

1. Write a balanced chemical equation for each reaction below, and then identify the type of reaction: synthesis, decomposition, single replacement, double replacement, combustion.

- sodium carbonate + calcium hydroxide yields sodium hydroxide + calcium carbonate
- aluminum + sulfuric acid yields aluminum sulfate + hydrogen
- potassium oxide + water yields potassium hydroxide
- calcium carbonate yields calcium oxide + carbon dioxide
- methane + oxygen gas yields water + carbon dioxide

2. Define "1 mole".

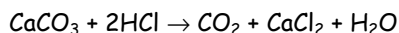
3. Convert 15.45 g $\text{Cu}(\text{CN})_2$ to mol.

4. Convert 135.8 g CH_4 to molecules.

5. Convert 85.0 L chlorine gas to grams (at STP).

6. Convert 3.33×10^{22} molecules oxygen gas to liters at STP.

7. Carbon dioxide, CO_2 , is produced in the reaction between calcium carbonate, CaCO_3 , and hydrochloric acid, HCl.



- How many g of calcium carbonate would be needed to react completely with 15.0 g of hydrochloric acid?
- How many g of carbon dioxide is produced when 5.50 mol of hydrochloric acid reacts with calcium carbonate?
- How many molecules of carbon dioxide are produced when 10.0 g of calcium carbonate reacts with hydrochloric acid?

8. Zinc metal reacts with sulfuric acid to produce hydrogen gas and zinc (II) sulfate, ZnSO_4 . Obtain a balanced chemical equation and then answer the following questions. (Hint: Sulfuric acid is one of your elementary knowledge acids you should have memorized and hydrogen is a diatomic molecule—HOFBrINCl).

- What volume of hydrogen gas can be produced when 25.50 g of zinc metal reacts with sulfuric acid at STP?
- How many atoms of zinc are needed to react if 20.0 L of hydrogen gas is produced at STP?
- How many g of zinc are needed to react with 100.0 g of sulfuric acid?

9. Calcium oxide is prepared by heating calcium in oxygen: $2\text{Ca} + \text{O}_2 \rightarrow 2\text{CaO}$

- How many g of calcium would be needed to make 14.5 g of calcium oxide?
- How many molecules of oxygen are needed to produce 4.50 mol of calcium oxide?