Moles and Stoichiometry Practice Problems

1. How many moles of sodium atoms correspond to 1.56x1021 atoms of sodium?
2. Determine the mass in grams of each of the following:
   1. 1.35 mol of Fe
   2. 24.5 mol O
   3. 1.25 mol Ca3(PO4)2
   4. 0.625 mol Fe(NO3)3
   5. 0.600 mol C4H10
3. Calculate the number of moles of each compound:
   1. 21.5g CaCO3
   2. 1.56g NH3
   3. 16.8g Sr(NO3)2
4. How many moles of Al are needed to combine with 1.58 mol of O2 to make aluminum oxide, Al2O3?
5. How many moles of Al are in 2.16 mol of Al2O3?
6. How many moles of H2 and N2 can be formed by the decomposition of 0.145 mol of ammonia, NH3?
7. What is the total number of atoms in 0.260 mol of glucose, C6H12O6
8. Chlorine is used by textile manufacturers to bleach cloth. Excess chlorine is destroyed by its reaction with sodium thiosulfate, Na2S2O3:

Na2S2O3(aq) + 4Cl2(g) + 5H2O(aq) 🡪 2NaHSO4(aq) + 8HCl(aq)

* 1. How many moles of Na2S2O3 are needed to react with 0.12mol of Cl2?
  2. How many moles of HCl can form from 0.12mol of Cl2?
  3. How many moles of H2O are required for the reaction of 0.12mol of Cl2?
  4. How many moles of H2O react if 0.24mol HCl is formed?

1. The incandescent white of a fireworks display is caused by the reaction of P4 with O2 to give P4O10.
   1. Write the balanced chemical equation for the reaction.
   2. How many grams of O2 are needed to combine with 6.85g of P4?
   3. How many grams of P4O10 can be made from 8.00g of O2?
   4. How many grams of P are needed to make 7.46g P4O10?
2. In dilute nitric acid, HNO3, copper metal dissolves according to the following equation:

3Cu(s) + 8HNO3(aq) 🡪 3Cu(NO3)2(aq) + 2NO(g) + 4H2O(aq)

How many grams of HNO3 are needed to dissolve 11.45g of Cu?

1. The reaction of powdered aluminum and iron(II)oxide,

2Al(s) + Fe2O3(s) 🡪 Al2O3(s) + 2Fe(l)

produces so much heat the iron that forms is molten. Because of this, railroads use the reaction to provide molten steel to weld steel rails together when laying track. Suppose that in one batch of reactants 4.20mol Al was mixed with 1.75mol Fe2O3.

* 1. Which reactant, if either, was the limiting reactant?
  2. Calculate the mass of iron (in grams) that can be formed from this mixture of reactants.

1. Silver nitrate, AgNO3, reacts with iron(III) chloride, FeCl3, to give silver chloride, AgCl, and iron(III) nitrate, Fe(NO3)3. A solution containing 18.0g AgNO3 was mixed with a solution containing 32.4g FeCl3. How many grams of which reactant *remains* after the reaction is over?