P H6 (pg 1 of 2) **Combustion Reactions** Name_____Per_____

Assume complete combustion unless told otherwise.
(Remember, your job balancing will be far easier if you balance the oxygen last.)
You are not asked to determine if the reaction is redox or not, because ALL combustion reactions are redox reactions.

1. sugar $C_{12}H_{22}O_{11}$

2. benzene C_6H_6

3. gasoline C_8H_{18}

4. propane C_3H_8

5. candle wax $C_{25}H_{52}$

6. methyl alcohol CH_3OH

7. methanethiol (aka methyl mercaptan) CH_4S

8. propyl alcohol C_3H_7OH

9. butane, from a disposable lighter C_4H_{10}

10. the combustion of nicotine; $C_{10}H_{14}N_2$

11. the combustion of nickel. Assume nickel(II) is preferred

12. the combustion of aluminum.

13. When is carbon monoxide a product of combustion?
    Why would it be too difficult to balance an equation if both carbon monoxide and carbon dioxide were products?

1. $C_{12}H_{22}O_{11} + 12\ O_2 \rightarrow 12\ CO_2 + 11\ H_2O$

2. $C_6H_6 + 7.5\ O_2 \rightarrow 6\ CO_2 + 3\ H_2O$
   Since we prefer to balance with whole numbers, multiply all the coefficients by 2 to eliminate the fractional coefficient.
   $2\ C_6H_6 + 15\ O_2 \rightarrow 12\ CO_2 + 6\ H_2O$

3. $C_8H_{18} + 12.5\ O_2 \rightarrow 8\ CO_2 + 9\ H_2O$
   Since we prefer to balance with whole numbers, multiply all the coefficients by 2 to eliminate the fractional coefficient.
   $2\ C_8H_{18} + 25\ O_2 \rightarrow 16\ CO_2 + 18\ H_2O$

4. $C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$

5. $C_{25}H_{52} + 38\ O_2 \rightarrow 25\ CO_2 + 26\ H_2O$

6. $CH_3OH + 1.5\ O_2 \rightarrow CO_2 + 2\ H_2O$
   Since we prefer to balance with whole numbers, multiply all the coefficients by 2 to eliminate the fractional coefficient.
   $2\ CH_3OH + 3\ O_2 \rightarrow 2\ CO_2 + 4\ H_2O$

7. $CH_4S + 3\ O_2 \rightarrow CO_2 + 2\ H_2O + SO_2$
   (Assume that the presence of some other element such as sulfur will result in that element's dioxide.)

8. $2\ C_3H_7OH + 9\ O_2 \rightarrow 6\ CO_2 + 8\ H_2O$

9. $2\ C_4H_{10} + 13\ O_2 \rightarrow 8\ CO_2 + 10\ H_2O$

10. $2\ C_{10}H_{14}N_2 + 31\ O_2 \rightarrow 20\ CO_2 + 14\ H_2O + 4\ NO_2$
    (Assume that the presence of some other element, such as nitrogen will result in that element's dioxide.)

11. $2\ Ni + O_2 \rightarrow 2\ NiO$ *(Burning metals will result in an oxide of that metal.)*

12. $4\ Al + 3\ O_2 \rightarrow 2\ Al_2O_3$ *(Burning metals will result in an oxide of that metal.)*

13. a Carbon monoxide is a product of incomplete combustion. It shows up it the combustion is not working efficiently. Perhaps the burn temperature is too low, perhaps there is an inadequate supply of oxygen.

    b It would be far to difficult to balance without more information because you would have no way of knowing how to many C's end up as CO and how many C's end up as CO_2.