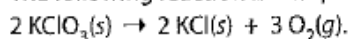


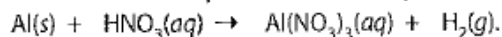
1. The following reaction is exceptional in that a single reactant species is both oxidized and reduced:



What mass of oxygen gas would be formed by the decomposition of 45.65 g of KClO_3 ? (How should your answer compare to the mass of reactant? Does your answer make sense?)

$$45.65 \text{ g KClO}_3 \times \frac{1 \text{ mol}}{122.6 \text{ g}} \times \frac{3 \text{ mol O}_2}{2 \text{ mol}} \times \frac{32.0 \text{ g O}_2}{1 \text{ mol O}_2} = \boxed{17.9 \text{ g}}$$

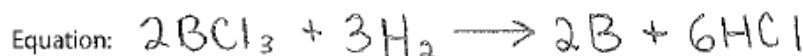
2. This *unbalanced* equation shows one possible set of products for the reaction of aluminum and nitric acid:



Use the balanced version of this equation to determine the mass of nitric acid required to form 170 kg of hydrogen gas.

$$170 \text{ kg} \times \frac{1 \text{ mol H}_2}{2.016 \text{ kg}} \times \frac{2 \text{ mol HNO}_3}{1 \text{ mol H}_2} \times \frac{63.0 \text{ g HNO}_3}{1 \text{ mol HNO}_3} = \boxed{1.1 \times 10^7 \text{ g}} \text{ (or } 11,000 \text{ kg)}$$

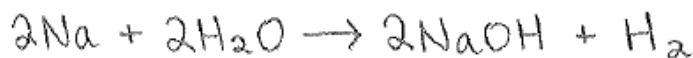
3. Hydrogen gas can be used as a reducing agent in the production of pure boron from boron trichloride. How many moles of boron would form from the reduction of 500.0 g of boron trichloride with excess hydrogen gas?



$$500.0 \text{ g BCl}_3 \times \frac{1 \text{ mol}}{117.3 \text{ g}} \times \frac{2 \text{ mol B}}{2 \text{ mol BCl}_3} = \boxed{4.263 \text{ mol}}$$

4. Write a balanced chemical equation for the reaction between sodium metal and water.

How many moles of hydrogen gas would form if 2 mol of sodium reacted with excess water? What volume would this gas occupy at STP conditions?



$$2 \text{ mol Na} \times \frac{1 \text{ mol H}_2}{2 \text{ mol Na}} = \boxed{1 \text{ mol H}_2} \quad 1 \text{ mole of gas} = \boxed{22.4 \text{ L}}$$