Limiting reagent (Homework)

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1.

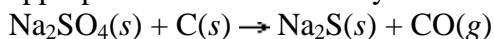$$2\ NaBH_4(s) + I_2(s) \rightarrow B_2H_6(g) + 2\ NaI(s) + H_2(g)$$

Diborane, B_2H_6, is used in organic synthesis and can be made by the reaction given above. A student combined 1.021 g of $NaBH_4$ with an excess of iodine and obtained 0.265 g of B_2H_6. What was the percent yield of B_2H_6?

2.

(a) Balance the following equation. (Use the smallest possible whole numbers. Enter 1 where appropriate. Do not leave any answer box blank.)
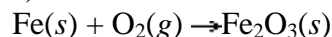
$$Na_2SO_4(s) + C(s) \rightarrow Na_2S(s) + CO(g)$$

(b) If you start with 76.0 g of sodium sulfate and 20.4 g carbon, calculate the maximum mass of sodium sulfide that could be produced.

(c) Assume the reaction in part (b) goes to completion. Calculate the mass of excess reactant that will remain.

(d) If 29.6 g of sodium sulfide is actually produced by the reaction in part (b), calculate the percent yield for this reaction.
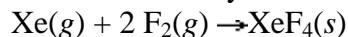
3.

If steel wool (iron) is heated until it glows and is placed in a bottle containing pure oxygen, the iron reacts spectacularly to produce iron(III) oxide.

$$Fe(s) + O_2(g) \rightarrow Fe_2O_3(s)$$

If 1.05 g of iron is heated and placed in a bottle containing 0.0223 mol of oxygen gas, what mass of iron(III) oxide is produced?

4.

Although they were formerly called the inert gases, at least the heavier elements of Group 8 do form relatively stable compounds. For example, xenon combines directly with elemental fluorine at elevated temperatures in the presence of a nickel catalyst.

$$Xe(g) + 2\ F_2(g) \rightarrow XeF_4(s)$$

What is the theoretical mass of xenon tetrafluoride that should form when 149 g of xenon is reacted with 140. g of F_2?

What is the percent yield if only 149 g of XeF_4 is actually isolated?