to yield carbon dioxide and water.

   a) Write a balanced equation for the process:

   b) What mass of oxygen is needed to burn 50.00 g of butane?