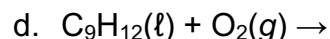
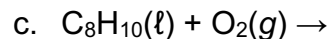
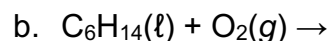
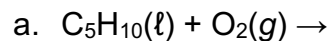
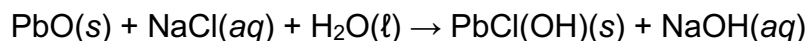


CH1020 Exercises (Worksheet 2)

1. Complete and balance the following chemical equations describing the complete combustion of several hydrocarbons.

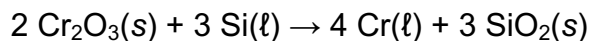
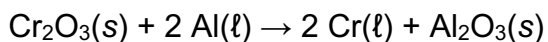


2. $\text{PbCl}(\text{OH})$ is one of several lead compounds used in ancient Egyptian cosmetics. It is prepared from PbO according to the following ancient recipe:



How many grams of PbO and how many grams of NaCl would be required to produce 10.0 g $\text{PbCl}(\text{OH})$?

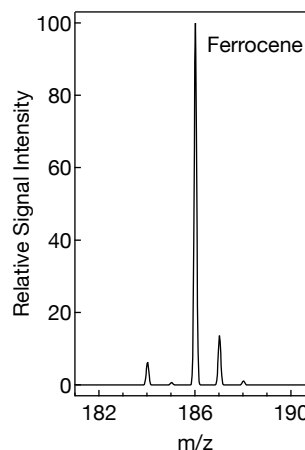
3. Chromium metal can be produced from high-temperature reactions of chromium(III) oxide with silicon or aluminum:



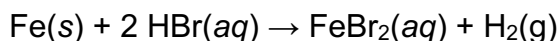
- a. Calculate the mass of aluminum required to prepare 400.0 grams of chromium metal by the first reaction.
- b. Calculate the mass of silicon required to prepare 400.0 grams of chromium metal by the second reaction.
4. Charcoal (C) and propane (C_3H_8) are used as fuel in backyard grills.
- a. Write balanced chemical equations for the complete combustion reactions of C and C_3H_8 .
- b. How many grams of carbon dioxide are produced from burning 500.0 grams of each of the two fuels?

5. The very first *organometallic* molecule discovered was an iron-containing hydrocarbon called *ferrocene*. Combustion analysis and mass spectrometry were essential in ascertaining its structure.

- a. You burn 21.31 g of ferrocene and capture 50.41 g of CO_2 and 10.32 g of H_2O . Determine an *empirical formula* for ferrocene.
- b. From the mass spectrum on the right and the empirical formula above, find the *molecular formula* of this compound.



6. You *really* want to know what chemical causes the foul odor of rancid butter, which you suspect contains carbon, hydrogen, and oxygen. You isolate and combust a 4.30 g sample, which produces 8.59 g of CO_2 and 3.52 g of H_2O . The most intense peak in the mass spectrum of the compound occurs at 88.1 m/z . Determine the formula of this smelly compound!
7. For each of the reactions, calculate the mass (in grams) of the product that forms when 3.67 g of the underlined reactant completely reacts. Assume that there is more than enough of the other reactant.
- a. Ba(s) + $\text{Cl}_2(g)$ \rightarrow $\text{BaCl}_2(s)$
- b. CaO(s) + $\text{CO}_2(g)$ \rightarrow $\text{CaCO}_3(s)$
- c. 2 Mg(s) + $\text{O}_2(g)$ \rightarrow $2\text{MgO}(s)$
- d. 4 Al(s) + $3 \text{O}_2(g)$ \rightarrow $2 \text{Al}_2\text{O}_3(s)$
8. Hydrobromic acid dissolves solid iron according to the reaction:



What mass of HBr (in grams) do you need to dissolve a 3.2 g pure iron bar on a padlock? What mass of H_2 would the complete reaction of the iron bar produce?