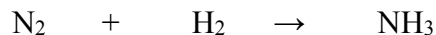
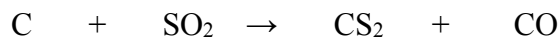


**Write out your work.** Do it on another piece of paper so you have room to work, and we can look back at it if you are having problems. Circle your final answer. Put units, identifiers and descriptors on your answers. Concern yourself at least a little bit with significant figures.

1. The reaction below represents the formation of ammonia,  $\text{NH}_3$ . Balance the equation. Calculate the number moles of hydrogen gas and the mass of nitrogen gas that are needed to produce 7.24 moles of ammonia.



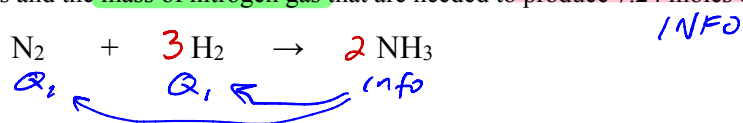
2. The reaction below represents the preparation of carbon disulfide by reacting coke (carbon) with sulfur dioxide.
- Balance the equation, and then calculate the mass of carbon monoxide that would be produced from 25.0 g of carbon reacting with an excess of sulfur dioxide.
  - What mass of sulfur dioxide actually reacted with the 25.0 g of carbon?



3. Bauxite is the mineral name for aluminum oxide. Much of the aluminum oxide mined in the United States is shipped to Iceland for electrical processing into aluminum metal. The large amount of electrical energy required for the reduction process is the reason for shipment to the island, because most of Iceland's electricity is inexpensively produced from hydro and geothermal sources. Balance the equation representing the reaction shown below.
- Calculate the mass of aluminum that can be recovered from 500. kg of bauxite.
  - How many moles of oxygen gas will be produced during the processing of the 500. kg of bauxite?



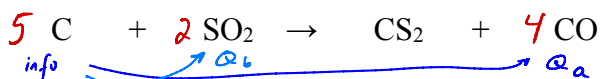
1. The reaction below represents the formation of ammonia, NH<sub>3</sub>. Balance the equation. Calculate the number moles of hydrogen gas and the mass of nitrogen gas that are needed to produce 7.24 moles of ammonia.



$$7.24 \text{ mol NH}_3 \times \frac{3 \text{ mol H}_2}{2 \text{ mol NH}_3} = 10.9 \text{ g H}_2 \text{ needed } \text{Q}_1$$

$$7.24 \text{ mol NH}_3 \times \frac{1 \text{ mol N}_2}{2 \text{ mol NH}_3} \times \frac{28.2 \text{ g N}_2}{1 \text{ mol N}_2} = 102 \text{ g N}_2 \text{ needed}$$

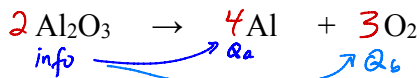
2. The reaction below represents the preparation of carbon disulfide by reacting coke (carbon) with sulfur dioxide.
- Balance the equation, and then calculate the mass of carbon monoxide that would be produced from 25.0 g of carbon reacting with an excess of sulfur dioxide.
  - What mass of sulfur dioxide actually reacted with the 25.0 g of carbon?



$$25.0 \text{ g C} \times \frac{1 \text{ mol C}}{12.01 \text{ g C}} \times \frac{4 \text{ mol CO}}{5 \text{ mol C}} \times \frac{28.01 \text{ g CO}}{1 \text{ mol CO}} = 46.6 \text{ g CO produced } \text{Q}_a$$

$$25.0 \text{ g C} \times \frac{1 \text{ mol C}}{12.01 \text{ g C}} \times \frac{2 \text{ mol SO}_2}{5 \text{ mol C}} \times \frac{64.07 \text{ g SO}_2}{1 \text{ mol SO}_2} = 53.3 \text{ g SO}_2 \text{ needed } \text{Q}_b$$

3. Bauxite is the mineral name for aluminum oxide. Much of the aluminum oxide mined in the United States is shipped to Iceland for electrical processing into aluminum metal. The large amount of electrical energy required for the reduction process is the reason for shipment to the island, because most of Iceland's electricity is inexpensively produced from hydro and geothermal sources. Balance the equation representing the reaction shown below.
- Calculate the mass of aluminum that can be recovered from 500. kg of bauxite.
  - How many moles of oxygen gas will be produced during the processing of the 500. kg of bauxite?



$$500. \text{ kg Al}_2\text{O}_3 \times \frac{1 \text{ mol Al}_2\text{O}_3}{101.96 \text{ g Al}_2\text{O}_3} \times \frac{4 \text{ mol Al}}{2 \text{ mol Al}_2\text{O}_3} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = 265 \text{ kg Al produced}$$

Notice that if we leave the initial mass in kg, the answer will be kg.  
 500,000 g would produce 265,000 g Al

$$500,000 \text{ g Al}_2\text{O}_3 \times \frac{1 \text{ mol Al}_2\text{O}_3}{101.96 \text{ g Al}_2\text{O}_3} \times \frac{3 \text{ mol O}_2}{2 \text{ mol Al}_2\text{O}_3} = 7360 \text{ mol O}_2$$

If you had left the mass of Al<sub>2</sub>O<sub>3</sub> as kg the answer would be kilomol! 7.62 kilomol O<sub>2</sub>