Vasquez High School -- Chemistry -- Quest #7 -- Section 9.3 -- 60 points

Read each problem carefully. Label everything. Show all work for full credit. Be neat and complete.

1) Consider the rusting of iron: $4\,Fe + 3\,O_2 ==> 2Fe_2O_3$ (fifteen points)

    a) You start with a huge 250.0 kg bar of pure solid iron. Because this process is not 100% efficient, it is found that the percentage yield of iron (III) oxide is only 86.5%. What is the actual yield for the product in the above reaction?

    b) Now suppose you had 150 g Fe and 75 g oxygen, what is the limiting reagent, how much of what is in excess, and how much product would be the theoretical yield then?

2) In the reaction between potassium and bromine gas, Br_2, it is discovered that 98.5 grams of potassium only produces an actual yield of 169.5 g KBr. What is the percentage yield here?

Fifteen points on this one.
3) Now we wish to remove the hydrogen selenide from a sample of natural gas by forcing it to react with oxygen gas under pressure...here's the recipe:

$$\underline{\hspace{1cm}}\ H_2Se\ +\ \underline{\hspace{1cm}}\ O_2\ ==>\ \underline{\hspace{1cm}}\ Se_4\ +\ \underline{\hspace{1cm}}\ H_2O$$
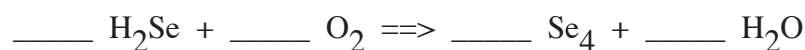
We know that we have 127.5 g of hydrogen selenide that needs to be removed (reacted with). I have just 36.0 g of oxygen gas left in the gas cylinder.

a) How many moles of each do we have?

b) Is there enough oxygen for all the   c) If so, how much oxygen is left over?
     hydrogen sulfide to be removed?   If not, state how much more we need.

d) How many <u>moles</u> of selenium are produced?

4) Your associate in the lab, G. Eyemaduntz, wishes to make barium uranate, $BaUO_3$, in order to facilitate the making of a new kind of nuclear fuel. He starts with 400 g of barium oxide, BaO, and 800 g of solid uranium. He asks you, "What can I expect as a theoretical yield of the uranate? What is the limiting reagent?"
He showed you the balanced reaction   ------------> $BaO + O_2 + U ===> BaUO_3$
What do you answer? (Ba = 137 g/mol and U = 238 g/mol...ten points)

5) Both butane (C_4H_{10}) and pentane (C_5H_{12}) react with oxygen gas to produce carbon dioxide and water. If you have equal masses of each, which will require a greater mass of oxygen to react? (SHOW WHY!)